

ADDENDUM NO. 2

COUNTY OF ERIE
DEPARTMENT OF ENVIRONMENT AND PLANNING
ERIE COUNTY SEWER DISTRICT NO. 3
CONTRACT NO. 80
CENTRAL REGION COLLECTIONS FACILITY

All bidders must **fax** or **e-mail** this sheet to Erie County Department of Environment and Planning/Division of Sewerage Management (Attn: Beth Pfalzer), to fax no. 716-858-6257 or e-mail beth.pfalzer@erie.gov. By signing and dating this sheet bidders are stating that their company has received Addendum No. 2 to the Erie County Sewer District No. 3; Contract No. 80; Central Region Collections Facility.

Received: _____

By: _____

Phone: _____

Date: _____

Acknowledge receipt of this Addendum in the space provided on the Bid Form. Failure to do so may subject the Bidder to disqualification for award of the associated Contract.

This Addendum consists of 4 pages plus the attachments.

Owner

Department of Environmental & Planning
Division of Sewerage Management

Architects/Engineers

DiDonato Associates
Engineering and Architecture, PC
689 Main Street
Buffalo, New York 14203

Buffalo Engineering PC
4245 Union Road
Suite 204
Buffalo, New York 14225

This Addendum amends Drawings and/or Specifications (Project Manual) and/or Addenda for the above titled project, as indicated below, and is hereby incorporated into the Contract Documents as part thereof.

ADDENDUM NO 2

GENERAL:

1. Addendum Number 01 was incorrectly dated October 8, 2024. The correct date should read: Date of Addendum October 1, 2024
2. The Agenda and Sign In Sheet for the Pre Bid Meeting which took place on October 3, 2024 are attached to this addendum
3. The bid opening has been extended to October 24, 2024 at 11:00 am. Bid opening will take place at 95 Franklin Street, Room 1034, Buffalo NY 14202 at which time they will be publicly opened and read aloud in Room 1004.

RESPONSES TO SUBMITTED QUESTIONS:

1. On Page E-501, it mentions "Provide rack mounted UPS per specification." However, I couldn't locate the specification. Could you point me in the right direction?
Response: See specification section 266100 – Voice and Data Comm Cabling page #4 in Addendum #2
4. Regarding the fiber between the Existing Control Building and the new location, should it be Single Mode or Multi Mode? Also, what is the required distance?
Response: Provide OM-4 cable, see specification section 266100 – Voice and Data Comm Cabling pages 5 and 6 in Addendum #2.

5. For the IT/Demarc Location, I checked pages A402, A403, A404, and A601, but I didn't see any markings. Could you confirm where it's supposed to be?

Response: The data Rack is located Supervisor 117 per note #16 on drawing E-201.

6. Is there temporary power on site or do contractors need to provide generators?

Response: The existing building on the west side of the property that is to remain has power that contractors can use.

REGARDING THE PROJECT SPECIFICATIONS:

1. **REPLACE** from Specification Section 08 7100 – DOOR HARDWARE the following door hardware types (changes highlighted):

Hardware Set 02

Doors: 03 and 17 All hardware to meet fire rating of door and frame

1	Continuous Hinge	PEMKOHINGE Full Mortise	CL	MK
1	Panic Hardware	2114 x 4914A LBR	626W	PH
1	Top Strike	S300		PH
1	Surface Closer	HD7000 x DA x DS	626	BA
1	Kick Plate	K1050 10" high B4E CSK	US32D	RO

Hardware Set 07

Doors: 30, 31, 32 and 33 All hardware to meet fire rating of door and frame

3	Butt Hinge	TA2314	CL	MK
1	Cylinder Lockset	9K x 7 x D x 15D x STK	626	BA
3	Silencer	608		
1	Kick Plate	K1050 10" high B4E CSK	US32D	RO

Hardware Set 08

Door: 08 All hardware to meet fire rating of door and frame

1	Continuous Hinge	PEMKOHINGE Full Mortise	CL	MK
1	Panic Hardware	FL2114 x 4914A	626W	PH
1	Strike	S300		PH
1	Surface Closer	HD7000 x DA x DS	626	BA
1	Kick Plate	K1050 24" high B4E CSK	US32D	RO

2. **ADD** to the contract documents Specification Section 08 8000 – GLAZING the following glazing type:

D. Glass type E - Interior Glazing, Frosted laminated Glass with two plies of float glass; ASTM C1172, and complying with other requirements specified and with the following:

1. Interlayer: Polyvinyl butyral of .0030 inches thickness with a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after laminating glass lites and installation.

2. Laminating Process: Fabricate laminated glass to produce glass free of foreign substances and air or glass pockets.
3. Provide safety glazing label
3. **REMOVE** from Specification Section 08 7100 – DOOR HARDWARE part 2.03; E, 1
4. **REPLACE** Specification Section 13 3419 – METAL BUILDING SYSTEM with the attached Specification Section 13 3419 – METAL BUILDING SYSTEM. Revisions are shown in red.
5. **ADD** to the contract documents Specification Section 26 4313 – SURGE PROTECTION FLOR LOW-VOLTAGE ELECTRICAL POWER CIRCUITS
6. **ADD** to the contract documents Specification Section 26 5100 – LIGHTING
7. **ADD** to the contract documents Specification Section 26 6100 – VOICE AND DATA COMMUNICATION CABLING
8. **ADD** to the contract documents Specification Section 26 7200 – FIRE ALARM SYSTEMS
9. **ADD** to the contract documents Specification Section 32 1317 – PIPE BOLLARDS
10. **REPLACE** Specification Section 33 0134 – WASTE WATER TREATMENT SYSTEM with specification section 33 3000 – SANITARY SEWER
11. **REPLACE** Specification Section 33 1100 – SITE WATER UTILITY DISTRIBUTION PIPING with ECWA specification sections 01 731 – CONNECTION TO EXISTING FACILITIES, 02 316 – SELECT GRANULAR FILL, 02 351 – EXCAVATION BACKFILL TRENCHING, 02 900 – RESTORATION, 15 051 – BURIED PIPING INSTALLATION, 15 107 – COPPER PIPE, and 15 120 - PIPING ACCESSORIES

REGARDING THE PROJECT DRAWINGS:

1. **REPLACE** Drawing CP101 – SITE PLAN with drawing CP101 – SITE PLAN dated 10/7/24 – Addendum No. 2
2. **REPLACE** Drawing CP502 – MISCELLANEOUS DETAILS with drawing CP502 – MISCELLANEOUS DETAILS dated 10/7/24 – Addendum No. 2
3. **REPLACE** Drawing CP504 – MISCELLANEOUS DETAILS with drawing CP504 – MISCELLANEOUS DETAILS dated 10/7/24 – Addendum No. 2
4. **REPLACE** Drawing CP506 – MISCELLANEOUS DETAILS with drawing CP506 – MISCELLANEOUS DETAILS dated 10/7/24 – Addendum No. 2
5. **REPLACE** Drawing CU101 – UTILITY PLAN with drawing CU101 – UTILITY PLAN dated 10/7/24 – Addendum No. 2

6. **REVISE** on Sheet A-501 – WINDOW AND DOOR SCHEDULE the following door Types and Glazing to the following:

<u>Door Mark</u>	<u>Door Type</u>	<u>Glazing</u>
06	B	E
07	B	E

7. **REPLACE** Drawing A-310 – WALL SECTIONS with the attached drawing A-310 – WALL SECTIONS dated 10/07/24 – Addendum No. 2
8. **REPLACE** Drawing A-311 – WALL SECTIONS with the attached drawing A-311 – WALL SECTIONS dated 10/07/24 – Addendum No. 2
9. **REPLACE** Drawing A-315 – SECTION DETAILS with the attached drawing A-315 – SECTION DETAILS dated 10/07/24 – Addendum No. 2
10. **REPLACE** Drawing A-316 – SECTION DETAILS with the attached drawing A-316 – SECTION DETAILS dated 10/07/24 – Addendum No. 2

End of Addendum 2

PROJECT: Erie County Sewer District No 3
Central Region Collections Facility
Contract 80

LOCATION: 3595 Jeffery Blvd, Blasdell NY 14219

DATE / TIME: October 3rd 2024, 1:00 pm

MEETING: Pre-Bid Meeting



1. INTRODUCTIONS/KEY INFORMATION

- Owners: Erie County
 - Assistant Deputy Commissioner– Garry Pecak PE
 - Sr Sanitary Engineer – Angela Horton PE
- Architects and Engineers:
 - DiDonato Associates – General and Site
 - Mike Banks
 - Claire Birkemeier
 - Anthony Sperrazza
 - Buffalo Engineering – Mechanical/Electrical/Plumbing and Fire Protection
 - Brian Zintel
 - Jeff Griffith
 - Adam Aydelotte
- There is a sign in sheet at the entrance if you haven't already signed in.
- **Bid Opening – Tuesday October 17, 2024 at 11:00 A.M**
- **RFI's due by the end of the day on October 10 to issue final Addendum, on October 14**
- **Complete all proposal sheets for bid to be accepted, inclusive of attachments itemized in article 2.01 of the Bid Form.** Failure to do so may eliminate bid from consideration.
- **Plans can be downloaded from Erie County Website. Bidders must be registered plan holders**
- **This is prevailing wage rate job**

2. PROJECT OVERVIEW –

- **4 separate contracts, each contract has allowances**
- **General Construction Work**
 - New Construction: Fleet Garage, Offices
 - Site Development: Access Driveways, Utility Connections, Parking Lot, Site Storm Drainage and Site Grading.
- **Plumbing Construction Work**
 - Facility Water Distribution
 - Facility Sanitary Sewer Waste System to 5ft outside of exterior building face.
 - Facility Plumbing Fixtures and Controls
 - Facility Gas Service
 - Floor Drainage System, and Grease Separator
 - Fire Protection/sprinklers



- **Mechanical Construction Work**
 - Facility Gas Service connection to mechanical equipment
 - Facility HVAC Systems
 - Facility Diffusers, registers and Grills
- **Electrical Construction Work**
 - Facility Electrical Service, including
 - Facility Electrical Distribution
 - Facility Lighting Fixtures and Electrical Devices
 - Install and Connect New Emergency Generator.

3. PROJECT SCHEDULE/SEQUENCE

- Anticipated Notice to Proceed – March/April 2025
- The construction schedule is 286 days
- Each Prime Contractor shall provide a detailed construction schedule as per section 01 32 16
- Timely submittals are critical in the construction process to meet the completion date.

4. SITE COORDINATION

- Coordination with the Erie County and DiDonato is critical for any areas to be excavated
 - Contractor is responsible for Initial coordination with the County through DiDonato
 - Site Representative is anticipated to be on site

5. MINORITY CONTRACT GOALS

- Workforce - Projects at or over \$250,000.00 Executive Order No. 18 is a requirement:
 - 100% of workforce must be from New York State's 8 Western Counties
 - 70% of the workforce must be from County of Erie
 - 30% of the workforce must be from the identified zip codes and/or disadvantaged status (1. Area Medium Income; 2. Released from prison in last 10 years; 3. Participated in Temporary Assistance for Needy Families Program; 4. Participated in Supplemental Nutritional Assistance Program; and/or 5. Was unemployed for a least 12 consecutive months.) Based on the number of hours worked on the project.
- **Apprenticeship: Projects at or over \$250,000.00 must show 10% of their hours working with apprentices from the union halls or from a New York State certified apprenticeship program.**
Apprenticeship Paperwork needed:
 1. Certification of approval of the New York State Certified Apprenticeship Training Program.
 2. Equal employment and affirmative action plans.
 3. Demonstration that a minimum of ten percent (10%) of the workforce of the Prime Contractor (inclusive of the workforce utilized by any subcontractor) participates in a NYSCATP.
- **Source of Funds: Erie County:**
 - Erie County MWBE requirements per local laws 6-1987 and 5-2023 apply
 - Minority Business Enterprise (MBE) 10%
 - Women's Business Enterprise (WBE) 2%
 - Service-Disabled Veteran-Owned Business (SDVOB) 6%
- **All Other Workforce Goals:**
 1. County of Erie = 13.2% Minority and 6.9% Women.
 2. Executive Order No. 18 is identified above.
- **Payment Applications:**
 1. See specification sections for payment procedures
 2. Required to use LCP tracker
 - a. Contractor will be sent invitation once contracts are executed
 - b. Contractor to be responsible for inviting/ granting access to subcontractors once they are



signed up and connected with a project.

- **Note: If you have any questions regarding the above Please contact** Angela Horton PE, angela.horton@erie.gov on all questions. Questions regarding minority participation can be directed to Andrew McClaren, Andrew.mclaren@erie.gov

6. GENERAL DISCUSSION/QUESTIONS



PROJECT: Eric County Sewer District No 3
 Central Region Collections Facility
 Contract 80
LOCATION: 3595 Jeffery Blvd, Blasdell NY 14219
DATE / TIME: October 3rd 2024, 1:00 pm
MEETING: Pre Bid Meeting

NAME	REPRESENTING	TELEPHONE	EMAIL
Michael Banks	Didonato Associates	(716) 656-1900	mbanks@didonato.cc
Claire Birkemeier	Didonato Associates	(716) 656-1900	cbirkemeier@didonato.cc
Garry Pecak	Erie County	(716) 858-6267	garry.pecak@erie.gov
Angela Horton	Erie County		angela.horton@erie.gov
Jo Fellingner	DIR	716 345- 21745 7145	JFellingner@Cirelectric.com
DAN GEORGE	MANHATTAN SERVICES	716-572-5809	dgeorge@msheo.com
BILL MISCOURT	RESTAURANTS	716-986-6197	bill@restaurantos.com
Bill Apple	Stw Panfor th	716-832-1440	bapple@stwdanforth.com
<i>Craig Lombardi</i>	<i>H-K Services</i>	<i>716-583-2477</i>	<i>clombardi@h-k-services.com</i>
Stephery Dix	Hohl	716-523-4968	sdix@Hohlind.com
Dave Hojnacki	DSM	711-823-8188	dave.hojnacki@ent.gov
Bruce Mappella	CServices	716-241-7083	bruce@mappellaes.com

PART 1 - GENERAL

1.01 RELATED DOCUMENT

- A. The Contractor shall be held to have read all of the Bidding Requirements; all General Conditions and Supplementary General conditions, and all Divisions of the Technical Specifications before submitting a Bid Proposal for the work, and in the execution of the work, he will be bound by all of the conditions and requirements therein.

1.02 SUMMARY

- A. Furnish and install all labor, materials, equipment, and incidentals required to complete all work shown on the drawings and as specified herein.
- B. This Section includes the following:
 - 1. Structural steel framing system.
 - 2. Metal Roof panel systems.
 - 3. Metal Wall panels.
 - 4. **Metal Soffit Panels**
 - 5. **Interior Metal Liner Panels**
 - 6. Roof Insulation System
 - 7. **Wall Insulation System**
 - 8. **Framed Wind Screens**
 - 9. Building components, as follows:
 - a. Preparation and installation of roof and wall louvers, vents, curbs, and ventilators.
 - 10. Accessories and trim.
- C. Coordinate all work indicated in this section with all work included and specified elsewhere in the project. This includes, but not is limited to related items in the following Specification Sections:
 - 1. Section 03 3000 – Cast In Place Concrete.
 - 2. Section 05 1200 – Structural Steel Framing
 - 3. Section 05 2100 - Steel Joist Framing
 - 4. Section 05 5000 – Metal Fabrications
 - 5. Section 07 7100 – Roof Specialties

6. Section 07 9200 - Joint Sealants.
 7. Section 08 1113 – Hollow Metal Doors and Frames.
 8. Section 08 3613 – Sectional Overhead Doors.
 9. Section 09 9900 - Painting.
- D. Coordinate all work to be provided under other contracts in this project including, but not limited to the following:
1. All Electrical and Fire Alarm System work.
 2. All Plumbing system work.
 3. All HVAC system work.
 4. All Sprinkler and Fire Protection Work
- E. Coordinate all work to be performed with actual field and project conditions. At a minimum, Contractor is to perform the following tasks prior to submitting bids or shop drawings for the project:
1. Perform field investigations to determine all necessary incidental items which will be required for complete and proper installation of all work. Verify all items affecting the bid price prior to bidding.
 2. Perform all necessary field measurements.
 3. Organized and attend all necessary coordination meetings required to assure proper coordination meetings required to assure proper coordination and installation of all related work included in the project.

1.03 DEFINITIONS

- A. Bay Spacing: Dimension between main frames measured normal to frame (at centerline of frame) for interior bays, and dimension from centerline of first interior main frame measured perpendicular to end wall (outside face of end-wall girt).
- B. Building Length: Dimension of the building measured perpendicular to main framing from end wall to end wall (outside face of girt to outside face of girt).
- C. Building Width: Dimension of the building measured parallel to main framing from sidewall to sidewall (outside face of girt to outside face of girt).
- D. Clear Span: Distance between supports of beams, girders, or trusses (measured from lowest level of connecting area of a column and a rafter frame, or knee).
- E. Eave Height: Vertical dimension from finished floor to eave (the line along the sidewall formed by intersection of the planes of the roof and wall).

- F. Clear Height under Structure: Vertical dimension from finished floor to lowest point of any part of primary or secondary structure, not including crane supports, located within clear span.
- G. Terminology Standard: Refer to MBMA's "Low Rise Building Systems Manual" for definitions of terms for metal building system construction not otherwise defined in this Section or in referenced standards.

1.04 SYSTEM PERFORMANCE REQUIREMENTS

- A. General: Provide a complete, integrated set of mutually dependent components and assemblies that form a metal building system capable of withstanding structural and other loads, thermally induced movement, and exposure to weather without failure or infiltration of water into building interior. Include primary and secondary framing, roof and wall panels, and accessories complying with requirements indicated, including those in this Article.
- B. Metal Building System Design: Of size, spacing, slope, and spans indicated, and as follows:
 - 1. Primary Frame Type: Rigid Modular - Solid-member structural-framing system, single span.
 - 2. End-Wall Framing: Engineer end walls to be expandable. Provide primary frame, capable of supporting full-bay design loads, and end-wall columns.
 - 3. Secondary Frame Type: Manufacturer's standard rafters with exterior-framed (bypass) girts.
 - 4. Eave Height: Per Drawing.
 - 5. Bay Spacing: Per Drawing.
 - 6. Roof Slope at Main Building: Per Drawing
 - 7. Roof System: Manufacturer's MR-24 roof panel system with insulation.
 - 8. Exterior Wall System: Manufacturer's eShadowall system with 8" Fiberglass insulation.
- C. Structural Performance: Provide metal building systems capable of withstanding the effects of gravity loads and the following loads and stresses within limits and under conditions indicated:
 - 1. Engineer metal building systems according to procedures in the latest edition of the "Building Code of New York State" and MBMA's "Low Rise Building Systems Manual."

2. Design Loads: As indicated on the structural drawings.
 3. Live Loads: As indicated on the structural drawings.
 4. Building Occupancy: Less than 50.
 5. Roof Snow Loads: As indicated on the structural drawings.
 6. Wind Loads: As indicated on the structural drawings.
 7. Collateral Loads: Include additional dead loads other than the weight of metal building system for permanent items such as sprinklers, mechanical systems, electrical systems, and ceilings.
 8. Load Combinations: Design metal building systems to withstand the most critical effects of load factors and load combinations.
 9. Deflection Limits: Engineer assemblies to withstand design loads with deflections no greater than the following:
 - a. Purlins and Rafters: Vertical deflection of 1/240 of the span.
 - b. Girts: Horizontal deflection of 1/240 of the span.
 - c. Roof Panels: Vertical deflection 1/240 of the span.
 - d. Wall Panels: Horizontal deflection of 1/240 of the span.
 - e. Wall and Frame Drift Limit: H/120 for Metal Panels and H/500 for Masonry, Interior partitions and/or Spandrel Supported Curtain Walls.
 10. Design secondary framing system to accommodate deflection of primary building structure and construction tolerances, and to maintain clearances at openings.
- D. Seismic Performance: Design and engineer metal building systems capable of withstanding the effects of earthquake motions determined according to the building code in effect for this Project and as indicated on the drawings.
- E. Thermal Movements: Provide metal building roof and wall panel systems that allow for thermal movements resulting from the following maximum change (range) in ambient and surface temperatures by preventing buckling, opening of joints, overstressing of components, failure of joint sealants, failure of connections, and other detrimental effects. Base engineering calculation on surface temperatures of materials due to both solar heat gain and nighttime-sky heat loss. Temperature Change (Range) = 180 deg F, material surfaces.
- F. Thermal Performance: Provide metal building roof and wall assemblies with thermal-resistance values (R-value) as specified to comply the **NYSBC 2020** Energy Conservation Code.
- G. Air Infiltration for Roof Panels: Provide roof panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed roof

area when tested according to ASTM E 1680 at a static-air-pressure difference of 4 lbf/sq. ft..

- H. Air Infiltration for Wall Panels: Provide wall panel assemblies with permanent resistance to air leakage through assembly of not more than 0.09 cfm/sq. ft. of fixed wall area when tested according to ASTM E 283 at a static-air-pressure difference of 4 lbf/sq. ft..
- I. Water Penetration for Roof Panels: Provide roof panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 1646 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft..
- J. Water Penetration for Wall Panels: Provide wall panel assemblies with no water penetration as defined in the test method when tested according to ASTM E 331 at a minimum differential pressure of 20 percent of inward-acting, wind-load design pressure of not less than 6.24 lbf/sq. ft. and not more than 12 lbf/sq. ft..
- K. Wind-Uplift Resistance: Provide roof panel assemblies that meet requirements of UL 580 for Class 90 wind-uplift resistance.

1.05 SUBMITTALS

- A. Product Data: Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of the following metal building system components:
 - 1. Structural-framing system.
 - 2. Roof panels.
 - 3. Wall panels.
 - 4. Soffit Panels
 - 5. Interior Liner Panels
 - 6. Insulation.
 - 7. Vapor retarders.
 - 8. Trim and closures.
 - 9. Man Doors and Overhead Doors.
 - 10. Windows.
 - 11. Accessories.
- B. Shop Drawings: For the following metal building system components. Include plans, elevations, sections, details, and attachments to other Work.

1. For installed components indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
 2. Anchor-Bolt Plans: Include location, diameter, and projection of anchor bolts required to attach metal building to foundation. Indicate column reactions at each location. **Furnished and installed and coordinated by the General Contractor.**
 3. Structural-Framing Drawings: Show complete fabrication of primary and secondary framing. Indicate welds and bolted connections, distinguishing between shop and field applications. Include transverse cross-sections.
 4. Roof and Wall Panel Layout Drawings: Show layouts of panels on support framing, details of edge conditions, joints, panel profiles, corners, custom profiles, supports, anchorages, trim, flashings, closures, and special details. Distinguish between factory- and field-assembled work.
 5. Personnel Door Schedule: Provide schedule of doors, frames and hardware, using the same reference numbers as indicated on Drawings. Include details of reinforcement and installation requirements for finish hardware.
 6. Accessory Drawings: Include details for roof penetrations, wall penetrations and louvers, gutters and downspouts.
- C. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors available for each type of the following products with factory-applied color finishes:
1. Roof panels.
 2. Wall panels.
 3. **Soffit Panels**
 4. **Interior Liner Panel**
 5. Trim and closures.
 6. Accessories.
- D. Samples for Verification: For the following products, in manufacturer's standard sizes, showing the full range of color, texture, and pattern variations expected, in the profile and style indicated. Prepare Samples from the same material to be used for the Work.
1. Roof Panels: 12 inches long by actual panel width. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.
 2. Wall Panels: 12 inches long by actual panel width. Include clips, caps, battens, fasteners, closures, and other exposed panel accessories.
 3. Trim and Closures: 12 inches long. Include fasteners and other exposed accessories.

4. Insulation and Vapor Retarders: 6-inch-square samples.
 5. Accessories: 12-inch-long samples for each type of accessory.
- E. Product Certificates: Signed by manufacturers of metal building systems certifying that products furnished comply with requirements.
1. Letter of Design Certification: Signed and sealed by a qualified professional engineer. Include the following:
 - a. Name and location of Project.
 - b. Order number.
 - c. Name of manufacturer.
 - d. Name of Contractor.
 - e. Building dimensions, including width, length, height, and roof slope.
 - f. Indicate compliance with AISC standards for hot-rolled steel and AISI standards for cold-rolled steel, including edition dates of each standard.
 - g. Governing building code and year of edition.
 - h. Design Loads: Include dead load, roof live load, collateral loads, roof snow load, deflection, wind loads/speeds and exposure, seismic zone or effective peak velocity-related acceleration/peak acceleration, and auxiliary loads.
 - i. Load Combinations: Indicate that loads were applied acting simultaneously with concentrated loads, according to governing building code.
 - j. Building-Use Category: Indicate category of building use and its effect on load importance factors.
 - k. AISC Certification for Category MB: Include statement that metal building system and components were designed and produced in an AISC-Certified Facility by an AISC-Certified Manufacturer.
- F. Welding Certificates: Copies of certificates for welding procedures and personnel.
- G. Erector Certificates: Signed by manufacturer certifying that erectors comply with requirements.
- H. Manufacturer Certificates: Signed by manufacturers certifying that they comply with requirements. Include evidence of manufacturing experience.
- I. Qualification Data: For firms and persons specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

- J. Material Test Reports: From a qualified testing agency indicating and interpreting test results of steel for compliance with requirements indicated.
- K. Material Certificates and Product Test Reports: Signed by manufacturers certifying that the thermal insulation and vapor retarders complies with the fire and energy code requirements.
- L. Surveys: Show final elevations and locations of major members. Engage a qualified engineer or land surveyor to perform surveys and certify their accuracy. Indicate discrepancies between actual installation and the Contract Documents.
- M. Warranties: Special warranties specified in this Section.

1.06 QUALITY ASSURANCE

- A. Erector Qualifications: An experienced erector who has specialized in erecting and installing work similar in material, design, and extent to that indicated for this Project and who is acceptable to manufacturer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of metal building systems that are similar to those indicated for this Project in material, design, and extent.
- C. Manufacturer Qualifications: A firm experienced in manufacturing metal building systems similar to those indicated for this Project and with a record of successful in-service performance.
 - 1. Member of MBMA.
 - 2. IAS AC472 Certification for Category MB: An IAS-Certified Manufacturer that designs and produces metal building systems and components.
 - 3. Engineering Responsibility: Preparation of Shop Drawings, testing program development, test result interpretation, and comprehensive engineering analysis by a qualified professional engineer.
- D. Surveyor Qualifications: A land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing surveying services of the kind indicated.
- E. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated, as documented according to ASTM E 548.
- F. Source Limitations: Obtain each type of metal building system component through one source from a single manufacturer.

- G. Welding: Qualify procedures and personnel according to AWS D1.1, "Structural Welding Code--Steel"; and AWS D1.3, "Structural Welding Code--Sheet Steel."
- H. Regulatory Requirements: Fabricate and label structural framing to comply with special inspection requirements at point of fabrication for welding and other connections required by authorities having jurisdiction.
- I. Structural Steel: Comply with AISC S335, "Specification for Structural Steel Buildings--Allowable Stress Design, Plastic Design"; or AISC S342, "Load and Resistance Factor Design Specification for Structural Steel Buildings," for design requirements and allowable stresses.
- J. Cold-Formed Steel: Comply with AISI SG-671, "Specification for the Design of Cold-Formed Steel Structural Members," and AISI SG-911, "Load and Resistance Facet Design Specification for Steel Structural Members," for design requirements and allowable stresses.

1.07 DELIVERY, STORAGE, AND HANDLING

- A. Deliver components, sheets, panels, and other manufactured items so as not to be damaged or deformed. Package roof and wall panels for protection during transportation and handling.
- B. Handling: Unload, store, and erect roof and wall panels to prevent bending, warping, twisting, and surface damage.
- C. Stack materials on platforms or pallets, covered with tarpaulins or other suitable weathertight and ventilated covering. Store roof and wall panels to ensure dryness. Do not store panels in contact with other materials that might cause staining, denting, or other surface damage.
- D. Protect plastic insulation as follows:
 - 1. Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - 2. Protect against ignition at all times. Do not deliver plastic insulation materials to Project site before installation time.
 - 3. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.08 PROJECT CONDITIONS

- A. Weather Limitations: Proceed with installation only when weather conditions permit roof and wall panel installation to be performed according to manufacturer's written instructions and warranty requirements.
- B. Field Measurements: Verify metal building system foundations by field measurements before metal building fabrication and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
 - 1. Established Dimensions for Foundations: Where field measurements cannot be made without delaying the Work, establish foundation dimensions and proceed with fabricating structural framing without field measurements. Coordinate anchor-bolt installation to ensure that actual anchorage dimensions correspond to established dimensions.
 - 2. Established Dimensions for Panels: Where field measurements cannot be made without delaying the Work, either establish framing and opening dimensions and proceed with fabricating roof and wall panels without field measurements, or allow for field-trimming panels. Coordinate roof and wall construction to ensure that actual building dimensions, locations of structural members, and openings correspond to established dimensions.

1.09 COORDINATION

- A. Coordinate size and location of concrete foundations and casting of anchor-bolt inserts into foundation walls and footings. Concrete, reinforcement, and formwork requirements are specified in Division 3 Section "Cast-in-Place Concrete."
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations, which are specified in mechanical specifications

1.10 WARRANTY

- A. General Warranty: Special warranties specified in this Article shall not deprive Owner of other rights Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by Contractor under requirements of the Contract Documents.
- B. Special Warranty on Panels: Written warranty, executed by manufacturer agreeing to repair or replace roof and wall panels that fail in materials or workmanship within three years from date of Substantial Completion.
- C. Special Warranty on Panel Finishes: Written warranty, signed by manufacturer agreeing to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period. Deterioration of finish includes, but is not limited to, color fade, chalking, cracking, peeling, and loss of film integrity.

1. Warranty Period for Roof and Wall Panels: 20 years from date of Substantial Completion.

- D. Special Warranty (on both types of) Standing-Seam Roof Panel Weathertightness: Written warranty, signed by manufacturer agreeing to repair or replace standing-seam roof panel assemblies that fail to remain weathertight within specified warranty period.
 1. Warranty Period: 25 years from date of Substantial Completion, (Extended Life Endorsement Warranty).

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or approved equal:
 1. Basis of Design: Butler Manufacturing Company.
 2. Ceco Building Systems.
 3. **Varco Prudent**

2.02 STRUCTURAL-FRAMING MATERIALS

- A. Structural-Steel Shapes: ASTM A 36/A 36M or ASTM A 529/A 529M.

- B. Steel Plate, Bar, or Strip: ASTM A 529/A 529M, ASTM A 570/A 570M, or ASTM A 572/A 572M; 50,000-psi minimum yield strength.

- C. Steel Tubing or Pipe: ASTM A 500, Grade B; ASTM A 501; or ASTM A 53, Grade B.

- D. Structural-Steel Sheet: Hot-rolled, ASTM A 570/A 570M, Grade 50 or Grade 55; hot-rolled, ASTM 568/A 568M; or cold-rolled, ASTM A 611, structural-quality, matte (dull) finish.

- E. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, structural quality, Grade 50, with G60 (Z180) coating designation; mill phosphatized.

- F. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M and the following requirements:
 1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 2. Aluminum-Zinc Alloy-Coated Steel Sheet: ASTM A 792/A 792M, Class AZ50 coating, Grade 40 (Class AZ150 coating, Grade 275); structural quality.

- G. Non-High-Strength Bolts, Nuts, and Washers: ASTM A 307, Grade A (ASTM F 568M, Property Class 4.6); carbon-steel, hex-head bolts; carbon-steel nuts; and flat, unhardened steel washers.
1. Finish: Hot-dip zinc coating, ASTM A 153, Class C.
- H. High-Strength Bolts, Nuts, and Washers: ASTM A 325, Type 1, heavy hex steel structural bolts, heavy hex carbon-steel nuts, and hardened carbon-steel washers.
1. Finish: Plain, uncoated.
- I. Anchor Rods, Bolts, Nuts, and Washers: As follows:
1. Unheaded Rods: ASTM A 572/A 572M, Grade 50 (Grade 345).
 2. Headed Bolts: ASTM A 325 (ASTM A 325M), Type 1, heavy hex steel structural bolts and heavy hex carbon-steel nuts.
 3. Washers: ASTM A 36/A 36M.
- J. Primers: As selected by manufacturer for resistance to normal atmospheric corrosion, compatibility with finish paint systems, capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.

2.03 PANEL MATERIALS

- A. Metallic-Coated Steel Sheet Prepainted with Coil Coating: Steel sheet metallic coated by the hot-dip process and prepainted by the coil-coating process to comply with ASTM A 755/A 755M and the following requirements:
1. Zinc-Coated (Galvanized) Steel Sheet: ASTM A 653/A 653M, G90 (Z275) coating designation; structural quality.
 2. Surface: Smooth, flat, mill finish.
- B. Panel Sealants: Provide the following:
1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.
 2. Joint Sealant: ASTM C 920; one-part elastomeric polyurethane, polysulfide, or silicone-rubber sealant; of type, grade, class, and use classifications required to seal joints in panels and remain weathertight; and as recommended by metal building system manufacturer.

2.04 ROOF INSULATION SYSTEM

- A. Roof Insulation System: Butler Manufacturing™ “TBS™” roof insulation system.
- B. System Components:
1. Metal Roof System: Butler Manufacturing™ “MR-24®” metal roof system.

2. Roof Panel Supports:
 - a. Pre-assembled 5-inch high 'insulation bridge' members, with.
 - 1) 4-foot long by 2-1/2" wide bridge channel to support flat of roof panels
 - 2) 5-inch high zee clips fastened to bridge channel at 1'o.c.
 - a) factory punched 'tubulated holes' provide for roof clip attachment
 - b) provide space for various thicknesses of insulation
 - 3) Attach insulation bridges to roof purlins with scrubolt™ fasteners.
 3. Insulation:
 - a. Faced Bottom Layer of Blanket Insulation
 - 1) Insulation facing
- C. Roof Facing: WMP-50.
1. 0.0015-inch-thick, UV-stabilized, white polypropylene film laminated to 30-pound Kraft paper/metalized polyester, reinforced with glass-fiber and polyester scrim.
 2. Adhere facing to Owens-Corning Fiberglas "Certified R", NAIMA 202, fiberglass blanket.
 3. Assembly of Insulation Blanket and Facing:
 - a. Flame Spread Rating: Less than 25.
 - b. UL Label: Submit as specified in Submittals article of this section.
 - c. U-Factor: These values were determined through certified guarded Hot Box testing. $R\text{-value} = 1/U\text{-factor}$.
 - d. Thermal space block: required
 - e. Faced Lower Layer (s): R-19
 - f. Unfaced Upper layer: R-30
 - g. U-factor: 0.029
 - h. Effective R-Value = $1/U$ or 34.4
 - i. Insulation R-Value: These values were suppliers' published R-values of actual insulation materials used in hot box testing.
- D. Fasteners:
1. Roof Supports (Insulation Bridges): Install with scrubolt™ fasteners for attachment
 2. Roof Attachment Fasteners: As specified under Roof System in this specification section.
- E. Provision for Expansion and Contraction:
1. Provision for Thermal Expansion and Contraction Movement: Accomplish in roof system.
 2. As specified under Roof System in this specification section.
- F. Performance Testing: As specified under Roof System in this specification section.

2.05 MISCELLANEOUS MATERIALS

- A. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.
- B. Nonmetallic, Shrinkage-Resistant Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage

compensating agents, plasticizing and water-reducing agents, complying with ASTM C 1107, of consistency suitable for application, and with a 30-minute working time.

- C. Shop Primer for Galvanized Metal Surfaces: Zinc dust, zinc-oxide primer selected by manufacturer for compatibility with substrate. Comply with FS TT-P-641.
- D. Finish Painting: Refer to Division 9 Section "Painting."

2.06 FABRICATION, GENERAL

- A. General: Design components and field connections required for erection to permit easy assembly and disassembly.
 - 1. Fabricate components in a manner that once assembled in the shop, they may be disassembled, repackaged, and reassembled in the field.
 - 2. Mark each piece and part of the assembly to correspond with previously prepared erection drawings, diagrams, and instruction manuals.
 - 3. Fabricate framing to produce clean, smooth cuts and bends. Punch holes of proper size, shape, and location. Cold-formed members shall be free of cracks, tears, and ruptures.
- B. Primary Framing: Shop-fabricate framing components to indicated size and section with baseplates, bearing plates, stiffeners, and other items required for erection welded into place. Cut, form, punch, drill, and weld framing for bolted field assembly.
 - 1. Make shop connections by welding or by using high-strength bolts.
 - 2. Join flanges to webs of built-up members by a continuous submerged arc-welding process.
 - 3. Brace compression flange of primary framing by angles connected between frame web and purlin or girt web, so flange compressive strength is within allowable limits for any combination of loadings.
 - 4. Weld clips to frames for attaching secondary framing members.
 - 5. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime primary structural members with specified primer after fabrication.
- C. Secondary Framing: Shop-fabricate framing components to indicated size and section by roll-forming or break-forming, with baseplates, bearing plates, stiffeners, and other plates required for erection welded into place. Cut, form, punch, drill, and weld secondary framing for bolted field connections to primary framing.
 - 1. Make shop connections by welding or by using non-high-strength bolts.
 - 2. Shop Priming: Prepare surfaces for shop priming according to SSPC-SP 2. Shop prime secondary structural members with specified primer after fabrication.
- D. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply the specified air-dried primer immediately after cleaning and pretreating.
 - 1. Prime primary, secondary, and end-wall steel framing members with specified

primer to a minimum dry film thickness of 1 mil.

- a. Prime secondary steel framing formed from metallic-coated steel sheet with red-oxide polyester paint, with a minimum dry film thickness of 0.5 mil on each side.
 2. Prime galvanized members, after phosphoric acid pretreatment, with manufacturer's standard zinc dust, zinc-oxide primer.
- E. Tolerances: Comply with MBMA's "Low Rise Building Systems Manual": Chapter IV, Section 9, "Fabrication and Erection Tolerances."

2.07 STRUCTURAL FRAMING

- A. Primary Framing: Manufacturer's standard structural primary framing system, designed to withstand required loads and specified requirements. Primary framing includes transverse and lean-to frames; rafter, rake, and canopy beams; sidewall, intermediate, end-wall, and corner columns; and wind bracing.
1. General: Provide frames with attachment plates, bearing plates, and splice members. Factory drill for field-bolted assembly. Provide frame span and spacing indicated.
 - a. Slight variations in span and spacing may be acceptable if necessary to meet manufacturer's standard, as approved by Architect.
 2. Rigid Modular Frames: I-shaped frame sections fabricated from shop-welded, built-up steel plates or structural-steel shapes. Provide interior columns fabricated from round steel pipe or tube, or shop-welded, built-up steel plates. Recess all base plates below finish slab as per the Structural Drawings.
 3. Frame Configuration:
 - a. Single Gable
 4. Exterior Column Type:
 - a. Tapered
 5. Rafter Type:
 - a. Tapered
- B. End-Wall Framing: Manufacturer's standard primary end-wall framing fabricated for field-bolted assembly to comply with the following:
1. End-Wall and Corner Columns: I-shaped sections fabricated from structural-steel shapes; shop-welded, built-up steel plates; or C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0747 inch.
 2. End-Wall Rafters: C-shaped, cold-formed, structural-steel sheet; with minimum thickness of 0.0598 inch.
 3. Recess all endwall frames below finish slab as indicated in the structural drawings.
- C. Secondary Framing: Manufacturer's standard secondary framing members, including purlins, girts, eave struts, flange bracing, base members, gable angles, clips, headers,

jamb, and other miscellaneous structural members. Fabricate framing from cold-formed, structural-steel sheet or roll-formed, metallic-coated steel sheet pre painted with coil coating, unless otherwise indicated, to comply with the following:

1. Purlins: C- or Z-shaped sections; fabricated from minimum 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes; minimum 2-1/2-inch-wide flanges, and 8-1/2" inches (minimum) depth.
2. Girts: C- or Z-shaped sections; fabricated from minimum 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes. Form ends of Z-sections with stiffening lips angled 45 to 50 degrees to flange and with minimum 2-1/2-inch-wide flanges, and 8-1/2 inches depth.
3. Eave Struts: Unequal-flange, C-shaped sections; fabricated from 0.0598-inch-thick steel sheet, built-up steel plates, or structural-steel shapes; to provide adequate backup for both roof and wall panels.
4. Flange and Sag Bracing: Minimum 1-5/8-by-1-5/8-inch structural-steel angles, with a minimum thickness of 0.0598 inch, to stiffen primary frame flanges.
5. Base or Sill Angles: Minimum 3-by-2-by-0.0747-inch zinc-coated (galvanized) steel sheet.
6. Purlin and Girt Clips: Minimum 0.0747-inch-thick, zinc-coated (galvanized) steel sheet.
7. Secondary End-Wall Framing: Manufacturer's standard sections fabricated from minimum 0.0747-inch-thick, zinc-coated (galvanized) steel sheet.
8. Framing for Openings: Channel shapes; fabricated from minimum 0.0598-inch-thick, cold-formed, structural-steel sheet or structural-steel shapes. Frame head and jamb of door openings, and head, jamb, and sill of other openings.
9. Miscellaneous Structural Members: Manufacturer's standard sections fabricated from cold-formed, structural-steel sheet; built-up steel plates; or zinc-coated (galvanized) steel sheet; designed to withstand required loads.

D. Bracing: Provide adjustable wind bracing as follows:

1. Rods: ASTM A 36/A 36M; ASTM A 572/A 572M, Grade D; or ASTM A 529/A 529M, Grade 50; 1/2-inch-diameter steel; threaded full length or threaded a minimum of 12 inches at each end.
2. Angles: Fabricated from structural-steel shapes to match primary framing, of size required to withstand design loads.
3. Rigid Portal Frames: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
4. Fixed-Base Columns: Fabricate from shop-welded, built-up steel plates or structural-steel shapes to match primary framing; of size required to withstand design loads.
5. Diaphragm Action of Panels: Design metal building to resist wind forces through diaphragm action of roof and wall panels.

6. Bracing: Provide wind bracing using any method specified above, at manufacturer's option.
- E. Bolts: Provide shop-painted bolts unless structural-framing components are in direct contact with roof and wall panels. Provide zinc-plated bolts when structural-framing components are in direct contact with roof and wall panels.

2.08 METAL ROOF SYSTEM

- A. Metal Roof System: Butler Manufacturing "MR-24[®]" roof system.
- B. Roof System Design:
 1. Design roof panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 2. Design roof paneling system for a minimum roof slope of 1/4 inch in 12 inches.
 3. Design roof paneling system to support design live, snow, and wind loads.
 4. Endwall Trim and Roof Transition Flashings: Allow roof panels to move relative to wall panels and/or parapets as roof expands and contracts with temperature changes.
- C. Roof System Performance Testing:
 1. UL Wind Uplift Classification Rating, UL 580: Class 90.
 2. Structural Performance Under Uniform Static Air Pressure Difference: Test roof system in accordance with ASTM E 1592.
 3. Roof system has been tested in accordance with U.S. Army Corps of Engineers Unified Facilities Guide Specification Section 07 61 13.
 4. FM Global (Factory Mutual):
 - a. Roof system has been tested in accordance with FMRC Standard 4471 and approved as a Class 1 Panel Roof.
 - b. Metal Building System Manufacturer: Provide specific assemblies to meet required wind rating in accordance with FM Global.
 - c. Installation modifications or substitutions can invalidate FM Global approval.
- D. Roof Panels:
 1. Factory roll-formed, 24 inches wide, with 2 major corrugations, 2 inches high (2-3/4 inches including seam), 24 inches on center.
 2. Flat of the Panel: Cross flutes 6 inches on center, perpendicular to major corrugations in entire length of panel to reduce wind noise.
 3. Variable Width Panels:
 - a. For roof lengths not evenly divisible by the 2'-0" panel width, factory-manufactured variable-width (9-inch, 12-inch, 15-inch, 18-inch, and 21-inch-wide) panels shall be used to ensure modular, weathertight roof installation.
 - b. Minimum Length: 15 feet.
 - c. Supply maximum possible panel lengths.
 4. Panel Material and Finish:
 - a. 24-gauge steel coated both sides with layer of acrylic-coated Galvalume aluminum-zinc alloy (approximately 55 percent aluminum, 45 percent zinc) applied by continuous hot-dip method.

- b. Minimum 0.55-ounce coated weight per square foot as determined by triple-spot test, ASTM A 792.
 - c. Apply clear acrylic film for additional protection.
 5. Use panels of maximum possible lengths to minimize end laps.
 6. Extend eave panels beyond structural line of sidewalls.
 7. Factory punch panels at panel end to match factory-punched holes in eave structural member.
 8. Panel End Splices: Factory punched and factory notched.
 9. Panel End Laps: Locate directly over, but not fastened to, a supporting secondary roof structural member and be staggered, to avoid 4-panel lap-splice condition.
 10. End Laps: Floating. Allows roof panels to expand and contract with roof panel temperature changes.
 11. Self-Drilling Fasteners: Not permitted.
 12. Ridge Assembly:
 - a. Design ridge assembly to allow roof panels to move lengthwise with expansion and contraction as roof panel temperature changes.
 - b. Factory punch parts for correct field assembly.
 - c. Install panel closures and interior reinforcing straps to seal panel ends at ridge.
 - d. Do not expose attachment fasteners on weather side.
 - e. Use lock seam plug to seal lock seam portion of panel.
 - f. High-Tensile Steel Ridge Cover: Span from panel closure to panel closure and flex as roof system expands and contracts.
- E. Provision for Expansion and Contraction:
 1. Provision for Thermal Expansion Movement of Roof Panels: Clips with movable tab.
 - a. Stainless Steel Tabs: Factory centered on roof clip when installed to ensure full movement in either direction.
 - b. Maximum Force of 8 Pounds: Required to initiate tab movement.
 - c. Each Clip: Accommodates a minimum of 1.25-inch movement in either direction.
 2. Roof: Provide for thermal expansion and contraction without detrimental effects on roof panels, with plus or minus 100-degree F temperature difference between interior structural framework of building and of roof panels.
- F. Fasteners:
 1. Make connections of roof panels to structural members, except at eaves, with clips with movable stainless steel tabs, seamed into standing seam side lap.
 2. Fasten panel clips to structural members with "Scrubolt™" fasteners in accordance with erection drawings furnished by metal building system manufacturer, using factory-punched holes in structural members.
 - a. Fasteners: Metal-backed rubber washer to serve as torque indicator.
 3. Exposed fasteners penetrating metal roof membrane at the following locations do not exceed the frequency listed:
 - a. Basic Panel System: 0 per square foot.
 - b. High Eave Trim, No Parapet: 2 per linear foot.
 - c. Exterior Eave Gutter: 2 per linear foot.
 - d. Panel Splices: 2 per linear foot.

- e. Gable Trim: 0 per linear foot.
- f. High Eave with Parapet: 0 per linear foot.
- g. Ridge: 0 per linear foot.
- h. Low Eave Structural: 1.5 per linear foot.

G. Accessories:

- 1. Accessories (i.e., roof curbs, skylights, gutters, overhangs): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
- 2. Exterior Metal Coating on Gutters, Downspouts, Gable Trim, and Eave Trim: "Butler-Cote™" finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
- 3. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.
- 4. Material used in flashing and transition parts and furnished as standard by metal building system manufacturer may or may not match roof panel material.
 - a. Parts: Compatible and not cause corrosive condition.
 - b. Copper and Lead Materials: Do not use with Galvalume panels.

2.09 METAL WALL SYSTEM

- A. Exterior Metal Wall System: Butler Manufacturing™ "eShadowall™" wall system.
- B. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
- C. Wall Panels:
 - 1. Roll-formed panels, 3 feet wide with 4 major corrugations, 1-7/16 inches high, 12 inches on center, with 2 minor corrugations between each of the major corrugations entire length of panel.
 - 2. One piece from base to building eave.
 - 3. Each Panel Corrugation: Fastener alignment groove to center fastener within corrugation.
 - 4. Exposed Panel Side Laps: Hemmed to eliminate raw cut panel edge.
 - 5. Factory punch or field drill or self-drillers for wall panels at panel ends and match factory-punched or field-drilled holes in structural members for proper alignment.
 - 6. Panel Material and Finish:
 - a. 26-gauge painted Galvalume aluminum-zinc alloy (approximately 55 percent aluminum, 45 percent zinc), ASTM A 792.
 - b. Paint with exterior colors of "Butler-Cote™" finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
 - c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
 - 1) Not to peel, crack, or chip.
 - 2) Chalking: Not to exceed ASTM D 4214, #8 rating.
 - 3) Fading: Not more than 5 color-difference units, ASTM D 2244.
- D. Fasteners:

1. Wall Panel-to-Structural Connections: Torx-head "Scrubolt™" or Torx-head self-drilling screws.
 2. Wall Panel-to-Panel Connections: Torx-head self-drilling screws.
 3. Fastener Locations: Indicated on erection drawings furnished by metal building system manufacturer.
 4. Exposed Fasteners: Factory painted to match wall color.
- E. Accessories:
1. Accessories (i.e., doors, windows, louvers): Standard with metal building system manufacturer, unless otherwise noted and furnished as specified.
 2. Location of Standard Accessories: Indicated on erection drawings furnished by metal building system manufacturer.
- F. Energy Conservation:
1. Insulate with foam blocking secondary girt structurals to eliminate "thermal short circuits" between structurals and wall panels.
 2. Minimize heat loss (thermal short circuit) caused by compression of blanket insulation between structural members and wall panels by use of thermal block at each structural location.

2.10 FASCIA AND SOFFIT PANELS

- A. Fascia Panels: Manufacturer's standard panels complying with the following:
1. Match roof panel profile and material.
- B. Soffit Panels: Manufacturer's standard panels complying with the following:
1. Flat Panels: Fabricate from 50-ksi steel sheets, factory formed to provide flat panel with 16-inch coverage. Panel shall be 1 inch deep. Design side laps for mechanical attachment to structure by interlocking panel edges and securing panels with concealed fasteners. Factory apply sealant at each interlocking joint. Comply with the following:
 - a. Material: Zinc-coated (galvanized) steel.
 - b. Metal Thickness: 0.0299 inch.
- C. Finishes: Finish panel surfaces to match adjacent panels as follows:
1. Fascia Panels: Match finish and color of roof panels.
 2. Soffit Panels: Match finish and color of roof panels.

2.11 INTERIOR METAL LINER PANEL WALL SYSTEM

- A. INTERIOR Metal Liner Panel Wall System: Butler Manufacturing™ "Butlerib® II" wall system.
1. Wall System Design: Design wall panels in accordance with AISI North American Specification for the Design of Cold-Formed Steel Structural Members.
 2. Wall Panels:

1. Roll-formed panels, 3 feet wide with 4 major corrugations, 1-1/2 inches high, 12 inches on center, with 2 minor corrugations between each of the major corrugations entire length of panel.
2. One piece from base to building eave.
3. Panel Material and Finish:
 - a. 26-gauge painted Galvalume aluminum-zinc alloy (approximately 55 percent aluminum, 45 percent zinc), ASTM A 792.
 - b. Paint with exterior colors of "Butler-Cote™" finish system, full-strength, 70 percent "Kynar 500" or "Hylar 5000" fluoropolymer (PVDF) coating.
 - c. PVDF Coating Warranty: Metal building system manufacturer shall warrant coating for 25 years for the following.
 - 1) Not to peel, crack, or chip.
 - 2) Chalking: Not to exceed ASTM D 4214, #8 rating.
 - 3) Fading: Not more than 5 color-difference units, ASTM D 2244.
4. Fasteners:
5. Wall Panel-to-Structural Connections: Torx-head self-drilling screws.
6. Wall Panel-to-Panel Connections: Torx-head self-drilling screws.
7. Fastener Locations: Indicated on erection drawings furnished by metal building system manufacturer.
8. Exposed Fasteners: Factory painted to match standard wall color selection.
 - a. Perm Rating: 0.02.

2.12 ACCESSORIES

- A. General: Provide accessories as standard with metal building system manufacturer, and complying with the following:
 1. Provide sheet metal accessories of same material and in same finish as roof and wall panels, unless otherwise indicated.
- B. Fasteners: Self-tapping screws, bolts, nuts, self-locking rivets and bolts, end-welded studs, and other suitable fasteners designed to withstand design loads. Provide fasteners with heads matching color of roof or wall sheets by means of plastic caps or factory-applied coating. Comply with the following:
 1. Fasteners for Roof Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with a stainless-steel cap or zinc-aluminum-alloy head and EPDM or neoprene sealing washer.
 2. Fasteners for Wall Panels: Self-drilling or self-tapping, zinc-plated, hex-head carbon-steel screws, with nylon or polypropylene washer.
 3. Fasteners for Roof and Wall Panels: Self-drilling or self-tapping 410 stainless or zinc-alloy steel hex washer head, with EPDM or PVC washer under heads of fasteners bearing on weather side of panels.
 4. Fasteners for Flashing and Trim: Blind fasteners or self-drilling screws with hex washer head.
 5. Blind Fasteners: High-strength aluminum or stainless-steel rivets.

- C. Flashing and Trim: Form from 0.0179-inch-thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet prepainted with coil coating. Provide flashing and trim as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent roof or wall panels.
1. Opening Trim: Minimum 0.028-inch-thick steel sheet. Trim head and jamb of door openings, and head, jamb, and sill of other openings.
- D. Gutters: Form from 0.0179-inch-thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre painted with coil coating. Match profile of gable trim, complete with end pieces, outlet tubes, and other special pieces as required. Fabricate in minimum 96-inch-long sections, sized according to SMACNA's "Architectural Sheet Metal Manual." Furnish gutter supports spaced 36 inches o.c., fabricated from same metal as gutters. Provide stainless steel wire ball strainers at outlets. Finish gutters to match roof fascia and rake trim.
- E. Downspouts: Form from 0.0179-inch-thick, zinc-coated (galvanized) steel sheet or aluminum-zinc alloy-coated steel sheet pre painted with coil coating; in 10-foot-long sections, complete with formed elbows and offsets. Finish downspouts to match wall panels.
- F. Louvers: Refer to Mechanical Specifications.
- G. Roof Curbs: Refer to Mechanical Specifications.
- H. Closures: Closed-cell, laminated polyethylene; minimum 1-inch-thick, flexible closure strips; cut or premolded to match roof and wall panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.
- I. Pipe Flashing: Premolded, EPDM pipe collar with flexible aluminum ring bonded to base.

2.12 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Appearance of Finished Work: Variations in appearance of abutting or adjacent pieces are acceptable if they are within one-half of the range of approved Samples. Noticeable variations in the same piece are not acceptable. Variations in appearance of other components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.13 SOURCE QUALITY CONTROL

- A. Employ an independent testing agency to perform source quality-control testing and special inspections, and to prepare test reports.
Testing agency will conduct and interpret tests and state in each report whether test specimens comply with or deviate from requirements.
 - 1. Allow testing agency access to places where structural framing is being fabricated or produced. Cooperate with testing agency and provide samples of materials as may be requested for additional testing and evaluation.
 - 2. Special inspections will not be required when fabrication is performed by a fabricator registered and approved by authorities having jurisdiction to perform such work without special inspection.
- B. Correct deficiencies in or remove and replace structural framing that inspections and test reports indicate do not comply with requirements.
- C. Additional testing, at Contractor's expense, will be performed to determine compliance of corrected Work with requirements.
- D. Shop-bolted connections will be tested and inspected according to RCSC's "Allowable Stress Design Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. In addition to visual inspection, shop welding will be inspected and tested according to AWS D1.1 and the inspection procedures listed below, at testing agency's option:
 - 1. Magnetic-Particle Inspection: ASTM E 709, performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - 2. Radiographic Inspection: ASTM E 94 and ASTM E 142, minimum quality level 2-2T.
 - 3. Ultrasonic Inspection: ASTM E 164.
- F. Testing agency will report test results promptly and in writing to Contractor and Engineer.
- G. Material used in flashing and transition parts and furnished as standard by Butler Manufacturing Company may or may not match the roof panel material. Parts shall be compatible and shall not cause a corrosive condition. Copper and lead material shall not be used with GALVALUME or optional aluminum coated panels.

2.14 ACCESSORIES

- A. Snow Retention System
 - 1. Refer to 07 7200 Roof accessories.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Examine substrates, with Erector present, for compliance with requirements for installation tolerances and other conditions affecting performance of metal building system.
 - 1. For the record, prepare written report, endorsed by Erector, listing conditions detrimental to performance of work.
 - 2. Proceed with erection only after unsatisfactory conditions have been corrected.
- B. Before erection proceeds, survey elevations and locations of concrete and masonry bearing surfaces, baseplates, and anchor bolts to receive structural framing. Verify compliance with requirements and metal building system manufacturer's tolerances.
 - 1. Engage land surveyor to perform surveying.

3.02 PREPARATION

- A. Clean substrates of substances, including oil, grease, rolling compounds, incompatible primers, and loose mill scale, that impair bond of erection materials.
- B. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified.

3.03 ERECTION

- A. Erect metal building system according to manufacturer's written instructions and erection drawings.
- B. Do not field cut, drill, or alter structural members without written approval from metal building system manufacturer's professional engineer.
- C. Set structural framing in locations and to elevations indicated and according to AISC specifications referenced in this Section. Maintain structural stability of frame during erection.
- D. Baseplates and Bearing Plates: Clean concrete and masonry bearing surfaces of bond reducing materials and roughen surfaces before setting baseplates and bearing plates. Clean bottom surface of baseplates and bearing plates.
 - 1. Set baseplates and bearing plates for structural members on wedges, shims, or settings nuts.
 - 2. Tighten anchor bolts after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of baseplate or bearing plate before packing with grout.
 - 3. Pack grout solidly between bearing surfaces and plates so no voids remain. Finish exposed surfaces, protect installed materials, and allow to cure.
 - a. Comply with manufacturer's written instructions for proprietary grout materials.

- E. Align and adjust framing members before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact. Make adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Establish required leveling and plumbing measurements on mean operating temperature of structure. Make allowances for difference between temperature at time of erection and mean temperature at which structure will be when completed and in service.

- F. Primary Framing and End Walls: Erect framing true to line, level, plumb, rigid, and secure. Level baseplates to a true even plane with full bearing to supporting structures, set with double-nutted anchor bolts. Use grout to obtain uniform bearing and to maintain a level base-line elevation. Moist cure grout for not less than seven days after placement. Make field connections using high-strength bolts. Tighten bolts by turn-of-the-nut method.

- G. Secondary Framing: Erect framing true to line, level, plumb, rigid, and secure. Fasten secondary framing to primary framing using clips with field connections using non-high-strength bolts. Hold rigidly to a straight line by sag rods.
 - 1. Provide rake or gable purlins with tight-fitting closure channels and fasciae.
 - 2. Locate and space wall girts to suit door and window arrangements and heights.
 - 3. Locate canopy framing as indicated.
 - 4. Provide supplemental framing at entire perimeter of openings, including doors, windows, louvers, ventilators, and other penetrations of roof and walls.

- H. Bracing: Install bracing in roof and sidewalls where indicated on erection drawings.
 - 1. Tighten rod and cable bracing to avoid sag.
 - 2. Locate interior end bay bracing only where indicated.

- I. Framing for Openings: Provide shapes of proper design and size to reinforce openings and to carry loads and vibrations imposed, including equipment furnished under mechanical and electrical work. Securely attach to building structural frame.

3.04 METAL ROOF PANEL INSTALLATION

- A. General: Provide roof panels of full length from eave to ridge when possible. Install panels perpendicular to purlins.
 - 1. Field cutting by torch is not permitted.
 - 2. Rigidly fasten eave end of roof panels and allow ridge end free movement due to thermal expansion and contraction. Pre-drill panels.
 - 3. Provide weather seal under ridge cap.
 - 4. Flash and seal roof panels with weather closures at eaves, rakes, and at perimeter of all openings. Fasten with self-tapping screws.

5. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 6. Use aluminum or stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.
 7. Locate and space fastenings in true vertical and horizontal alignment.
 8. Install ridge caps as roof panel work proceeds.
 9. Locate panel splices over, but not attached to, structural supports. Stagger panel splices to avoid a four-panel lap splice condition.
- B. Standing-Seam Roof Panels: Fasten roof panels to purlins with concealed clips at each standing-seam joint. Install clips over top of insulation at location and spacing determined by manufacturer.
1. Panel clips shall be positioned by matching the hole in the clip with the prepunched holes in the secondary structural members.
 2. Panel shall be positioned and properly aligned by matching the prepunched holes in the panel end with the prepunched holes in the eave structural member and by aligning the panel with the panel clip.
 3. Panel side lap shall be field-seamed by a self-propelled and portable electrical lock-seaming machine. The machine field forms the final 180 degrees of a 360-degree Pittsburgh double-lock standing seam; all side lap sealant shall be factory applied.
 4. Panel endlap, when required, shall be at least 6", sealed with Butler sealant and fastened together by clamping plates. Sealant shall contain hard nylon beads, which prevent it from flowing out due to clamping actions. The panel lap shall be joined by means of a two-piece clamped connection consisting of a bottom reinforcing plate and a top panel strap. The panel endlap shall be located directly over, but not fastened to, a supporting secondary roof structural member and be staggered, so as to avoid a four-panel lap splice condition.
 2. Include nine inches (9") of Certified "R" fiberglass NAIMA roof insulation for this project.
- C. Fasteners
1. Connection of MR-24 roof system panel-to-structural member, except at eave, shall be made with clips with movable stainless steel tabs that are seamed into the standing seam side lap.
 2. Panel clip shall be fastened to structural member with Scrubolt™ fastener as per manufacturer's erection drawings, using factory-prepunched hole in structural member.
 - a. Scrubolt fastener shall contain a metal backed rubber washer, which serves as a torque indicator.
 3. MR-24 roof system panel-to-panel connection shall be made with a positive, field-formed standing double-lock seam, formed by a special seaming machine. The machine field forms the final 180 degrees of a 360-degree Pittsburgh double-lock

standing seam; all side lap sealant shall be factory applied.

4. Fasteners penetrating the metal membrane at the following locations shall not exceed the frequency listed:
 - a. Fastening System Frequency
 - b. Basic Panel System 0 per sq. ft.
 - c. Exterior Eave Gutter 2 per lineal ft. Gable Trim (no parapet) 2 per lineal ft.
Ridge 1 per lineal ft.
 - d. High Eave (no parapet) 2 per lineal ft. Panel Splices 2 per lineal ft.

3.05 METAL WALL PANEL INSTALLATION

- A. General: Provide panels full height of building when possible. Install panels perpendicular to girts.
 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted sheets one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 2. Unless otherwise indicated, begin panel installation at corners with center of rib lined up with line of framing.
 3. Field cutting by torch is not permitted.
 4. Align bottom of wall panels and fasten with blind rivets, bolts, or self-tapping screws.
 5. Fasten flashing and trim around openings and similar elements with self-tapping screws.
 6. When two rows of panels are required, lap panels 4 inches minimum. Locate panel splices over structural supports.
 7. When building height requires two rows of panels at gable ends, align lap of gable panels over wall panels at eave height.
 8. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 9. Provide weather-resistant escutcheons for pipe and conduit penetrating exterior walls.
 10. Flash and seal wall panels with weather closures under eaves and rakes, along lower panel edges, and at perimeter of all openings.
 11. Apply elastomeric sealant continuously between metal base channel (sill angle) and concrete, and elsewhere as necessary for waterproofing. Handle and apply sealant and backup according to sealant manufacturer's written instructions.
 12. Use stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.
 13. Locate and space fastenings in true vertical and horizontal alignment.

- B. Field-Assembled, Insulated Panels: Install wall panels on exterior side of girts. Attach panels to supports with fasteners as recommended by manufacturer. Install insulation as specified below, and cover with liner panels.
- C. Uninsulated Panels: Install wall panels on exterior side of girts. Attach panels to supports with fasteners as recommended by manufacturer.

3.06 FASCIA AND SOFFIT PANEL INSTALLATION

- A. General: Provide panels full width of fasciae and soffits. Install panels perpendicular to support framing.
 - 1. Arrange and nest side-lap joints so prevailing winds blow over, not into, lapped joints. Install panels with vertical edges plumb. Lap ribbed or fluted panels one full rib corrugation. Apply panels and associated items for neat and weathertight enclosure. Avoid "panel creep" or application not true to line.
 - 2. Field cutting by torch is not permitted.
 - 3. Fasten flashing and trim around openings and similar elements with self-tapping screws.
 - 4. Install screw fasteners with power tools having controlled torque adjusted to compress neoprene washer tightly without damage to washer, screw threads, or panels. Install screws in predrilled holes.
 - 5. Use stainless-steel fasteners for exterior applications and galvanized fasteners for interior applications.
 - 6. Locate and space fastenings in true vertical and horizontal alignment.
- B. Fascia Panels: Align bottom of panels and fasten with blind rivets, bolts, or self-tapping screws. Flash and seal panels with weather closures where fasciae meet soffits, along lower panel edges, and at perimeter of all openings.
- B. Soffit Panels: Flash and seal panels with weather closures where soffit meets walls and at perimeter of all openings.
- C. Liner Panel Installation: Per manufacture's instructions. Include fasteners, and matching flashings and trims at all exposed edges, corners, wall cap and base conditions.

3.07 INSULATION INSTALLATION

- A. General: Install insulation concurrently with panel installation, according to manufacturer's written instructions and as follows:
 - 1. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for fire stopping.
 - 2. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

- B. Blanket Insulation: Install blankets straight and true in one-piece lengths. Install vapor retarder over insulation with both sets of facing tabs sealed to provide a complete vapor retarder. Comply with the following installation method:
1. Over-Framing Installation: Extend insulation and vapor retarder over and perpendicular to top flange of secondary framing members. Hold in place by panels fastened to secondary framing.
 2. Two-Layers-between-Purlin-with-Spacer-Block Installation: Extend insulation and vapor retarder between purlins. Carry vapor-retarder facing tabs up and over purlin, overlapping adjoining facing of next insulation course maintaining continuity of retarder. Install layer of filler insulation over first layer to fill space between purlins formed by thermal spacer blocks. Hold in place with bands and cross bands below insulation.
 3. Retainer Strips: Install retainer strips at each longitudinal insulation joint, straight and taut, nesting with secondary framing to hold insulation in place.

3.08 DOOR INSTALLATION

- A. General: Comply with manufacturer's written instructions for installing doors, hardware, operators, and other door components. Coordinate installation with wall flashings and other components. Seal perimeter of each door frame with elastomeric sealant used for panels.
- B. Doors and Frames: Install doors and frames straight, level, and plumb. Securely anchor frames to building structure. Set units with maximum 1/8-inch clearance between door and frame at jambs and head and maximum 3/4-inch clearance between door and floor.
- C. Glazing: Clean channel surfaces and prime as recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bite all around. Do not install glass that has significant edge damage or other defects.
1. Install setting blocks at quarter points, set in a bed of sealant if heel bead is used. Install spacers inside and out, all around, where liquid or plastic/mastic compounds are used, except on glass sizes smaller than 50 united inches.
 2. Replace glass that is broken or damaged to ensure that each piece of exterior glass is airtight and watertight through normal weather/temperature cycles and through normal door/window operation.
- D. Hardware: Mount units at heights indicated in DHI's "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."
1. Install surface-mounted items after finishes have been completed on substrates involved.
 2. Set units level, plumb, and true to line and location. Adjust and reinforce substrate as

necessary for proper installation and operation.

3. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
4. Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant complying with requirements specified in Division 7 Section "Joint Sealants."

3.09 WINDOW INSTALLATION

- A. General: Comply with manufacturer's written instructions for installing window units, and other window components. Coordinate installation with wall flashings and other components.
- B. Set window units level, plumb, and true to line, without warp or rack of frames or sash. Provide proper support and anchor securely in place.
 1. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials by complying with requirements specified in "Dissimilar Materials" Paragraph in appendix to AAMA 101.
- C. Set sill members and other members in a bed of sealant or with joint fillers or gaskets to provide weathertight construction. Refer to Division 7 Section "Joint Sealants" for compounds, fillers, and gaskets to be installed concurrently with window units.
- D. Anchor windows securely in place. Seal perimeter of each unit with elastomeric sealant used for panels. Mount screens direct to frames with tapped screw clips.
- E. Glazing: Clean channel surfaces and prime as recommended by sealant manufacturer. Cut glass to required size for measured opening; provide adequate edge clearance and glass bite all around. Do not install glass that has significant edge damage or other defects.
 1. Install setting blocks at quarter points, set in a bed of sealant if heel bead is used. Install spacers inside and out, all around, where liquid or plastic/mastic compounds are used, except on glass sizes smaller than 50 united inches.
 2. Replace glass that is broken or damaged to ensure that each piece of exterior glass is airtight and watertight through normal weather/temperature cycles and through normal window operation.
- F. Glazing: Replace glass that is broken or damaged to ensure that each piece of exterior glass is airtight and watertight through normal weather/temperature cycles and through normal window operation.

3.10 ACCESSORY INSTALLATION

- A. General: Install gutters, downspouts, ventilators, louvers, and other accessories according to manufacturer's written instructions, with positive anchorage to building and weathertight mounting. Coordinate installation with flashings and other components.
- B. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide for thermal expansion of metal units; conceal fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.
1. Install exposed flashing and trim without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance.
 2. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped or bayonet-type expansion provisions cannot be used or would not be sufficiently weather resistant and waterproof, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
 3. Separations: Separate metal from incompatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
- C. Gutters: Join sections with riveted and soldered or lapped and sealed joints. Attach gutters to eave with gutter hangers spaced not more than 4 feet (1.2 m) o.c. using manufacturer's standard fasteners. Provide end closures and seal watertight with sealant. Provide for thermal expansion.
- D. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.
1. Provide elbow at base of downspout to direct water away from building.
 2. Tie downspouts to underground drainage system indicated.
- E. Louvers: Set louvers complete with necessary hardware, anchors, dampers, weather guards, and equipment supports according to manufacturer's written instructions. Locate and place louver units level, plumb, and at indicated alignment with adjacent work.
1. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
 2. Provide perimeter reveals and openings of uniform width for sealants and joint fillers.
 3. Protect galvanized- and nonferrous-metal surfaces from corrosion or galvanic action by applying a heavy coating of bituminous paint on surfaces that will be in contact with

concrete, masonry, or dissimilar metals.

4. Install concealed gaskets, flashings, joint fillers, and insulation, as louver installation progresses, where required to make louver joints weathertight. Comply with Division 7 Section "Joint Sealants" for sealants applied during louver installation.

- F. Pipe Flashing: Form flashing around pipe penetration and roof panels. Fasten and seal to roof panel as recommended by manufacturer.

3.11 ERECTION AND LOCATION TOLERANCES

- A. Structural-Steel Erection Tolerances: Comply with erection tolerance limits of AISC S303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Roof Panel Installation Tolerances: Shim and align units within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- C. Wall Panel Installation Tolerances: Shim and align units within installed tolerance of 1/4 inch in 20 feet on level, plumb, and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.
- D. Door Installation Tolerances: Fit doors in frames within clearances specified in SDI 100.

3.12 ADJUSTING

- A. Doors: After completing installation, lubricate, test, and adjust doors to operate easily, free from warp, twist, or distortion.
- B. Hardware: Adjust and check each operating item of hardware to ensure proper operation and function. Replace units that cannot be adjusted to operate freely and smoothly.
 1. Where door hardware is installed more than one month before acceptance or occupancy, make final check and adjustment of hardware items during the week before acceptance or occupancy. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.
- C. Windows: Adjust operating ventilators and hardware to provide a tight fit at contact points and weather stripping, for smooth operation and a weathertight closure.

3.13 CLEANING AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean, prepare, and prime or re-prime welds, bolted connections, and abraded surfaces of prime-painted primary and secondary

framing, accessories, and bearing plates. The color coating on all gable trim, gutters & down spouts to be standard color Butler-Cote finish.

1. Clean and prepare surfaces by hand-tool cleaning, SSPC-SP 2, or power-tool cleaning, SSPC-SP 3.
 2. Apply compatible primer of same type as shop primer used on adjacent surfaces.
- B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- C. Roof and Wall Panels: Remove temporary protective coverings and strippable films, if any, as soon as each panel is installed. On completion of panel installation, clean finished surfaces as recommended by panel manufacturer and maintain in a clean condition during construction. Replace panels that have been damaged or have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.
- D. Doors: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer. Immediately before final inspection, remove protective wrappings from doors and frames.
- E. Windows: Clean metal surfaces promptly after installing windows. Exercise care to avoid damage to protective coatings and finishes. Remove excess glazing and sealant compounds, dirt, and other substances. Lubricate hardware and other moving parts. Clean glass promptly after installing windows.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes field-mounted SPDs for low-voltage (120 to 600 V) power distribution and control equipment.

1.3 DEFINITIONS

- A. Inominal: Nominal discharge current.
- B. MCOV: Maximum continuous operating voltage.
- C. Mode(s), also Modes of Protection: The pair of electrical connections where the VPR applies.
- D. MOV: Metal-oxide varistor; an electronic component with a significant non-ohmic current-voltage characteristic.
- E. OCPD: Overcurrent protective device.
- F. SCCR: Short-circuit current rating.
- G. SPD: Surge protective device.
- H. VPR: Voltage protection rating.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. Include rated capacities, operating characteristics, electrical characteristics, and furnished specialties and accessories.
 - 2. Copy of UL Category Code VZCA certification, as a minimum, listing the tested values for VPRs, Inominal ratings, MCOVs, type designations, OCPD requirements, model numbers, system voltages, and modes of protection.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.
- B. Sample Warranty: For manufacturer's special warranty.

1.6 CLOSEOUT SUBMITTALS

- A. Maintenance Data: For SPDs to include in maintenance manuals.

1.7 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to replace or replace SPDs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period: Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 GENERAL SPD REQUIREMENTS

- A. SPD with Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Comply with UL 1449.
- D. MCOV of the SPD shall be the nominal system voltage.

2.2 SERVICE ENTRANCE SUPPRESSOR

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Square D by Schneider Electric
 - 2. Eaton
 - 3. Liebert, Asco (Emerson)
- B. SPDs: Comply with UL 1449, Type 1.
 - 1. SPD's shall have the following features and accessories:
 - a. Indicator lights for protection status.
 - b. Form C contacts rated at 2A and 24Vac, one normally open and one normally closed, for remote monitoring of protection status.
 - c. Surge counter.
 - d. Audible alarm activated on failure of any surge diversion module.
- C. Peak Surge Current Rating: The minimum single-pulse surge current withstand rating per phase shall not be less than 120 kA. The peak surge current rating shall be the arithmetic sum of the ratings of the individual MOVs in a given mode.
- D. Protection modes and UL 1449 VPR for grounded wye circuits with 480Y/277 V and 208Y/120 V three-phase, four-wire circuits shall not exceed the following:
 - 1. Line to Neutral: 1200V for 480Y/277 V and 700 V for 208Y/120 V.
 - 2. Line to Line: 2000V for 480Y/277 V and 1200 V for 208Y/120 V.
- E. SCCR: Equal or exceed 200 kA.

- F. Inominal Rating: 20 kA.
- G. SPD shall be a modular type unit, with field replaceable modules.
- H. SPD shall have LED indicator lights for power and protection status.

2.3 ENCLOSURES

- A. Indoor Enclosures: NEMA 250, Type 3R.

2.4 CONDUCTORS AND CABLES

- A. Power Wiring: Same size as SPD leads, complying with Section 26 05 19 "Low-voltage Electrical Power Conductors."
- B. Class 2 Control Cables: Multiconductor cable with copper conductors not smaller than No. 18 AWG, complying with Section 26 05 19 "Low-voltage Electrical Power Conductors."
- C. Class 1 Control Cables: Multiconductor cable with copper conductors not smaller than No. 14 AWG, complying with Section 26 05 19 "Low-voltage Electrical Power Conductors."

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1.
- B. Install an OCPD or disconnect as required to comply with the UL listing of the SPD.
- C. Install SPDs with conductors between suppressor and points of attachment as short and straight as possible, and adjust circuit-breaker positions to achieve shortest and straightest leads. Do not splice and extend SPD leads unless specifically permitted by manufacturer. Do not exceed manufacturer's recommended lead length. Do not bond neutral and ground.
- D. Use crimped connectors and splices only. Wire nuts are unacceptable.
- E. Wiring:
 - 1. Power Wiring: Comply with wiring methods in Section 26 05 19 "Low-voltage Electrical Power Conductors."
 - 2. Controls: Comply with wiring methods in Section 26 05 19 "Low-voltage Electrical Power Conductors."

3.2 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections with the assistance of a factory-authorized service representative.
 - 1. Compare equipment nameplate data for compliance with Drawings and Specifications.
 - 2. Inspect anchorage, alignment, grounding, and clearances.
 - 3. Verify that electrical wiring installation complies with manufacturer's written installation requirements.

B. An SPD will be considered defective if it does not pass tests and inspections.

C. Prepare test and inspection reports.

3.3 STARTUP SERVICE

A. Complete startup checks according to manufacturer's written instructions.

B. Do not perform insulation-resistance tests of the distribution wiring equipment with SPDs installed. Disconnect SPDs before conducting insulation-resistance tests, and reconnect them immediately after the testing is over.

C. Energize SPDs after power system has been energized, stabilized, and tested.

3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to operate and maintain SPDs.

END OF SECTION 264313

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. This Section includes the following:

- 1. Interior LED Lighting fixtures.
- 2. LED Lighting fixtures mounted on exterior building surfaces.
- 3. Exit signs.

- B. Related Sections include the following:

- 1. Division 26 Section 262726 "Wiring Devices".
- 2. Division 26 Section 260923 "Lighting Control Devices"

- C. Provide and install items as specified herein and listed on the Lighting Fixture Schedule on the drawings.

- D. Furnish and install all lighting fixtures complete with lamps.

1.3 DEFINITIONS

- A. BF: Ballast factor. Ratio of light output of a given lamp(s) operated by the subject ballast to the light output of the same lamp(s) when operated on an ANSI reference circuit.

- B. CRI: Color rendering index.

- C. CU: Coefficient of utilization.

- D. LER: Luminaire efficiency rating, which is calculated according to NEMA LE 5. This value can be estimated from photometric data using the following formula:

- 1. LER is equal to the product of total rated lamp lumens times BF times luminaire efficiency, divided by input watts.

- E. RCR: Room cavity ratio.

1.4 SUBMITTALS

- A. Product Data: For each type of lighting fixture scheduled, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of fixture, including dimensions and verification of indicated parameters.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include life, output (lumens, CCT, and CRI), and energy-efficiency data.
 - 5. Photometric data and adjustment factors based on laboratory tests, IES LM-79 and IES LM-80.
- B. Shop Drawings: Show details of nonstandard or custom fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Wiring Diagrams: Power, signal, and control wiring.
- D. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
 - 1. Suspended ceiling components.
 - 2. Structural members to which lighting-fixture suspension systems will be attached.
 - 3. Other items in finished ceiling, including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Access panels.
 - e. Fire Alarm Devices
 - 4. Perimeter moldings.
- E. Product Certificates: For each type of ballast for dimmer-controlled fixtures, signed by product manufacturer.
- F. Source quality-control test reports.
- G. Field quality-control test reports.
- H. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 1 Section "Closeout Procedures," include the following:
 - 1. Catalog data for each fixture. Include the diffuser, ballast, and lamps installed in that fixture.
- I. Warranties: Special warranties specified in this Section.

1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.
- C. NFPA 101 Compliance: Comply with visibility and luminance requirements for exit signs.

1.6 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.
- B. Obtain exact location of all ceiling outlets from the Architect.
- C. Coordinate all lighting switch locations with Architectural drawings for exact location of doors and door swing prior to roughing in.

1.7 WARRANTY

- A. Special Warranty for LED Fixtures: Manufacturer's standard form, in which the LED fixture manufacturer agrees to repair or replace LED components that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for LED Fixtures: Five year from date of Substantial Completion.

PART 2 – PRODUCTS**2.1 MANUFACTURERS**

- A. Products: Subject to compliance with requirements, provide product indicated on drawings.

2.2 FIXTURES AND COMPONENTS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application
- B. Factory-Applied Labels: Comply with UL 1598. Locate labels where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
- C. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- D. LED Fixtures: Comply with IESNA LM-79, LM-80 and TM-21.
- E. Metal Parts: Free of burrs and sharp corners and edges.
- F. Sheet Metal Components: Steel, unless otherwise indicated. Form and support to prevent warping and sagging.

- G. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- H. Reflecting surfaces shall have minimum reflectance as follows, unless otherwise indicated:
 - 1. White Surfaces: 85 percent.
 - 2. Specular Surfaces: 83 percent.
 - 3. Diffusing Specular Surfaces: 75 percent.
 - 4. Laminated Silver Metallized Film: 90 percent.
- I. Plastic Diffusers, Covers, and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless different thickness is scheduled.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass, unless otherwise indicated.

2.3 EXIT SIGNS

- A. General: Comply with UL 924; for sign colors and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Lamps for AC Operation: Light-emitting diodes, 70,000 hours minimum of rated lamp life.

2.4 LED LIGHTING FIXTURES AND COMPONENTS

- A. LED: Color temperature as indicated on drawings.
- B. CRI 80 (minimum).
- C. Rated minimum life of 50,000 hours to L70.
- D. Drivers: Constant current driver at 350 mA, 100-277V.
- E. ENERGY STAR or DLC certified.

2.5 FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Basic Electrical Materials and Methods" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated, 12 gauge.
- E. Wires For Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch-minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.
- H. Aircraft Cable Support: Use cable, anchorages, and intermediate supports recommended by fixture manufacturer.

2.6 FINISHES

- A. Fixtures: Manufacturers' standard, color as selected by Architect, unless otherwise indicated.
 - 1. Paint Finish: Applied over corrosion-resistant treatment or primer, free of defects.
 - 2. Metallic Finish: Corrosion resistant.

2.7 SOURCE QUALITY CONTROL

- A. Provide services of a qualified, independent testing and inspecting agency to factory test fixtures with ballasts and lamps; certify results for electrical ratings and photometric data.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1
- B. Fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- C. Support for Fixtures in or on Grid-Type Suspended Ceilings: Support fixtures directly from building structure.
 - 1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from fixture corners.
 - 2. Support Clips: Fasten to fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.
 - 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.

D. Suspended Fixture Support: As follows:

1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
4. Continuous Rows: Suspend from cable.

E. Flush-Mounted Luminaires

1. Secured to outlet box.
2. Attached to ceiling structural members at four points equally spaced around circumference of luminaire
3. Trim ring flush with finished surface

F. Wall-Mounted Luminaires:

1. Attached to structural members in walls or using a minimum 20 gauge backing plate attached to wall structural members.
2. Do not attach luminaires directly to gypsum board

G. Adjust aimable fixtures to provide required light intensities.

3.2 CONNECTIONS

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

3.3 FIELD QUALITY CONTROL

- A. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- B. Verify normal operation of each fixture after installation.
- C. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify normal transfer to battery power source and retransfer to normal.
- D. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.
- E. Corroded Fixtures: During warranty period, replace fixtures that show any signs of corrosion.

END OF SECTION 265100

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes wire, cable, connecting devices, cable identification, installation, and testing for wiring systems to be used as signal pathways for voice and high-speed data transmission.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. IDC: Insulation displacement connector.
- C. LAN: Local area network.
- D. PVC: Polyvinyl chloride.
- E. UTP: Unshielded twisted pair.

1.4 SUBMITTALS

- A. Product Data: Include data on features, ratings, and performance for each component specified.
- B. Shop Drawings: Include dimensioned plan and elevation views of each individual component. Show equipment assemblies, method of field assembly, workspace requirements, and access for cable connections.
 - 1. Wiring diagrams. Show typical wiring schematics including the following:
 - a. Workstation outlets, jacks, and jack assemblies.
 - b. Patch cords.
 - c. Patch panels.
- C. Cable Administration Drawings: As specified in Part 3.
- D. Product Certificates: For each type of cable, connector, and terminal equipment, signed by product manufacturer.
- E. Qualification Data: For Installer and Cable Tester.
- F. Field quality-control test reports.
- G. Operation and Maintenance Data: For voice and data communication cabling to include in emergency, operation, and maintenance manuals.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: System installer must have on staff a registered communication distribution designer certified by Building Industry Consulting Service International (BICSI).
- B. Source Limitations: Obtain all products except twisted-pair and fiber-optic cables through one source from a single manufacturer.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- D. Comply with NFPA 70.

1.6 COORDINATION

- A. Coordinate layout and installation of voice and data communication cabling with Owner's telecommunications and LAN equipment administrator. Coordinate service entrance arrangement with local exchange carrier.
 - 1. Meet jointly with telecommunications and LAN equipment administrator, local exchange carrier representatives, and Owner to exchange information and agree on details of equipment arrangements and installation interfaces.
 - 2. Record agreements reached in meetings and distribute to other participants.
 - 3. Adjust arrangements and locations of distribution frames and cross-connect and patch panels in equipment rooms and wiring closets to accommodate and optimize arrangement and space requirements of telephone switch and LAN equipment.

1.7 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. Patch-Panel Units: One of each type for every six installed, but no fewer than one.
 - 2. Connecting Blocks: One of each type for every 25 installed, but no fewer than one.
 - 3. Outlet Assemblies: One of each type for every 25 installed, but no fewer than one.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cable:
 - a. Commscope/TE Connectivity
 - b. Belden Inc.; Electronics Division.
 - c. General Cable Corporation.
 - d. Corning Fiber
 - e. Panduit Corp.
 - f. Superior Essex; Superior Telecommunications Inc.

2. Terminal and Connector Components and Distribution Racks:
 - a. Commscope/TE Connectivity
 - b. Hubbell Premise Wiring.
 - c. Leviton Telecom.
 - d. Panduit Corp.
 - e. Middle Atlantic Products, Inc.

2.2 SYSTEM REQUIREMENTS

- A. General: Coordinate the features of materials and equipment so they form an integrated system. Match components and interconnections for optimum future performance.
- B. Expansion Capability: Unless otherwise indicated, provide spare fibers and conductor pairs in cables, positions in cross-connect and patch panels, and terminal strips to accommodate 20 percent future increase in active workstations.

2.3 PATHWAYS

- A. General Requirements: Comply with TIA/EIA-569-B.
- B. Cable Support above accessible ceilings: NRTL labeled. Cable support brackets shall be designed to prevent degradation of cable performance and pinch points that could damage cable. Cable tie slots fasten cable ties to brackets.
 1. Comply with NFPA 70 and UL 2043 for fire-resistant and low-smoke-producing characteristics.
 2. Support brackets with cable tie slots for fastening cable ties to brackets.
 3. Lacing bars, spools, J-hooks, and D-rings.
 4. Straps and other devices.
- C. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

2.4 BACKBOARDS

- A. Backboards: Plywood, fire-retardant treated, 3/4 by 48 by 96 inches. Comply with requirements for plywood backing panels specified in Division 06 Section "Rough Carpentry."

2.5 EQUIPMENT FRAMES

- A. General Frame Requirements:
 1. Distribution Frames: Freestanding, modular-steel units designed for telecommunications terminal support and coordinated with dimensions of units to be supported.
 2. Module Dimension: Width compatible with EIA 310 standard, 19-inch panel mounting.
 3. Finish: Manufacturer's standard, baked-polyester powder coat.
- B. Floor-Mounted Racks: Modular-type, 4-post open, steel or aluminum construction, 45U space.

1. Vertical and horizontal cable management channels, top and bottom cable troughs, grounding lug, and a power strip.
2. Baked-polyester powder coat finish.
3. Provide rack mounted UPS. Provide APC Smart UPS model #SMT2200RM2UNC or approved equal.

C. Cable Management for Equipment Frames:

1. Metal, with integral wire retaining fingers.
2. Baked-polyester powder coat finish.
3. Vertical cable management panels shall have front and rear channels, with covers.
4. Provide horizontal crossover cable manager at the top of each relay rack, with a minimum height of two rack units each.
5. Provide 2U horizontal wire manager for each 48 port patch panel.

2.6 POWER STRIPS

A. Power Strips: Comply with UL 1363:

1. Rack mounting.
2. Six, 20-A, 120-V ac, NEMA WD 6, Configuration 5-20R receptacles.
3. LED indicator lights for power and protection status.
4. LED indicator lights for reverse polarity and open outlet ground
5. Circuit Breaker and Thermal Fusing: Unit continues to supply power if protection is lost
6. Cord connected with 15-foot line cord.
7. Rocker-type on-off switch, illuminated when in on position
8. Peak Single-Impulse Surge Current Rating: 33 kA per phase
9. Protection modes shall be line to neutral, line to ground, and neutral to ground. UL 1449 clamping voltage for all three (3) modes shall be not more than 330 V

2.7 CATEGORY 6A TWISTED-PAIR CABLES

- A. Description: Four-pair, balanced-twisted pair cable, color-coded; enclosed in PVC jacket with internal spline, certified to meet transmission characteristics of Category 6a cable at frequencies up to 500MHz
- B. Standard: Listed as complying with TIA-568-C.2 for Category 6a cables.
- C. Conductors: 100-ohm, 23 AWG solid copper.
- D. Shielding/Screening: Unshielded twisted pairs (UTP)
- E. Cable Rating: Plenum
- F. Cable Jacket Color : Yellow
- G. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment or in the horizontal cross-connect.

2.8 TWISTED-PAIR CABLES CONNECTORS AND TERMINAL EQUIPMENT

- A. Description: Hardware designed to connect, splice, and terminate twisted pair copper communications cable.
- B. Comply with the performance requirements of Category 6A.
- C. Comply with TIA/EIA-568-C.2, IDC type, using modules designed for punch-down caps or tools.
 - 1. IDC Terminal Block Modules: Integral with connector bodies, including plugs and jacks where indicated.
 - 2. IDC Connecting Hardware: Consistent throughout Project.
- D. Cable shall be terminated with connecting hardware of same category or higher.
- E. Source limitations: Obtain twisted pair cable hardware from single source from single manufacturer.
- F. Cross-Connect Panel: Modular array of IDC terminal blocks arranged to terminate building cables and permit interconnection between cables.
 - 1. Number of Terminals per Field: One for each conductor in assigned cables.
 - 2. Mounting: Backboard.
- G. Patch Panel: Modular panels housing multiple-numbered jack units with IDC-type connectors at each jack for permanent termination of pair groups of installed cables.
 - 1. Number of Jacks per Field: One for each four-pair conductor group of indicated cables, plus spares and blank positions adequate to satisfy specified expansion criteria.
 - 2. Mounting: Rack.
- H. Jacks and Jack Assemblies for UTP Cable: Modular, listed as complying with Category 6A, color-coded, RJ-45 receptacle units with integral IDC-type terminals. Use keyed jacks for data service.
- I. UTP Patch Cords: Four-pair cables in 48-inch lengths, terminated with RJ-45 plug at each end. Use keyed plugs for data service. Provide one for each terminated jack.
- J. Workstation Outlets:
 - 1. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular. Comply with TIA/EIA-568-C.2.
 - 2. Faceplate: to match wall plate and cover requirements in specification section 262726 "Wiring Devices".
 - 3. Mounting: Flush, unless otherwise indicated.
 - 4. Marked to indicate transmission performance.

2.9 FIBER-OPTIC CABLES, CONNECTORS, AND TERMINAL EQUIPMENT

- A. Indoor/Outdoor Multimode Fiber, laser optimized, OM-4, 50/125-micrometer, 12-fiber, nonconductive, single loose tube, optical fiber cable. UV protected jacket, water blocking

buffer materials, suitable for in-building and inter-building backbone. Operating temperature - 40° thru 160° F.

1. Comply with ICEA S-104-696 for mechanical properties.
2. Comply with TIA/EIA-568-D for performance specifications.
3. Comply with TIA/EIA-492AAAD for detailed specifications.
4. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444, UL 1651, and NFPA 70 for the following types:
 - a. Plenum Rated, Nonconductive: Type OFNP, complying with NFPA 262.
5. Maximum Attenuation: 3.0 dB/km at 850 nm; 1.0 dB/km at 1300 nm.
6. Minimum Modal Bandwidth: 3500 MHz-km at 850 nm; 500 MHz-km at 1300 nm.

B. Jacket:

1. Jacket Color: Aqua for OM 4, 50/125-micrometer cable.
2. Cable cordage jacket, fiber, unit, and group color shall be according to TIA/EIA-598-D.
3. Imprinted with fiber count, fiber type, and aggregate length at regular intervals not to exceed 40 inches.

2.10 OPTICAL FIBER CABLE HARDWARE

A. Cross-Connects and Patch Panels: Modular panels housing multiple-numbered, duplex cable connectors.

1. Number of Connectors per Field: One for each fiber of cable or cables assigned to field, plus spares and blank positions adequate to suit specified expansion criteria.

B. Patch Cords: Factory-made, dual-fiber cables in 36-inch lengths, LC-LC type, provide three (3) per rack/closet.

C. Cable Connecting Hardware:

1. Comply with Optical Fiber Connector Intermateability Standards (FOCIS) specifications of the TIA/EIA-604 series. Comply with TIA/EIA-568-C.3.
2. Quick-connect, simplex and duplex, Type LC connectors. Insertion loss not more than 0.75 dB.
3. Type SFF connectors may be used in termination racks, panels, and equipment packages.

2.11 GROUNDING AND BONDING

A. Materials: Comply with NFPA 70, TIA/EIA-607, and UL 467.

B. Comply with requirements in Division 26 Section "Grounding and Bonding" for grounding conductors and connectors.

2.12 IDENTIFICATION PRODUCTS

- A. Comply with Division 26 Section "Electrical Identification" and the following:
 - 1. Retain below with either option selected in paragraph above.
 - 2. Cable Labels: Self-adhesive vinyl or vinyl-cloth wraparound tape markers, machine printed with alphanumeric cable designations.
- B. Comply with TIA/EIA-606-A.

PART 3 - EXECUTION**3.1 EXAMINATION**

- A. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLICATION OF MEDIA

- A. Backbone Cable for Voice/Data Service: Use multi-mode fiber-optic cable for runs between equipment rooms and wiring closets and for runs between wiring closets.
- B. Horizontal Cable for Data Service: Use UTP Category 6A cable for runs between wiring closets and workstation outlets.
- C. Horizontal Cable for Voice Service: Use UTP Category 6A cable for runs between wiring closets and workstation outlets.

3.3 INSTALLATION

- A. Wiring Method: Install wiring in raceway and cable tray except within consoles, cabinets, desks, and counters and except in accessible ceiling spaces and in gypsum board partitions where unenclosed wiring method may be used. Use UL-listed plenum cable in all areas. Conceal raceway and cables except in unfinished spaces.
- B. Install cables using techniques, practices, and methods that are consistent with Category 6A rating of components and that ensure Category 6 performance of completed and linked signal paths, end to end.
- C. Install cables without damaging conductors, shield, or jacket.
- D. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.
- E. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
 - 1. Pull cables simultaneously if more than one is being installed in same raceway.
 - 2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
 - 3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.

- F. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
 - G. Secure and support cables at intervals not exceeding 30 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
 - H. Wiring within Wiring Closets and Enclosures: Provide conductors of adequate length. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
 - I. Separation of Wires: Comply with TIA/EIA-569-A rules for separating unshielded copper voice and data communication cabling from potential EMI sources, including electrical power lines and equipment.
 - J. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
 - K. Use splice and tap connectors compatible with media types.
- 3.4 GROUNDING
- A. Comply with Division 26 Section "Grounding and Bonding for Electrical Systems."
 - B. Ground cable shields, drain conductors, and equipment to eliminate shock hazard and to minimize ground loops, common-mode returns, noise pickup, cross talk, and other impairments.
 - C. Signal Ground Terminal: Locate in each equipment room and wiring closet; isolate from power system and equipment grounding.
 - D. Signal Ground Bus: Mount on wall of main equipment room with standoff insulators.
 - E. Signal Ground Backbone Cable: Extend from signal ground bus to signal ground terminal in each equipment room and wiring closet.
- 3.5 INSTALLATION IN EQUIPMENT ROOMS AND WIRING CLOSETS
- A. Install plywood backboards on walls of equipment rooms and wiring closets from floor to ceiling.
 - B. Mount patch panels, terminal strips, and other connecting hardware on backboards, unless otherwise indicated.
 - C. Group connecting hardware for cables into separate logical fields.
 - D. Use patch panels to terminate cables entering the space, unless otherwise indicated.
- 3.6 INSTALLATION STANDARDS
- A. Comply with requirements in TIA/EIA-568-A and TIA/EIA-569-A.

3.7 IDENTIFICATION

- A. Coordinate Identification and labeling requirements with the Owners IT prior to labeling any drop location.
- B. In addition to requirements in this Article, comply with applicable requirements in Division 26 Section "Identification for Electrical Systems" and TIA/EIA-606A.
- C. System: Use a unique, three-syllable, alphanumeric designation for each cable, and label cable and jacks, connectors, and terminals to which it connects with same designation. Use logical and systematic designations for facility's architectural arrangement.
 - 1. First syllable identifies and locates equipment room or wiring closet where cables originate. Example: B1 – Second Closet, First Floor.
 - 2. Second syllable identifies and locates cross-connect- or patch-panel field in which cables terminate. Example: D – Forth Panel in Rack. (Dxxx See #3).
 - 3. Third syllable designates outlet number by position occupied by cable pairs or fibers in field. Example: D014: (Jack number in Panel 001-999).
- D. Workstation:
 - 1. Outlet face plates: Cover of the assembly (See #2 above)
 - 2. Label cables within outlet boxes.
- E. Distribution Racks and Frames: Label each unit and field within that unit.
- F. Within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- G. Cables, General: Label each cable within 4 inches of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
- H. Exposed Cables and Cables in Cable Trays and Wire Troughs: Label each cable at intervals not exceeding 15 feet.
- I. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project, in software and format selected by Owner.
- J. Cable Administration Drawings: Show building floor plans with cable administration point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA-606.

3.8 FIELD QUALITY CONTROL

- A. Perform test and inspections
- B. Tests and Inspections
 - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with TIA/EIA-568-B.1.
 - 2. Visually confirm Category 6A marking of outlets, cover plates, outlet/connectors, and patch panels.
 - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
 - 4. Test UTP backbone copper cabling for DC loop resistance, shorts, opens, intermittent faults, and polarity between conductors. Test operation of shorting bars in connection blocks. Test cables after termination but not cross-connection.
 - a. Test instruments shall meet or exceed applicable requirements in TIA/EIA-568-B.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
 - 5. UTP Performance Tests:
 - a. Test for each outlet and MUTOA. Perform the following tests according to TIA/EIA-568-B.1 and TIA/EIA-568-B.2:
 - 1) Applicable Room number of the jack location (per specs)
 - 2) Applicable Telecommunications Room Number
 - 3) Circuit I.D. Number with corresponding jack identification.
 - 4) Wire map. – Shall include the following:
 - a) Continuity to the remote end.
 - b) Shorts between any two or more conductors
 - c) Crossed pairs
 - d) Reversed pairs.
 - e) Split pairs.
 - f) Any other missed wiring.
 - 5) Length (physical vs. electrical, and length requirements).
 - 6) Insertion loss.
 - 7) Near-end crosstalk (NEXT) loss.
 - 8) Power sum near-end crosstalk (PSNEXT) loss.
 - 9) Equal-level far-end crosstalk (ELFEXT).
 - 10) Power sum equal-level far-end crosstalk (PSELFEXT).
 - 11) Return loss.
 - 12) Propagation delay.
 - 13) Delay skew.

6. Final Verification Tests: Perform verification tests for UTP after the complete communications cabling and workstation outlet/connectors are installed.
 - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
 - b. Data Tests: These tests assume the Information Technology Staff has a network installed and is available to assist with testing. Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
 - C. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
 - D. End-to-end cabling will be considered defective if it does not pass tests and inspections.
 - E. Prepare test and inspection reports.
- 3.9 DEMONSTRATION
- A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.

END OF SECTION 271500

PART 1 - GENERAL**1.1 RELATED DOCUMENTS**

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-alarm control unit.
 - 2. Manual fire-alarm boxes.
 - 3. System smoke detectors.
 - 4. Heat detectors.
 - 5. Notification appliances.
 - 6. Device guards.
 - 7. Addressable interface device.
 - 8. Digital alarm communicator transmitter.

1.3 DEFINITIONS

- A. LED: Light Emitting Diode.
- B. FACP: Fire Alarm Control Panel.
- C. NICET: National Institute for Certification in Engineering Technologies.

1.4 SUBMITTALS

- A. General Submittal Requirements:
 - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
 - 2. Shop Drawing shall be prepared by persons with the following qualifications.
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified, fire-alarm technician; Level II minimum.
- B. Product Data: For each type of product, including furnished options and accessories.
 - 1. Include construction details, material descriptions, dimensions, profiles, and finishes.
 - 2. Include rated capacities, operating characteristics, and electrical characteristics.
- C. Shop Drawings: For fire-alarm system.
 - 1. Comply with recommendations and requirements in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - 2. Include plans, elevations, sections, details, and attachments to other work.
 - 3. Include voltage drop calculations for notification-appliance circuits.
 - 4. Include battery-size calculations.
 - 5. Include performance parameters and installation details for each detector.

6. Verify that each duct detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
 7. Include plans, sections, and elevations of heating, ventilating, and air-conditioning ducts, drawn to scale; coordinate location of duct smoke detectors and access to them.
 - a. Show critical dimensions that relate to placement and support of sampling tubes, detector housing, and remote status and alarm indicators.
 - b. Show field wiring required for HVAC unit shutdown on alarm.
 - c. Locate detectors according to manufacturer's written recommendations.
 8. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits and point-to-point wiring diagrams.
- D. Qualification Data: For Installer.
- E. Field quality-control reports.
- F. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals.
1. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following and deliver copies to authorities having jurisdiction:
 - a. Comply with the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - b. Provide "Fire Alarm and Emergency Communications System Record of Completion Documents" according to the "Completion Documents" Article in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - c. Complete wiring diagrams showing connections between all devices and equipment. Each conductor shall be numbered at every junction point with indication of origination and termination points.
 - d. Riser diagram.
 - e. Device addresses.
 - f. Air-sampling system sample port locations and modeling program report showing layout meets performance criteria.
 - g. Record copy of site-specific software.
 - h. Provide "Inspection and Testing Form" according to the "Inspection, Testing and Maintenance" chapter in NFPA 72, and include the following:
 - 1) Equipment tested.
 - 2) Frequency of testing of installed components.
 - 3) Frequency of inspection of installed components.
 - 4) Requirements and recommendations related to results of maintenance.
 - 5) Manufacturer's user training manuals.
 - i. Manufacturer's required maintenance related to system warranty requirements.
 - j. Abbreviated operating instructions for mounting at fire-alarm control unit and each annunciator unit.
- G. Software and Firmware Operational Documentation:
1. Software operating and upgrade manuals.
 2. Program Software Backup: On magnetic media or compact disk, complete with data files.

3. Device address list.
4. Printout of software application and graphic screens.

1.5 EXTRA MATERIALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than one unit.
 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than two units.
 3. Smoke Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than two unit of each type.
 4. Detector Bases: Quantity equal to two percent of amount of each type installed, but no fewer than one unit of each type.
 5. Keys and Tools: One extra set for access to locked or tamperproofed components.
 6. Audible and Visual Notification Appliances: Quantity equal to 10 percent of amount of each type installed but no fewer than One of each type installed.
 7. Fuses: Two of each type installed in the system.

1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.
- C. Source limitations for fire alarm system and components: Obtain fire alarm system from single source from single manufacturer.
- D. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.
- E. Electrical components, devices and accessories: Listed and labeled as defined in NFPA 70, by qualified testing agency, and marked for intended location and application.

1.7 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864
- B. Technical Support: Beginning with Substantial Completion, provide software support for two (2) years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.
 1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS**2.1 MANUFACTURERS**

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Farenhyt; a Honeywell Company
 2. Gamewell; a Honeywell Company
 3. Siemens Building Technologies, Inc.; Fire Safety Division
 4. NOTIFIER; a Honeywell company.
 5. Edwards System Technology

2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
1. Manual stations.
 2. Heat detectors.
 3. Smoke detectors.
 4. Duct smoke detectors.
 5. Combustible gas detectors.
 6. Automatic sprinkler system water flow.
 7. Fire-extinguishing system operation.
- B. Fire-alarm signal shall initiate the following actions:
1. Continuously operate alarm notification appliances.
 2. Identify alarm and specific initiating device at fire-alarm control unit and remote annunciators.
 3. Transmit an alarm signal to the remote alarm receiving station.
 4. Unlock electric door locks in designated egress paths.
 5. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 6. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
1. Valve supervisory switch.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
1. Open circuits, shorts, and grounds in designated circuits.
 2. Opening, tampering with, or removing alarm-initiating and supervisory signal-initiating devices.
 3. Loss of communication with any addressable sensor, input module, relay, control module, remote annunciator, printer interface, or Ethernet module.
 4. Loss of primary power at fire-alarm control unit.
 5. Ground or a single break in internal circuits of fire-alarm control unit.
 6. Abnormal ac voltage at fire-alarm control unit.
 7. Break in standby battery circuitry.
 8. Failure of battery charging.
 9. Abnormal position of any switch at fire-alarm control unit or annunciator.
 10. Carbon monoxide detectors.

- E. System Supervisory Signal Actions:
 - 1. Initiate notification appliances.
 - 2. Identify specific device initiating the event at fire-alarm control unit and remote annunciators.
 - 3. Transmit system status to building management system.

2.3 FIRE-ALARM CONTROL UNIT

- A. General Requirements for Fire-Alarm Control Unit:
 - 1. Field-programmable, microprocessor-based, modular, power-limited design with electronic modules, complying with UL 864.
 - a. System software and programs shall be held in nonvolatile flash, electrically erasable, programmable, read-only memory, retaining the information through failure of primary and secondary power supplies.
 - b. Include a real-time clock for time annotation of events on the event recorder and printer.
 - c. Provide communication between the FACP and remote circuit interface panels, annunciators, and displays.
 - d. The FACP shall be listed for connection to a central-station signaling system service.
 - e. Provide nonvolatile memory for system database, logic, and operating system and event history. The system shall require no manual input to initialize in the event of a complete power down condition. The FACP shall provide a minimum 500-event history log.
 - 2. Addressable Initiation Device Circuits: The FACP shall indicate which communication zones have been silenced and shall provide selective silencing of alarm notification appliance by building communication zone.
 - 3. Addressable Control Circuits for Operation of Notification Appliances and Mechanical Equipment: The FACP shall be listed for releasing service.
- B. Alphanumeric Display and System Controls: Arranged for interface between human operator at fire-alarm control unit and addressable system components including annunciation and supervision. Display alarm, supervisory, and component status messages and the programming and control menu.
 - 1. Annunciator and Display: Liquid-crystal type, two line(s) of 40 characters, minimum.
 - 2. Keypad: Arranged to permit entry and execution of programming, display, and control commands and to indicate control commands to be entered into the system for control of smoke-detector sensitivity and other parameters.
- C. Initiating-Device, Notification-Appliance, and Signaling-Line Circuits:
 - 1. Pathway Class Designations: NFPA 72, Class B.
 - 2. Pathway Survivability: Level 0.
 - 3. Install no more than 50 addressable devices on each signaling-line circuit.
 - 4. Serial Interfaces:
 - a. One dedicated RS 485 port for central-station operation using point ID DACT.

- b. One RS 485 port for remote annunciators, Ethernet module, or multi-interface module (printer port).
 - c. One USB port for PC configuration.
- D. Notification-Appliance Circuit:
- 1. Audible appliances shall sound in a three-pulse temporal pattern, as defined in NFPA 72.
 - 2. Where notification appliances provide signals to sleeping areas, the alarm signal shall be a 520-Hz square wave with an intensity 15 dB above the average ambient sound level or 5 dB above the maximum sound level, or at least 75 dBA, whichever is greater, measured at the pillow.
 - 3. Visual alarm appliances shall flash in synchronization where multiple appliances are in the same field of view, as defined in NFPA 72.
- E. Remote Smoke-Detector Sensitivity Adjustment: Controls shall select specific addressable smoke detectors for adjustment, display their current status and sensitivity settings, and change those settings. Allow controls to be used to program repetitive, time-scheduled, and automated changes in sensitivity of specific detector groups. Record sensitivity adjustments and sensitivity-adjustment schedule changes in system memory, and print out the final adjusted values on system printer.
- F. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.
- G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory signals and supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
- 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
- 1. Batteries: Sealed lead calcium.
- I. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
- 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
 - 2. Station Reset: Key- or wrench-operated switch.

2.5 SYSTEM SMOKE DETECTORS**A. General Requirements for System Smoke Detectors:**

1. Comply with UL 268; operating at 24-V dc, nominal.
2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
5. Integral Visual-Indicating Light: LED type, indicating detector has operated and power-on status.
6. Remote Control: Unless otherwise indicated, detectors shall be digital-addressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by fire-alarm control unit.
 - a. Rate-of-rise temperature characteristic of combination smoke- and heat-detection units shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
 - b. Fixed-temperature sensing characteristic of combination smoke- and heat-detection units shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
 - c. Multiple levels of detection sensitivity for each sensor.
 - d. Sensitivity levels based on time of day.

B. Photoelectric Smoke Detectors:

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).

3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector for smoke detection in HVAC system ducts.
4. Each sensor shall have multiple levels of detection sensitivity.
5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
6. Relay Fan Shutdown: Fully programmable relay rated to interrupt fan motor-control circuit.

2.6 CARBON MONOXIDE DETECTORS

- A. General: Carbon monoxide detector listed for connection to fire-alarm system.
 1. Mounting: Adapter plate for outlet box mounting.
 2. Testable by introducing test carbon monoxide into the sensing cell.
 3. Detector shall provide alarm contacts and trouble contacts.
 4. Detector shall send trouble alarm when nearing end-of-life, power supply problems, or internal faults.
 5. Comply with UL 2075.
 6. Locate, mount, and wire according to manufacturer's written instructions.
 7. Provide means for addressable connection to fire-alarm system.
 8. Test button simulates an alarm condition.

2.7 MULTICRITERIA DETECTORS

- A. Mounting: Twist-lock base interchangeable with smoke-detector bases.
- B. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Automatically adjusts its sensitivity by means of drift compensation and smoothing algorithms. The detector shall send trouble alarm if it is incapable of compensating for existing conditions.
- D. Test button tests all sensors in the detector.
- E. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 1. Primary status.
 2. Device type.
 3. Present sensitivity selected.
 4. Sensor range (normal, dirty, etc.).
- F. Sensors: The detector shall be comprised of four sensing elements including a smoke sensor, a carbon monoxide sensor, an infrared sensor, and a heat sensor.
 1. Smoke sensor shall be photoelectric type as described in "System Smoke Detectors" Article.
 2. Carbon monoxide sensor shall be as described in "Carbon Monoxide Detectors" Article.
 3. Heat sensor shall be as described in "Heat Detectors" Article.
 4. Each sensor shall be separately listed according to requirements for its detector type.

2.8 HEAT DETECTORS

- A. General Requirements for Heat Detectors: Comply with UL 521.

1. Temperature sensors shall test for and communicate the sensitivity range of the device.
- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.9 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Connected to notification-appliance signal circuits, zoned as indicated, equipped for mounting as indicated, and with screw terminals for system connections.
 1. Combination Devices: Factory-integrated audible and visible devices in a single-mounting assembly, equipped for mounting as indicated, and with screw terminals for system connections.
- B. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- C. Visible Notification Appliances: Xenon strobe lights complying with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch- high letters on the lens.
 1. Rated Light Output:
 - a. 15/30/75/110 cd, selectable in the field.
 2. Mounting: Wall mounted unless otherwise indicated.
 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
 4. Flashing shall be in a temporal pattern, synchronized with other units.
 5. Strobe Leads: Factory connected to screw terminals.
 6. Mounting Faceplate: Factory finished, red.

2.10 ADDRESSABLE INTERFACE DEVICE

- A. General:
 1. Include address-setting means on the module.
 2. Store an internal identifying code for control panel use to identify the module type.
 3. Listed for controlling HVAC fan motor controllers.

- B. Monitor Module: Microelectronic module providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- C. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall and to circuit-breaker shunt trip for power shutdown.
 - 1. Allow the control panel to switch the relay contacts on command.
 - 2. Have a minimum of two normally open and two normally closed contacts available for field wiring.
- D. Control Module:
 - 1. Operate notification devices.
 - 2. Operate solenoids for use in sprinkler service.

2.11 DIGITAL ALARM COMMUNICATOR TRANSMITTER

- A. Digital alarm communicator transmitter shall be acceptable to the remote central station and shall comply with UL 632.
- B. Functional Performance: Unit shall receive an alarm, supervisory, or trouble signal from fire-alarm control unit and automatically transmit the information to a remote central station by means of a standard telephone line and one or more of the following additional means of communication: internet, cellular or radio. When contact is made with central station(s), signals shall be transmitted. If service on either line is interrupted for longer than 45 seconds, transmitter shall initiate a local trouble signal and transmit the signal indicating loss of communication line to the remote alarm receiving station over the remaining line. Transmitter shall automatically report communication service restoration to the central station. If service is lost on both communication lines, transmitter shall initiate the local trouble signal.
- C. Local functions and display at the digital alarm communicator transmitter shall include the following:
 - 1. Verification that both communication lines are available.
 - 2. Programming device.
 - 3. LED display.
 - 4. Manual test report function and manual transmission clear indication.
 - 5. Communications failure with the central station or fire-alarm control unit.
- D. Digital data transmission shall include the following:
 - 1. Address of the alarm-initiating device.
 - 2. Address of the supervisory signal.
 - 3. Address of the trouble-initiating device.
 - 4. Loss of ac supply.
 - 5. Loss of power.
 - 6. Low battery.
 - 7. Abnormal test signal.
 - 8. Communication bus failure.
- E. Secondary Power: Integral rechargeable battery and automatic charger.

- F. Self-Test: Conducted automatically every 24 hours with report transmitted to central station.

2.12 FIRE-ALARM RADIO TRANSMITTERS

A. Performance Criteria:

1. Regulatory Requirements:

- a. NFPA 72.
- b. NFPA 1221.
- c. 47 CFR 90.

2. General Characteristics:

- a. Must be factory assembled, wired, and tested; ready for installation and operation.
- b. Packaging: Single, modular, NEMA 250, Type 1 metal enclosure with tamper-resistant flush tumbler lock.
- c. Signal Transmission Mode and Frequency: VHF or UHF 2-W power output, coordinated with operating characteristics of established remote alarm receiving station designated by Owner.
- d. Normal Power Input: 120 V(ac).
- e. Secondary Power: Integral-sealed, rechargeable, 12 V battery and charger. Comply with NFPA 72 requirements for battery capacity; submit calculations.
 - 1) Antenna: Omnidirectional, coaxial half-wave, dipole type with driving point impedance matched to transmitter and antenna cable output impedance. Wind-load strength of antenna and mounting hardware and supports must withstand 100 mph with gust factor of 1.3 without failure.
 - 2) Antenna Cable: Coaxial cable with impedance matched to transmitter output impedance.
 - 3) Antenna-Cable Connectors: Weatherproof.
 - 4) Alarm Interface Devices: Circuit boards, modules, and other auxiliary devices, integral to transmitter, matching fire-alarm and other system outputs to message-generating inputs of transmitter that produce required message transmissions.
- f. Functional Performance: Unit must receive alarm, supervisory, or trouble signal from FACU or from its own internal sensors or controls and must automatically transmit signal along with unique code that identifies transmitting station to remote alarm receiving station. Transmitted messages must correspond to standard designations for fire-reporting system to which signal is being transmitted and must include separately designated messages in response to the following events or conditions:
 - 1) Transmitter Low-Battery Condition: Sent when battery voltage is below 85 percent of rated value.
 - 2) System Test Message: Initiated manually by test switch within transmitter cabinet, or automatically at optionally preselected time, once every 24 hours, with transmission time controlled by programmed timing device integral to transmitter controls.

- 3) Transmitter Trouble Message: Actuated by failure, in excess of one-minute duration, of transmitter normal power source, derangement of wiring of transmitter, or alarm input interface circuit or device connected to it.
- 4) Local Fire-Alarm-System Trouble Message: Initiated by events or conditions that cause trouble signal to be indicated on building system.
- 5) Local Fire-Alarm-System Alarm Message: Actuated when building system goes into alarm state. Identifies device that initiated alarm.
- 6) Local Fire-Alarm-System, Supervisory-Alarm Message: Actuated when building alarm system indicates supervisory alarm.

2.13 DEVICE GUARDS

- A. Description: Welded wire mesh of size and shape for the manual station, smoke detector, gong, or other device requiring protection.
 1. Factory fabricated and furnished by device manufacturer.
 2. Finish: Paint of color to match the protected device.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas and conditions for compliance with requirements for ventilation, temperature, humidity, and other conditions affecting performance of the Work.
 1. Verify that manufacturer's written instructions for environmental conditions have been permanently established in spaces where equipment and wiring are installed, before installation begins.
- B. Examine roughing-in for electrical connections to verify actual locations of connections before installation.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 EQUIPMENT INSTALLATION

- A. Comply with NFPA 72, NFPA 101, and requirements of authorities having jurisdiction for installation and testing of fire-alarm equipment. Install all electrical wiring to comply with requirements in NFPA 70 including, but not limited to, Article 760, "Fire Alarm Systems."
 1. Devices placed in service before all other trades have completed cleanup shall be replaced.
 2. Devices installed but not yet placed in service shall be protected from construction dust, debris, dirt, moisture, and damage according to manufacturer's written storage instructions.
- B. Install wall-mounted equipment, with tops of cabinets not more than 78 inches above the finished floor.
- C. Manual Fire-Alarm Boxes:
 1. Install manual fire-alarm box in the normal path of egress within 60 inches of the exit doorway.

2. The operable part of manual fire-alarm box shall be between 42 inches and 48 inches above floor level. All devices shall be mounted at the same height unless otherwise indicated.
- D. Smoke- or Heat-Detector Spacing:
1. Comply with the "Smoke-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for smoke-detector spacing.
 2. Comply with the "Heat-Sensing Fire Detectors" section in the "Initiating Devices" chapter in NFPA 72, for heat-detector spacing.
 3. Smooth ceiling spacing shall not exceed 30 feet.
 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Annex A in NFPA 72.
 5. HVAC: Locate detectors not closer than 36 inches from air-supply diffuser or return-air opening.
 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture and not directly above pendant mounted or indirect lighting.
- E. Install a cover on each smoke detector that is not placed in service during construction. Cover shall remain in place except during system testing. Remove cover prior to system turnover.
- F. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct. Tubes more than 36 inches long shall be supported at both ends.
1. Do not install smoke detector in duct smoke-detector housing during construction. Install detector only during system testing and prior to system turnover.
- G. Remote Status and Alarm Indicators: Install in a visible location near each smoke detector, sprinkler water-flow switch, and valve-tamper switch that is not readily visible from normal viewing position.
- H. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille. Install all devices at the same height unless otherwise indicated.
- I. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling. Install all devices at the same height unless otherwise indicated.
- J. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- K. Antenna for Radio Alarm Transmitter: Mount to building structure. Use mounting arrangement and substrate connection that resists wind load of 100mph with gust factor of 1.3 without damage.

3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- B. Install framed instructions in a location visible from fire-alarm control unit.

3.4 GROUNDING

- A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.
- B. Ground shielded cables at the control panel location only. Insulate shield at device location.

3.5 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to test and inspect components, assemblies, and equipment installations, including connections.
- B. Tests and inspections:
 - 1. Visual Inspection: Conduct visual inspection prior to testing.
 - a. Inspection shall be based on completed record Drawings and system documentation that is required by the "Completion Documents, Preparation" table in the "Documentation" section of the "Fundamentals" chapter in NFPA 72.
 - b. Comply with the "Visual Inspection Frequencies" table in the "Inspection" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
 - 2. System Testing: Comply with the "Test Methods" table in the "Testing" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
 - 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
 - 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
 - 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" section of the "Fundamentals" chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" section of the "Inspection, Testing and Maintenance" chapter in NFPA 72.
- C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- G. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning at Substantial Completion, service agreement shall include software support for two years.
- C. Upgrade Service: At Substantial Completion, update software to latest version. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system and new or revised licenses for using software.
 - 1. Upgrade Notice: At least 30 days to allow Owner to schedule access to system and to upgrade computer equipment if necessary.

3.7 MAINTENANCE

- A. Maintenance Service: Beginning at Substantial Completion, maintenance service must include 60 months' full maintenance by skilled employees of manufacturer's designated service organization. Include preventive maintenance, repair or replacement of worn or defective components, lubrication, cleaning, and adjusting as required for proper operation. Parts and supplies must be manufacturer's authorized replacement parts and supplies.
 - 1. Include visual inspections in accordance with "Visual Inspection Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 2. Perform tests in "Test Methods" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.
 - 3. Perform tests per "Testing Frequencies" table in "Testing" paragraph of "Inspection, Testing and Maintenance" chapter in NFPA 72.

3.8 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION

SECTION 32 1317 – PIPE BOLLARDS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The Contractor shall be held to have read all of the Bidding Requirements; all of the General Conditions and Supplementary General Conditions, and all Sections of the Technical Specifications before submitting a bid for the proposed work, and in the execution of the work, he will be bound by all of the conditions and requirements therein.

1.2 SUMMARY

- A. Furnish and install all labor, materials, equipment, and incidentals required to complete all work shown on the Contract Drawings and as specified herein.
- B. Work in this section includes, but is not limited to the following:
 - 1. Furnish and install steel pipe bollards of the dimension and size indicated on the Contract Drawings.
 - 2. Furnish and install concrete infill material.
 - 3. Painting and finishing.

1.3 COORDINATION

- A. Coordinate all Work indicated in this section with all work included and specified elsewhere in the project.

1.4 SUBMITTALS

- A. Submit the manufacturers catalog Product Data Sheets for each and every product specified in this section

PART 2 – PRODUCTS

2.1 MATERIALS

- A. Steel Pipe: 6” diameter, standard weight (Schedule 40).
- B. Concrete infill shall meet the requirements of NYSDOT Standard Specification for Class A Portland Cement Concrete.
- C. Owner shall furnish PVC sleeves to be installed over pipe bollards.

PART 3 – EXECUTION

3.1 INSTALLATION

- A. Brace steel bollards plumb and set in center of hole.
- B. Bollards shall be set in concrete, as shown on Contract Drawings.
- C. Tops of all bollards shall be uniform in height.
- D. Fill pipe with concrete. Dome concrete above top edge of pipe to shed water.
- E. Install Owner furnished PVC sleeves over steel bollards.

END OF SECTION 32 1317

SECTION 33 3000 – SANITARY SEWER

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. The contractor shall be held to have read all the Bidding Requirements; all of the General Conditions and Supplementary General Conditions and all Divisions of the Technical Specifications before submitting a bid proposal for the project, and in the execution of the work, they will be bound by all of the conditions and requirements therein.

1.2 SUMMARY

- A. Work in this section includes, but is not limited to the following items:
 - 1. Furnish all labor, materials, equipment and incidentals required to perform all excavating, backfilling, installation of structures, piping, thrust blocks, steel reinforcing, select materials, site grading, restoration and installation of other facilities required to complete the Work in every respect.
 - 2. All jointing and gasketing materials, specials, couplings, flexible couplings, mechanical couplings, harnessed and flanged adapters, sleeves, tie rods, and all other Work required to complete the piping installation.
 - 3. Sanitary Sewer piping
 - 4. Modifications to existing piping and structures.
 - 5. Typical joint and harnessing details.
 - 6. Testing of all work included in this Contract.
 - 7. Any work and/or materials not shown or specified herein, that is an integral part of, or is obviously necessary for the completion of the structures shall be considered as part of this contract.

1.3 COORDINATION

- A. Coordinate all Work indicated in this section with all work included and specified elsewhere in the project. This includes, but is not limited to the following Specification Sections:
 - 1. Section 31 10 00 – Site Clearing.
 - 2. Section 31 23 00 – Excavation, Backfill and Bedding.
 - 3. Section 31 25 00 – Erosion and Sediment Control.
 - 4. Section 32 10 00 – Select Backfill Material.
- B. Coordinate all work to be performed with actual field and project conditions. At a minimum, contractor is to perform the following tasks prior to submitting bids or shop drawings for the project:
 - 1. Perform field investigations to determine all necessary incidental items, which will be required for complete and proper installation of all work. Verify all items affecting the bid price prior to bidding.
 - 2. Perform all necessary field measurements to provide complete, accurate, and coordinated shop drawing submittals.

3. Organize and attend all necessary coordination meetings required to assure proper coordination and installation of all related work included in the project.

1.4 SUBMITTALS

- A. Submit the manufacturers catalog Product Data Sheets for each and every product specified in this section.
- B. Provide Shop Drawings for special assemblies and construction details as required by the Architect/Engineer. This includes, but is not limited to the following items:
- C. Cleanouts and all pipe materials used to convey flow.
 1. Details of conditions unique to the project. This includes details indicated on the contract drawings, details to address specific job conditions, or details which the contractor may propose to use which differ from those indicated on the contract drawings.
 2. Provide material list indicating manufacturer, material, gage or catalog cuts of all fabricated items contained in this Section.
 3. As-Built Survey of Sanitary Sewer Connection, complete with all inverts, swing ties and coordinates of all connects, deflections (horizontal and vertical), and final rim elevations for cleanouts and manholes as applicable.

1.5 QUALITY ASSURANCE

- A. Qualifications: The contractor is to have satisfactorily performed work of similar scope on projects of similar size for a minimum of 5 years.
- B. Warranties: All work is to be subject to the following warranties:
 1. Materials Warranties: The material manufacturers standard warranties are to be provided for each product unless otherwise indicated.
 2. Labor and Workmanship Warranty: Provide a one (1) year warranty against defects in workmanship which lead to failures within that period. Failures include, but are not limited to cracking, sagging, bowing, or misalignment of any work affected by the items specified herein. Contractors warranty is to include the correction of all other related work affected by any failure. Contractor will at their own expense without charge to the Owner make repair to the originally specified condition of all work required to be corrected as a result of all failures occurring within the warranty period.
- C. Regulatory Requirements: All work is to be completed in accordance with all the latest requirements of the following authorities and/or documents the most stringent requirements of which will apply:
 1. Comply with all New York State Department of Transportation (NYSDOT) Standards and Specifications, Village of Depew Plumbing requirements and Current all current Erie County and Village of Depew codes, permits, and Standard Specifications for Construction Materials, as applicable.
 2. Code and Regulations: Comply with all applicable codes, rules and regulations pertaining to sanitary sewer systems.

- D. Verification: Check inverts of all existing sewer structures and pipes to which new lines are to be connected and notify the Architect/Engineer of any discrepancy prior to commencement of work.

PART 2 - PRODUCTS

2.1 BEDDING AND BACKFILL

- A. Bedding and backfill shall conform to the requirements of Section 32 10 00 of the specifications.
- B. Excavated material may be used as backfill only in unpaved areas, provided that it is free of large stones (over 3”), debris, loam or frozen material and approved by the Architect/Engineer. Where excavated material is unacceptable as backfill, provide acceptable material from off-site at no additional cost.

2.2 PIPING MATERIALS:

- A. Ductile Iron Sewer Pipe: ASTM A 746, for push on joints.
 - 1. Standard Pattern, Ductile Iron Fittings: AWWA C110, ductile or gray iron, for push_on joints.
 - 2. Gaskets: AWWA C111, rubber.
- B. PVC Sewer Pipe and Fittings: ASTM D 3034, SDR 35, for gasketed joints.
 - 1. Gaskets: ASTM F 477, elastomeric seals.
- C. Sleeve Type Pipe Couplings: ASTM C 1173, rubber or elastomeric sleeve and band assembly fabricated to mate with OD of pipes to be joined, for nonpressure joints.

2.3 GRAY IRON CLEANOUTS

- A. ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside calk or spigot connection and countersunk, tapered-thread, brass closure plug. Use units with top-loading classifications according to the following applications:
 - 1. Light Duty: In earth or grass foot-traffic areas.
 - 2. Medium Duty: In paved foot-traffic areas.
 - 3. Heavy Duty: In vehicle-traffic service areas.
 - 4. Extra-Heavy Duty: In roads.
- B. Sewer Pipe Fitting and Riser to Cleanout: ASTM A 74, Service class, cast-iron soil pipe and fittings.

2.4 MISCELLANEOUS

- A. Concrete: Concrete shall have a minimum 28 day compressive strength of 4000 psi and shall conform to the latest NYSDOT Standard Specification for Class A Portland Cement Concrete.
- B. Brick: The brick shall conform to the requirements of ASTM C 32, Grade SM.
- C. Mortar shall consist of one part Portland cement and two parts sand. The Portland cement shall conform to the requirements of ASTM C 150, Type I. The sand shall conform to the requirements of ASTM C 144.
- D. Reinforcing steel shall conform to ASTM A 615 Grade 60.
- E. Concrete for pipe cradles shall have a minimum compressive strength of 2000 psi at 28 days and conform to the requirements of NYSDOT Class A Concrete.
- F. Geotextile Fabric shall conform to the requirements of Section 32 05 19.
- G. Warning Tape: Warning tape shall be a continuous 6” wide (minimum) detectable tape 0.035 inches of color specified by the Architect/Engineer, with the words “Buried Sanitary Line Below” printed thereon.

PART 3 - EXECUTION

3.1 PIPE INSTALLATION

- A. Excavating, trenching, and backfilling are specified in Division 31 "Excavation and Backfill", Section 31 20 00.
- B. Identification: Materials and their installation are specified in Division 31 "Excavation and Backfill." Arrange for installing green warning tapes directly over piping and at outside edges of underground structures.
 - 1. Use warning tape or detectable warning tape over ferrous piping.
 - 2. Use detectable warning tape over nonferrous piping and over edges of underground structures.
- C. Sleeve-Type Pipe Couplings: Use where required to join piping and no other appropriate method is specified. Do not use instead of specified joining methods.
- D. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground sanitary sewerage piping. Location and arrangement of piping layout take design considerations into account. Install piping as indicated, to extent practical.
- E. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings according to manufacturer's written instructions for using lubricants, cements, and other installation requirements. Maintain swab or drag in line, and pull past each joint as it is completed.

- F. Use proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- G. Install gravity flow piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
 - 1. Install piping pitched down in direction of flow, at minimum slope of 1 percent, unless otherwise indicated.
 - 2. Install piping with 48-inch minimum cover or as shown on the Contract Plans.
- H. Extend sanitary sewerage piping and connect to building's sanitary drains, of sizes and in locations indicated. Terminate piping as indicated.
- I. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch overlap, with not less than 6 inches of concrete with 28-day compressive strength of 4000 psi.
- J. Make branch connections from side into existing piping, NPS 4 to NPS 20. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye with not less than 6 inches of concrete with 28-day compressive strength of 4000 psi.
- K. Protect existing piping and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.
- L. Clear interior of piping and structures of dirt and superfluous material as work progresses. Maintain swab or drag in piping, and pull past each joint as it is completed.
- M. Place plug in end of incomplete piping at end of day and when work stops.
- N. Flush piping between manholes and other structures to remove collected debris, if required by authorities having jurisdiction.

3.2 CLEANOUTS

- A. Install cleanouts and riser extension from sewer pipe to cleanout at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
- B. Set cleanout frames and covers in earth in cast in place concrete block, 18 by 18 by 12 inches deep. Set with tops 1 inch above surrounding grade.
- C. Set cleanout frames and covers in concrete pavement with tops flush with pavement surface.
- D. Make connections to existing piping and underground structures so finished Work complies as nearly as practical with requirements specified for new Work.

3.3 INSPECTION

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches of backfill is in place, and again at completion of Project.

- B. Defects requiring correction include the following:
1. Alignment: Less than full diameter of inside of pipe is visible between structures.
 2. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 3. Crushed, broken, cracked, or otherwise damaged piping.
 4. Infiltration: Water leakage into piping.
 5. Exfiltration: Water leakage from or around piping.
- C. Replace defective piping using new materials, and repeat inspections until defects are within allowances specified.
- D. Re-inspect and repeat procedure until results are satisfactory.

3.4 TESTING

- A. Test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
1. Do not enclose, cover, or put into service before inspection and approval.
 2. Test completed piping systems according to authorities having jurisdiction.
 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 4. Submit separate reports for each test.
 5. If authorities having jurisdiction do not have published procedures, perform tests as follows:
 - a. Sanitary Sewerage: Perform hydrostatic test.
 - 1.) Allowable leakage is maximum of 50 gal. per inch of nominal pipe size per mile of pipe, during 24-hour period, or as specified by the Village of Depew.
 - 2.) Close openings in system and fill with water.
 - 3.) Purge air and refill with water.
 - 4.) Disconnect water supply.
 - 5.) Test and inspect joints for leaks.
 - 6.) Option: Test ductile iron piping according to AWWA C600, Section "Hydrostatic Testing." Use test pressure of at least 10 psig.
 - b. Sanitary Sewerage: Perform air test according to UNI B 6

- B. Leaks and loss in test pressure constitute defects that must be repaired.
- C. Replace leaking piping using new materials, and repeat testing until leakage is within allowances specified.

3.5 CLEANING AND RESTORATION

- A. After the backfill is completed, the Contractor shall dispose of all surplus material, dirt, and rubbish from the site. Surplus dirt may be deposited in embankments, shoulders, disposed off site, or as ordered by the Architect/Engineer. The Contractor shall restore all disturbed areas to their original condition.

END OF SECTION 33 3000

SECTION 01731 – CONNECTIONS TO EXISTING FACILITES

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Perform all construction necessary to complete connections and tie-ins to existing facilities.
- B. Keep existing facilities in operation unless otherwise specifically permitted in these Specifications or approved by OWNER.
- C. CONTRACTOR shall perform all construction activities so as to avoid interference with operations of the facility and the work of others, and the safety and quality of the finished water.
- D. Related work specified elsewhere:
 - 1. Section 01311, Coordination with OWNER’S Operations.
 - 2. Divisions 2-15, Technical Specifications.

1.2 GENERAL INFORMATION

- A. Construction of interconnections is subject to CONTRACTOR’S submittal of materials, detailed procedures, schedules, etc. required by the contract. The following is for information only and the CONTRACTOR is responsible for all interconnections and abandonments.
- B. The CONTRACTOR shall not operate existing valves. Once a new watermain is placed into service, CONTRACTOR shall not operate those valves.
- C. The OWNER only shall operate existing valves. The CONTRACTOR is advised that watertight conditions may not exist when existing valves are closed. The CONTRACTOR shall consider this in his bid.
- D. The CONTRACTOR shall perform test pits at existing pipes, valves, etc. as shown on the drawings or directed. Watermain installation and the pipe laying schedule should reflect the field information obtained by the test pits. The stationing of tees, fittings and valves should be coordinated with the test pit information in order to facilitate construction of the new watermains and construction of the interconnections.
- E. The CONTRACTOR shall submit to the ENGINEER his proposed interconnection details, procedures and schedules.
- F. The CONTRACTOR shall notify all affected customers of any shut-down at least 48 hours in advance.
- G. The CONTRACTOR shall notify appropriate fire stations 48 hours in advance prior to taking any fire hydrants out of service. Any hydrant not in service shall be bagged in burlap.
- H. Any shut-down shall be limited to 4 consecutive hours.

SECTION 01 731 – CONNECTIONS TO EXISTING FACILITIES

- I. The CONTRACTOR shall have all equipment, manpower, and materials required for the construction on site and ready for use and/or prior to commencing any shut-down or removing any existing facilities.
- J. The CONTRACTOR shall schedule and coordinate his work with others in accordance with the specifications and shall coordinate all proposed shut-downs with the ENGINEER and OWNER. The work shall be scheduled through the ENGINEER so that the OWNER has a minimum of three (3) working days advance notice.
- K. Only one interconnection will be allowed until the proposed watermain and end of line valves (if applicable) have been installed, tested and disinfected and the ENGINEER authorizes the interconnections.
- L. Caps (or plugs) on iron pipe shall be mechanically restrained watertight caps (or plugs) compatible with the pipe being capped and suitable to resist thrusts due to operating pressures.
- M. Temporary caps shall be watertight and shall remain in place until the actual interconnections are made.
- N. In unpaved areas, all interconnection joints shall remain exposed and tested under operating pressure for a 24-hour period.
- O. If no leaks occur, the exposed interconnection piping can, upon ENGINEER'S authorization, be backfilled.
- P. The CONTRACTOR shall dewater trenches, existing mains, etc. as required to perform the interconnections.
- Q. The CONTRACTOR shall submit his detailed procedures for his interconnection sequence to the ENGINEER.
- R. If the CONTRACTOR wishes to propose construction of several interconnections at one time, he shall submit a written, detailed proposal to the ENGINEER.
- S. No work shall begin on the interconnections until the ENGINEER authorizes the work.
- T. Firms performing taps on existing waterlines shall be acceptable to the OWNER.
- U. All joints at interconnections shall be mechanically restrained.
- V. New hydrants shall remain bagged in burlap (except for flushing and/or testing) until placed into service.
- W. The interconnections and abandonment items include all costs to comply with permits, regulatory agencies, etc., not included under other bid items.
- X. Removals shall be made with caution to prevent damage to hydrants, valves, etc., being removed.

SECTION 01 731 – CONNECTIONS TO EXISTING FACILITIES

- Y. At all valves being abandoned: locate the valve, close the valve, remove the valve box, backfill and restore as required.
- Z. CONTRACTOR will provide a temporary bypass for water service for all businesses, schools, and other establishments as defined by ENGINEER. No disruption in water service for these establishments will be permitted at any time during construction.

1.3 SCHEMATIC DRAWINGS

- A. The schematic drawings included on the plans are not to scale and only indicate the general arrangement of the interconnections and abandonments.
- B. In general, heavy lines indicate proposed improvements, pipe, fittings, etc. and light lines indicate existing facilities.
- C. The schematic drawings do not show other features (such as other underground utilities, etc.) which could affect the work.
- D. The CONTRACTOR shall, at his expense, verify all field conditions.
- E. Restrained mechanical joint solid sleeves or restrained flexible sleeve type couplings will be required to connect the proposed pipe to existing pipe, where applicable.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION 01731

SECTION 02 316 – SELECT GRANULAR MATERIALS

PART 1 - GENERAL

1.1 DESCRIPTION

- A. Work Specified
Select granular materials shall be used in bedding, pipe encasement, or backfill and as specified or as directed by the ENGINEER.
- B. Related Work Specified Elsewhere
 - 1. Section 02351 - Excavation, Backfill and Trenching
 - 2. Section 15051 - Buried Piping Installation

1.2 QUALITY ASSURANCE

- A. Reference Standards
 - 1. NYSDOT Standards, latest revision

1.3 SUBMITTALS

- A. The CONTRACTOR shall furnish representative samples, sieve analysis and certification of specification compliance for the select granular materials to the ENGINEER and advise on the location of the source.
- B. The CONTRACTOR shall submit copies of proposed materials, methods and operations of backfilling and compaction to the ENGINEER for review prior to the start of work. A list of equipment to be used in CONTRACTOR'S Methods and Operations must be included.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bedding and Pipe Encasement
 - 1. NYSDOT No. 1 Crushed Stone or Crushed Gravel – bedding for PVC, DIP, and PCCP watermain.
Thoroughly washed, clean, sound, tough, hard, crushed limestone conforming to the requirements of NYSDOT Item No. 703.0201 or crushed gravel conforming to the requirements of NYSDOT Item No. 703.0202, having the following gradation by weight:

SECTION 02 316 – SELECT GRANULAR MATERIALS

- | <u>% Passing</u> | <u>Sieve</u> |
|------------------|--------------|
| 100 | 1-inch |
| 90 - 100 | 1/2-inch |
| 0 - 15 | 1/4-inch |
2. NYSDOT No. 2A Crushed Stone or Crushed Gravel – bedding for DIP and PCCP watermain.
 Shall be a No. 1 and No. 2 blend, thoroughly washed, clean, sound, tough, hard, crushed limestone conforming to the requirements of NYSDOT Item No. 703.0201 or crushed gravel conforming to the requirements of NYSDOT Item No. 703.0202, having the following gradation by weight:

<u>% Passing</u>	<u>Sieve</u>
100	1-1/2-inch
93-100	1-inch
27-58	1/2-inch
0-8	1/4-inch

3. NYSDOT Concrete Sand – bedding for copper and polyethylene tubing.
 Washed, fine aggregate sand shall conform to the requirements of NYSDOT Item No. 703.07, having the following gradation by weight:

<u>% Passing</u>	<u>Sieve</u>
100	3/8-inch
90 - 100	No. 4
75 - 100	No. 8
50 - 85	No. 16
25 - 60	No. 30
10 - 30	No. 50
1 - 10	No. 100
0 - 3	No. 200

B. Select Backfill

1. NYSDOT Subbase Type 2 Crusher Run Stone or Crusher Run Gravel.
 Material shall conform to the requirements of NYSDOT Item No. 304.12, having the following gradation by weight:

<u>% Passing</u>	<u>Sieve</u>
100	2-inch
25 - 60	1/4-inch
5 - 40	No. 40
0 - 10	No. 200

C. Peagravel

1. NYSDOT Type 1A Screened Gravel for the annular space between the carrier pipe and the casing pipe.
 Screened gravel shall conform to the requirements of NYSDOT Item No. 703.0203 and have the following gradation by weight:

<u>% Passing</u>	<u>Sieve</u>
100	1/2-inch
90 - 100	1/4-inch
0 - 15	1/8-inch

SECTION 02 316 – SELECT GRANULAR MATERIALS

- D. Follow NYSDOT Standard Specifications if gradation data varies from those listed above.
- E. Recycled concrete or asphalt pavement shall not be allowed.
- F. Slag of any type shall not be allowed.
- G. Flowable Fill shall comply with NYSDOT Item 733-0102 – Controlled Low Strength Material (No Fly Ash).

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Select granular material as specified or directed for watermain bedding or encasement shall be placed in accordance with Section 02351 - Excavation, Backfill and Trenching and Section 15051 - Buried Piping Installation.
2. Select backfill where specified or directed shall be placed in accordance with the backfilling provisions of Section 02351 - Excavation, Backfill & Trenching.
3. Flowable Fill (Controlled Low Strength Material) shall only be used where defined on the contract drawings and approved for use by the ENGINEER and OWNER.

3.2 DISPOSAL OF DISPLACED MATERIALS

- A. Materials displaced through the use of the above materials shall be wasted or disposed of by the CONTRACTOR and the cost of such disposal shall be included in the appropriate bid item.

END OF SECTION 02 316

SECTION 02 351 – EXCAVATION, BACKFILL AND TRENCHING

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Specified

1. The CONTRACTOR shall furnish all labor, materials, equipment, and incidentals necessary for excavation, trenching, backfill, and compaction as shown and specified. Disposal of excess and unsuitable excavated material is included.
2. Backfill of excavations with acceptable materials as specified in other Sections.

B. Related Work Specified Elsewhere

1. Section 02316 - Select Granular Materials
2. Section 02317 - Rock Excavation
3. Section 02900 - Restoration
4. Section 15051 - Buried Piping Installation

1.2 QUALITY ASSURANCE

A. Reference Standards

1. ASTM A36, Structural Steel
2. ASTM A328, Steel Sheet Piling
3. ASTM D422, Particle-Size Analysis of Soils
4. ASTM D698, Moisture-Density Relations of Soils, using 5.5 lb. Rammer and 12-inch Drop
5. ASTM D1556, Density of Soil in Place by the Sand-Cone Method
6. ASTM D1557, Moisture-Density Relations of Soils, using 10 lb. Rammer and 18-inch Drop
7. ASTM D2321, Recommended Practices for Underground Installation of Pipe for Sewers and Other Gravity Flow Applications
8. ASTM D2922, Density of Soil and Soil-Aggregate in Place by Nuclear Method (Shallow Depth)
9. AISC Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings
10. Occupational Safety and Health Administration (OSHA) Regulations
11. Industrial Code Rule 23

1.3 SUBMITTALS

- A. Before any excavation begins, the CONTRACTOR shall obtain all permits and licenses required by governing authorities having jurisdiction and submit certified copies to ENGINEER prior to work being performed.
- B. The CONTRACTOR shall submit drawings submitted with a PE stamp, for information only, for the following items as required:

SECTION 02 351 – EXCAVATION, BACKFILL AND TRENCHING

1. Sheeting, shoring and bracing
 2. Dewatering systems
 3. Cofferdams
 4. Additional protection systems required
 5. Underpinning
 6. Underdraining
 7. Sediment and Erosion control
 8. Boring and Receiving Pits.
- C. The CONTRACTOR shall submit proposed materials, methods and operations of backfilling and compaction to the ENGINEER for review prior to the start of work. A list of equipment to be used in CONTRACTOR’S methods and operations must be included.
- D. All drawings shall be prepared and sealed by an independent professional engineer recognized as an expert in the specialty involved and licensed to practice in the State of New York. The drawings shall be submitted to the ENGINEER to establish compliance with the terms of the Contract Documents. Calculations shall not be submitted. Drawing submissions will not be checked and will not imply approval by the ENGINEER of the work involved. CONTRACTOR shall be wholly responsible for designing, installing, and operating whatever system is necessary to accomplish satisfactory sheeting, bracing, protection, underpinning, and dewatering.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Bedding and Select Backfill
1. Bedding and select backfill material shall be in accordance with Section 02316 - Select Granular Materials.
- B. Backfill and Fill Materials
1. Excavated materials may be used for backfill provided:
 - a. Material is sandy, loamy or similar to bank run gravel.
 - b. Material is free of debris, hazardous materials, frozen materials, organic or other deleterious materials. Material greater than 4-inches in any direction is unacceptable. Material greater than 2-inches in any direction is unacceptable for backfill directly against the watermain.
 - c. Maximum dry density and optimum moisture content are determined in accordance with the above.
 - d. Material is reviewed and deemed acceptable by the ENGINEER.
 2. Use select granular backfill within 5 feet or within a 1 on 1 slope from the trench to the edge of pavement of all roadways.
- C. Topsoil
1. Topsoil shall be furnished and installed and coordinated with Section 02900, Restoration.
- D. Explosives

SECTION 02 351 – EXCAVATION, BACKFILL AND TRENCHING

1. Explosives are not allowed to be used nor allowed on site.

E. Sheeting, Shoring & Bracing

1. Used material shall be in good condition, not damaged or excessively pitted. Unless otherwise specified, all sheeting to remain in place shall be new. New or used sheeting may be used for temporary work.
2. All timber used for breast boards (lagging) shall be new or used, meeting the requirements for Douglas Fir Dense Construction grade or Southern Pine No. 2 Dense S3. Where close or tight sheeting is required, wood sheeting shall be tongued and grooved.
3. All steel work for sheeting, shoring, bracing, cofferdams, etc. shall be designed in accordance with the provisions of the “Specifications for the Design, Fabrication and Erection of Structural Steel for Buildings”, of the AISC except that field welding will be permitted.
4. Steel sheet piling shall be manufactured from steel conforming to ASTM A328. Steel soldier piles, wales and braces shall be new or used and shall conform to ASTM A36.
5. Steel sheeting shall have a minimum thickness of 3/8-inch in web, unless otherwise specified.

PART 3 - EXECUTION

3.1 INSPECTION

- A. The CONTRACTOR shall provide the ENGINEER with sufficient time and means to examine the areas and conditions under which excavating, filling and grading are to be performed. The CONTRACTOR shall notify the ENGINEER of conditions detrimental to the proper and timely completion of work. The CONTRACTOR shall not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the ENGINEER.

3.2 TEST PITS

- A. Where shown or ordered by the ENGINEER, the CONTRACTOR shall excavate and backfill test pits in advance of construction to determine conditions or location of existing facilities. The CONTRACTOR shall perform all work required in connection with excavating, stockpiling, maintaining, sheeting, shoring, backfilling and restoring the surface for the test pits.
- B. Test pits which the CONTRACTOR excavates that are not shown on the Drawings or specified or ordered shall be at the CONTRACTOR’S expense.
- C. No test pits will be dug prior to utility company stakeout.
- D. Cold patch for temporary repair shall be placed as directed by the ENGINEER.

3.3 EROSION CONTROL

- A. All necessary precautions shall be taken to preclude the contamination of any wetland or waterway by suspended solids, sediment, fuels, solvents, lubricants, epoxy coatings, paints, concrete leachate or any other environmentally deleterious substance associated with the project.

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- B. All necessary precautions shall be taken to prevent the entry of raw concrete or concrete liquors into the waters and/or wetlands of the State of New York. Equipment washwater from this project shall not be allowed to enter any waterway or wetland.
- C. All sediments are to be retained on the project site through the use of hay bales, silt fences or other barriers, as specified or approved by the local authority having jurisdiction, to prevent erosion.
- D. All areas of soil disturbance resulting from this project shall be seeded with an appropriate perennial grass seed and mulched with hay or straw within one week of final grading. Mulch shall be maintained until a suitable vegetative cover has been established.
- E. Pumped groundwater collected from excavations shall not be allowed to be discharged directly to any wetland, waterway, or other water body.
- F. Contamination of any wetland, waterway, or other water body shall be cleaned and/or restored to the satisfaction of the ENGINEER and governing authorities at the expense of the CONTRACTOR.

3.4 EXCAVATION

- A. The CONTRACTOR shall perform all excavation required to complete the work as shown and specified. Excavations shall include earth, sand, clay, gravel, hardpan, boulders and ledge rock, decomposed rock, pavements, rubbish and all other materials within the excavation limits, except rock. Where the excavation is in rock meeting the definition in Section 02317 - Rock Excavation (requiring drilling, jack-hammering and hand removal), the rock shall be removed as specified in Section 02317.
- B. Excavations for pipelines, utilities and structures shall be open excavations, shored and braced where necessary, according to OSHA standards, to prevent possible injury to workmen and to new and existing structures or pipelines.
- C. Where the pipeline, utility or structure is to be placed below the ground water table, well-points, cofferdams or other acceptable methods shall be used to permit construction under dry conditions. Dry conditions shall prevail until concrete has reached sufficient strength to withstand earth and hydrostatic loads and until the pipelines are properly jointed, tested and backfilled.
- D. Pumping in excavations shall be done in such a manner so as to prevent damage to the existing subgrade, and to prevent the carrying away of unconsolidated concrete materials.
- E. Excavations for pipelines shall be made sufficiently wide to permit proper laying and jointing of the pipe. The trench width at the top of the pipe should not be greater than the outside diameter of the pipe barrel plus 2 feet, but shall be sufficient to allow thorough compacting of earth refill adjacent to the bottom half of the pipe. The depth of trench shall be sufficient to allow a minimum cover over the top of the pipe as shown on the drawings. The use of excavating equipment which requires the trench to be excavated to an excessive width will not be allowed. All trenches for buried piping shall be excavated at least 6 inches below the bottom of the pipe and backfilled with pipe bedding material as specified in Section 02316 – Select Granular Materials.

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- F. Acceptable excavated materials shall be stockpiled in specified areas until required for backfill or fill. Place, grade and shape stockpiles for proper drainage.
1. Locate and retain soil materials away from edge of excavations.
 2. Unsuitable backfill material shall be kept separate from all other material and shall be disposed of as specified hereinafter. Disposal of unsuitable and excess excavated material shall be accomplished immediately upon removal from the excavation.
 3. Stockpiles shall not be located such that they interfere with traffic or access to public or private property. If necessary, the CONTRACTOR shall maintain additional stockpile areas located elsewhere on the site, and shall transport the suitable backfill material to and from such stockpile areas as required for the work.
 4. In built-up districts and in streets where traffic conditions render it necessary, the material excavated from the initial opening shall be removed by the CONTRACTOR as soon as excavated, and the material subsequently excavated, if suitable for the purpose, shall be used to backfill the trenches in which pipe has been laid or structures have been built, and neither the excavated material nor materials of construction shall be stored on the streets or sidewalks.
- G. If the material at the design grade is unsuitable as determined by the ENGINEER, the CONTRACTOR, when ordered in writing, shall excavate additional material to the depth necessary and shall backfill to the proposed grade with select granular material.
- H. Unless otherwise directed or permitted, not more than 100 feet of trench in advance of the end of the completed pipe or structure therein shall be opened at any time. Every trench in rock shall be fully opened at least 30 feet in advance of any place where masonry or pipe is being laid. Any time when the CONTRACTOR'S crews are not on the job working, a trench length equal to or less than one-half of the last length of pipe installed may be left open, but properly covered or barricaded to protect the public.
- I. At such locations where two pipes may be installed in parallel in a common trench, and where specified, the CONTRACTOR shall install the pipes a minimum of 2 feet apart as measured horizontally from the outside diameter of pipe.

3.5 UNAUTHORIZED EXCAVATION

- A. All excavation outside the lines and grades shown and not specified, together with the removal and disposal of the associated material shall be at the CONTRACTOR'S expense. The unauthorized excavation shall be filled as directed by the ENGINEER with select compacted backfill at the CONTRACTOR'S expense. Claims and damages resulting from the CONTRACTOR'S unauthorized excavation will be his sole responsibility.

3.6 DRAINAGE AND DEWATERING

- A. General
1. Prevent surface and subsurface water from flowing into excavations and from flooding adjacent areas.
 2. Remove water from excavation as fast as it collects.

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3. Maintain the ground water level at least 2 feet below the bottom of the excavation to provide a stable surface for construction operations and to prevent damage to the work during all stages of construction.
4. Provide and maintain pumps, sumps, suction and discharge lines and other dewatering system components necessary to convey water away from excavations.
5. Provide sediment traps when water is conveyed into water courses.
6. Notify the ENGINEER before shutting down dewatering systems for any reason.
7. Standing water shall not be permitted in the excavation at any time. If the material at the design grade becomes unsuitable or contaminated due to the actions of the CONTRACTOR, the CONTRACTOR shall excavate additional material to the depth necessary and shall backfill to the proposed grade with select fill or crushed stone.
8. 100% stand-by pumps (gasoline powered) shall be maintained at the site at all times.
9. Any hardships created by the temporary dewatering for this Contract which adversely affects the water supply to local property owners, shall be satisfactorily resolved by the CONTRACTOR, including the provision of temporary water service, if required, at no additional cost to the OWNER.
10. Obtain required permits from agencies of jurisdiction, NYSDEC, and USACOE, for any water being discharged into rivers, streams, or water courses.

B. Disposal of Water Removed by Dewatering Systems

1. Dispose of all water removed from the excavation in such a manner as not to endanger public health, property, or any portion of the work under construction or completed.
2. Dispose of water in such a manner as to cause no inconvenience to the owner or others on or adjacent to the site.
3. Convey water from the excavation in a closed conduit. Do not use trench excavations as temporary drainage ditches.
4. Disposal of water shall be by specified methods and shall not cause erosion or sedimentation to occur in existing drainage systems. All sedimentation or blocking of existing systems shall be thoroughly cleaned and returned to original condition by the CONTRACTOR at his expense.
5. Damage caused by the CONTRACTOR'S operations to public or private property shall be repaired by him to the satisfaction of the ENGINEER and the damaged property owner at the CONTRACTOR'S expense.
6. The CONTRACTOR shall perform all work, furnish all materials and install all measures required to reasonably control soil erosion resulting from construction operations and prevent excessive flow of sediment from the construction site. Such work may include the installation of water diversion structures, diversion ditches and sediment basins and seeding, mulching or sodding critical areas to provide temporary protection. The CONTRACTOR shall submit a plan showing the methods to be used for controlling erosion and sedimentation during construction along with the schedule of construction operations to the ENGINEER for review.
7. All erosion and sediment control practices shall be in place prior to any grading operations and installation of proposed structures or utilities.
8. All erosion and sediment control practices shall be left in place until construction is completed and/or area is stabilized.
9. Where necessary, disturbed areas shall be temporarily seeded and/or mulched until proper weather conditions exist for establishment of a permanent vegetative cover.

3.7 SHEETING, SHORING, AND BRACING

A. General

1. Unless otherwise shown or specified, excavations shall be open, shored and braced or sheeted where necessary to prevent injury to workmen, structures, pipelines and utilities.
2. Structures within 100 feet of sheeting installations shall be subject to a pre-construction survey to identify and record existing structural conditions. In the instance of private residencies, the homeowners shall be contacted directly. These inspections shall be carried out by a pre-inspection firm experienced in this line of work.
3. During the actual construction process, the CONTRACTOR shall provide the monitoring and recording of the actual vibrations generated. A baseline of ambient vibration levels shall be established prior to driving sheet piling.
 - a. The particle acceleration during the driving of the sheet piling shall not exceed 2.0 FPS.
 - b. The CONTRACTOR will be required to change the construction methods if the work is resulting in unacceptable vibration levels.
4. All municipal, county, state, and federal ordinances, codes, regulations, and laws shall be observed. The CONTRACTOR shall provide all sheeting, shoring, and bracing which conforms to New York State Department of Labor – Industrial Code Note 23 and all applicable sections of the 1970 Occupational Safety and Health Act (OSHA), and any other requirements as necessary.
5. All municipal, county, state and federal ordinances, codes, regulations, laws and OSHA regulations shall be observed.
6. Maintain shoring and bracing in excavations regardless of time period excavations will be open. Carry down the shoring and bracing as excavation progresses.
7. Safe and satisfactory sheeting, shoring and bracing shall be the entire responsibility of the CONTRACTOR.
8. The CONTRACTOR shall be held accountable and responsible for the sufficiency of all shoring and bracing used and for all damage to persons or property resulting from the improper quality, strength, placing, maintaining or removing of the same.
9. The ENGINEER'S permission to proceed with work in either a sheeted, shored braced or open trench condition shall in no way relieve the CONTRACTOR from the above responsibilities.
10. The clearances and types of temporary structures, insofar as they affect the character of the finished work, and the design of steel sheeting to be left in place, will be subject to the review of the ENGINEER, but the CONTRACTOR shall be solely responsible for the adequacy of all sheeting, shoring, bracing, cofferdamming, etc.
11. Unless otherwise shown, specified, or ordered, all materials used for temporary construction shall be removed when work is completed. Such removal shall be made in a manner not injurious to the pipelines or structures.
12. All steel sheet piling designed to remain in place shall be new materials. New or used materials may be used for temporary work.
13. Steel sheet piling shall be manufactured from steel conforming to ASTM A328. Steel for soldier piles, wales, and braces shall be manufactured to conform to ASTM A36.

B. Sheeting Left in Place

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1. Steel sheet piling shall be left in place or where conditions are such that the removal of sheeting will endanger the work or adjacent pipes or structures or when ordered in writing to be left in place by the ENGINEER. It shall consist of rolled sections of the continuous interlocking type unless otherwise specified. The type and design of the sheeting and bracing shall conform to the above specifications for all steel work for sheeting and bracing.
2. Steel sheet piling to be left in place shall be driven straight to the lines and grades as shown or directed. The piles shall penetrate into firm materials with secure interlocking throughout the entire length of the pile. Damaged piling having faulty alignment shall be pulled and replaced by new piling.
3. The type of guide structure used and method of driving for steel sheet piling to be left in place shall be submitted to the ENGINEER for review. Jetting will not be permitted.
4. The CONTRACTOR shall cut off piling left in place at least 2 feet below road surface or to the grades shown or ordered by the ENGINEER and shall dispose of the cutoffs.
5. Portions of sheeting or soldier piles and breast boards which are in contact with concrete shall be left in place.

C. Removal of Sheeting and Bracing

1. Sheeting and bracing shall be removed from excavation unless otherwise indicated by the ENGINEER. Removal shall be done so as to not cause injury to the work.
 - a. Wood or steel sheeting shall not be removed when adjacent to structures, pavement, pipes, or any other public or private property where removal may cause damage to such property.
 - b. Fill all voids left by removal of sheeting with select fill.
2. Removal of sheet piling shall be done so as not to cause injury to the Work. Removal shall be equal on both sides of excavation to ensure no unequal loads on pipe or structures.

D. Pipeline Alignment in New York State Department of Transportation and Erie County Highway Department Right-Of-Way:

1. The New York State Department Of Transportation and Erie County Highway Department require all trenches or excavations which fall within a 1 on 1 slope as measured from the edge of pavement to be tight-sheeted with pre-driven steel sheet piling prior to excavation.
 - a. The design of the predriven steel sheet piling and bracing system is the responsibility of the CONTRACTOR. The ENGINEER may reject any materials which he regards as unsound.
 - b. A copy of all predriven steel sheet piling and bracing system designs shall be submitted to the ENGINEER for his information before installation of same. Each drawing and computation page shall display the seal and signature of a licensed New York State professional engineer. This information must also be submitted to the Agency having jurisdiction for review and must meet with that Agency's approval.
 - c. The CONTRACTOR'S submittal to the ENGINEER shall include written verification from the Agency of jurisdiction that the information being submitted to the ENGINEER has been approved by that Agency.
2. If devices other than pre-driven steel sheet piling are approved by the Agency of jurisdiction in areas designated as requiring temporary sheeting, the CONTRACTOR may (with the ENGINEER'S review) be allowed to use them. However, the costs of furnishing

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and using these devices will be considered as included in the unit prices bid for the various pipe sections.

- E. In areas where the Drawings call for sheeting to remain in place, alternate sheeting methods will not be allowed. Only pre-driven, steel sheet piling systems designed for the CONTRACTOR by a professional engineer will be allowed in these areas.

3.8 BACKFILL AND COMPACTION

- A. All backfill required for trenches and structures required to provide the finished grades shown and as described herein shall be furnished, placed and compacted in 6 inch lifts by the CONTRACTOR. Unless otherwise specified or required, fill shall be obtained from the excavated materials. All materials used for filling and backfilling shall be soil of acceptable quality, free from boulders, frozen lumps, wood, stumps, sludge, or other organic matter or other deleterious or hazardous materials. Excavated materials meeting these requirements and approved by the ENGINEER may be used as backfill.
- B. Rock and/or earth material may be encountered during the work that is unsuitable for backfilling. When this material is encountered, it shall be disposed of in the specified manner, possibly resulting in a shortage of suitable backfill material. In this event, the CONTRACTOR shall be responsible for furnishing, delivering and installing clean earth or select backfill materials to properly and completely backfill the excavation. Backfill material for these situations may be obtained from other areas of the project where suitable material is available or from offsite locations as approved by the ENGINEER. All backfill material is subject to the ENGINEER'S review and must meet the minimum requirements of the specifications above.
- C. Backfill excavations as promptly as work permits, but not until completion of the following:
 - 1. Inspection by the ENGINEER of all work within the excavation.
 - 2. Inspection, testing approval, and recording of locations of underground utilities, connections, branches, structures and other facilities.
 - 3. Removal of shoring and bracing, and backfilling of voids with satisfactory materials. Cut off temporary sheet piling driven below bottom of structures and remove in a manner to prevent settlement of the structure or utilities, or leave in place if required.
 - 4. Removal and proper disposal of trash and debris.
- D. Excavation shall be kept dry during backfilling operations. Backfill around piping and structures shall be brought up evenly on all sides.
- E. The minimum density to be obtained during backfilling operations shall be 95 percent and is a percentage of the maximum density obtained in the laboratory as defined in ASTM D698 Method C including Note 2. This percentage is of modified Proctor density. In-place density determinations shall be made using a sand density cone or equivalent method as specified by ASTM D1556. If any bricks, bottles, pieces of metal, debris or other foreign matter larger than 3/4-inch size are encountered in the density test hole, a different test location shall be chosen. The ENGINEER will determine the frequency of field testing required to determine the density of the fill and shall direct the number and location of density tests. All equipment necessary to determine fill density, including nuclear density meters, shall be supplied by the CONTRACTOR.

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- F. The water content of fill material shall be controlled during placement within the range necessary to obtain the density specified. In general, the moisture content of the fill shall be within 5 percent dry and 2 percent wet of the optimum moisture content for the specified density as determined by laboratory tests. The CONTRACTOR shall perform all necessary work to adjust the water content of the material to within the range necessary to permit the density specified. No fill material shall be placed and no compaction of fill will be permitted when there is any standing water in the trenches or when the fill material or the ground the fill is to be placed on is frozen.
- G. The CONTRACTOR is not allowed to access any part of an existing water supply system (fire hydrants, etc.) as a source of water for any reason during construction activities, including the use of water for backfilling to obtain the proper moisture content.
- H. If the specified densities are not obtained because of the CONTRACTOR'S improper control of placement or compaction procedures, or because of inadequate or improperly functioning equipment, the CONTRACTOR shall perform whatever work is required to provide the specified densities. This work shall include complete removal of unacceptable fill areas, replacement and recompaction until acceptable fill is provided.
- I. All backfill in pipe trenches shall be placed in horizontal layers not exceeding 6 inches in depth and thoroughly compacted before the next layer is placed.
- J. Where pipe is laid in rock excavation, crushed stone or gravel fill shall be carefully placed and tamped over the rock before the pipe is laid. After laying, pipe, the balance of the backfill shall be placed as described herein above.
- K. Placement:
 - 1. Place pipe bedding, select backfill and/or earth backfill or borrow materials, as specified herein and in Section 15051- Buried Piping Installation.
 - 2. Trenches under roadways shall be backfilled with select backfill material for the entire length of the open cut crossing plus 5 feet back from the edge of pavement or a distance equal to a 1 on 1 slope to the invert, whichever is greater.
 - 3. Where shoulders are excavated, the trench shall be backfilled with select granular material.
 - 4. The entire trench area under driveways, parking areas, and sidewalks, shall be backfilled with select granular material in accordance with the Contract Drawings and Specifications.
 - 5. Prior to commencing with the backfilling operation, the CONTRACTOR shall submit information to the ENGINEER such as catalog cuts, specification sheets, etc., describing the type of compaction equipment he intends to use.
- L. Pipe Trench Preparation
 - 1. Braced trench width shall be minimized to greatest extent practical but shall conform to the following:
 - a. Trench width shall be sufficient to provide room for installing, jointing and inspecting piping, as shown on Contract Drawings.
 - b. Enlargements at pipe joints may be made if required and specified by the ENGINEER.
 - c. Trench width shall be sufficient for sheeting, bracing, sloping, and dewatering.
 - d. Trench width shall be sufficient to allow thorough compacting of backfill.

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- e. Do not use excavating equipment which requires the trench to be excavated to excessive width.
- 2. Depth of trench shall be as shown. If required, depths may be revised as specified by the ENGINEER.

M. The CONTRACTOR shall repair any settlement that occurs at no additional cost to the OWNER.

3.9 GRADING

A. General

Uniformly grade areas within limits of grading under this Section including adjacent transition areas. Smooth subgrade surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades.

B. Turfed Areas

Finish areas to receive topsoil to within not more than 1 inch above or below the required subgrade elevation.

C. Walks and Pavements

Shape surface of areas under walks to line, grade and cross-section, with finish surface not more than 1/2 inch above or below the required subgrade elevation.

D. Slabs

Grade smooth and even, free of voids, compacted as specified, and to required elevation. Provide final grades within a tolerance of \square inch when tested with a 10 foot straightedge.

E. Compaction

After grading, compact subgrade surfaces to the depth and percentage of maximum density required.

F. All existing drainage swales and ditches, if disturbed, shall immediately, upon completion of pipe installation, be restored to proper lines and grades. CONTRACTOR shall ensure the final drainage facilities are in working condition and acceptable to the agency of jurisdiction.

3.10 PAVEMENT SUBBASE COURSE

A. General

Place subbase material, in layers of specified thickness, over ground surface to support the pavement base course.

B. Grade Control

During construction, maintain lines and grades including crown and cross-slope of subbase course.

C. Shoulders

Place shoulders along edges of subbase course to prevent lateral movement. Construct shoulders of acceptable soil materials as specified, placed in such quantity to compact to thickness of each subbase course layer. Compact and roll at least 12 inch width of shoulder simultaneously with compacting and rolling of each layer of subbase course.

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D. Placing

Place subbase course material on prepared subgrade in layers of uniform thickness, conforming to indicated cross-section and thickness. Maintain optimum moisture content for compacting subbase material during placement operations. When a compacted subbase course is shown to be 6 inches thick or less, place material in a single layer. When shown to be more than 6 inches thick, place material in equal layers, except no single layer more than 6 inches or less than 3 inches in thickness when compacted.

3.11 DISPOSAL OF EXCAVATED MATERIALS

- A. Material removed from the excavations which does not conform to the requirements for fill or is in excess of that required for backfill shall be hauled away by the CONTRACTOR and disposed of in compliance with Municipal, County, State, Federal or other applicable regulations at no additional cost to the OWNER.
- B. The CONTRACTOR shall not dispose waste excavated material in any of the following locations:
 - 1. Wetland areas.
 - 2. Flood plains.
 - 3. Any area where excess siltation will damage or pollute receiving water.
 - 4. Disposal of excess materials shall only be allowed at locations approved by NYSDEC Region 9.

3.12 RESTORATION AND CLEAN-UP

- A. Following installation, the CONTRACTOR shall restore all areas to their original condition to the requirements of Section 02900 - Restoration, and to the satisfaction of the ENGINEER.

END OF SECTION 02 351

SECTION 02 900 – RESTORATION

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Specified

1. The work specified shall include all labor, material, equipment, services and incidentals necessary to restore surfaces, pavements, sidewalks, driveways, curbs, gutters, lawns, culverts, and other features disturbed, damaged, or destroyed during the performance of the work under or as a result of the operations of the Contract.

B. Related Work Specified Elsewhere

1. Section 02316 - Select Granular Materials
2. Section 02317 - Rock Excavation
3. Section 02351 - Excavation, Backfill, and Trenching
4. Section 03300 - Concrete
5. Section 15051 - Buried Piping Installation

1.2 QUALITY ASSURANCE

- A. The quality of materials and the performance of work used in the restoration shall produce a surface or feature equal to the condition of each before the work began.

B. Reference Standards

1. American Association of Nurserymen (AAN)
2. ASTM D698, Standard Compaction Test
3. ASTM D2487, Classification of Soils for Engineering
4. ASTM D2974, Standard Test Method for Moisture, Ash and Organic Matter of Peat and Other Organic Soils
5. New York State Department of Transportation Standard Specifications, latest revision

1.3 SUBMITTALS

- A. CONTRACTOR shall submit the following submittals:

1. The location of source and data for off-site topsoil.
2. Analysis of the seed.
3. Should a hydroseeder be used, the CONTRACTOR shall submit all data including material and application rates.
4. Mix designs for asphalt.

1.4 SCHEDULE OF RESTORATION

- A. A schedule of restoration operations shall be submitted by the CONTRACTOR for review.

- 1. After an accepted schedule has been agreed upon it shall be adhered to unless otherwise revised by the ENGINEER.
- B. In general, permanent restoration of traveled surfaces will not be permitted until one month time has elapsed after excavations have been completely backfilled as specified.
- C. The replacement of surfaces at any time, as scheduled or as directed, shall not relieve the CONTRACTOR of responsibility to repair damages by settlement or other failures.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Topsoil shall be unfrozen friable clayey loam free from clay lumps, stones, roots, sticks, stumps, brush, hazardous materials, or foreign objects.
- B. Fertilizer shall be a standard quality commercial carrier of available plant food elements. A complete prepared and packaged material containing a minimum of 10 percent nitrogen, 10 percent phosphoric acid and 10 percent potash.
 - 1. Each bag of fertilizer shall bear the manufacturer’s name and guaranteed statement of analysis.
- C. Seed mixtures shall be of commercial stock of the current season’s crop and shall be delivered in unopened containers bearing the guaranteed analysis of the mix.
 - 1. All seed shall meet the New York State Department of Transportation 713-04 standard specifications for germination and purity.
- D. Seed Mixtures:

<u>Specia</u>	<u>Lawn Areas*</u>	<u>Non-maintained Areas*</u>
Kentucky Bluegrass	50	20
Creeping Red Fescue	30	20
Manhattan or Pennfine Ryegrass	20	60
* % by weight		

- E. Mulch shall be stalks of oats, wheat, rye or other acceptable crops which are free from noxious weeds.

2.2 MATERIALS

- A. Paving Materials: The source and gradation of materials shall be acceptable to the ENGINEER. Materials shall conform to the following:
 - 1. Pavement Sub-Base Course Material: The sub-base course materials shall be select backfill material as specified in Section 02316 of the Specifications.

2. Tack Coat: The tack coat shall be NYSDOT Section 702, Item 702-3401 Asphalt Emulsion (HFMS-2H).
 3. Bituminous Base Course: Base course where required shall be placed in accordance with the NYSDOT Specifications, Section 403 – Hot Mix Asphalt Concrete Pavement. The material shall be NYSDOT, Item 403.12, Type 2, Base Course.
 4. Bituminous Binder Course: Binder course pavement where required shall be placed in accordance with NYSDOT Specifications, Section 403 – Hot Mix Asphalt Concrete Pavement. The binder course pavement material shall be NYSDOT Item No. 403.13, Type 3, Binder Course.
 5. Bituminous Surface Course: The bituminous concrete surface course shall be a hot mix bituminous material consisting of a mixture of mineral aggregate and asphalt cement as approved by ENGINEER. The surface course shall be NYSDOT Item No. 403.19, Type 7F, Top Course.
- B. Concrete Materials: Concrete used for road bases, roads, driveways, sidewalks, curbs, or similar items shall be a 4,000 psi mix. Concrete and reinforcing materials shall be as specified in Section 03300 of these Specifications.

2.3 MATERIALS TESTING

- A. All materials must be tested and approved prior to delivery to the site. Samples of materials proposed for use shall be submitted by the CONTRACTOR to the ENGINEER and the testing laboratory. Samples of the materials shall be submitted at least ten days in advance of its anticipated use.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Temporary Pavement

1. Immediately upon completion of backfilling of the trench or excavation, the CONTRACTOR shall place a temporary pavement over all disturbed areas of streets, driveways, sidewalks, and other traveled places where the original surface has been disturbed as a result of his operations.
2. The temporary pavement shall consist of compacted select backfill surfaced with cold patch to such a depth as required to withstand the traffic to which it will be subjected.
3. The surface of the temporary pavement shall conform to the slope and grade of the area being restored.
4. For dust prevention, the CONTRACTOR shall treat all surfaces, not covered with cold patch, as frequently as may be required
5. The temporary pavement shall be maintained by the CONTRACTOR in a safe and satisfactory condition until such time as the permanent paving is completed. The CONTRACTOR shall immediately remove and restore all pavement as shall become unsatisfactory.

B. Permanent Pavement Replacement

1. The permanent and final re-paving of all streets, driveways and similar surfaces where pavement has been removed, disturbed, settled or damaged by or as a result of performance

of the Contract shall be repaired and replaced by the CONTRACTOR, by a new and similar pavement, consisting of base, binder, and/or top courses each having the same depth as existing pavement or as required by the local community or Highway Permit.

- a. The top surface shall conform with the grade of existing adjacent pavement and the entire replacement shall meet the current specifications of the local community for the particular types of pavement.
- b. Where the local community has no specification for the type of pavement, the work shall be done in conformity with the New York State Department of Transportation Standard which conforms the closest to the type of surfacing being replaced, as determined by the ENGINEER and with the following specifications:
 - 1). Unless specified otherwise, replacement of existing roads under the jurisdiction of New York State, Counties or Cities, shall be constructed to the following requirements:
 - a). Pavement subbase as outlined under Section 02316.
 - b). Base Course Pavement – 8 inches minimum compacted thickness or combination of concrete base where encountered.
 - c). Binder Course Pavement – 1-1/2 inches minimum compacted thickness.
 - d). Surface Course Pavement – 1 inch minimum compacted thickness.
 - 2). Unless specified otherwise, replacement of existing roads under the jurisdiction of Towns or Villages shall be constructed to the following requirements:
 - a). Pavement subbase as outlined under Section 02316.
 - b). Binder Course Pavement – 4 inches minimum compacted thickness.
 - c). Surface Course Pavement – 2 inches minimum compacted thickness.
- c. All required permits for local governing bodies shall be obtained.
- d. Install or reinstall pavement striping in accordance with NYSDOT Standard Specifications.

C. Preparation for Permanent Pavement

1. When scheduled and within the time specified, the temporary pavement shall be removed and base prepared, at the depth required by the local community or Highway Permit, to receive the permanent pavement.
 - a. The base shall be brought to the required grade and cross-section and thoroughly compacted before placing the permanent pavement.
 - b. Any base material which has become unstable for any reason shall be removed and replaced with compacted base materials.
 - c. Cuts which are not straight will require another saw-cutting further from the trench. Additional select backfill and pavement needed for restoration outside the defined pay limits will be installed and paid for by the CONTRACTOR.
2. Prior to placing the permanent pavement, all service boxes, manhole frames and covers and similar structures within the area shall be adjusted to the established grade and cross-section.
3. The edges of existing asphalt pavement shall be cut a minimum of one foot beyond the excavation or disturbed base whichever is greater.
 - a. All cuts shall be parallel or perpendicular to the centerline of the street.
 - b. All cuts will be made in straight continuous lines by saw-cutting or other acceptable technique.

- c. Additional one-foot saw cut may be required for top course if shown on the drawings or required by permit.
 - 4. Install or reinstall traffic inductance loops in accordance with NYSDOT Standard Specifications by a firm which is qualified by the NYSDOT.
- D. Bituminous Tack Coat
- 1. The tack coat shall be uniformly applied by a pressure distributor to a prepared clean pavement. The tack coat shall be applied as approved by the ENGINEER to offer the least inconvenience to traffic and to permit one-way traffic, where practical, to prevent pickup or tracking of the bituminous material.
 - 2. Tack coat shall not be applied on a wet pavement surface or when the surface temperature is below 45 degrees F. The temperature and areas to be treated shall be approved by the ENGINEER prior to application. The application rate shall be 0.03 to 0.07 gallons per square yard as approved by the ENGINEER.
- E. Asphalt Pavement
- 1. The permanent asphalt pavement replacement for streets, driveways and parking area surfaces shall be replaced with bituminous materials of the same depth and kind as the existing unless otherwise specified.
 - 2. Prior to placing of any bituminous pavement tack coat shall be applied to the edges of the existing pavement and other features.
 - 3. The furnishing, handling and compaction of all bituminous materials shall be in accordance with the New York State Department of Transportation Standards latest edition.
- F. Cold Milling
- 1. Cold milling of existing surfaces shall follow New York State Department of Transportation Standard Specifications, latest edition.
 - 2. Material removed during the milling process will become the property of the CONTRACTOR and shall be disposed of at an acceptable location off-site.
 - 3. CONTRACTOR must maintain drainage into all gutters and catch basins during the milling operation.
- G. Concrete Pavement and Pavement Base
- 1. Concrete pavements and concrete bases for asphalt, brick or other pavement surfaces shall be replaced with Class “B” concrete, air-entrained as specified in Section 03300.
 - 2. Paving slabs or concrete bases shall be constructed to extend one foot beyond each side of the trench and be supported on undisturbed soil. Where such extension of the pavement will leave less than two feet of original pavement slab or base, the repair of the pavement slab or base shall be extended to replace the slab to the original edge of the pavement or base unless otherwise indicated on the Contract Drawings.
 - 3. Where the edge of the pavement slab or concrete base slab falls within the excavation, the excavation shall be backfilled with Select Backfill compacted to 95 percent maximum dry density as determined by ASTM D698 up to the base of the concrete.
 - 4. The new concrete shall be of the same thickness as the slab being replace and shall contain reinforcement equal to the old pavement.

- a. New concrete shall be placed and cured in accordance with the applicable provisions of the State Department of Transportation Standards.

H. Stone or Gravel Pavement

- 1. All pavement and other areas surfaced with stone or gravel shall be replaced with material to match the existing surface unless otherwise specified.
 - a. The depth of the stone or gravel shall be at least equal to the existing or at least 6 inches.
 - b. After compaction, the surface shall conform to the slope and grade of the area being replaced.
 - c. Stone material used shall comply with the New York State Department of Transportation Standard Specifications, latest edition.

I. Driveways

- 1. Asphalt Driveways
 - a. After the watermain has been installed and the trench properly backfilled, the CONTRACTOR shall cut back the drive one foot each side of the trench. The asphalt shall be cut with carborundum saw or other device to give a uniform and continuous straight edge. Where watermains or service piping are installed under drive aprons the ENGINEER may specify the replacement of the entire apron and the CONTRACTOR shall remove and replace same to its base.
 - b. The cut edge shall be painted with a bituminous seal coat and asphalt shall then be replaced to equal or exceed the existing asphalt in quality and depth.
 - 1). In no case shall the finished thickness of the asphalt driveway be less than four (4) inches, a minimum of three (3) inches of binder and one (1) inch of top to match the existing driveway.
 - 2). Courses shall be laid in one (1) inch lifts and compacted with a minimum two (2) ton roller or other mechanical means specified by the ENGINEER.
 - 3). If the existing drive was in the opinion of the ENGINEER recently sealed, then the CONTRACTOR shall apply one (1) coat of coal tar emulsion sealer over the top lift. In no case shall cold patch be considered pavement, but may be used temporarily as an expedient, the cost of which will be borne by the CONTRACTOR.
- 2. Concrete Driveways
 - a. The CONTRACTOR shall be responsible for the proper consolidation of the sub-grade before laying the new driveway, and any settlement or failure of the new driveway shall be repaired or replaced by the CONTRACTOR to the satisfaction of the ENGINEER.
 - b. Where drives are encountered, the CONTRACTOR shall cut the concrete each side of the trench limits using a concrete saw at breaks in the drive or at expansion joints at the direction of the ENGINEER. Any concrete broken beyond the cut or break line will be replaced at the CONTRACTOR'S expense.
 - c. The drive shall then be replaced to equal or exceed the existing drive in quality and depth.
 - 1). Reinforcing shall be installed in all replacements, tying it to existing reinforcing where it protrudes from the cut edge. 6 x 6 x 6 welded wire mesh or equal shall be used. The CONTRACTOR shall then install Transit Mix

Concrete meeting NYSDOT specifications to the depth of the original base, or a minimum of six (6") inches, whichever is more.

- 2). The surface shall be finished to match the existing surface. The CONTRACTOR shall properly cure all concrete after placing and shall protect it from damage from all types of traffic and harm prior to final setting.

J. Concrete Walks, Curbs and Gutter Replacement

1. Concrete walks, curbs and gutters removed or damaged in connection with or as a result of the construction operations shall be replaced with new construction.
 - a. The minimum replacement will be a flag or block of sidewalk and five feet of curb or gutter.
2. Walks shall be constructed of concrete, air-entrained with NYSDOT No.1 stone aggregate on a 4-inch base of compacted gravel or stone.
 - a. The walk shall be not less than 4 inches in thickness or to match the thickness of the replaced walk, shall have construction joints spaced to match the existing walks, and shall have expansion joints spaced not more than 50 feet apart and shall be sloped at right angles to the longitudinal centerline approximately 1/8-inch per foot of width.
3. One-half inch expansion joint material shall be placed around all objects within the sidewalk area as well as objects to which the new concrete will abut, such as valve boxes, manhole frames, curbs, buildings and others.
4. Walks shall be hand-floated and broom-finished, edged and grooved at construction joints and at intermediate intervals matching those intervals of the walk being replaced.
 - a. The intermediate grooves shall be scored a minimum of 1/4 of the depth of the walk.
 - b. The lengths of blocks formed by the grooving tool, and distances between construction and expansion joints shall be uniform throughout the length of the walk in any one location.
5. The minimum length of curb or gutter to be left in place or replaced shall be 5 feet. Where a full section is not being replaced, the existing curb or gutter shall be saw cut to provide a true edge.
 - a. The restored curb or gutter shall be the same shape, thickness and finish as being replaced and shall be built of the same concrete and have construction and expansion joints as stated above for sidewalks.
6. All concrete shall be placed and cured as specified in Section 03300, Concrete.

K. Lawns and Improved Areas

1. The area to receive topsoil shall be graded to a depth of not less than 4 inches or as specified, below the proposed finished surface. If the depth of existing topsoil prior to construction was greater than 4 inches, topsoil shall be replaced to that depth.
 - a. All debris and inorganic material shall be removed and the surface loosened for a depth of 2 inches prior to the placing of the topsoil.
 - b. The topsoil shall not be placed until the subgrade is in suitable condition and shall be free of excessive moisture and frost.
 - c. Topsoil placed in areas of earth excavation will not be placed until suitable earth compaction has been performed.
2. Satisfactory topsoil removed from the excavations shall be placed on the prepared subgrade to the depth required.

- a. In the event the topsoil removed during excavation is unsatisfactory or inadequate to obtain the required finish grades, the CONTRACTOR shall furnish the required quantity of satisfactory topsoil from specified sources off site.
- b. All topsoil shall be free from stones, roots, sticks and other foreign substances and shall not be placed in a frozen or muddy condition.
- c. The finished surface shall conform to the lines and grades of the area before disturbed or as shown on the Contract Drawings. Any irregularities shall be corrected before the placement of fertilizer and seed.
3. The fertilizer shall be applied uniformly at the rate of 20 pounds per 1000 square feet.
 - a. Following the application of the fertilizer and prior to application of the seed, the topsoil shall be scarified to a depth of at least 2 inches with a disc or other suitable method traveling across the slope if possible.
4. When the topsoil surface has been fine graded, the seed mixture shall be uniformly applied upon the prepared surface with a mechanical spreader at a rate of not less than 5 pounds per 1000 square feet.
 - a. The seed shall be raked lightly into the surface and rolled with a light hand lawn roller.
 - b. Seeding and mulching shall not be done during windy weather.
5. The mulch shall be hand or machine spread to form a continuous blanket over the seed bed, approximately 2 inches uniform thickness at loose measurement. Excessive amounts or bunching of mulch will not be permitted.
 - a. Mulch shall be anchored by an acceptable method.
 - b. Unless otherwise specified, mulch shall be left in place and allowed to disintegrate.
 - c. Any anchorage or mulch that has not disintegrated at time of first mowing, shall be removed. Anchors may be removed or driven flush with ground surface.
6. Seeded areas shall be watered as often as required to obtain germination and to obtain and maintain a satisfactory sod growth. Watering shall be in such a manner as to prevent washing out of seed. Any washout or damage which occurs shall be regraded and reseeded until a good sod is established.
7. Hydroseeding may be accepted as an alternative method of applying fertilizer, seed and mulch. The CONTRACTOR must submit all data regarding materials and application rates to the ENGINEER for review.
8. The CONTRACTOR shall maintain the newly seeded areas, including regrading, reseeding, watering and mowing, in good condition, until the development of an established cover.

L. Cultivated Area Replacement

1. Areas of cultivated lands shall be graded to a depth to receive topsoil of not less than the depth of the topsoil before being disturbed. All debris and inorganic material shall be removed prior to placing of the topsoil.
2. After the topsoil has been placed and graded, the entire area disturbed during construction shall be cultivated to a minimum depth of 12 inches with normal farm equipment.
 - a. Any debris or inorganic materials appearing shall be removed.
 - b. The removal of stones shall be governed by the adjacent undisturbed cultivated area.
3. Grass areas shall be re-seeded using a mixture equal to that of the area before being disturbed, unless otherwise specified.

M. Other Types of Restoration

1. Shrubs and landscape items damaged or destroyed as a result of the construction operations shall be replaced in like species and size.
 - a. All planting and care thereof shall meet the standards of the American Association of Nurserymen.
2. Water courses shall be reshaped to the original grade and cross-section and all debris removed. Where required to prevent erosion, the bottom and sides of the water course shall be protected.
3. Culverts destroyed or removed as a result of the construction operations shall be replaced in like size and material and shall be replaced at the original location and grade. When there is minor damage to a culvert and with the consent of the ENGINEER, a repair may be undertaken, if satisfactory results can be obtained.
4. Should brick pavements be encountered in the work, the restoration shall be as set forth in the General Requirements or as directed.
5. Items removed for construction such as mailboxes, signposts, reflector markers, and the like shall be replaced in as good or better condition than existing. Items damaged by the CONTRACTOR shall be replaced at his expense. Privately owned items, such as mailboxes, shall be reinstalled to the satisfaction of the OWNER and ENGINEER.

N. Lawn Maintenance

1. All lawn areas shall be mowed by the CONTRACTOR before the new grass reaches a height of 4 inches.
 - a. Following the establishment of a good stand of grass and the first mowing, the CONTRACTOR'S obligation shall end except for the repair of settlement or damage
2. Any lawn area which does not develop an established cover shall be re-seeded and maintained at the CONTRACTOR'S expense until an established cover is present.

O. Tree Plantings

1. Determine location of underground utilities and perform work in a manner which will avoid possible damage. Hand excavate, as required, to minimize possibility of damage to underground utilities. Maintain grade stakes until removal is mutually agreed upon by all parties concerned.
2. Trees replaced by the CONTRACTOR will be a minimum of 6 feet high and 3 inches in trunk diameter. CONTRACTOR must fertilize and water tree appropriately after planting and will guarantee tree for a period of two years. All issues regarding tree planting including type, size, and final location must be approved by the ENGINEER prior to payment.

END OF SECTION 02 900

SECTION 15051 - BURIED PIPING INSTALLATION

PART 1 – GENERAL

1.1 DESCRIPTION

A. Work Specified

The work specified shall include all labor, material, equipment, services and incidentals necessary to furnish and install watermain, specials and fittings, install fire hydrants and to perform interconnections and abandonments as shown on the plans and specified herein.

B. Related Work Specified Elsewhere

1. Section 02080 - Fire Hydrants
2. Section 02316 - Select Granular Materials
3. Section 02351 - Excavation, Backfill, and Trenching
4. Section 15106 - Ductile Iron Pipe and Fittings
5. Section 15107 - Copper Pipe
6. Section 15110 - Valves and Appurtenances
7. Section 15120 - Piping Specialties and Accessories
8. Section 15140 - Testing and Disinfection

1.2 QUALITY ASSURANCE

A. Reference Standards

1. AWWA Standards identified in other related sections
2. ASTM Standards identified in other related sections
3. ANSI Standards identified in other related sections
4. Occupational Safety and Health Administration (OSHA)
5. 1996 Safe Drinking Water Act
6. NSF/ANSI Standard 60 and 61, as applicable
7. All other standards itemized in related work sections

1.3 SUBMITTALS

A. Shop Drawings

Prior to obtaining any products in relationship to this Section, the CONTRACTOR shall submit detailed shop drawings and data for review by the ENGINEER.

B. Materials List

The CONTRACTOR shall submit, along with shop drawings, a materials list, which shall include full information regarding all components of the watermain. Materials of construction shall be presented in the listing.

C. Other Submittals

1. Prior to installation of the proposed watermain, the CONTRACTOR shall furnish the required number of the manufacturer's Operation and Maintenance Manual for each item.

2. The CONTRACTOR shall submit certificates of compliance with the applicable referenced standards.
3. A tabulated layout schedule.
4. Detailed procedure, schedules and list of materials for interconnection sequence.
5. Furnish delivery tickets indicating the pipe manufacturer, pipe type and class, identifying that the pipe was new and from a manufacturer that has been submitted and approved.

D. Certificate

1. Submit certificate of compliance with NSF/ANSI Standard 61 for all products under this section, including interior coatings, by an independent, authorized laboratory.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. During delivery and handling, all materials shall be braced and protected from any distortion or damage in accordance with the manufacturer's requirements; any such distortion or damage shall be basis for rejection of the materials.
- B. Equipment used for unloading shall be covered with wood or rubber to avoid damage to the exterior of the pipe, fittings and accessories. Do not drop or roll materials off trucks.
- C. The materials shall be inspected before and after unloading. Materials that are found to be cracked, chipped, gouged, dented, or otherwise damaged shall not be accepted.
- D. Interiors of pipe, fittings and specials shall be kept free from dirt and foreign matter.
- E. Store pipe and fittings on heavy wood blocking or platforms so they are not in contact with the ground.
- F. Pipe, fittings, and specials shall be unloaded opposite to or as close to the place where they are to be used as is practical to avoid unnecessary handling.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General

1. All products, including interior coatings, shall be suitable for use in a potable water system.
2. All products, including wetted parts, shall be certified to meet NSF/ANSI Standard 61.

B. Pipe

Materials for the piping, joints and fittings shall be as specified in other related sections or as shown in the pipe schedule or on the Contract Drawings.

1. Pipe and appurtenances shall comply with the applicable standards for its type of material.
2. All pipes, fittings, valves, hydrants, specials, and accessories must be new materials in first-class condition. Used or recycled materials shall not be allowed, regardless of condition.
3. Piping for hydrant branches shall only be Class 53 ductile iron.

SECTION 15 051 – BURIED PIPING INSTALLATION

4. Piping within casing pipes (except for tree bores) and beneath pavement shall be either ductile iron pipe or prestressed concrete cylinder pipe as shown and as specified.
 5. Piping in non-paved areas shall be either ductile iron pipe, prestressed concrete cylinder pipe, or PVC as shown and as specified.
- C. Joints
Type of joints shall be as specified in other related Sections or as shown in the pipe schedule or as on the Contract Drawings.
- D. Detectable Pipe Marking Tape
Detectable pipe marking tape as manufactured by C. H. Hanson Products or approved equal shall be installed above all new watermain.
1. Tape shall be 3 inches wide consisting of two (2) exterior plies of polyethylene with an aluminum alloy foil core.
 2. Tape shall be blue color and labeled: “WATER” in black letters.
 3. Tape shall have a minimum thickness of 5 mils as per ASTM D2103.

PART 3 - EXECUTION

3.1 INSTALLATION

A. General

1. Excavation and backfilling shall be in accordance with the applicable provisions of Section 02351 - Excavation, Backfill, and Trenching.
2. Blocking will not be permitted under pipe, except where the pipe is to be laid with concrete cradle or encasement.
3. Pipe shall be installed on a layer of select material as shown on the Drawings to provide an acceptable bedding. The top of this layer shall then be considered the bottom of the trench.
4. Pipe shall not be laid on bedrock without appropriate bedding stone.
5. No pipe shall be laid upon a foundation in which frost exists; or when there is danger of the formation of ice or the penetration of frost at the bottom of the excavation.
6. Bell holes shall be dug in the bottom of the trench to allow the pipe to have a firm bedding along the entire length of the pipe.
7. Temporary watertight bulkheads shall be placed in all open ends of pipe whenever pipe laying is not actively in process. The bulkheads shall be designed to prevent the entrance of dirt, debris, or water.
8. Precautions shall be taken to prevent the flotation of pipe in the event of water entering the trench.
9. Hydrant installation shall be as specified in Section 02080 - Fire Hydrants and as specified herein.

B. Location and Grade

1. Watermain and appurtenances shall be located as shown on the Contract Drawings or as directed and as established from the control survey in accordance with the General Requirements.

SECTION 15 051 – BURIED PIPING INSTALLATION

2. The alignment and grades shall be determined and maintained by a method acceptable to the ENGINEER.
3. Pipe shall be installed in straight horizontal trenches. “Snaking” of pipe by bending sections horizontally shall not be allowed.

C. Subgrade

The subgrade for pipelines shall be earth or bedding as specified or directed and shall be installed in accordance with Section 02351 - Excavation, Backfill and Trenching.

D. Joints

1. Joints shall be assembled using gaskets, lubricants and solvents as furnished by the pipe manufacturer and in accordance with the manufacturer’s recommendations.
2. Joint deflection shall not exceed 50% of manufacturer’s recommendations.

E. Bedding

Bedding shall be deposited and compacted in accordance with Section 02351 - Excavation, Backfill, and Trenching, and shall be as itemized below unless otherwise specified or directed.

1. For watermains:
 - a. The bedding shall be as specified in Section 02316, Select Granular Materials.
 - b. Bedding shall be deposited and tamped in 6-inch layers to the centerline of the pipe or to 6 inches above the pipe in paved or traveled areas.
 - c. Native material placed above the centerline of the pipe shall be deposited in such a manner as to not damage the pipe. Native material shall be suitable for backfill above the centerline of the pipe provided the materials are 2 inches in size or less. Native materials shall be suitable for backfill 6 inches above the pipe in non-paved areas provided the materials are 2 to 4 inches in size, but bedding is required to 6 inches above the pipe. Native materials greater than 4 inches are unacceptable for backfill.

F. Thrust Restraints

Thrust restraints for watermains shall be accomplished by the use of both thrust blocks and mechanical restraints for sizes through 12 inches. Joints for watermains 16 inches and larger shall have thrust restraints provided by harnessed joints only. Restraints shall be in the form of retainer glands; ductile iron locking segments with spigot weldment; or anchors of the size and type specified or as required by the pressure and stability of the supporting surface.

1. Thrust restraints shall be installed at all changes in direction, changes in size, dead ends or other locations where shown or directed.
2. Valves shall be treated as a bulkhead condition and pipe joints shall be restrained on both sides of the valve.
3. Cast in place concrete used for thrust restraints shall have developed the required strength prior to testing of the watermain.
4. When approved for use by ENGINEER, tie rods and nuts for thrust restraints shall be of high tensile steel and shall have a minimum yield strength of 70,000 psi.
 - a. Tie rods and nuts installed underground shall be coated with two coats of coal tar pitch preservative coating after installation.
 - b. Oil, grease, paint, or any coating which requires drying will not be acceptable.
5. All fire hydrant branches from the mainline tee to and including valve and hydrant shall be restrained.

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6. All piping installed for interconnections shall be restrained.
7. All piping installed within casing pipes shall be restrained for the full length of the pipe installed within the casing pipe.
8. All piping installed within the limits of creek crossings shall be restrained for the full length of the creek crossing limits.

G. Service Connections

1. Connections to in-service pressure watermains shall be in accordance with the applicable provisions of Section 15120, Piping Specialties and Accessories.

H. Concrete Thrust Blocks

1. Solid concrete blocks shall be used for proper blocking. Hollow concrete blocks or wooden blocking are not acceptable. Cast-in-place wet concrete mix shall be used for vertical bends and anchor collars.

I. Detectable Pipe Marker

1. Detectable pipe marker tape shall be placed above all new watermains as shown on the Drawings.
2. Detectable pipe marker tape shall be tied to watermain valve boxes.
3. Splices, where needed, shall be made in accordance with manufacturer's recommendations.
4. At completion of the project and before final payment is made, the CONTRACTOR shall test the entire length of the pipe using pipe locating equipment. Tests shall be made only in the present of the ENGINEER. Any section of tape not continuous or that is undetectable shall be removed and replaced at the CONTRACTOR'S expense.

3.2 CUTTING AND SPECIAL HANDLING

- A. Field cuts of pipes shall be in accordance with the manufacturer's instructions.
- B. Where a pipe requires special handling or installation it shall be in accordance with the applicable referenced standard.

3.3 INTERCONNECTIONS

- A. Perform interconnections as shown on the Contract Drawings and in accordance with Section 01731, Connections to Existing Facilities.

3.4 ABANDONMENTS

A. Hydrants and Valves

1. Removal of existing and abandoned hydrants and valves shall be made with caution to prevent damage while being removed.
2. Return all existing and abandoned hydrants as specified or when directed to the Erie County Water Authority at 3030 Union Road, Cheektowaga, New York.
3. CONTRACTOR is responsible for unloading the abandoned hydrants at the Erie County Water Authority and placing the hydrants in the location specified by the AUTHORITY.
4. CONTRACTOR must deliver the hydrants during normal business hours and must schedule the delivery at least 48 hours in advance.
5. At all valves being abandoned, locate the valve, close the valve, remove the entire valve box, backfill and restore as shown on the Drawings.

B. Existing Watermains

1. No watermain abandonments shall be performed until the ENGINEER is satisfied that the new watermain is functional and meets all codes, standards, tests, and requirements.
2. Abandonments shall only be allowed after all service connections have been transferred to the new watermain, when applicable.
3. Perform the abandonments as shown on Contract Drawings and in accordance with Section 01731, Connections to Existing Facilities.

3.5 TREE TUNNELING

A. Provide root protection at trees by boring casing pipe through root system.

1. Use casing pipe as defined in Section 15121, Casing Pipe.
2. All pipe installed in casing pipe must be restrained.
3. PVC pipe may be installed in casing pipe if authorized by ENGINEER.
4. Fill annular space with pea gravel to satisfaction of ENGINEER.
5. The volume of pea gravel used shall be compared to the annular space volume to ensure complete filling. Incomplete filling of annular space will not be considered acceptable. CONTRACTOR shall remove pea gravel and reinstall, at his expense, if so ordered by the ENGINEER.

3.6 INSTALLATION OF PIPE UNDER CREEKS BY OPEN CUT METHOD

A. General

1. Install watermain, fittings, bedding, and rip rap within the pay limits for the creek crossings as shown and specified.
2. Comply with the applicable requirements of this section as well as other sections of these specifications.
3. Comply in all respects with the requirements of the applicable permits issued for this project.
4. Construction of the creek crossings shall be performed within the work limits shown on the plans or specified in the permits. Any other lands, easements, or rights-of-way required by the CONTRACTOR for his operations shall be obtained by the CONTRACTOR at his expense.
5. All necessary precautions shall be taken to prevent contamination of any wetland or waterway by any soils, sediments, fuels, solvents, lubricants, paints, or any other environmental deleterious materials associated with this project.
6. Any material dredged in the prosecution of the Work shall be removed evenly, without leaving large refuse piles, ridges across the bed of the waterway, or deep holes that may cause damage to navigable channels or to the banks of the waterway.
7. Debris or excess material dredged during construction operations shall be completely removed from the bed and banks of all water areas and sent to an approved upland area for disposal.
8. All sediments are to be retained on the project site through the use of silt fences or other approved sediment traps.
9. Disturbances to the bed and banks of the creek shall be limited to those areas shown on the plans and covered under the applicable permits.
10. No work on creek crossings shall be performed immediately after a storm that may cause high water conditions or flooding.
11. Whenever possible, creek excavation and bank grading shall be carried out by equipment operating on dry land.

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12. Prior to trenching through stream banks, the upland sections of the trench shall be bulkheaded or plugged to prevent drainage of turbid water into the creek.
13. Existing stream banks and vegetation shall be protected as much as possible to prevent bank collapse and erosion.
14. Watermain markers shall be provided on both sides of the creek crossings. Markers shall be flexible, impact resistant fiberglass and royal blue in color. Labels shall be self-adhesive and waterproof.
15. All other applicable requirements of this section shall apply to excavation and backfill of creek crossings.

3.7 TESTING

A. General

Performance testing, leakage, hydrostatic, and proof-of-design tests shall be as specified in Section 15140 - Testing and Disinfection.

B. Testing Criteria

Perform pressure testing to the criteria listed in the table as shown on the Drawings.

C. Ultrasonic Joint Testing.

1. Each joint shall, at the CONTRACTOR'S sole cost and expense, be tested with ultrasonic test equipment prior to being backfilled. If a leak is detected, corrective action shall be taken prior to installing the next pipe.
2. The fact that a point (or joints) has passed the ultrasonic testing does not waive the requirements for the hydrostatic tests described in Section 15140.
3. The testing equipment shall be as manufactured by Moffat Enterprises of Powell Butte, or equal.

3.8 DISINFECTION

- A. All watermains, hydrant branches, blow-offs, and ARV piping shall be tested and disinfected in accordance with Section 15140 - Testing and Disinfection.

3.9 GENERAL

- A. Install watermain, fittings, and accessories in accordance with applicable sections; as shown on the drawings; and, as specified, required, or directed.

B. Tapping Information

1. All materials as specified herein shall be installed by or under the direction of personnel who are acceptable to the Authority.
 - a. Threaded taps shall be made using a machine designed for cutting, threading and inserting the corporation without interruption of service.
 - 1). Teflon tape may be used on corporation threads.
 - b. Tapping sleeve connections shall be made using a machine to cut and remove the segment through the valve without interruption of service.
2. Valve boxes shall be set plumb and shall be independently supported on concrete blocking so no weight will be transmitted to the curb stop or watermain.
3. Service saddles and tapping saddles installed on prestressed concrete cylinder pipe shall be encased in a minimum of 2 inches of concrete mortar after installation.

SECTION 15 051 – BURIED PIPING INSTALLATION

4. Service saddles shall be used under the following condition:
 - a. When water services are placed on 4-inch or smaller pipes.
 - b. When water services larger than 1-inch are placed on a 6-inch pipe.
 - c. When water services larger than 1-1/2-inch are placed on an 8-inch pipe.
 - d. When water services are tapped to all plastic (PVC) pipe.
 - e. When services larger than 1-1/2-inch are placed on ductile iron pipe.
 - f. When water services are tapped to all asbestos-cement pipe.
5. CONTRACTOR is not allowed to excavate, disturb, or park any equipment beyond the Right-of-Way line without prior approval from the property owner.
6. If minimum depth is not achieved for the water service at any location, CONTRACTOR shall either excavate and lower the service or repush/drill the service to the minimum depth, at his expense, until a satisfactory service is installed.
7. Curb boxes are not allowed to be cut for any reason.
8. Repair or replace any connections, which are leaking to ensure a watertight connection.

C. Water Service Tubing

1. Copper tubing shall be installed in accordance with the applicable provisions of Section 02351 - Excavation, Backfill & Trenching, Section 15051 - Buried Piping Installation and Section 15107 - Copper Pipe.
2. Bedding for service connection tubing shall be furnished, installed and coordinated with Section 02316 - Select Granular Materials.

D. Water Service Installations

1. Existing service lines shall be maintained until such time as the proposed watermain has been installed, tested, and disinfected, and approval to place the watermain into service has been obtained. Existing services may then be transferred to the new watermain.
2. New water service installations shall be installed by boring or jacking method under existing roads and pavements. Open-cut of water services across roads will not be allowed.
3. Use tapping machines and equipment compatible with corporation stops and service saddles specified. Use tools and cutting equipment, which minimizes the amount of PVC shavings and remove shavings during tapping; retain coupon, and reduce stress during tapping. Single fluted cutters or twist drills shall not be used for tapping PVC piping.
5. Service locations shown on the drawings are shown schematically only. The actual service locations shall be determined by ENGINEER and CONTRACTOR in the field.
6. For additional information relating to water services, refer to the Drawings.

E. Tapping Watermain.

1. Wet tap connections to existing watermains shall be as shown on the drawings.
2. The person or firm who will be performing the watermain tap shall be acceptable to the Authority.
3. Prior to ordering the tapping sleeve, the CONTRACTOR shall excavate a test pit to the depth required and expose the main to be taped to accurately measure the outside diameter of the main. No tapping sleeve shall be ordered until this information has been obtained.
4. Tapping sleeves shall be suitable for use with the existing pipe to be tapped. Tapping sleeve shall be compatible with the tapping valve furnished.
5. Thrust blocks shall be constructed behind the wet tap connection as shown on the drawings and specified herein.
6. Refer to Section 15140 for additional requirements for tapping sleeve and valve testing.
7. After each tap has been completed, the CONTRACTOR shall keep the tapping area uncovered for a minimum period of one (1) hour to determine if any leakage is occurring.

SECTION 15 051 – BURIED PIPING INSTALLATION

If any leakage has occurred, the tap shall be made watertight in a manner approved by the ENGINEER.

8. A full pipe coupon shall be retained as a result of the tapping operation.
9. The valves shall be kept closed until approval from the ENGINEER is given to open the valve.

F. Discrepancies

1. If discrepancies occur between the Drawings and field conditions, the CONTRACTOR shall notify the ENGINEER immediately.
2. The CONTRACTOR shall not proceed with the installation in areas of discrepancy until said discrepancy is resolved.

END OF SECTION 15 051

SECTION 15 107 – COPPER PIPE

PART 1 - GENERAL

1.1 DESCRIPTION

A. Work Specified

The work specified shall include all labor, materials, tools, equipment, services and incidentals necessary to furnish and install new copper pipe and fittings as shown, specified and required.

B. Related Work Specified Elsewhere

1. Section 15051 - Buried Piping Installation
2. Section 15120 - Piping Specialties and Accessories
3. Section 15140 - Testing and Disinfection

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Manufacturer shall have a minimum of 5 years experience producing copper pipe, fittings and appurtenances, and shall show evidence of at least 5 installations in satisfactory operation.
2. Parts Interchangeability: It is the intent of these specifications that all materials furnished herein shall be compatible with similar materials of other manufacturers.

B. Reference Standards

1. ASTM B32, Specification for Solder Metal
2. ASTM B42, Specification for Standard Size Seamless Copper Pipe
3. ASTM B68, Specification for Bright Annealed Seamless Copper Tube
4. ASTM B75, Specification for Seamless Copper Tube
5. ASTM B88, Specification for Seamless Copper Water Tube
6. ASTM B302, Specification for Threadless Copper Pipe
7. ASTM B306, Specification for Copper Drainage Tube (DWV)
8. NSF/ANSI Standard 61
9. Underwriter's Laboratories (UL)
10. International Organization for Standardization (ISO)
11. Factory Mutual Research Corporation
12. National Fire Protection Association
13. ASME, Boiler and Pressure Vessel Code
14. Federal Specification WW-P-377D(1), Pipe, Copper, Seamless Standard Sizes (S/S by ASTM B42)
15. ANSI B16.22, Wrought Copper and Bronze Solder - Joint Pressure Fittings
16. 1996 Safe Drinking Water Act

1.3 SUBMITTALS

- A. Shop Drawings: Submit for approval the following:

1. Detailed drawings and data on pipe, fittings and accessories.
 2. A materials list, which shall include full information regarding all components of the equipment. Materials of construction shall be presented in the listing.
 3. Any operations and maintenance information for copper pipe.
- B. Submit certificates of compliance with the applicable referenced standards.
- C. Submit certificate of compliance with NSF/ANSI Standard 61 for all products under this section, including interior coatings, by an independent, authorized laboratory.
- D. Furnish delivery tickets indicating the pipe manufacturer, pipe type and class, identifying that the pipe was new and from a manufacturer that has been submitted and approved.
- 1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING
- A. During delivery and handling, all materials shall be braced and protected from any distortion or damage; any such distortion or damage shall be basis for rejection of the materials.
- B. The materials shall be inspected before unloading. Materials that are found to be cracked, gouged, chipped, dented, or otherwise damaged will not be accepted.
- C. Interiors of pipe, fittings and appurtenances shall be kept free from dirt and foreign matter.
- D. Store pipe and fittings so they are not in contact with the ground.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. All products, including interior coatings, shall be suitable for use in a potable water system.
- B. All products, including wetted parts, shall be certified to meet NSF/ANSI Standard 61.
- C. All piping and fittings shall be designed for a working pressure and field hydrostatic test pressure as shown in Section 15051, Buried Piping Installation.
- D. Copper pipe: Copper pipe shall conform to the requirements of ASTM B88 and Federal Specification WW-T-799a. Buried copper piping to maximum 2-inch diameter shall be type K, soft temper, suitable for use with flared fittings. Exposed copper piping shall be Type L hard temper tubing. Fittings shall conform to ANSI B16.22.
- E. All copper piping and accessories must be new materials in first-class condition. Used or recycled materials will not be allowed, regardless of condition.

2.2 MARKING

- A. All items shall be marked or labeled with the following information:
1. Metal or alloy designation.
 2. Temper.

3. Size and schedule.
4. ASTM specification number.
5. Name and location of supplier.

2.3 JOINTING

- A. All joints shall conform to manufacturer's recommendations and shall be made by skilled workmen.
- B. Joints shall develop full strength and shall be stronger than the pipe joined.

PART 3 - EXECUTION

3.1 GENERAL

- A. Refer to Section 15051 for copper piping installation.
- B. All connections to copper piping shall be watertight at operating pressure.
- C. Copper Tubing
 1. Copper tubing shall be installed in accordance with the applicable provisions of Section 02351, Excavation, Backfill and Trenching and Section 15051, Buried Piping Installation.
 - a. Flared connections shall only be allowed for all buried fittings.
 - b. No coupling shall be allowed, especially under paved areas. Exception shall be based on the length of the service and the size of the coil of tubing provided and shall be only as allowed by ENGINEER.
 - c. Installation shall be suitable for open-cut or push or drill methods.
 2. Exposed copper tubing shall be carefully erected and neatly arranged.
 - a. Copper tubing shall be run parallel with walls inside structures and shall be pitched to drain.
 - b. Drain valves shall be installed at the low points of liquid filled systems.
 - c. Joints shall be soldered suitable for the pressure intended.
 3. Unions shall be provided on copper tubing systems with soldered joints.
 - a. Unions shall be located at control valves, solenoid valves, moisture and steam traps, other items of connected equipment and as shown on the Drawings.
 - b. Unions shall be of cast bronze or brass construction.
 - c. Dielectric unions shall be used when connecting copper tubing to ferrous metals.

END OF SECTION 15 107

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

PART 1 GENERAL

1.1 DESCRIPTION

A. Work Specified

1. CONTRACTOR shall provide all labor, materials, equipment, tools, services, and incidentals necessary to furnish and install piping specialties and accessories as shown, specified and required. Included, but not limited to the following: couplings, repair clamps, joint clamps, service saddles, service fittings, water meter fittings, tile set, corporation stops, curb stops, and curb boxes.

B. Related Work Specified Elsewhere

1. Section 02316 - Select Granular Materials
2. Section 02351 - Excavation, Backfill and Trenching
3. Section 15106 - Ductile Iron Pipe and Fittings
4. Section 15107 - Copper Pipe
5. Section 15110 - Valves and Appurtenances
6. Section 15140 - Testing and Disinfection

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications

1. Manufacturer shall have a minimum of 5 years of experience in the production of substantially similar types of piping specialties specified and shall show evidence of satisfactory service in at least 5 installations.
2. Parts Interchangeability: It is the intent of these specifications that all materials furnished herein shall be compatible with similar materials of other manufacturers.

B. Reference Standards

1. AWWA C104, Cement-Mortar Lining for Ductile Iron Pipe and Fittings for Water
2. AWWA C115, American National Standard for Flanged Ductile-Iron Pipe with Ductile-Iron Pressure Pipe and Fittings
3. AWWA C301, Prestressed Concrete Pressure Pipe, Steel-Cylinder Type, for Water and Other Liquids
4. AWWA C600, Standard for Installation of Ductile-Iron Watermains and Their Appurtenances
5. AWWA C605, Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water
6. AWWA C651, Standard for Disinfecting Watermains
7. AWWA C800, Underground Service Line Valves and Fittings
8. AWWA C900, Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch Through 12-inch for Water Distribution
9. ASTM A536, Standard Specification for Ductile Iron Castings

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

10. ASTM B92, Specification for Standard Size Seamless Copper Pipe
11. ASTM B62, Standard Specification for Composition Bronze or Ounce Metal Castings
12. ASTM D2000, Standard Classification System for Rubber Products in Automotive Applications
13. NSF/ANSI Standard 61
14. Underwriter's Laboratories (UL)
15. International Organization for Standardization (ISO)
16. Factory Mutual Research Corporation
17. 1996 Safe Drinking Water Act

1.3 SUBMITTALS

A. Shop Drawings: Submit for approval the following:

1. Manufacturer's literature, illustrations, specifications, detailed drawings, data and descriptive literature on all piping specialties.
2. Deviations from Drawings and Specifications.
3. Engineering data including dimensions, materials, size and weight.
4. Fabrication, assembly, installation and wiring diagrams.

B. Operation and Maintenance Data: Submit complete manuals including:

1. Copies of all Shop Drawings, test reports, maintenance data and schedules, description of operation, and spare parts information.

C. Certificates:

1. Where specified or otherwise required by ENGINEER, submit test certificates.
2. The CONTRACTOR shall submit certificates of compliance with the applicable referenced standards.
3. Submit certificate of compliance with NSF/ANSI Standard 61 for all products under this section, including interior coatings, by an independent, authorized laboratory.

D. Delivery Tickets:

1. Furnish delivery tickets indicating the manufacturer, accessory type and class, identifying that the equipment was new and from a manufacturer that has been submitted and approved.

1.4 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. During delivery and handling, all materials shall be braced and protected from any distortion or damage; any such distortion or damage shall be basis for rejection of the materials.
- B. Handle all materials very carefully. Materials which are cracked, dented or otherwise damaged will not be accepted.
- C. The materials shall be inspected before and after unloading. Materials that are found to be cracked, gouged, chipped, dented or otherwise damaged will not be accepted.

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

- D. Interiors of pipe, fittings and accessories shall be kept free from dirt and foreign matter.
- E. Store piping specialties and accessories on heavy wood blocking or platforms as necessary so they are not in contact with the ground.
- F. Pipe, fittings, and specials shall be unloaded as necessary opposite to or as close to the place where they are to be used as is practical to avoid unnecessary handling.

PART 2 PRODUCTS

2.1 MATERIALS

A. General

- 1. All products, including interior coatings shall be suitable for use in a potable water system.
- 2. All products, including wetted parts, shall be certified to meet NSF/ANSI Standard 61.
- 3. All piping specialties and accessories must be new materials in first-class condition. Used or recycled materials will not be allowed, regardless of condition.

B. Couplings

- 1. Sleeve Type, Flexible Couplings:
 - a. Material: Steel, with epoxy coated sleeve.
 - b. Gasket: Manufacturer's standard best quality for the service intended.
 - c. Bolts and Nuts: Buried or submerged couplings shall be provided with Type 304 stainless steel or fluorocarbon coated bolts and nuts.
 - d. Couplings shall be designed for a working pressure and field hydrostatic test pressure as identified in Section 15051, Buried Piping Installation.
 - e. Harnessing:
 - 1) Harness couplings to restrain pressure piping. Couplings shall be designed for a working pressure and field hydrostatic test pressure as identified in Section 15051, Buried Piping Installation.
 - 2) Adjacent flanges shall be tied with bolts of corrosion resistant alloy steel. Provide flange mounted stretcher bolt plates and lugs as required and to be designed by coupling manufacturer, unless otherwise approved.
 - 3) Conform to dimensions, size, spacing and materials for lugs, bolts, washers and nuts as recommended by manufacturer and approved by ENGINEER for the pipe size, wall thickness and test pressure required. However, the following minimum bolting shall be provided if not specifically stated by the ENGINEER.

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

Pipe Diameter (In.)	Minimum Number of Bolts	Bolt Diameter (In.)	At (Degrees)
4	2	5/8	180
6-8	2	3/4	180
10-12	2	7/8	180
14-20	4	1	90
24-48	4	1-1/2	90

- f. Remove pipe stop unless otherwise shown or specified.
 - g. Couplings 16-inches to 24-inches shall be furnished as long laying lengths of 16-inches. Couplings over 24-inches shall be furnished as 10-inch lengths.
 - h. Manufacturer:
 - 1) Dresser Industries, Style 138, for sizes up to 12-inches,
 - 2) Dresser Industries, Style 38, for sizes over 12-inches,
 - 3) Smith-Blair, Type 411, (or type 441 where specified),
 - 4) Or approved equal.
2. Hymax Coupling:
- a. Material: Center sleeve shall be fabricated of high strength carbon steel tubing. Compression end rings to be either one bolt or two fabricated of carbon steel.
 - b. Gasket: Two layered gaskets of which the inner ring is removable to expand the range of the coupling. Material shall be EPDM according to NSF61.
 - c. Bolts and Nuts: Buried or submerged couplings shall be provided with type 304 stainless steel. Bolts to be coated with an anti-seize coating to prevent galling.
 - d. Coating: Interior and exterior shall be provided with NFS-61 approved fusion bonded epoxy coating.
 - e. Harnessing: as specified herein.
 - f. To be used only when approved by ENGINEER.
 - g. Manufacturer:
 - 1) Dresser Industries Style 262 for sizes up to 12-inches,
 - 2) Or approved equal.

C. Flanged Coupling Adapter

- 1. The body shall be ductile iron conforming to ASTM A536. The bolt circle, bolt size, and spacing shall conform to AWWA C115 flange drilling.
- 2. The follower gland shall be ASTM A536 ductile iron.
- 3. Gaskets and “O” rings shall be grade 30 standard.
- 4. Nuts and bolts shall be fluorocarbon coated or Type 304 stainless steel, high strength, low alloy.
- 5. Provide fusion bonded epoxy coating on the gasket ring and shop prime enamel on the body.
- 6. Flange coupling adapter shall not be provided with anchor studs, which are not allowed.
- 7. Flange coupling adapter shall be suitable for use on ductile or cast iron pipe to the outside diameter specified.

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

8. Flange coupling adapters shall be restrained as shown, specified, or required.
9. Manufacturer:
 - a. Smith-Blair, Style 912,
 - b. Dresser, Style 128,
 - c. Ford FFCA,
 - d. Hymax 2100,
 - e. Or approved equal.

D. Restrained Flanged Adapter

1. Restraint shall be accomplished by use of a gland that incorporates wedges that increase their resistance to pull out as pressure or external forces increase.
2. The restrained flange adapter shall be comprised of two rings made of ductile iron conforming to ASTM A536.
3. The restraining ring shall be suitable for flanges conforming to AWWA C115 flange drilling.
4. Nuts and bolts shall be fluorocarbon coated or Type 304 stainless steel, high strength, low alloy.
5. Torque limiting twist off nuts shall be used to insure the proper actuation of the wedges. When the nut is sheared off, a standard hex head shall remain.
6. Provide fusion bonded epoxy coating on the gasket ring and shop primer on the body.
7. Restrained flange adapter shall be suitable for use on ductile iron pipe.
8. Manufacturer:
 - a. EBAA Iron, Series 2100 Megaflange,
 - b. Or approved equal.

E. Repair Clamps

1. Repair clamps shall be full circle, 18-8 type 304 stainless steel single band provided in minimum length of 12-inches unless otherwise specified. Bands are to be single section for sizes to 12 inches and double sections for sizes over 12 inches.
2. Nuts and bolts shall be Type 304 stainless steel or fluorocarbon coated.
3. Ductile iron lugs shall be field removable.
4. Repair clamps with a separate keeper bar will not be accepted nor repair clamps with two bolts on a 7.5 inch full circle clamp.
5. Grade 60 gasket.
6. When ordered, provide tapped repair clamps with stainless steel outlet taps for corporation stops in CC (AWWA) thread.
7. Manufacturer:
 - a. Smith-Blair, Style 226, for sizes to 12 inches,
 - b. Smith-Blair, Style 227, for sizes over 12 inches,
 - c. Smith-Blair, 238 and 239 for tapped clamps,
 - d. Dresser, Style 360,
 - e. Ford, Style F1, for sizes to 12 inches,
 - f. Ford, Style F2, for sizes over 12 inches,
 - g. Or approved equal.

F. Joint Clamps

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

1. Joint clamps shall be furnished to permanently stop or prevent leaks through the jointing materials of bell and spigot joints.
2. Clamp shall be fully adjustable to provide a close fit on the bell and spigot and shall be designed to be installed on pipes without interruption of water service.
3. Manufacturers standard rubber gasket shall shut the leak off when compressed by the spigot ring drawn up, in turn, by bolts connected to a bell ring.
4. Manufacturer:
 - a. Smith-Blair, Style #274,
 - b. Dresser, Style 160,
 - c. Or approved equal.

G. Service Saddles

1. Service saddles for iron, asbestos-cement pipe or Polyvinyl Chloride (PVC) pipe shall be of the double strap style.
2. Bodies shall be brass alloy conforming to ASTM B62 (85-5-5-5) and a threaded outlet conforming to AWWA C800.
3. Straps shall be high quality silicon bronze, flattened to provide a wider bearing surface to the pipe.
4. Nuts shall be brass alloy as per ASTM B62.
5. Gasket shall be Buna-N rubber in accordance with ASTM D2000.
6. Manufacturer:
 - a. Smith-Blair, Style 323,
 - b. Ford, Style 202B,
 - c. Or approved equal.

H. Services Fittings: Bronze Unions, Couplings and Adapters

1. General
 - a. Service fittings shall have a body cast from corrosion resistant bronze in accordance with ASTM B62 (85-5-5-5).
 - b. Connections shall meet applicable sections of AWWA C-800 and be suitable for flared connection to type K copper pipe.
2. Manufacturer:
 - a. Unions, copper to copper, three parts:
 - 1) Mueller Co #H-15400,
 - 2) Ford C22-XX,
 - 3) Or approved equal.
 - b. Unions, copper to copper, two parts:
 - 1) Mueller Co #H-15405,
 - 2) Ford C02-XX,
 - 3) Or approved equal.
 - c. Eighth bend coupling with gasket:
 - 1) Mueller Co #H-15063,
 - 2) Ford LA02-XX,
 - 3) Or approved equal.
 - d. Quarter bend coupling with gasket:
 - 1) Mueller Co #H-15068,
 - 2) Ford L02-XX,

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

- 3) Or approved equal.
- e. Straight male adapter:
 - 1) Mueller Co #H-15425,
 - 2) Ford C28-XX,
 - 3) Or approved equal.
- f. Straight female adapter:
 - 1) Mueller Co #H-15450,
 - 2) Ford C21-XX,
 - 3) Or approved equal.

I. Water Meter Couplings, Flanges and Gaskets

- 1. Water Meter Coupling:
 - a. Meter couplings shall be bronze hex body with iron pipe thread and bronze nut drilled for wire seal.
 - b. Manufacturer:
 - 1) Ford #C38 Body Style A,
 - 2) Or approved equal.
- 2. Water Meter Flanges:
 - a. Meter flanges shall be bronze, tapped for iron pipe or have male iron pipe thread.
 - b. Manufacturer:
 - 1) Ford #6F or M; and, Ford #7F,
 - 2) Or approved equal.
- 3. Water Meter Gaskets:
 - a. Gaskets shall be 1/8-inch thick, not reinforced rubber.
 - b. Manufacturer:
 - 1) Ford: #GT120R, #GT140 and #GT141,
 - 2) Or approved equal.

J. Water Meter Tile Set

- 1. The water meter tile set shall be rigid PVC, high insulating “R” value body meter box specially designated for buried meter applications.
- 2. The water meter tile set shall be designed such that the meter is easily accessible and braced for additional stabilization. No bottom is to be provided.
- 3. A closed-cell insulation pad or a double lid cover system shall be provided to prevent freezing.
- 4. The water meter tile set shall be suitable for a minimum depth of cover of 5 feet over the water service tubing.
- 5. A locking cast iron lid shall be furnished for each tile set.
- 6. The water meter tile set shall be furnished complete with male I.P. thread inlet and outlet connections, full port angle key at meter inlet, dual check valve at meter outlet, coupling and fittings ready for a complete meter installation.
- 7. Manufacturer:
 - a. Mueller/McCullough Thermo Coil Meter Box,
 - b. Ford Pit Setter – PD VHH-188-18-60 for 5/8-inch x 3/4-inch meters,
 - c. Ford Pit Setter – PD VHH-488-20-60 for 1-inch meters,
 - d. Or approved equal.

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

K. 1 ½-inch and 2-inch Water Meter Tile Set.

1. The water meter tile set shall be suitable diameter to allow for 1 ½-inch and 2-inch meters and shall be constructed of rigid PVC specially designated for buried meter applications.
2. The water meter tile set shall be designed such that the meter is easily accessible and braced for additional stabilization. No bottom is to be provided.
3. The water meter tile set shall be suitable for a minimum depth of cover of 5 feet over the water service tubing.
4. A locking cast iron lid shall be furnished for each tile set. An insulation pad or double lid arrangement shall be provided to prevent freezing.
5. The water meter tile set shall be furnished complete with male I.P. thread inlet and outlet connections, angle key valve at meter inlet, angle key valve at meter outlet, bypass piping with ball valve, flanged meter couplings, and fittings ready for a complete meter installation.
6. Manufacturer:
 - a. Mueller/McCullough EZ-Vault Meter Setter,
 - b. Ford Pit Setter-PMBB-688-36HB-60 for 1 ½-inch meters,
 - c. Ford Pit Setter-PMBB-788-36HB-60 for 2-inch meters,
 - d. Or approved equal.

L. Corporation Stops

1. Corporation stops shall be furnished with bronze stem, washer, nut, body and key.
2. Corporation stops shall be threaded to conform to AWWA C800 with standard corporation stop thread at the inlet. The outlet shall be fitted with coupling nut for flared tube service unless otherwise specified.
3. Components shall be suitable for operating pressure meeting or exceeding AWWA C-800 criteria for high pressure application.
4. Manufacturer:
 - a. Mueller: copper outlet, #B25000, for sizes ¾-inch through 1-inch,
 - b. Mueller: copper outlet, #B25020, for sizes over 1-inch,
 - c. Ford: copper outlet, FB600, for sizes ¾-inch through 1-inch,
 - d. Ford: copper outlet, FB600 with L02, for sizes over 1-inch,
 - e. Or approved equal.

M. Curb Stops

1. Curb stops shall be manufactured in accordance with AWWA C-800 and shall have all brass components conforming to 85-5-5-5 ASTM B62.
2. Curb stops shall be ball type, quarter turn to open or close, and shall be suitable for potable water service buried application.
3. Components shall be suitable for operating pressure meeting or exceeding AWWA C-800 criteria for high pressure application.
4. Manufacturer:
 - a. Mueller:
 - 1) ¾-inch through 2-inch copper to copper: B25204.
 - 2) ¾-inch through 2-inch copper to iron: B25174.
 - b. Ford:
 - 1) ¾-inch through 2-inch copper to copper: B22.

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

- 2) 3/4-inch through 2-inch copper to iron: B21,
- c. Or approved equal.

N. Curb Boxes

1. Curb boxes shall be high quality cast-iron castings suitable for H2O loadings.
2. Boxes shall be two-piece adjustable depth with arch pattern base. An extension stem will not be allowed.
3. Valve box covers shall be marked “water” and shall be cast iron with a brass pentagon plug.
4. Manufacturer:
 - a. Bibby-LaPerle:
 - 1) For 3/4-inch and 1-inch; 2 1/2-inch shaft: V-009, size 95E,
 - 2) For 1 1/2-inch and 2-inch; 4 1/4-inch shaft: V-425, size 145R,
 - b. Hays,
 - c. Mueller,
 - d. Clow - a division of McWane, Inc.,
 - e. Tyler - a division of McWane, Inc.,

O. Valve Boxes

1. Valves installed in the ground shall be equipped with an adjustable screw type valve box, minimum 1 foot adjustment.
2. The valve box shall have a barrel with a base to fit the valve on which it is to be installed.
3. Valve boxes for gate valves shall be three piece screw type, 5-1/4" shaft with No. 6 base and a valve box cover.
4. Valve boxes for butterfly valves shall be two piece screw type, 5-1/4" shaft, with integrated base and a valve box cover.
5. Valve boxes shall be high quality cast-iron castings suitable for HS-20 loadings.
6. All valve box parts must be compatible and interchangeable with Buffalo Pipe and Foundry Corp. valve boxes.
7. Valve box covers shall be marked “water” and shall fit properly in the barrel without movement.
8. Manufacturer:
 - a. Bibby-LaPerle, (Figure V619 for gate, V652 for butterfly valves),
 - b. Bass & Hays, BH39605,
 - c. Tyler Union - a division of McWane, Inc. (6860 for gate, 6850 for butterfly valves),
 - d. Sigma

P. Insulation

1. Materials
 - a. Watermain, valves, water service piping and fittings and other appurtenances installed where depth of bury is less than 54 inches (4 feet, 6 inches) or where shown on the drawings, shall be fully wrapped with a closed cell polystyrene insulation.

2.2 PAINTING

A. Shop Painting

SECTION 15 120 – PIPING SPECIALTIES AND ACCESSORIES

1. Clean and prime coat ferrous metal surfaces.
2. All interior wetted ferrous surfaces of valves and appurtenances except finished or bearing surfaces shall be shop-painted with an approved epoxy paint system certified to NSF/ANSI Standard 61 for potable water and applied in accordance with the paint system manufacturer's recommendations.
3. Coat machined, polished and non-ferrous surfaces including gears, bearing surfaces and similar unpainted surfaces with corrosion prevention compound listed in NSF/ANSI Standard 61 and applied in accordance with the manufacturer's recommendations. Maintain coating during storage and until equipment begins operation.

PART 3 - EXECUTION

3.1 GENERAL

- A. Install piping specialties and accessories as shown on the Drawings and in accordance with the applicable requirements of Section 15051, Buried Piping Installation.

END OF SECTION 15 120



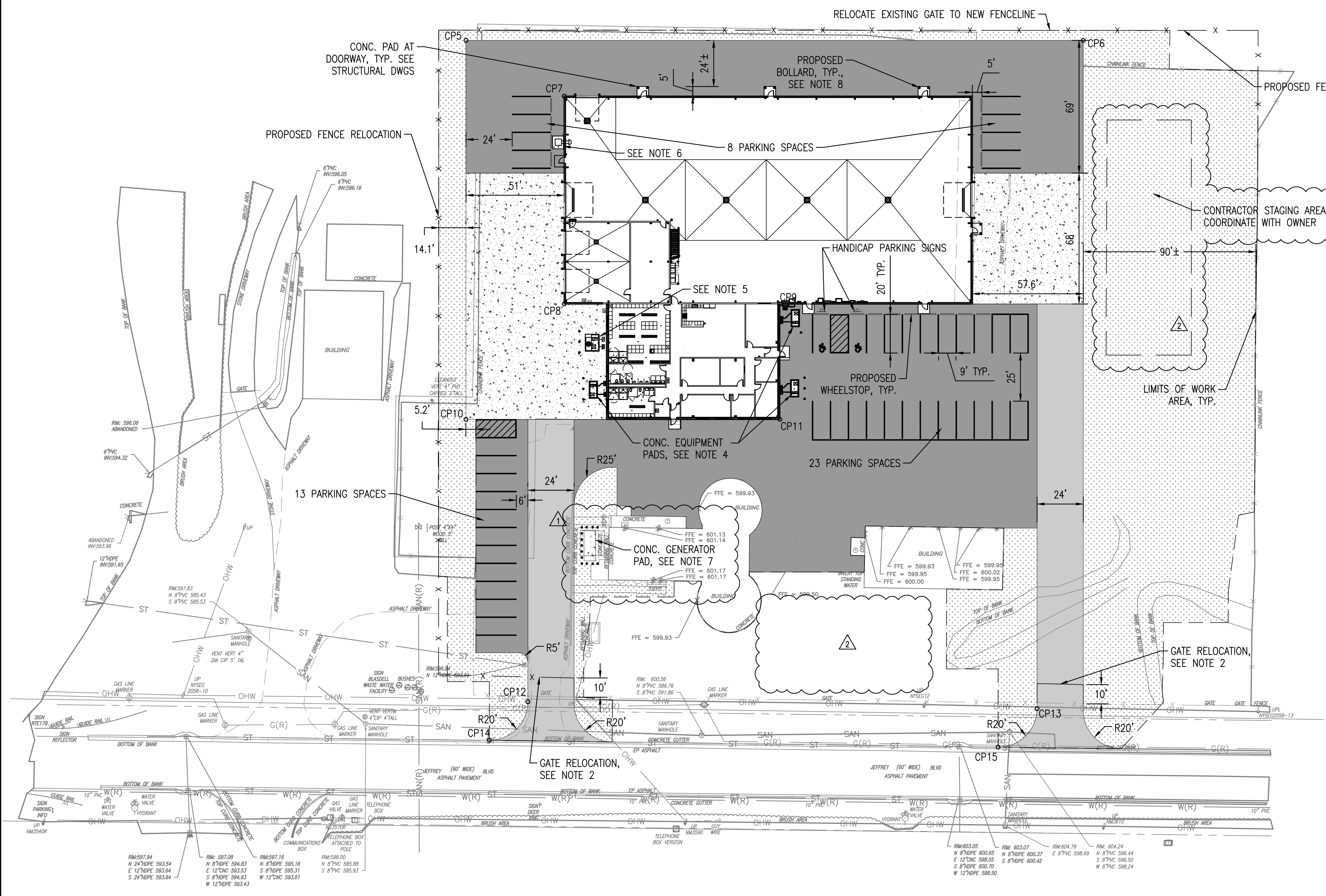
**ERIE COUNTY SEWER DISTRICT NO. 3
CENTRAL REGION COLLECTIONS FACILITY
CONTRACT NO. 80**

DRAWING NOTES:

- SITE LAYOUT IS BASED ON DIRECTION FROM ERIE COUNTY THAT THERE ARE AGREEMENTS IN PLACE BETWEEN THE COUNTY AND THE VILLAGE OF BLASDELL TO CONSTRUCT THE WORK AS SHOWN.
- CONTRACTOR SHALL INSTALL NEW GATE (SEE MECHANICAL DWGS) 10' OFFSET FROM EXISTING GATE LOCATION. GATES ARE TO BE CONNECTED TO FENCELINE WITH NEW CHAINLINK FENCE WITH FENCEPOST SPACING PER MANUFACTURERS SPECIFICATIONS, SEE DETAIL CP504.
- APPROXIMATE TOTAL LENGTH OF NEW CHAINLINK FENCE = 895'
- CONTRACTOR SHALL INSTALL 9' X 4'-4" EQUIPMENT PADS ON-GRADE, USING 6" HIGH REINFORCED CONCRETE ON CRUSHED STONE. COORDINATE WITH MECHANICAL CONTRACTOR.
- CONTRACTOR SHALL INSTALL 8'-10" X 7'-3" EQUIPMENT PAD ON-GRADE, USING 6" HIGH REINFORCED CONCRETE ON CRUSHED STONE. COORDINATE WITH MECHANICAL CONTRACTOR.
- CONTRACTOR SHALL INSTALL 6'-8" X 5'-8" EQUIPMENT PAD ON-GRADE, USING 6" HIGH REINFORCED CONCRETE ON CRUSHED STONE. COORDINATE WITH MECHANICAL CONTRACTOR.
- CONTRACTOR SHALL INSTALL 16' X 6' GENERATOR PAD ON-GRADE, SEE GENERATOR PAD DETAIL E-502. COORDINATE WITH ELECTRICAL CONTRACTOR.
- TOTAL COUNT OF PROPOSED BOLLARDS = 42. SEE BOLLARD DETAIL CP501.
- CONTRACTOR IS REQUIRED TO OBTAIN HIGHWAY WORK PERMITS FOR THE DRIVEWAY CURB CUT, AND ANY UTILITY WORK WITHIN THE COUNTY RIGHT OF WAY, PRIOR TO THE START OF CONSTRUCTION WITHIN THE RIGHT OF WAY. UTILITY AND NON-UTILITY PERMIT FORMS AND INSTRUCTIONS ARE AVAILABLE AT THE ERIE COUNTY WEBSITE - DIVISION OF HIGHWAYS.

LEGEND

- PROPOSED ASPHALT PAVEMENT (STANDARD SECTION)
- PROPOSED ASPHALT PAVEMENT (HEAVY DUTY SECTION)
- PROPOSED CONCRETE PAVEMENT
- TURF REESTABLISHMENT AREA



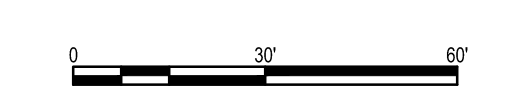
SURVEY CONTROL
VERTICAL DATUM = NAVD88
HORIZONTAL DATUM = NGVD29

POINT	NORTHING	EASTING	ELEVATION	DESCRIPTION
CONTROL POINT #1	1015762.97	1081063.41	598.39	REBAR
CONTROL POINT #2	1015837.94	1080903.92	597.11	REBAR
CONTROL POINT #3	1015653.80	1080910.29	599.36	REBAR
CONTROL POINT #4	1015651.12	1080996.32	599.46	MAG NAIL

NOTE: SEE DWG VF101 FOR CONTROL POINT TIES

DATA POINTS

POINT	NORTHING	EASTING	DESCRIPTION
CP5	1015855.97	1081223.09	CORNER OF PROP. PAVEMENT
CP6	1015535.35	1081223.09	CORNER OF PROP. PAVEMENT
CP7	1015804.97	1081194.09	CORNER OF NEW BLDG.
CP8	1015804.97	1081086.09	CORNER OF NEW BLDG.
CP9	1015692.97	1081086.09	CORNER OF NEW BLDG.
CP10	1015856.02	1081026.12	CORNER OF PROP. PAVEMENT
CP11	1015692.97	1081026.09	CORNER OF NEW BLDG.
CP12	1015823.84	1080879.36	N. DW APRON PC OF FLARE
CP13	1015559.35	1080875.79	S. DW APRON PC OF FLARE
CP14	1015843.84	1080859.36	N. DW APRON AT ROADWAY
CP15	1015579.62	1080855.79	S. DW APRON AT ROADWAY



MARK	DATE	DESCRIPTION
10/7/2024		ADDENDUM #2
10/1/2024		ADDENDUM #1
9/24/2024		BID SUBMISSION

ISSUE:
PROJECT NO:
DESIGNER PROJECT NO: 24-3450
CAD DWG FILE: CP101.DWG
DRAWN BY: ADS
CHECKED BY: JDM
SCALE: AS NOTED
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SHEET TITLE

SITE PLAN

DRAWING#

CP101



**ERIE COUNTY SEWER DISTRICT NO. 3
CENTRAL REGION COLLECTIONS FACILITY
CONTRACT NO. 80**

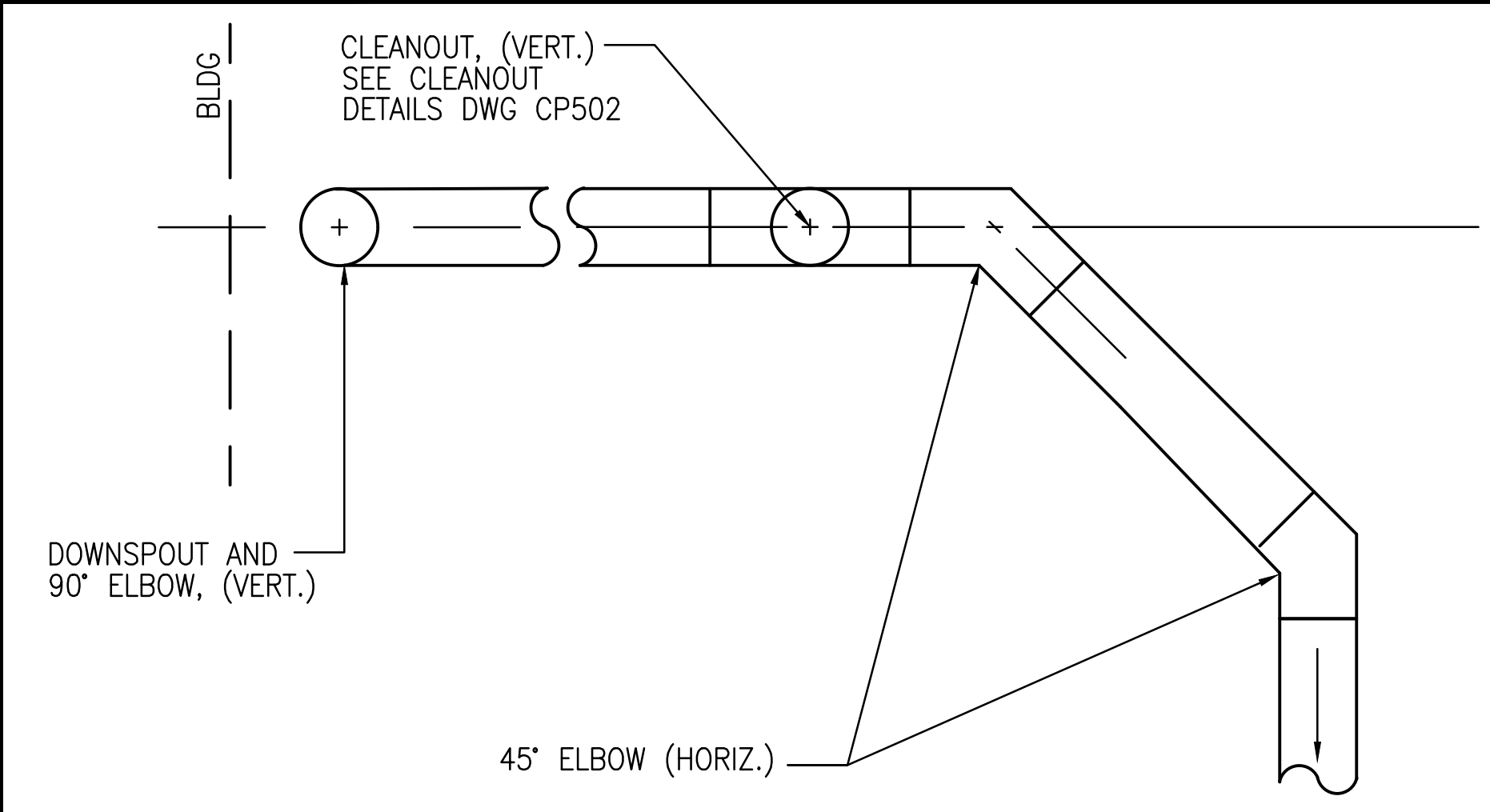
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▲	10/1/2024	ADDENDUM #1
	9/24/2024	BID SUBMISSION

ISSUE:	
PROJECT NO:	
DESIGNER PROJECT NO:	24-3450
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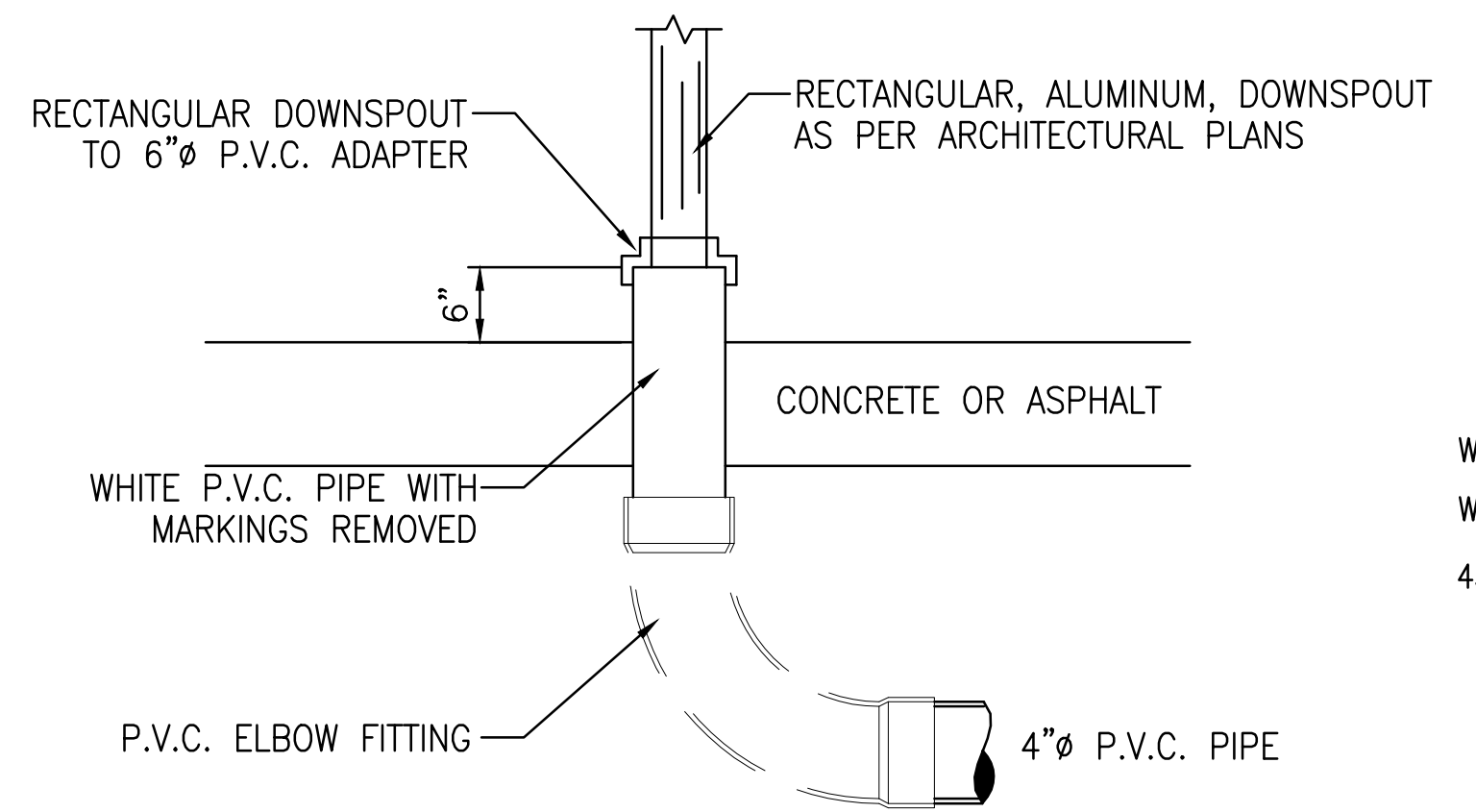
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MISCELLANEOUS DETAILS

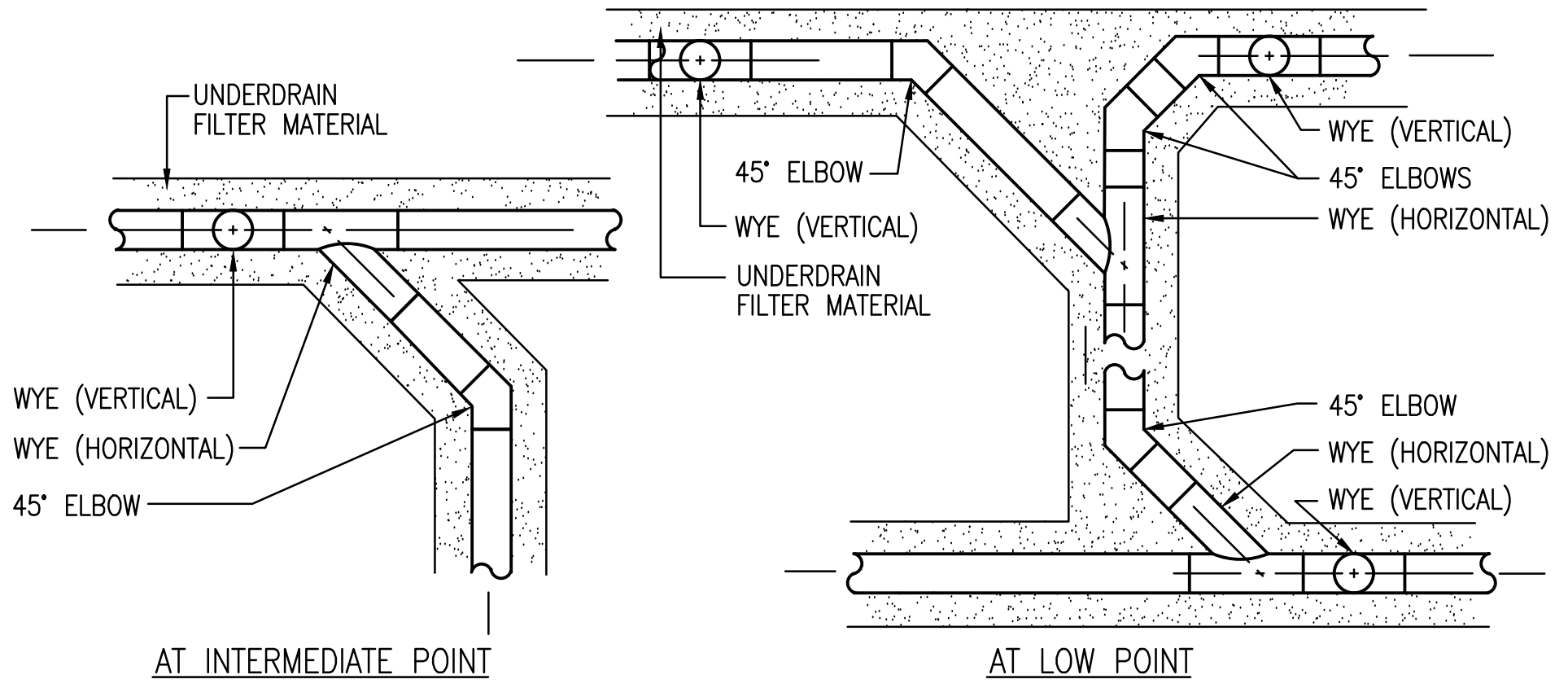
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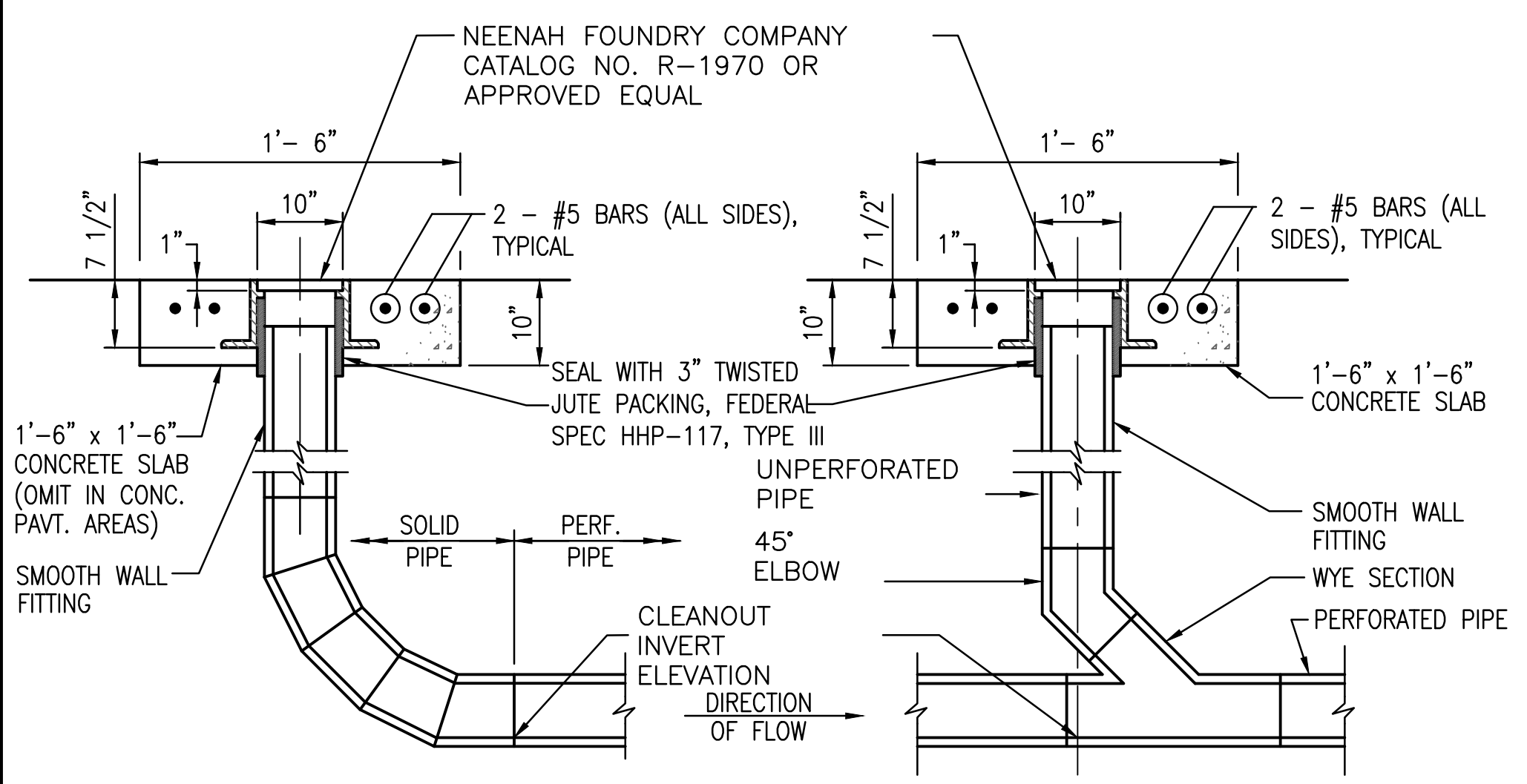
DOWNSPOUT/CLEANOUT PLAN
NOT TO SCALE



D2 TYPICAL DOWNSPOUT DETAILS
NTS



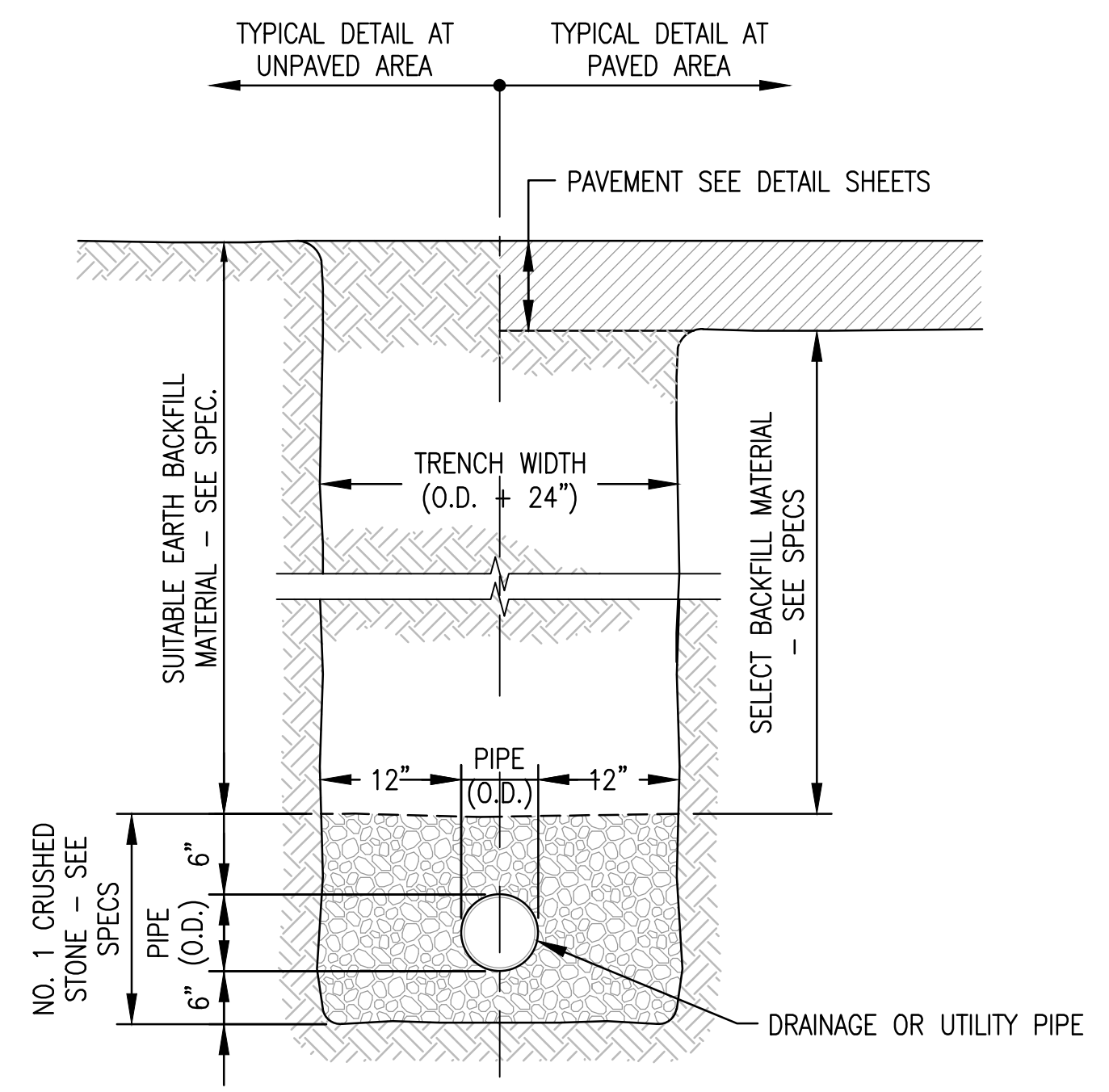
D5 TYPICAL UNDERDRAIN LAYOUT PLANS
NTS



BEGINNING CLEANOUT

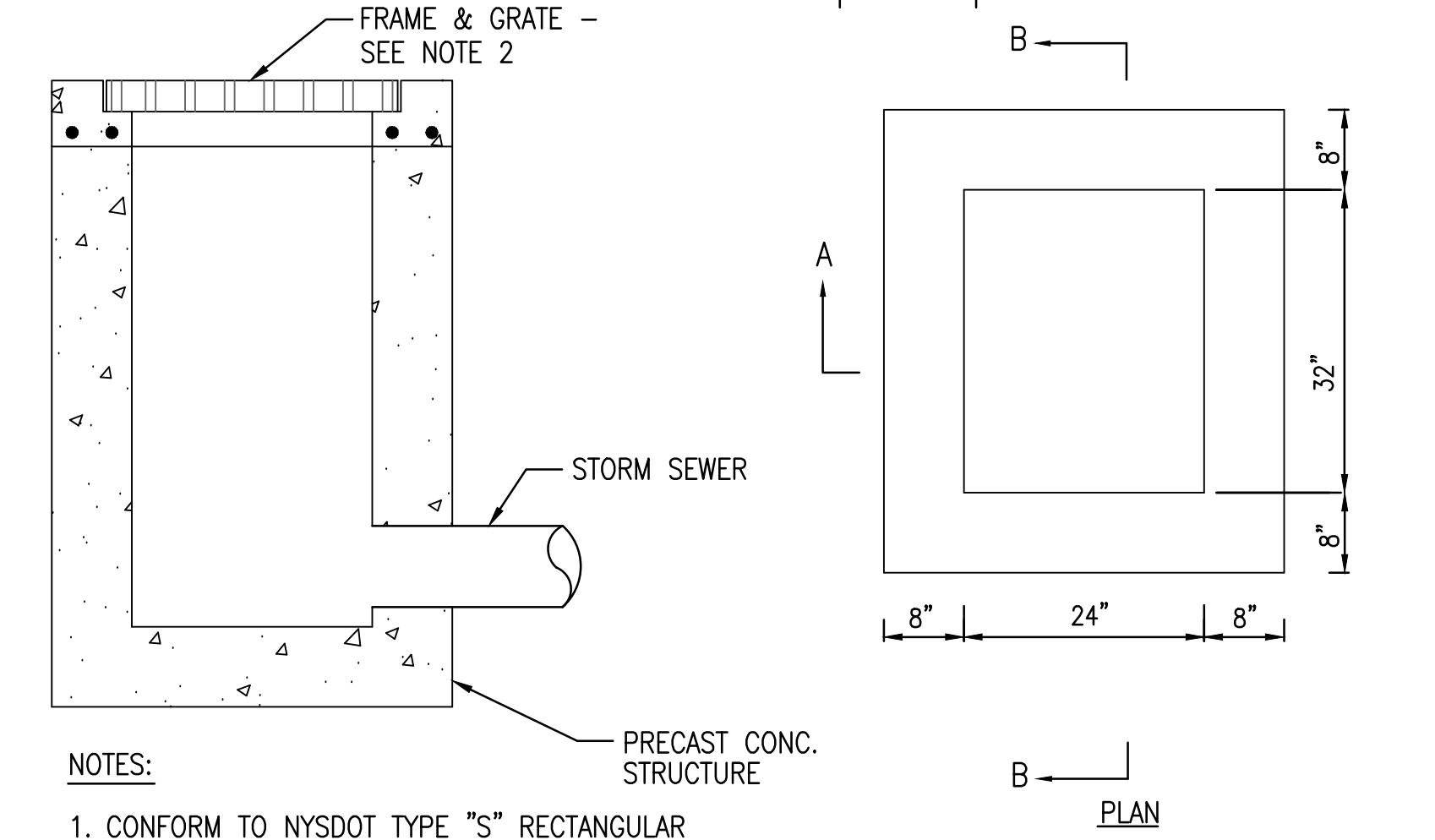
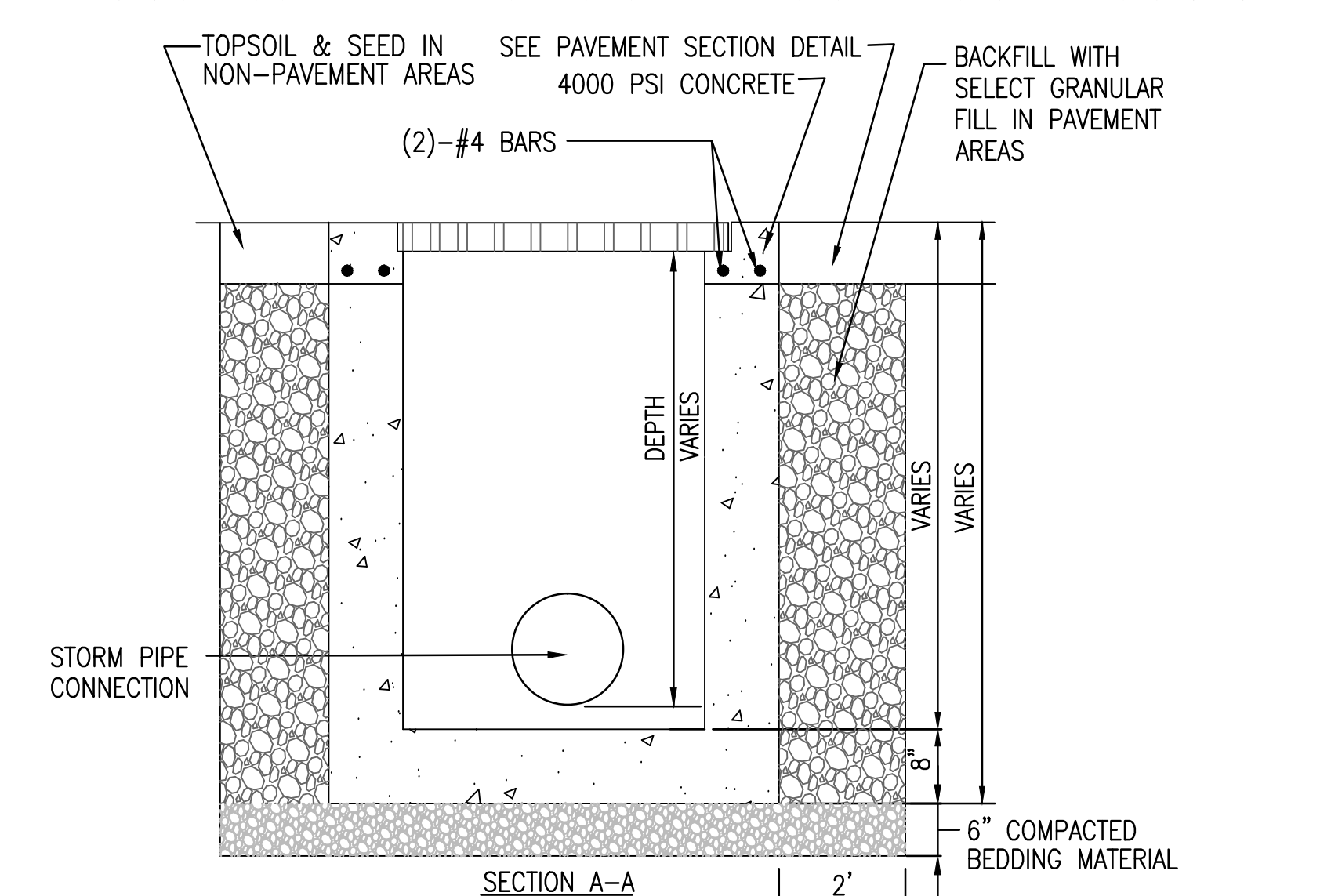
INTERMEDIATE CLEANOUT

B1 TYPICAL UNDERDRAIN CLEANOUT DETAILS
NTS



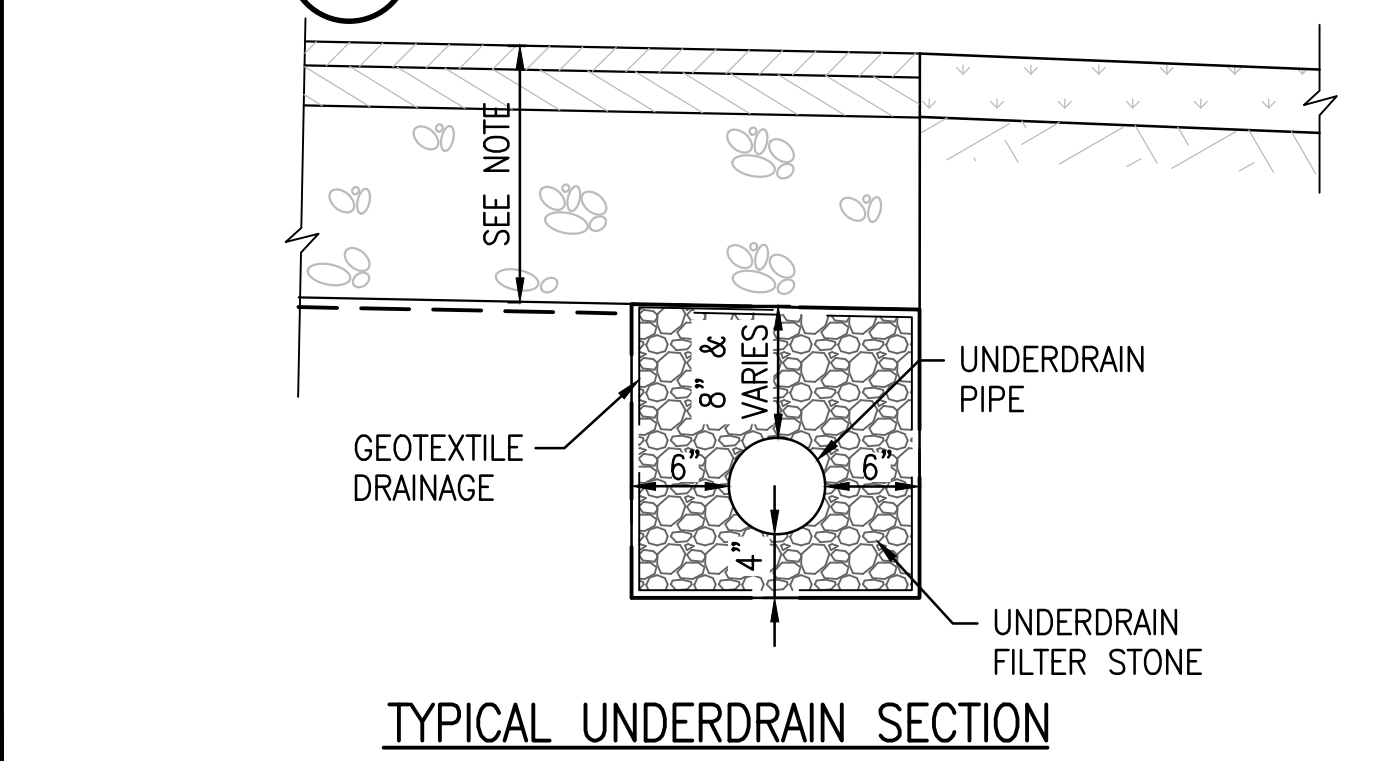
TYPICAL DRAINAGE OR UTILITY PIPE TRENCH DETAIL
NOT TO SCALE

B3 TYPICAL STORM TRENCH DETAIL
NTS



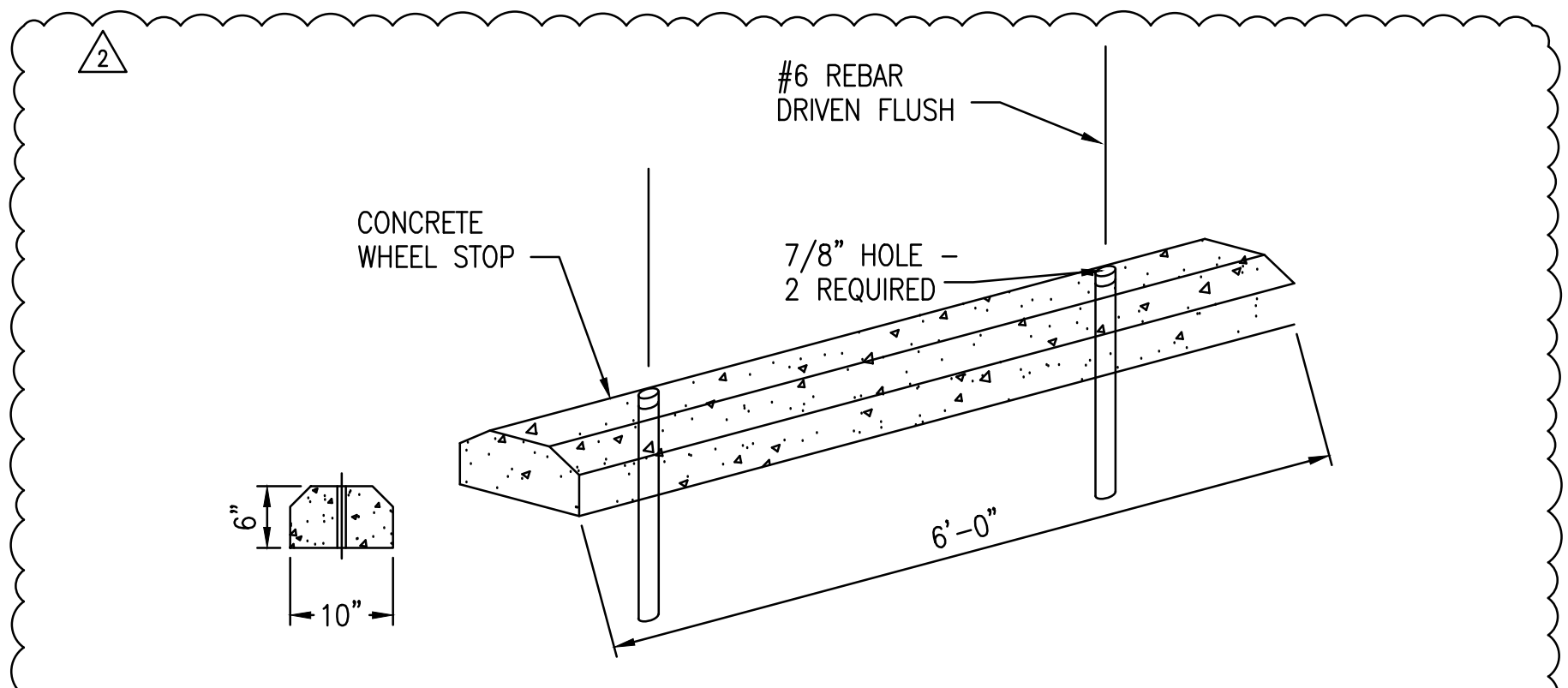
- NOTES:
- CONFORM TO NYSDOT TYPE "S" RECTANGULAR DRAINAGE STRUCTURE PER NYSDOT STD. SHEET 604-02
 - FRAME & GRATE SHALL MEET NYSDOT STANDARD SHEET 655-02 PARALLEL BAR FRAME AND GRATE (INCLUDED IN PRICE FOR ITEM 334400)
 - ALL EXTERIOR SURFACES OF DRAINAGE STRUCTURES TO BE COATED WITH CARBOLINE BITUMASTIC SUPER SERVICE BLACK OR APPROVED EQUAL MIN. 22 MIL. DRIED THICKNESS.
 - ALL DRAINAGE STRUCTURES SHALL BE DESIGNED TO SUPPORT HS20 LOADING, UNLESS OTHERWISE NOTED.

A6 TYPE "S" PRECAST CONCRETE DRAINAGE INLET
NTS



TYPICAL UNDERDRAIN SECTION
NOTE: SEE PLANS AND DRAWING CP501
FOR APPLICABLE PAVEMENT SECTIONS

A1 TYPICAL UNDERDRAIN SECTION
NTS



B3 TYPICAL WHEELSTOP DETAIL
NTS



ERIE COUNTY SEWER DISTRICT NO. 3
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	9/24/2024	BID SUBMISSION

ISSUE:	
PROJECT NO:	
DESIGNER PROJECT NO:	24-3450
CAD DWG FILE:	CP504.DWG
DRAWN BY:	ADS
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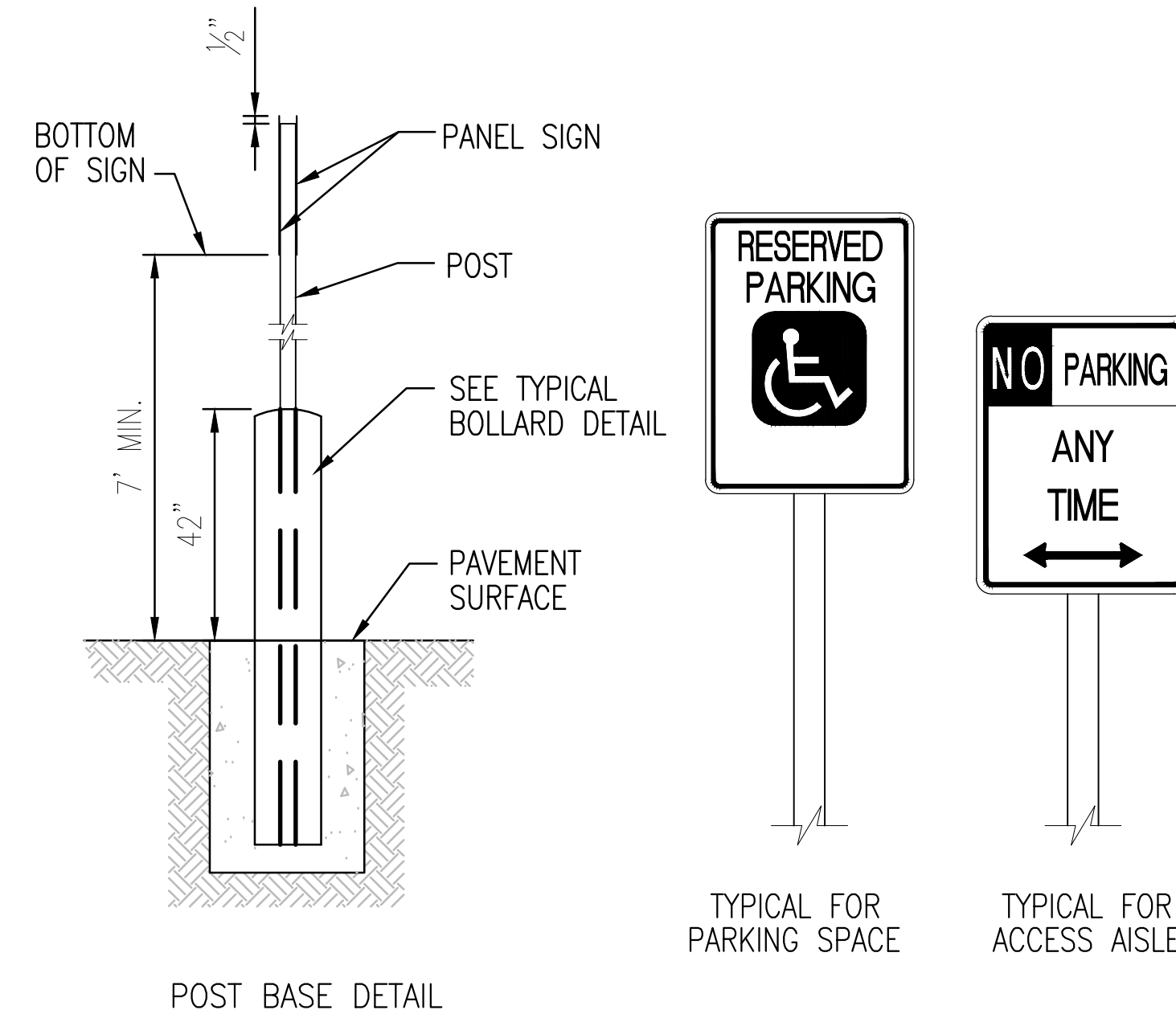
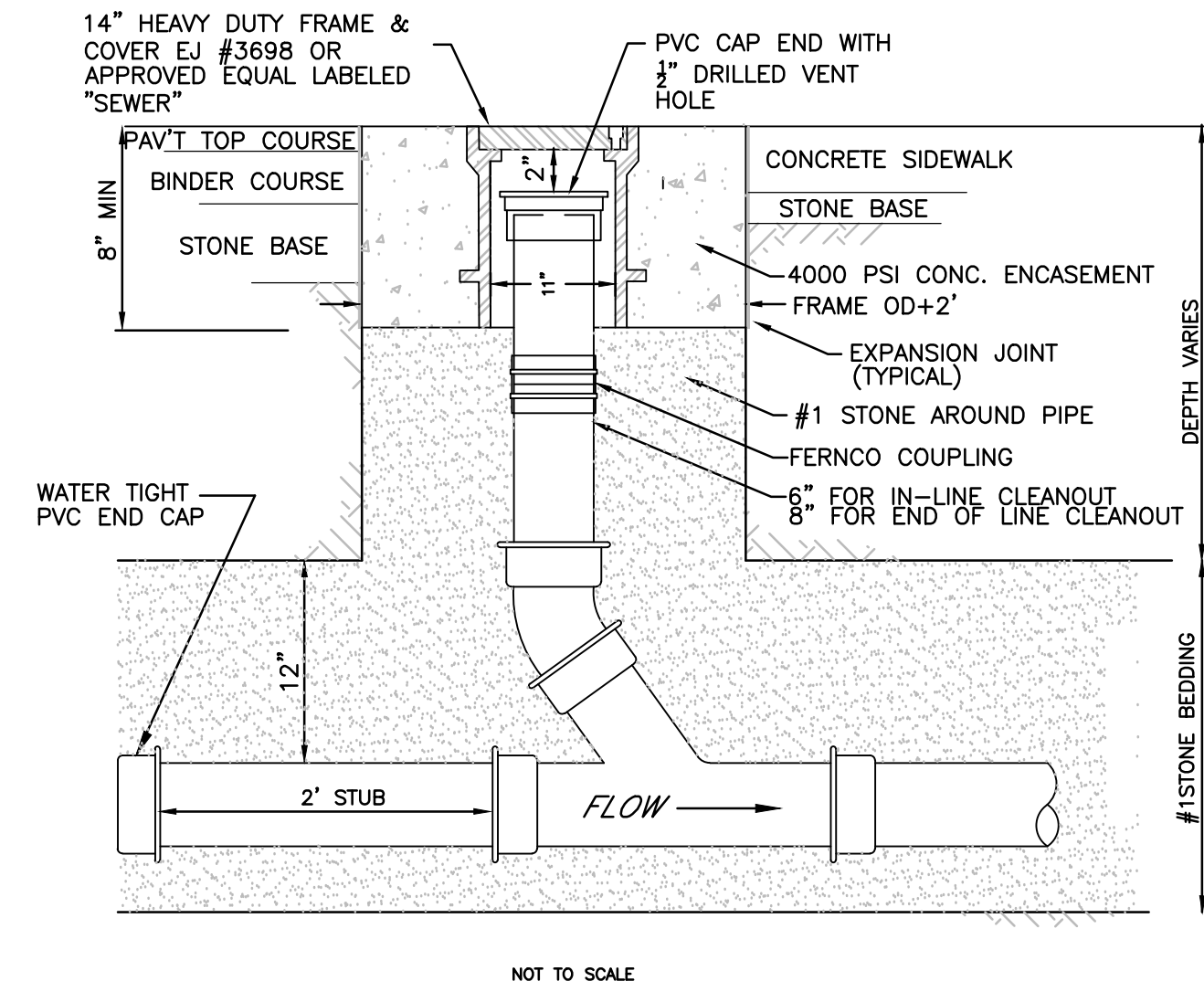
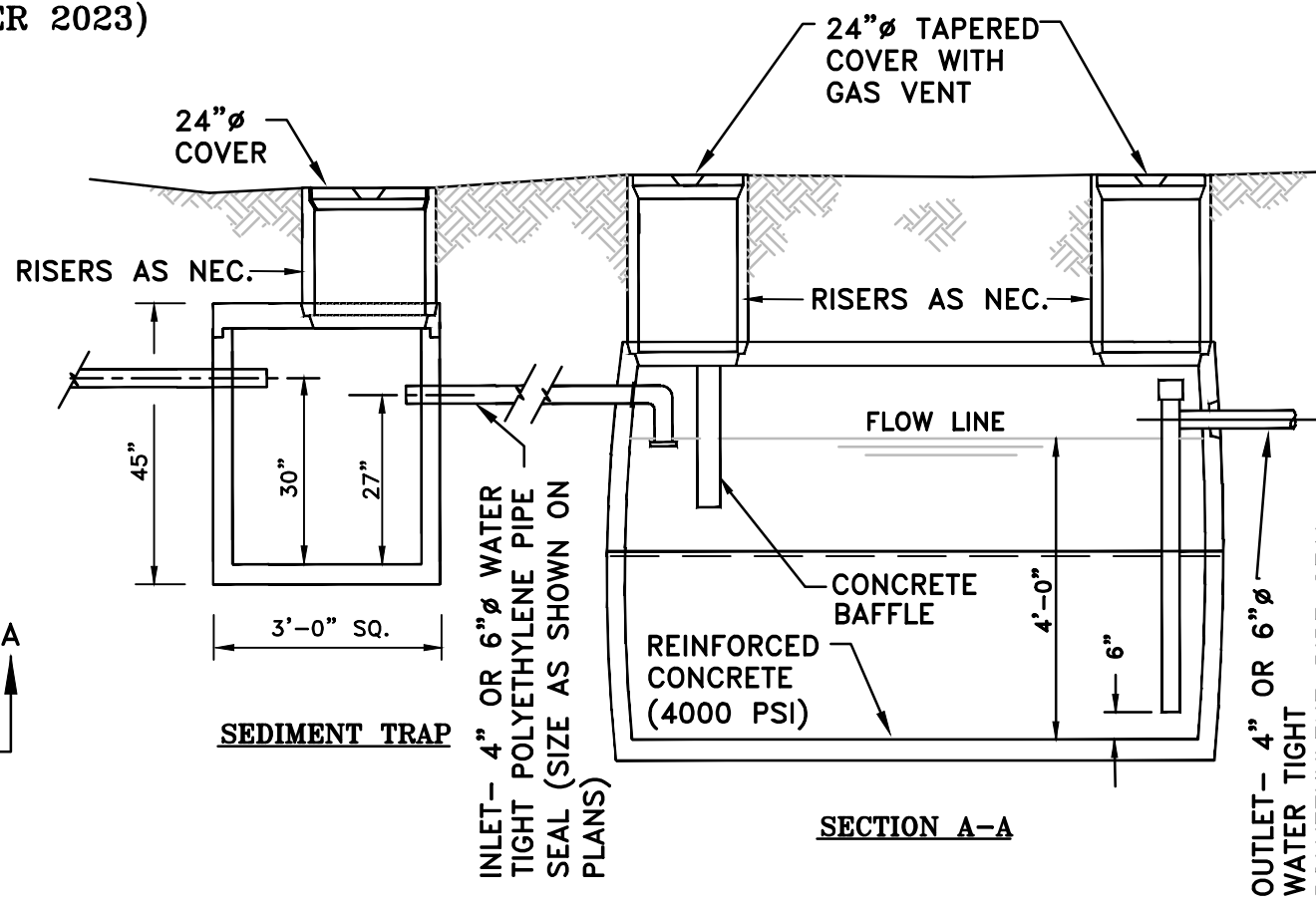
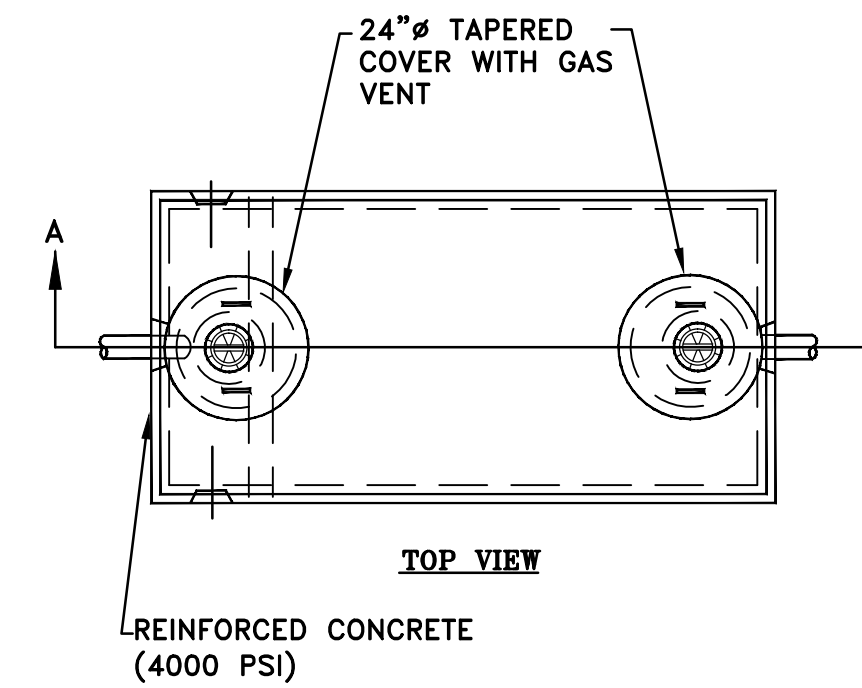
SHEET TITLE

MISCELLANEOUS DETAILS

DRAWING#
CP504
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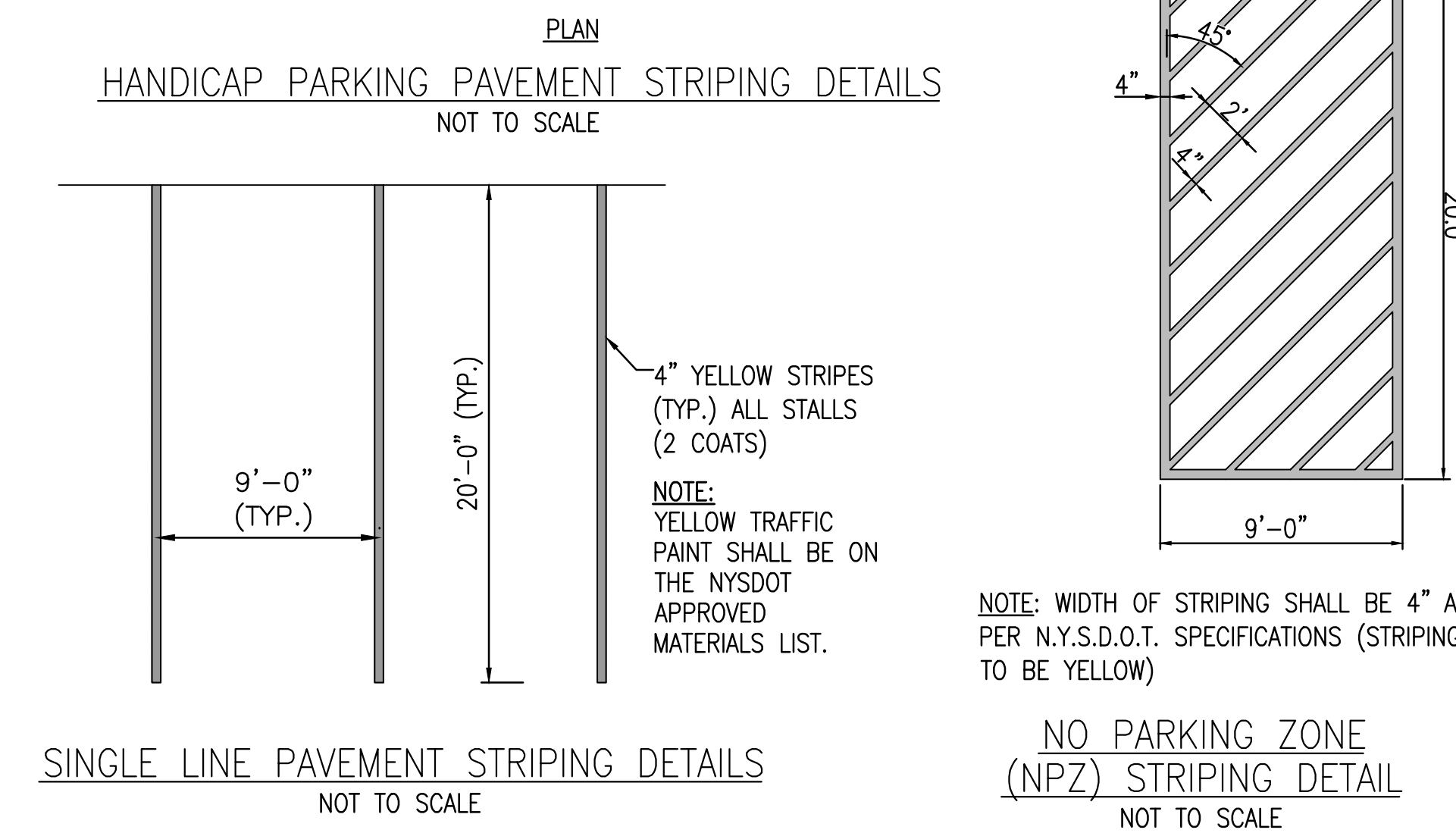
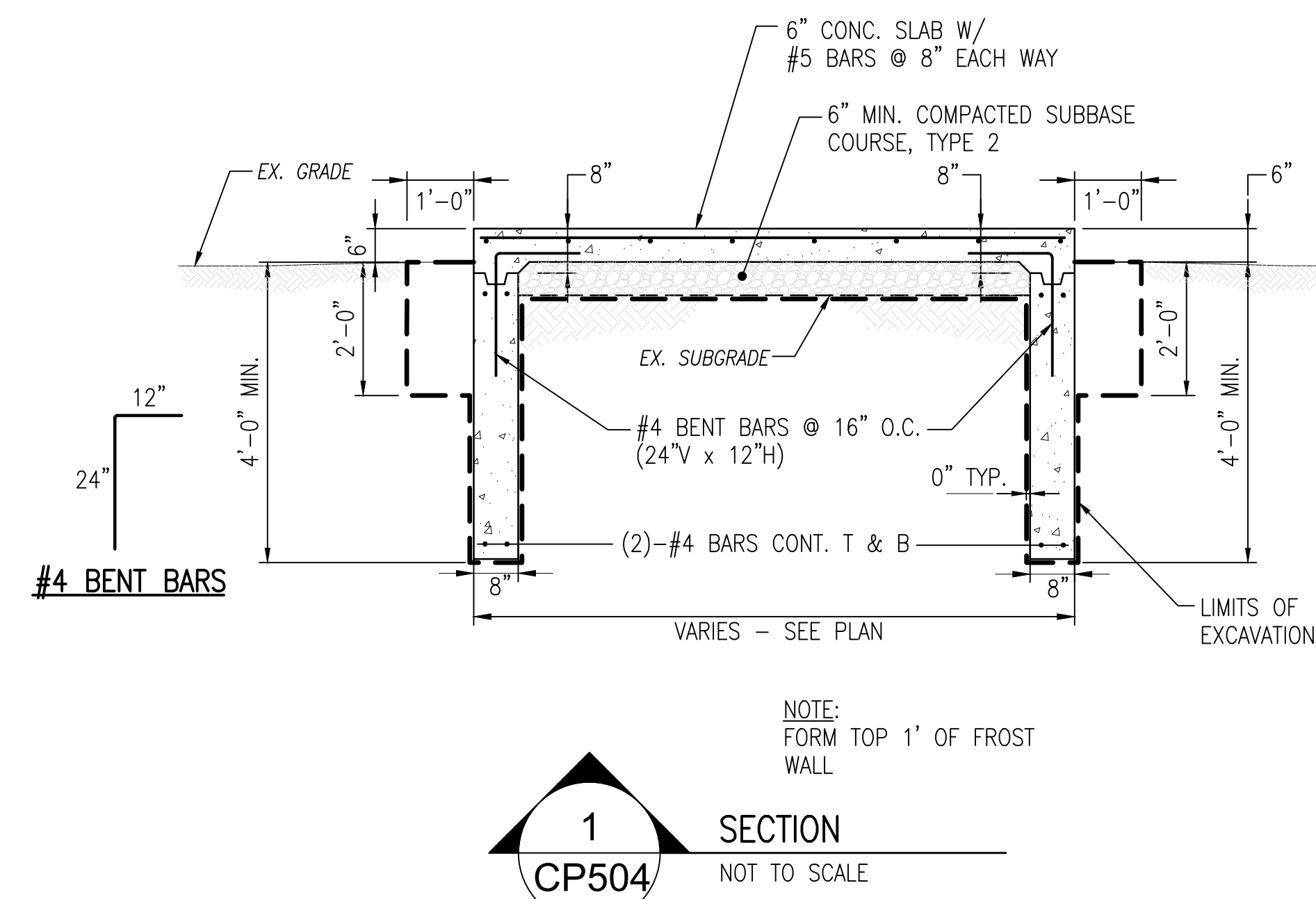
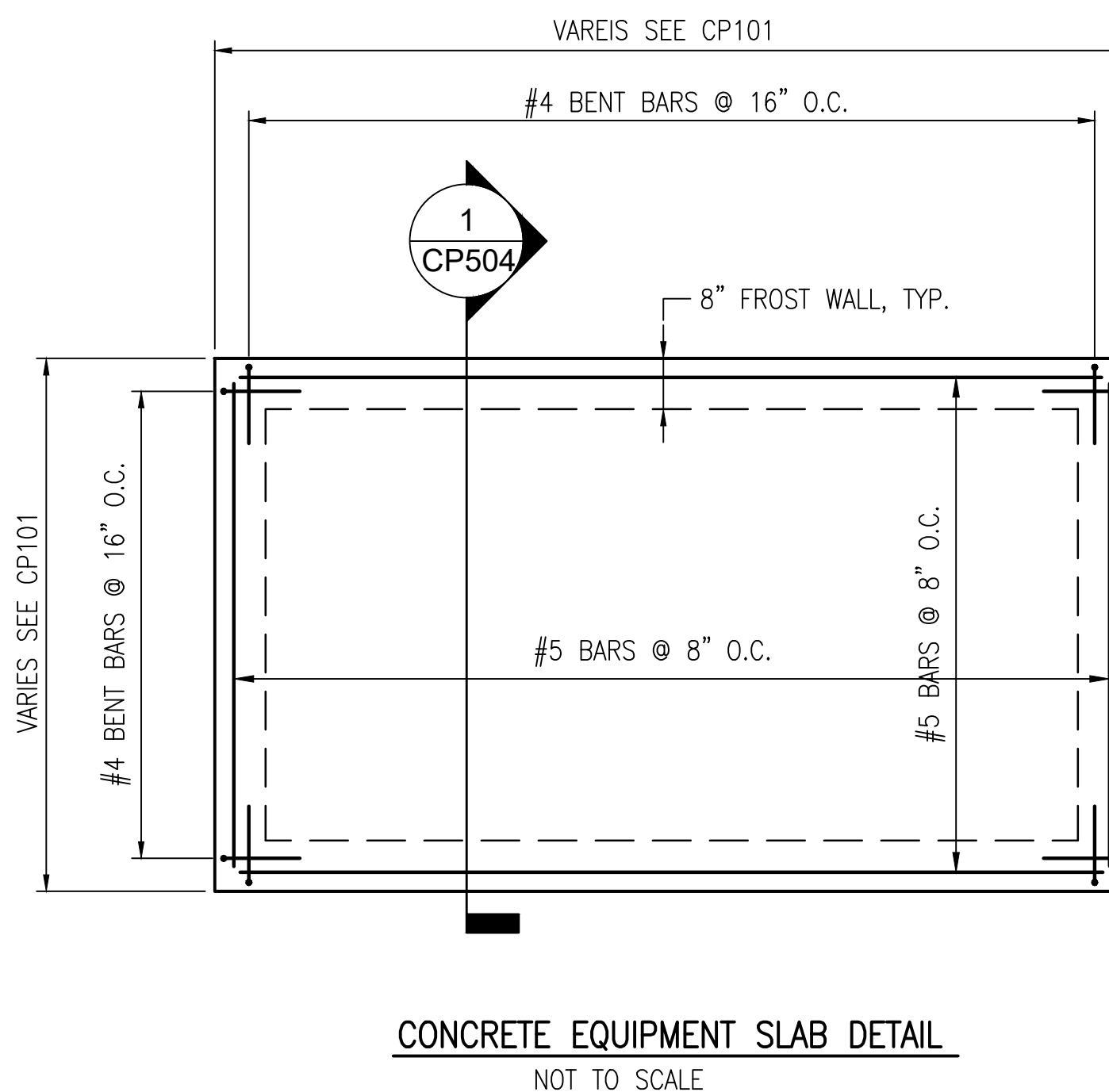
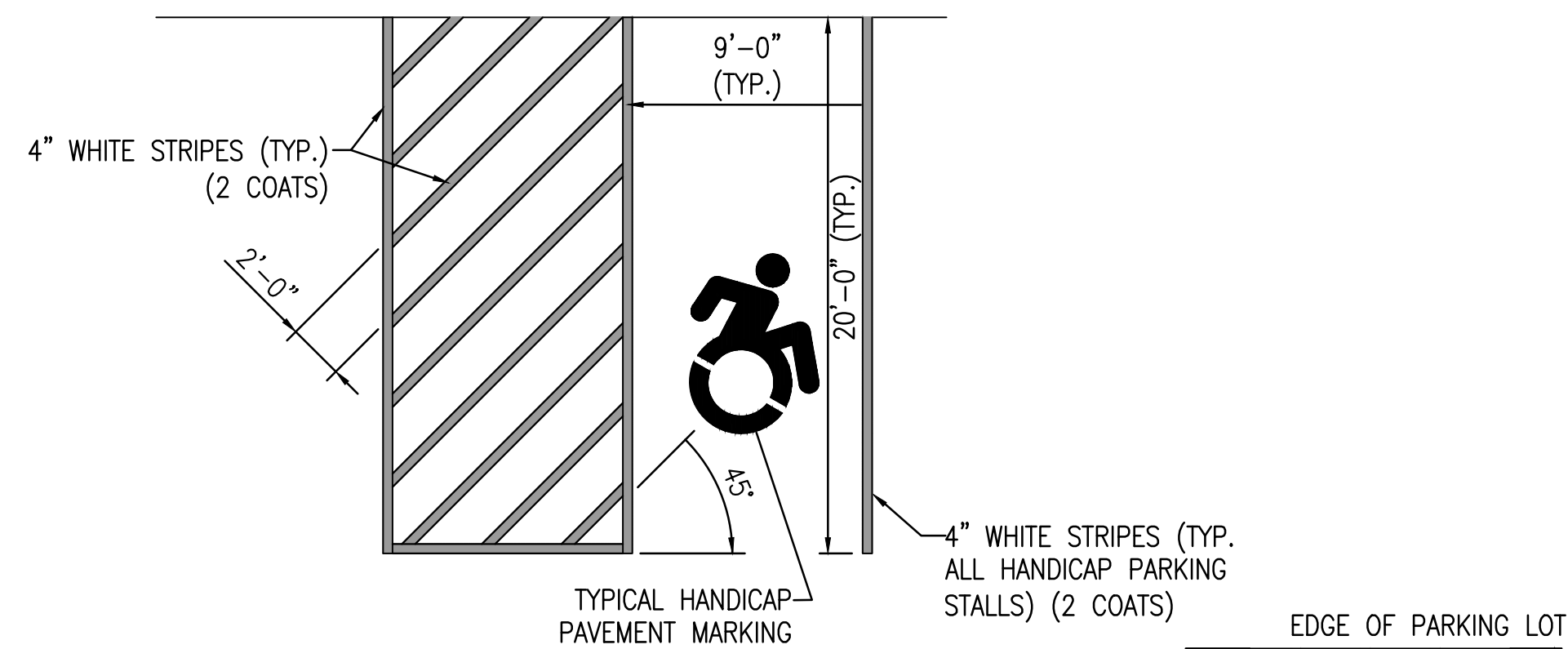
SEDIMENT TRAP & OIL/WATER SEPARATOR DETAIL
(NOVEMBER 2023)

- NOTES:
1) THE UNITS SHALL BE REINFORCED TO WITHSTAND H-20 LOADING
2) OIL/WATER SEPARATOR SHALL CONFORM TO ERIE COUNTY SEWER STANDARD REQUIREMENTS



D3 OIL/WATER SEPARATOR DETAIL
NTS

D6 CLEANOUT IN PAVEMENT DETAIL
NTS



A5 CONCRETE EQUIPMENT SLAB DETAIL
NTS

A1 TYPICAL PAVEMENT STRIPING DETAILS
NTS



**ERIE COUNTY SEWER DISTRICT NO. 3
CENTRAL REGION COLLECTIONS FACILITY
CONTRACT NO. 80**

MARK	DATE	DESCRIPTION
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△	10/1/2024	ADDENDUM #1
	9/24/2024	BID SUBMISSION

ISSUE:	
PROJECT NO:	24-3450
DESIGNER PROJECT NO:	CP506.DWG
CAD DWG FILE:	ADS
DRAWN BY:	JDM
CHECKED BY:	AS NOTED
SCALE:	
COPYRIGHT:	

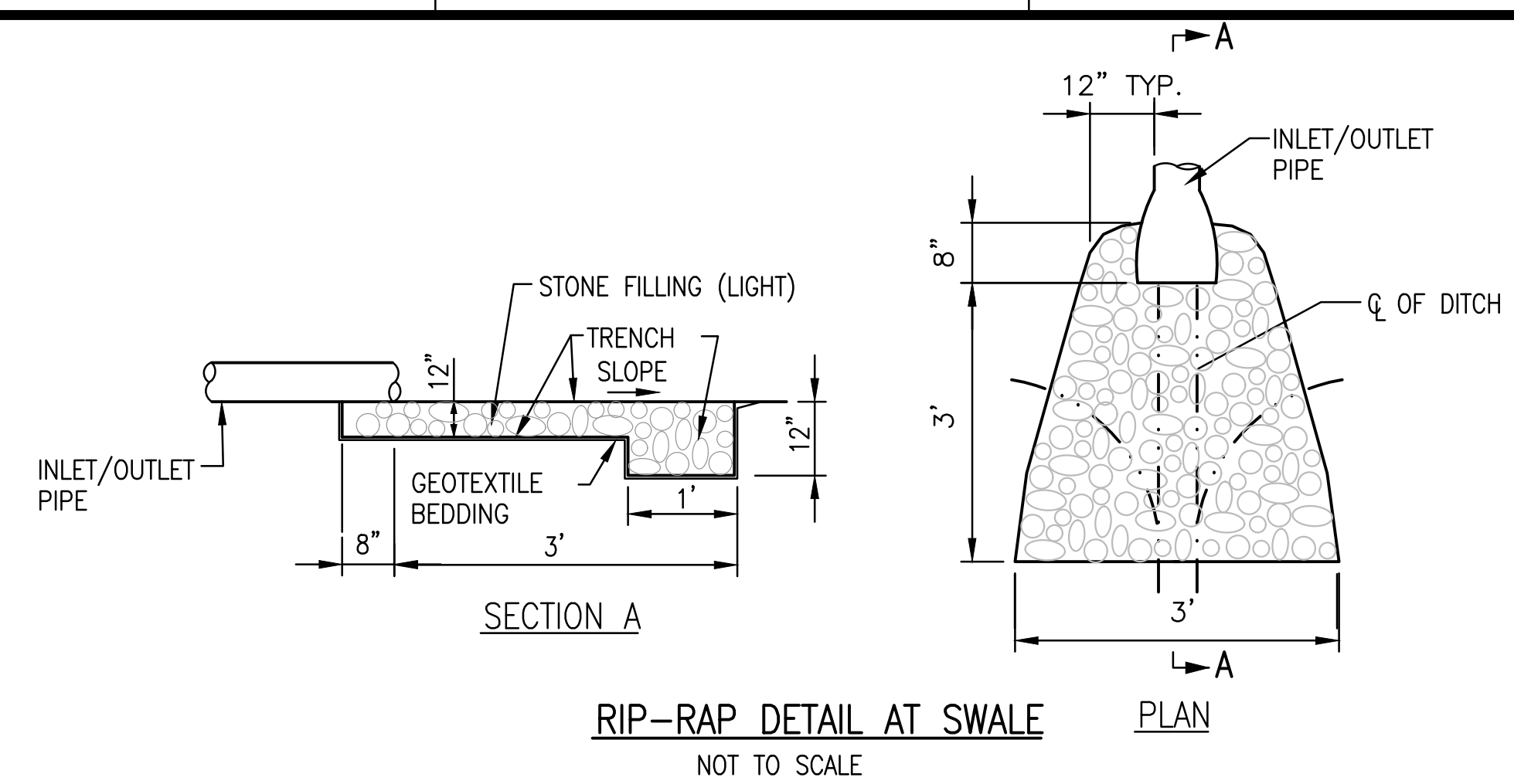
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MISCELLANEOUS DETAILS

DRAWING#

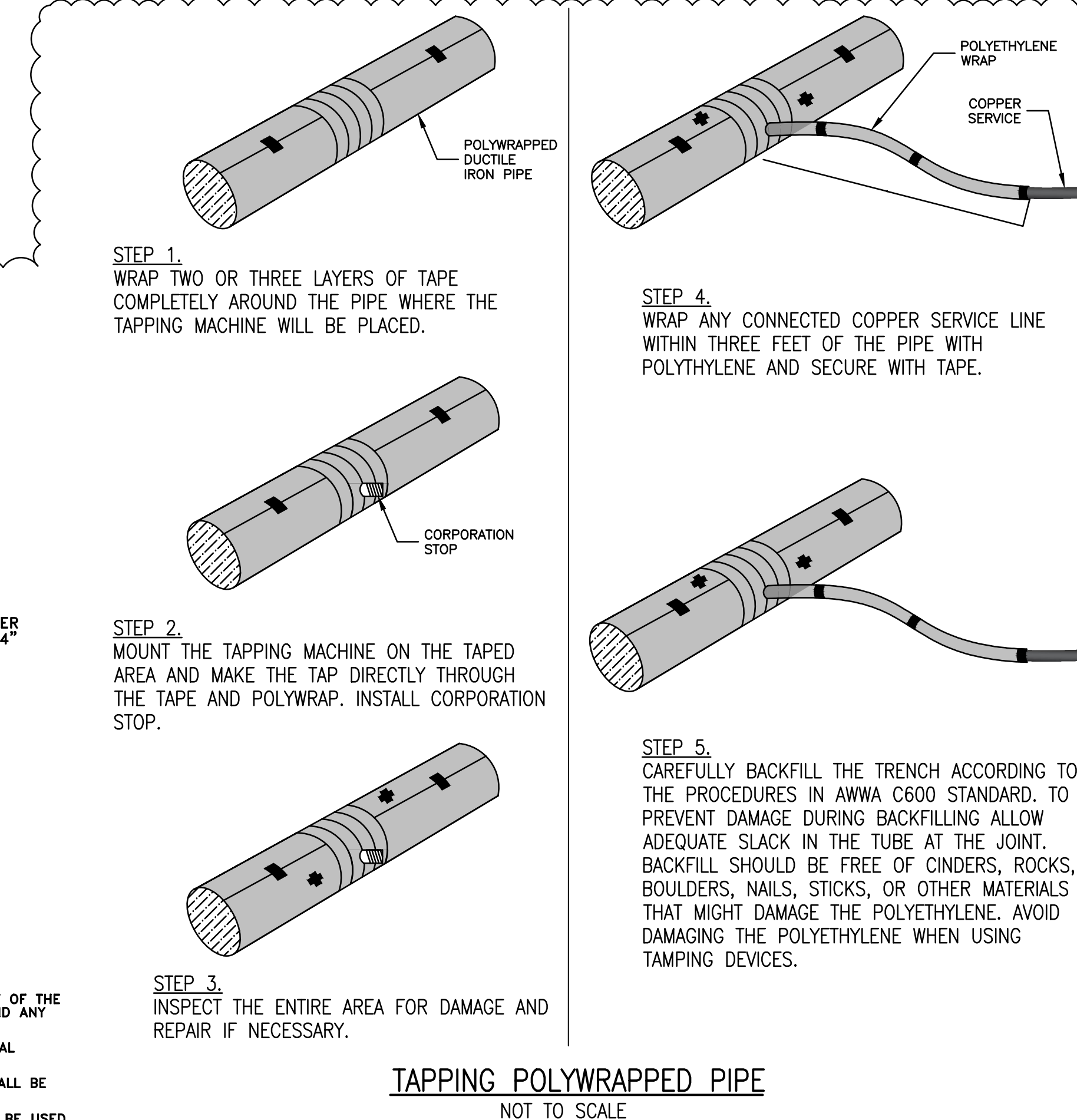
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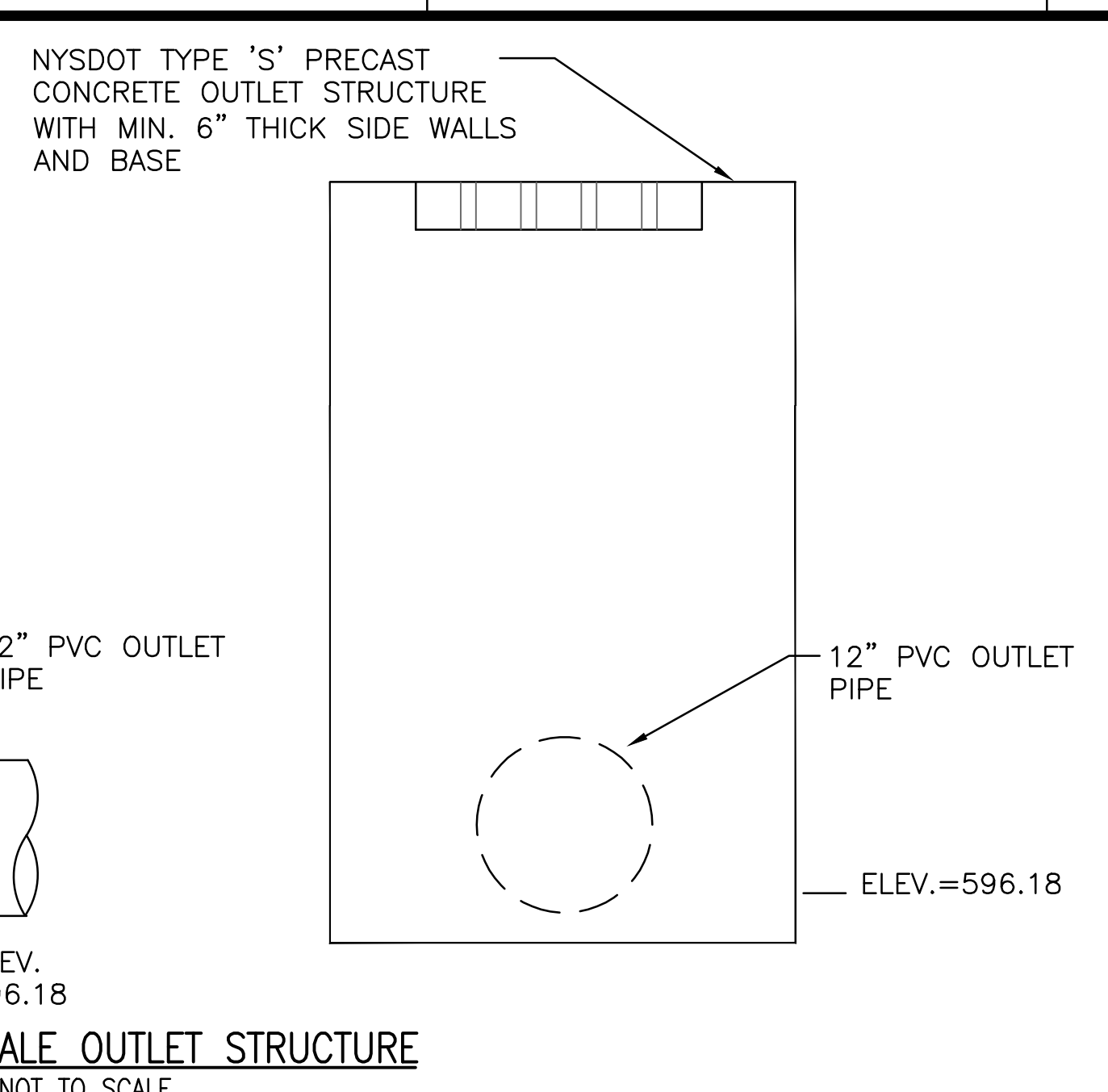


- NOTES:**
1. SOIL RESTORATION SHALL BE REQUIRED ALONG THE BASE OF THE DETENTION BASIN. USE OF HEAVY EQUIPMENT THAT MIGHT COMPACT THE SOILS IS NOT PERMITTED.
 2. TILL THE EXISTING SOILS AT THE BASE OF THE SWALES TO A DEPTH OF AT LEAST 12 INCHES WITH LIGHT EQUIPMENT. THE SOILS AT THE BOTTOM OF THE SWALES SHALL BE RESTORED SUCH THAT A 3/8" METAL BAR CAN BE PUSHED AT LEAST 12 INCHES INTO THE SOILS BY BODY WEIGHT.
 3. APPLY TOPSOIL TO A DEPTH OF 6 INCHES ALONG THE BASE OF THE SWALE AND SIDE SLOPES PRIOR TO STABILIZING THE SWALE, AND SURROUNDING AREA.
 4. PROVIDE RIP-RAP AT INLETS AND OUTLETS AS PER DETAIL.
 5. SOIL EROSION AND SEDIMENT CONTROL MEASURES SHALL BE MAINTAINED AT ALL TIMES UNTIL THE DISTURBED AREAS ARE STABILIZED.
 6. PROVIDE THE METAL END SECTION FOR THE 12" SWALE PIPE WITH METAL FIBER MESH WITH 2.5" SPACING TO PREVENT DEBRIS FROM ENTERING THE PIPE AND CLOGGING THE 3" ORIFICE WITHIN THE STRUCTURE.
 7. REFER TO DRAWING CU101 FOR DRAINAGE STRUCTURE TABLE.

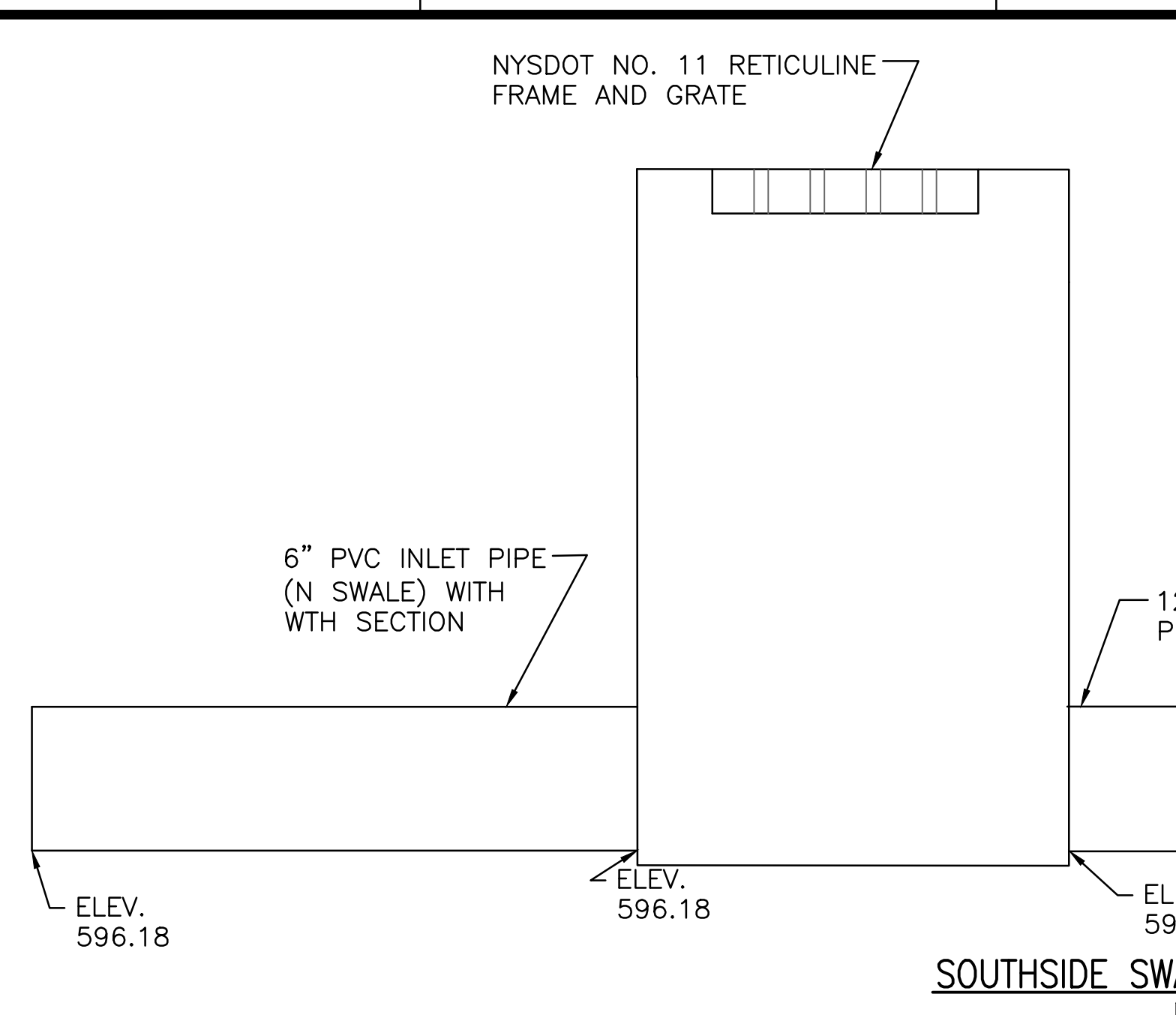
C5 SOUTHSIDE SWALE RIP-RAP DETAIL
NTS



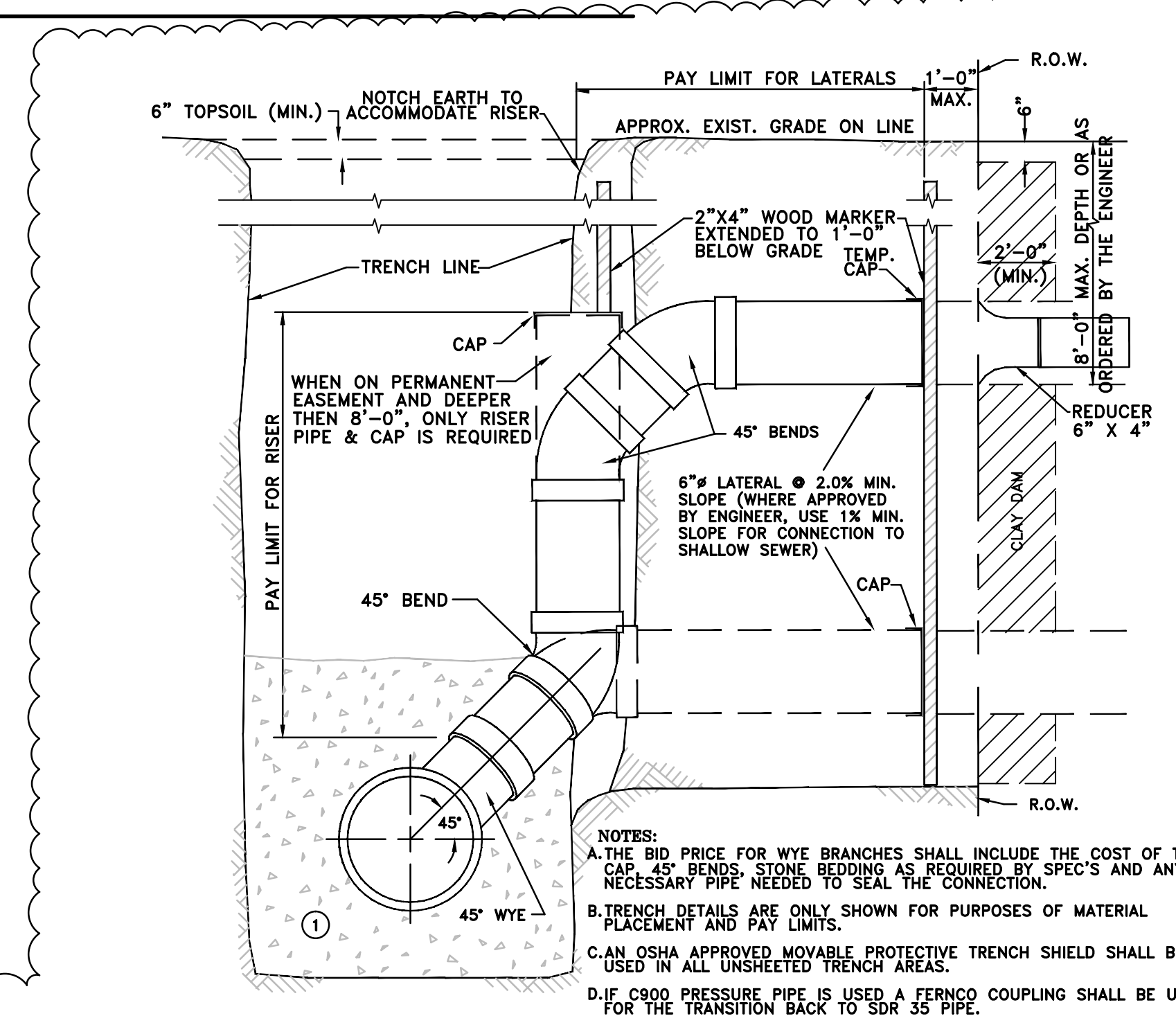
A6 TAPPING POLYWRAPPED PIPE
NTS



SOUTH SIDE SWALE OUTLET STRUCTURE
NOT TO SCALE

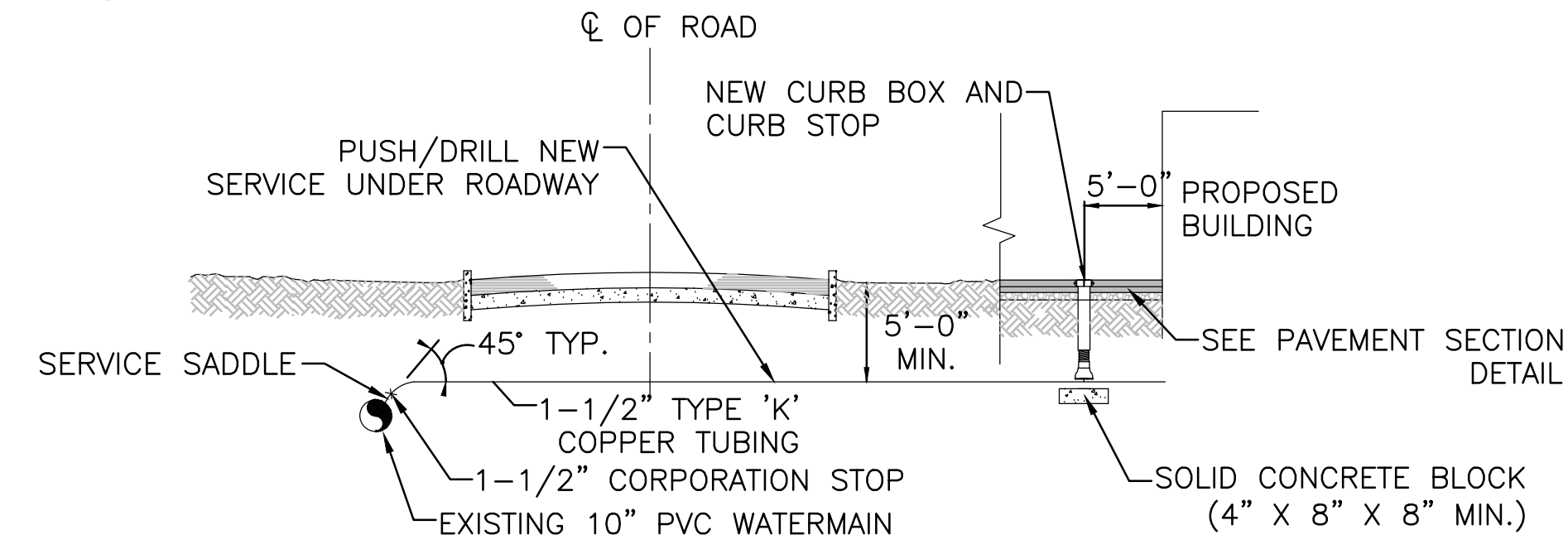


SOUTH SIDE SWALE SECTION
NOT TO SCALE



A3 SANITARY MAIN LINE LATERAL CONNECTION - RISER DETAIL
NTS

B1 SOUTH SIDE SWALE DETAILS
NTS



- NOTES:**
1. SERVICE SADDLES SHALL BE USED WHEN TAPPING PLASTIC (PVC) PIPE.
 2. COPPER PIPE SHALL MEET REQUIREMENTS OF ASTM B88.
 2. CURB BOX SHALL BE 2-1/2" SCREW TYPE V009 BY BIBBY LAPERLE OR APPROVED EQUAL.
 3. 1-1/2" BALL VALVE BY FORD METER BOX COMPANY, INV. OR APPROVED EQUAL ON DOMESTIC SERVICE ONLY.

A1 WATER SERVICE DETAIL
NTS

- NOTES:**
- A. THE BID PRICE FOR WYE BRANCHES SHALL INCLUDE THE COST OF THE CAP, 45° BENDS, STONE BEDDING AS REQUIRED BY SPEC'S AND ANY NECESSARY PIPE NEEDED TO SEAL THE CONNECTION.
 - B. TRENCH DETAILS ARE ONLY SHOWN FOR PURPOSES OF MATERIAL PLACEMENT AND PAY LIMITS.
 - C. AN OSHA APPROVED MOVABLE PROTECTIVE TRENCH SHIELD SHALL BE USED IN ALL UNSHEETED TRENCH AREAS.
 - D. IF C900 PRESSURE PIPE IS USED A FERNCO COUPLING SHALL BE USED FOR THE TRANSITION BACK TO SDR 35 PIPE.

PROPOSED UTILITY STRUCTURE TABLE

STRUCTURE	TYPE	RIM	INVERTS	LOCATION	REMARKS
ST-1	CATCH BASIN	598.80	6" N=597.06 2) 6" S=597.06	N: 1015642.97 E: 1081050.92	INSTALL NEW CATCH BASIN. CONNECT TO PROPOSED SWALE USING 179 LF OF (2) 6" PVC PIPE AT 0.4%
ST-2	CATCH BASIN	599.21	6" S=597.44 4" E=597.44	N: 1015705.92 E: 1081005.84	INSTALL NEW CATCH BASIN. CONNECT TO ST-1 USING 76 LF OF 6" PVC PIPE LEVEL.
ST-3	CATCH BASIN	599.32	6" E=596.18 12" W=596.18	N: 1015462.44 E: 1080986.40	INSTALL NEW CATCH BASIN. CONNECT TO PROPOSED SWALE USING 14 LF 6" PVC PIPE AT 0.50%.
ST-4	CATCH BASIN	602.41	12" N=595.17 12" S=595.17 6" E=595.17	N: 1015557.87 E: 1080904.58	INSTALL NEW CATCH BASIN. CONNECT TO ST-3 USING 125 LF OF 12" PVC PIPE AT 0.80%
ST-5	CATCH BASIN	599.25	12" N=594.91 12" S=594.91	N: 1015600.39 E: 1080904.58	INSTALL NEW CATCH BASIN. CONNECT TO ST-4 USING 40 LF OF 12" PVC PIPE AT 0.64%.
ST-6	CATCH BASIN	596.80	12" N=593.34 12" S=593.34 6" E=594.11	N: 1015848.74 E: 1080888.97	INSTALL NEW CATCH BASIN. CONNECT TO ST-5 USING 246 LF OF 12" PVC PIPE AT 0.64%.

STRUCTURE	TYPE	RIM	INVERTS	LOCATION	REMARKS
ST-7	CATCH BASIN	597.24	12" N=593.22 12" S=593.22 6" E=595.74	N: 1015863.89 E: 1080904.12	INSTALL NEW CATCH BASIN. CONNECT TO ST-6 USING 19 LF OF 12" PVC PIPE AT 0.64%. INSTALL 144 LF OF 6" PVC AT 0.50% TO THE EAST AND CONNECT TO SWALE.
ST-8	EX. CATCH BASIN	596.84	12" N=593.54	N: 1015825.70 E: 1080898.51	REMOVE EXISTING CATCH BASIN AND 39 LF OF 12" HDPE PIPE TO PROPOSED DRAINAGE BASIN ST-7.
ST-9	DRAIN BASIN	597.51	8" N=593.79	N: 1015788.13 E: 1080884.46	INSTALL NEW DRAINAGE BASIN. CONNECT USING 12"x8" TEE TO 12" PVC PIPE USING 7 LF OF 8" PVC PIPE AT 1.0%.

NOTES:

- CONTRACTOR SHALL FIELD VERIFY SERVICE LOCATIONS AND DEPTHS AT START OF CONSTRUCTION AND NOTIFY ENGINEER OF ANY DISCREPANCIES.
- CONNECT NEW SERVICE LINES (SEWER, WATER, ETC.) FROM NEW BUILDING TO EXISTING SERVICE LINES AT 5' FROM NEW STRUCTURE.
- CONNECT ROOF DRAINS INTO EXISTING DRAINAGE SYSTEM.
- CONTRACTOR SHALL TAKE ALL PRECAUTIONS NECESSARY TO PRESERVE THE INTEGRITY OF THE EXISTING UTILITIES TO REMAIN AND SHALL PROVIDE UNINTERRUPTED SERVICE TO ALL USERS OF THE EXISTING UTILITIES. INSTALLATION OF ALL UTILITIES, INCLUDING ANY REMOVAL OR RELOCATION, SHALL BE IN ACCORDANCE WITH THE LOCAL REQUIREMENTS.
- EXISTING UTILITIES (LOCATION, SIZES AND INVERTS) SHOWN ON THE PLANS HAVE BEEN PLOTTED FROM FIELD SURVEYS AND RECORD MAPS AND ARE NOT CERTIFIED AS TO THE ACCURACY OF THEIR LOCATION OR COMPLETENESS. THE CONTRACTOR SHALL BE RESPONSIBLE FOR DETERMINING THE EXACT LOCATIONS AND DEPTH OF ALL UTILITIES AND STRUCTURES. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ANY DELAYS OR DAMAGES OCCURRING AS A RESULT OF INCORRECTLY LOCATED UTILITIES. NO EXTENSIONS OF CONTRACT TIME AND NO MONETARY DAMAGE CLAIMS SHALL BE ALLOWED AS A RESULT OF REVISED DESIGN LOCATIONS.
- THE CONTRACTOR SHALL EXPOSE EXISTING UTILITIES AHEAD OF ALL PIPE LAYING OPERATIONS TO ALLOW FOR MINOR ADJUSTMENTS TO BE MADE IN ELEVATION AND/OR ALIGNMENT DUE TO INTERFERENCE FROM THESE UTILITIES, IF NECESSARY.
- CONTRACTOR SHALL PROVIDE COUNTY REPRESENTATIVES AND DESIGN TEAM INSPECTORS FREE ACCESS TO ALL PARTS OF THE SITE FOR PROPER INSPECTION.
- CONTRACTOR SHALL PERFORM NO WORK OUTSIDE OF THE DESIGNATED WORK LIMITS WITHOUT APPROVAL FROM THE ENGINEER.
- APPROXIMATE LOCATION OF OIL/WATER SEPARATOR AND SEDIMENTATION TANK AS MANUFACTURED BY KISTNER CONCRETE OR APPROVED EQUALS (SEE DETAIL CP504). PROVIDE RISERS AS NECESSARY TO FINISHED GRADE PER MANUFACTURER SPECIFICATIONS AND CONNECT OUTLET TO 4" SANITARY LINE. REFER TO PLUMBING DRAWINGS FOR ADDITIONAL INFORMATION. OIL/WATER SEPARATOR AND SEDIMENTATION TANK TO BE PROVIDED BY GC.
- SEE DECOMMISSION PLAN INCLUDED IN CONTRACT DOCUMENTS FOR AREAS WHERE PROPOSED UTILITIES MAY CONFLICT WITH EXISTING UNDERGROUND FOUNDATIONS.
- SEE DWG ES-101 FOR DUCT BANKS DETAILS. CONTRACTOR TO COORDINATE WITH STORM PIPE INSTALLATION TO AVOID CONFLICTS. CONDUITS ARE APPROXIMATE BASED ON PLAN SHEET ES-101.
- LOCATION OF GAS METER. COORDINATE FINAL LOCATION WITH OWNER.
- GAS COMPANY SHALL BE RESPONSIBLE FOR TAPPING AND INSTALLATION OF GAS PIPING FROM SERVICE MAIN TO BUILDING. OWNER RESPONSIBLE FOR GAS SERVICE FEES. GAS METER WILL BE PROVIDED BY GAS COMPANY. PLUMBING CONTRACTOR SHALL BE RESPONSIBLE FOR PIPING DOWNSTREAM OF METER.
- CONTRACTOR SHALL NOTIFY ECWA PRIOR TO MAKING SERVICE CONNECTION.
- CONTRACTOR SHALL NOT OPERATE ANY WATER VALVES WITHOUT APPROVAL FROM ECWA
- CONTRACTOR SHALL USE ECWA SPECIFICATIONS FOR WATER SERVICE INSTALLATION. SEE ADDENDUM NO. 2 FOR RELEVANT SPECIFICATIONS. CONTRACTOR SHALL CONTACT ECWA FOR ADDITIONAL SPECIFICATIONS AS NEEDED.
- REFER TO DWG. CP506 FOR WATER SERVICE DETAILS.



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didonatoassociates.com

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ERIE COUNTY SEWER DISTRICT NO. 3 CENTRAL REGION COLLECTIONS FACILITY CONTRACT NO. 80

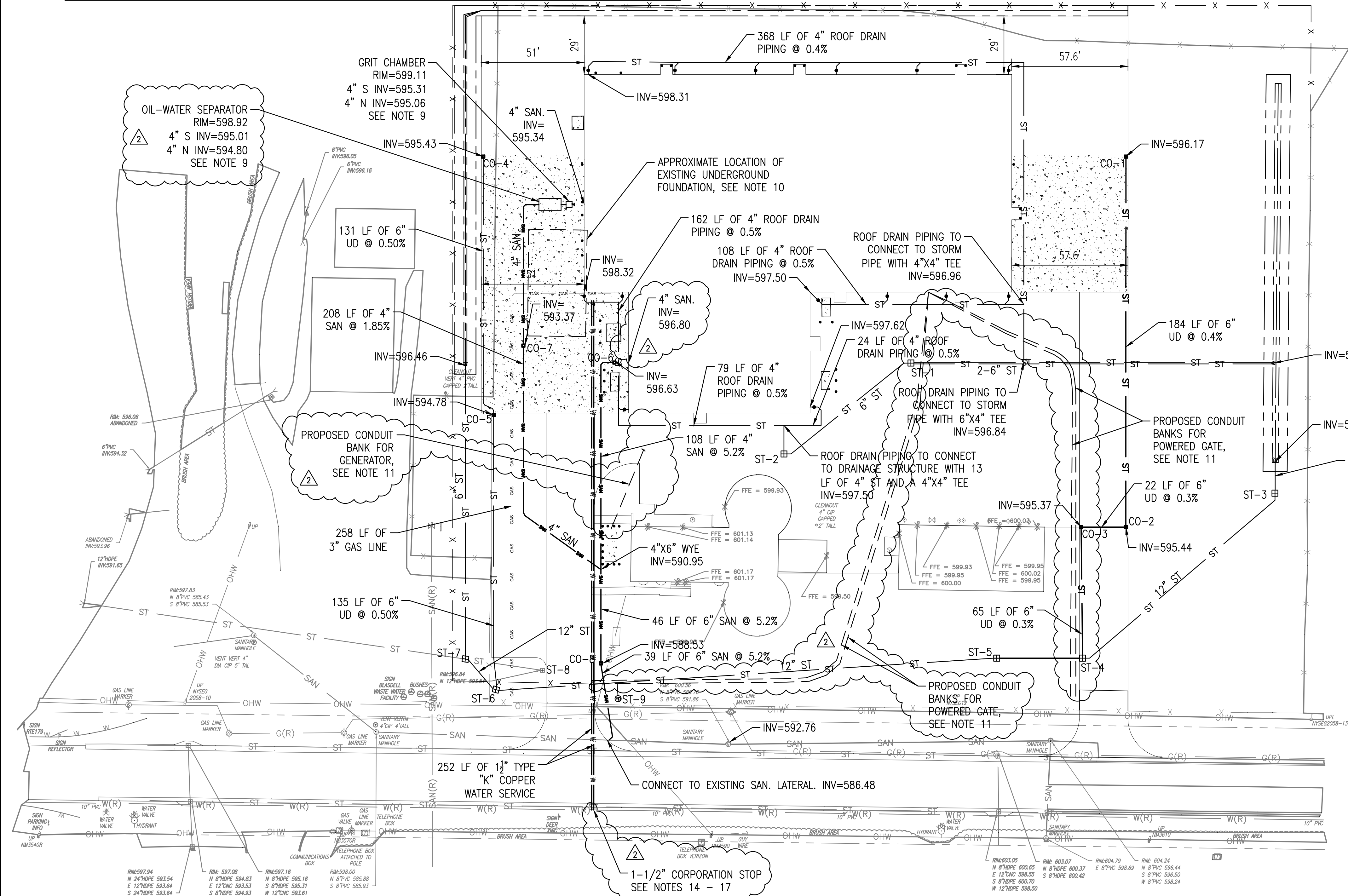
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△	10/1/2024	ADDENDUM #1
	9/24/2024	BID SUBMISSION

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UTILITY PLAN

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CU101





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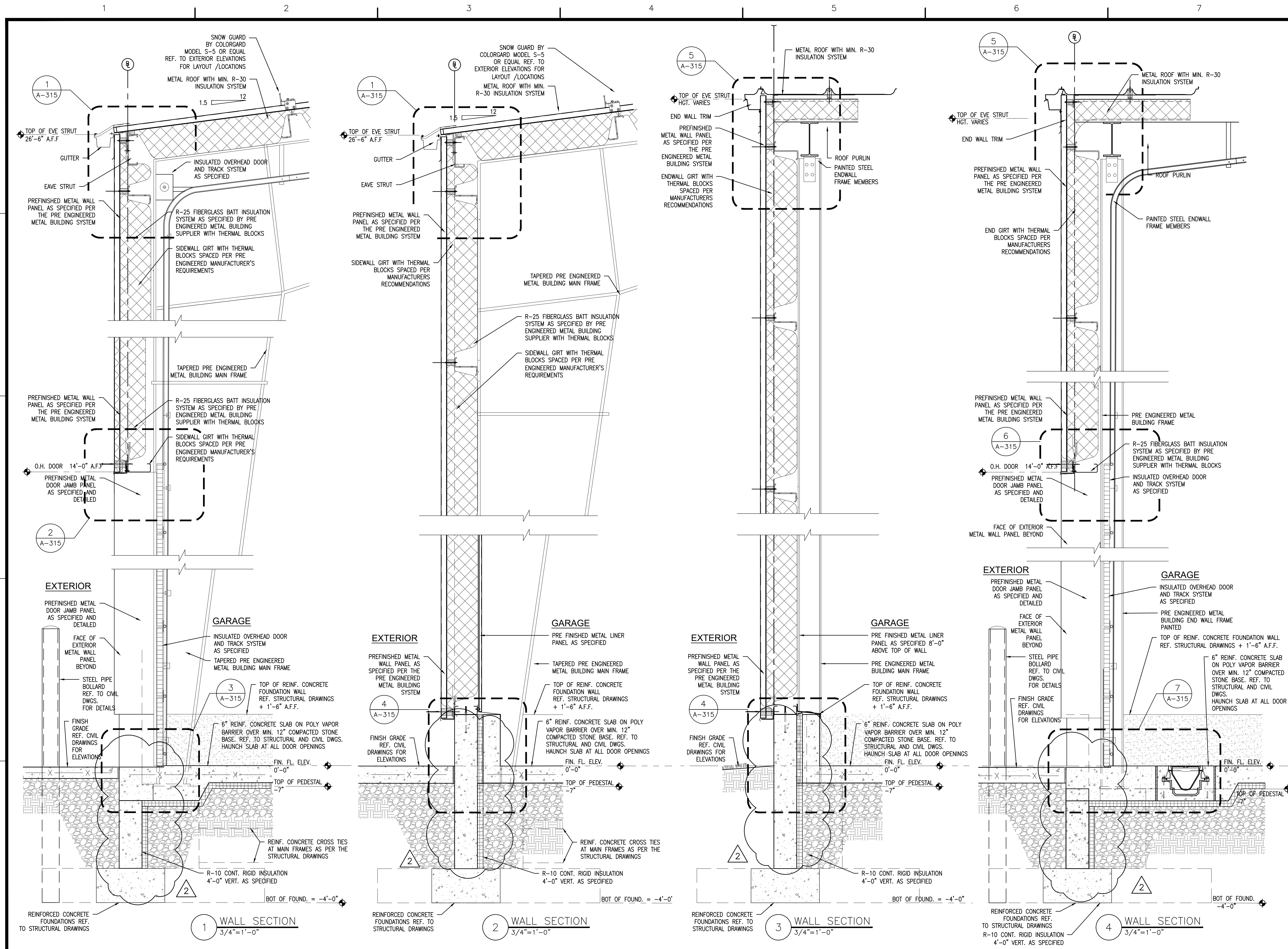
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SHEET TITLE

WALL SECTIONS

DRAWING#

A-310





**ERIE COUNTY SEWER DISTRICT NO. 3
CENTRAL REGION
COLLECTIONS FACILITY
CONTRACT NO. 80**

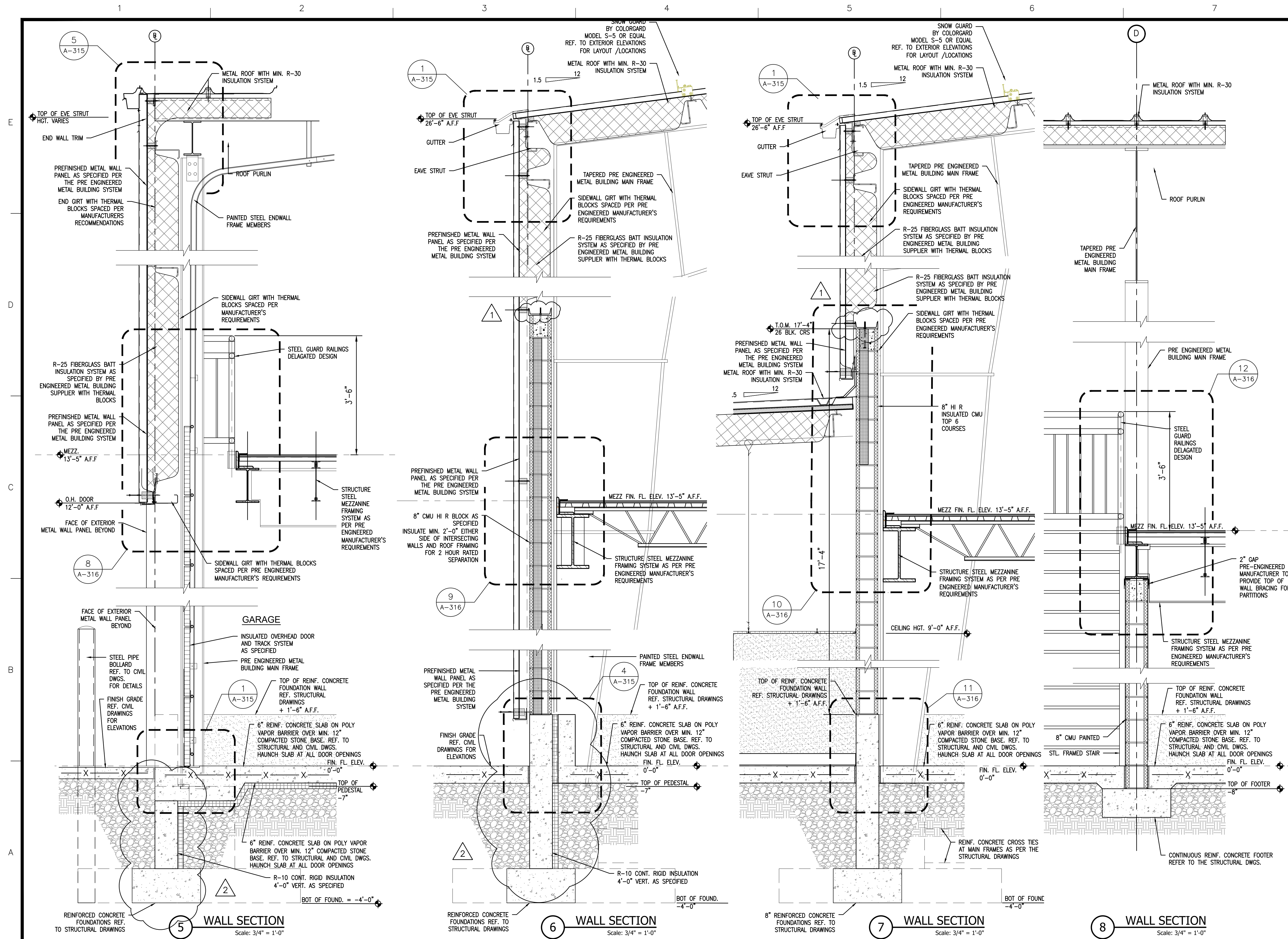
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	9/24/2024	BID SUBMISSION

ISSUE:	
PROJECT NO:	
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SHEET TITLE

WALL SECTIONS

DRAWING#
A-311

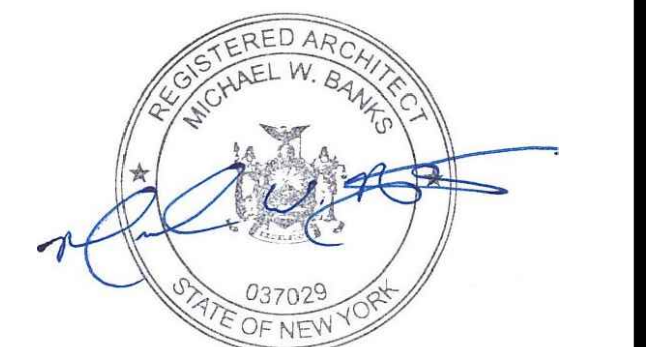


5 WALL SECTION
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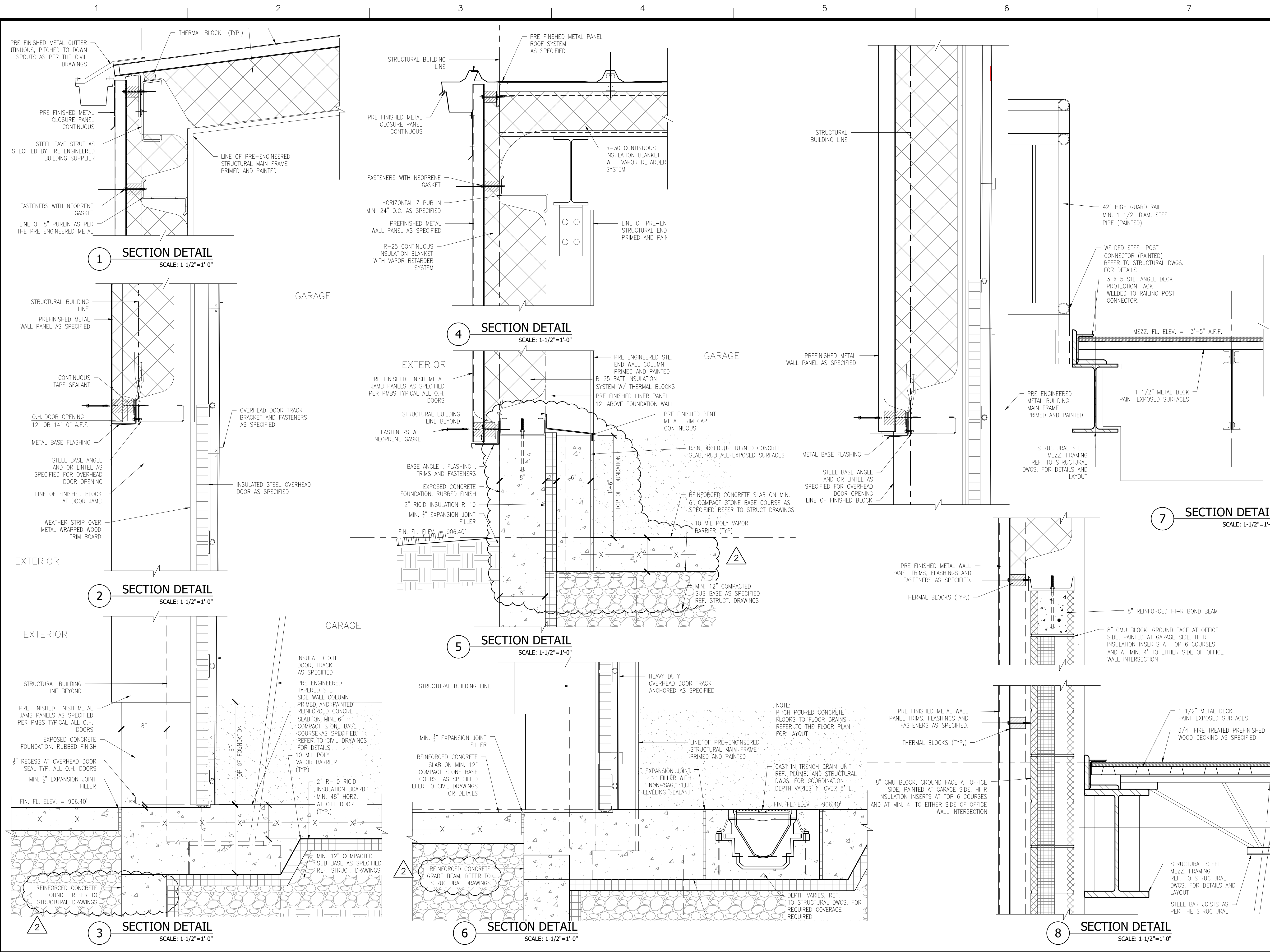
6 WALL SECTION
Scale: 3/4" = 1'-0"

7 WALL SECTION
Scale: 3/4" = 1'-0"

8 WALL SECTION
Scale: 3/4" = 1'-0"



ERIE COUNTY SEWER DISTRICT NO. 3 CENTRAL REGION COLLECTIONS FACILITY CONTRACT NO. 80



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ISSUE:	
PROJECT NO:	
DESIGNER PROJECT NO:	24-3450
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SECTION DETAILS

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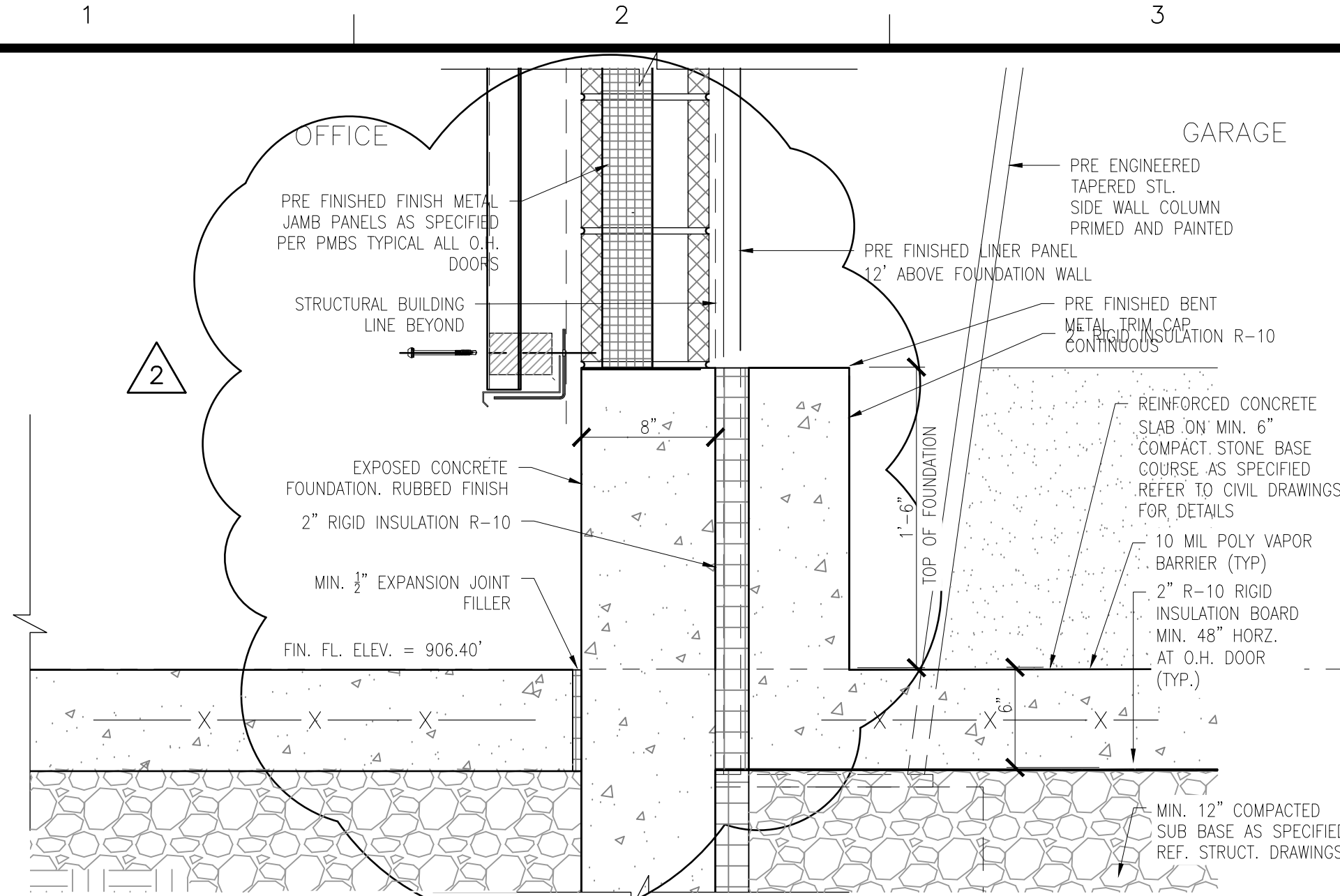
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Δ	10/1/2024	ADDENDUM #1
	9/24/2024	BID SUBMISSION

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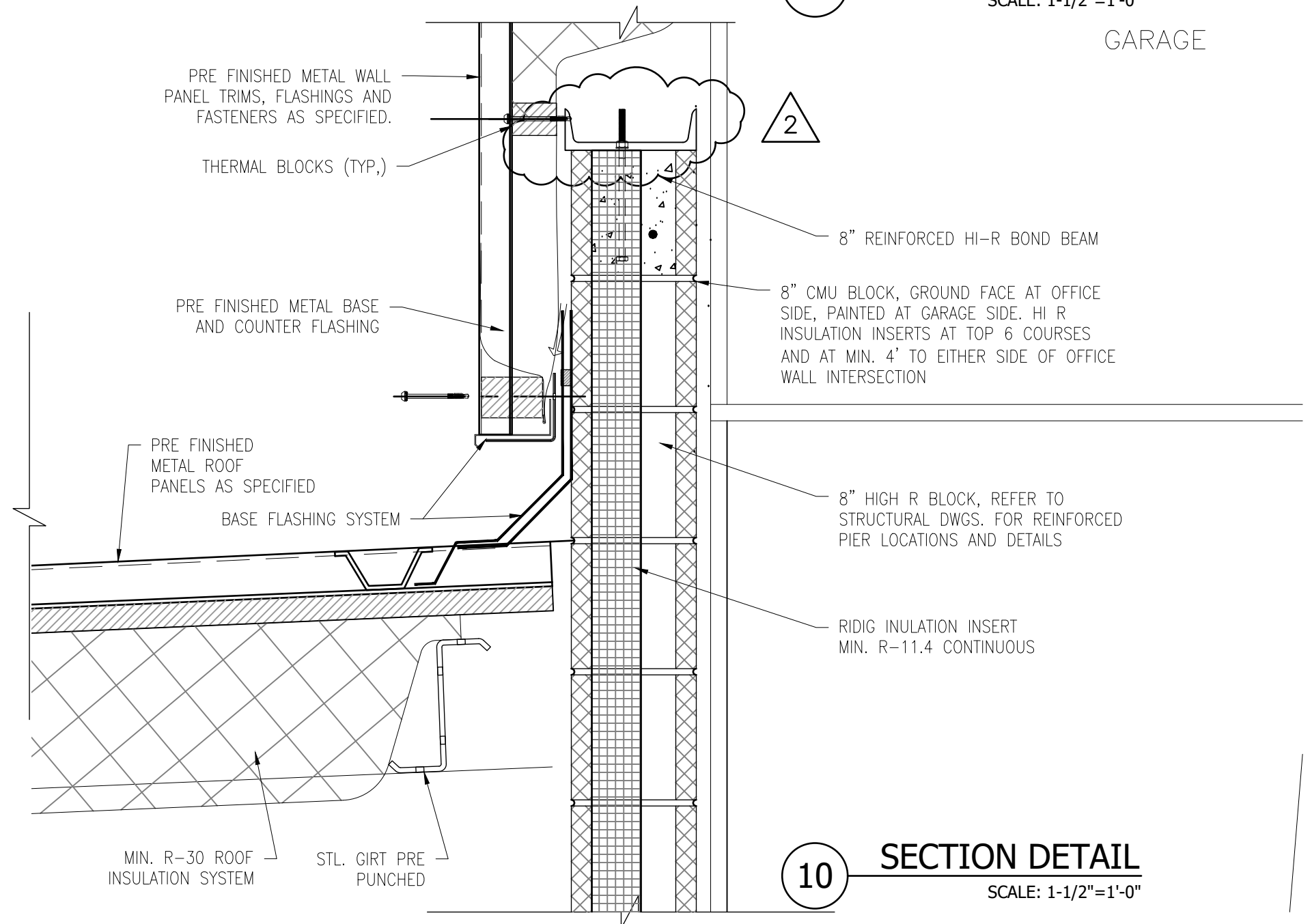
SHEET TITLE

SECTION DETAILS

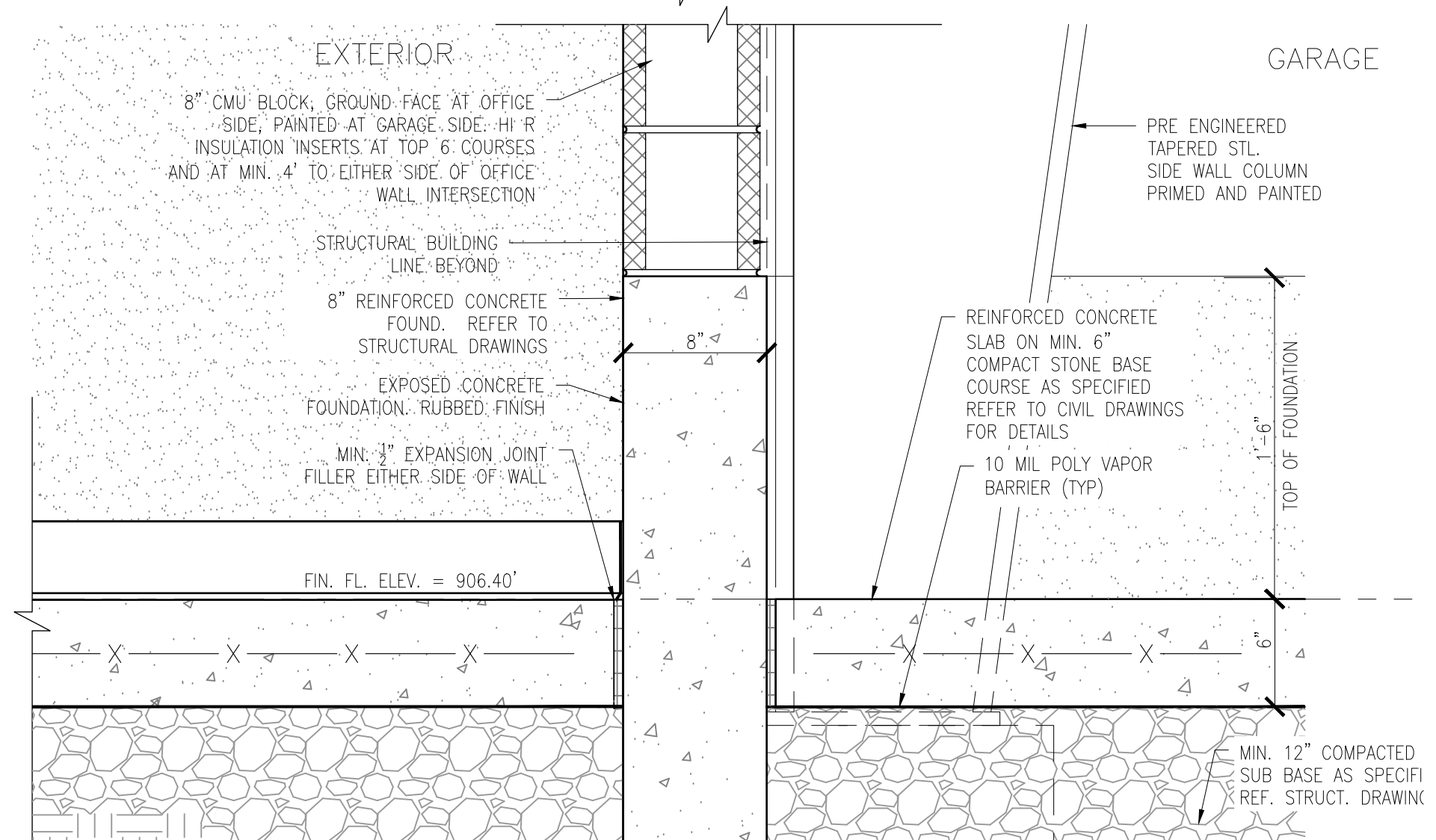
DRAWING#
A-316



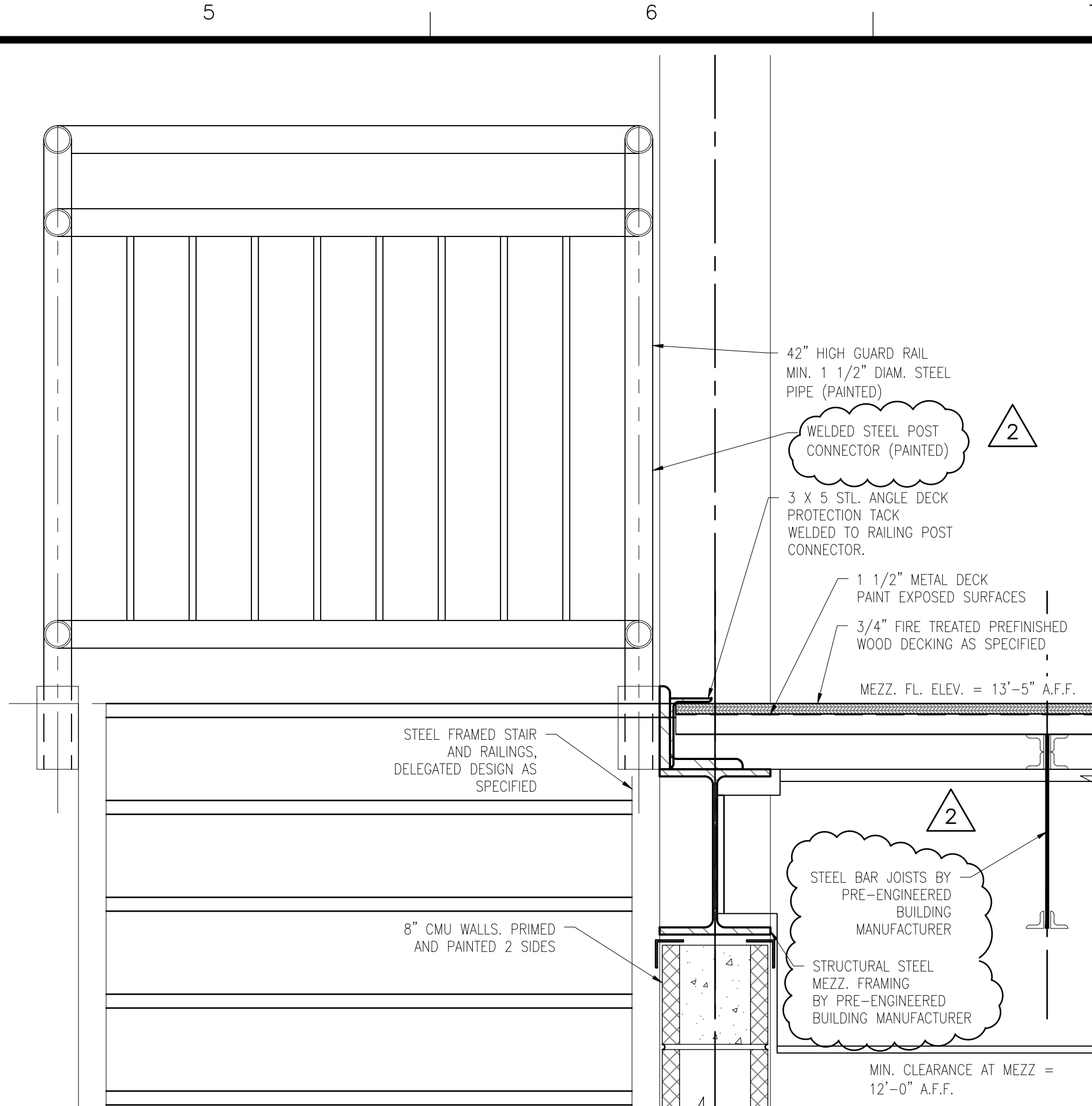
9 SECTION DETAIL
SCALE: 1-1/2"=1'-0"



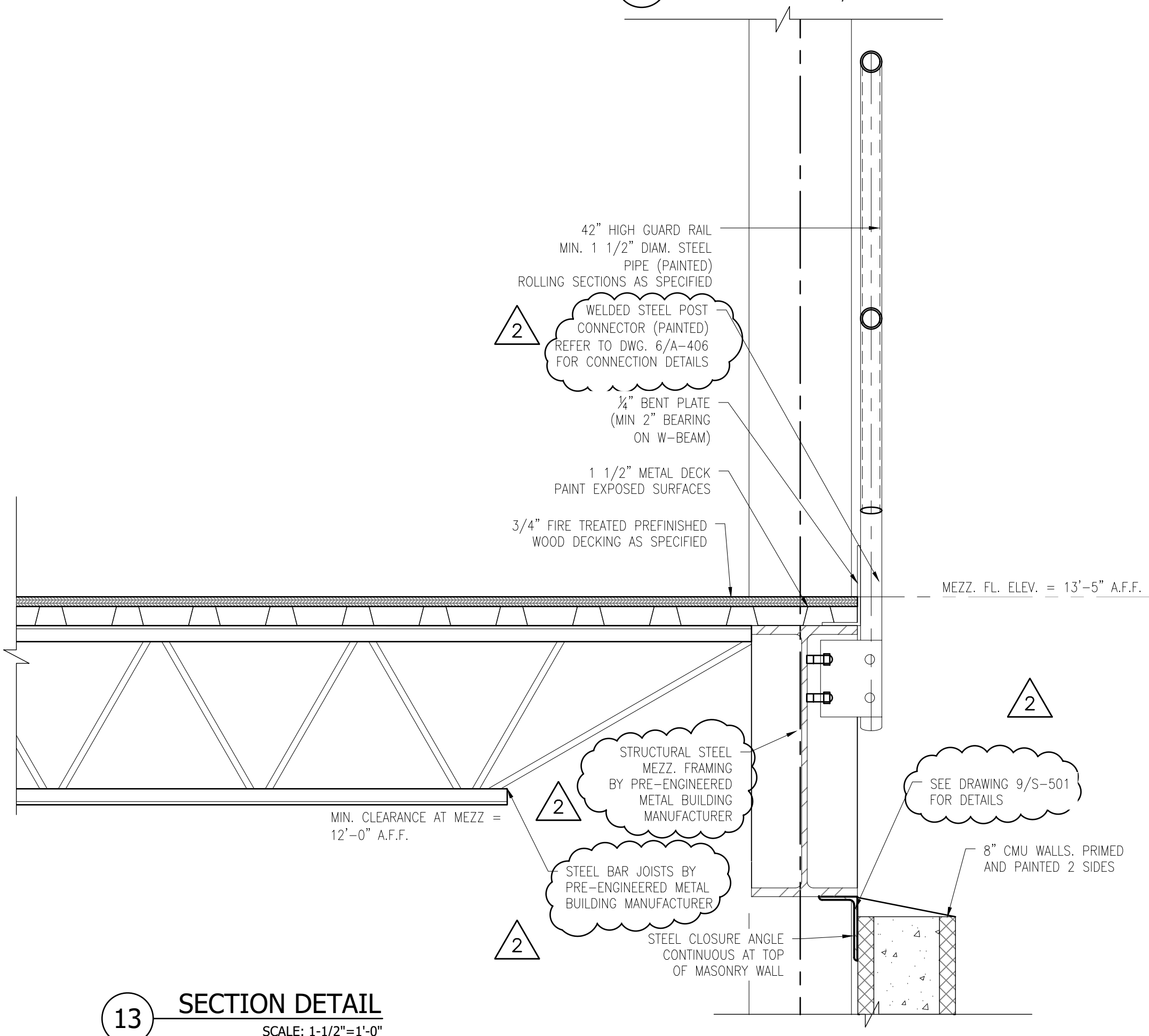
10 SECTION DETAIL
SCALE: 1-1/2"=1'-0"



11 SECTION DETAIL
SCALE: 1-1/2"=1'-0"



12 SECTION DETAIL
SCALE: 1-1/2"=1'-0"



13 SECTION DETAIL
SCALE: 1-1/2"=1'-0"