

Specifications for  
**THE VILLAS OF  
TIMBERWOOD  
OFFSITE SANITARY  
SEWER EXTENSION**

Specifications for  
**THE VILLAS OF  
TIMBERWOOD  
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SEWER EXTENSION**



*Brooke Lindholm*  
2/13/26

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**INVITATION TO BID****PART 1 GENERAL****1.01 PROJECT IDENTIFICATION**

- A. Project Name: The Villas of Timberwood Offsite Sanitary Sewer Extension, located west of Deer Cross Ln and Timberline Dr..
- B. Project Number: 00013370-000.
- C. The Owner, hereinafter referred to as Owner: The Villas of Timberwood HOA.
- D. Owner's Representative: Pape-Dawson.
  - 1. Address: 2000 NW Loop 410.
  - 2. City, State, Zip: San Antonio, TX 78213.
  - 3. Phone/Fax: (210) 375-9000.

**1.02 BID OPENING**

- A. Bid Place
  - 1. Sealed bids will be received in the office of the Engineer:  
Project Name: The Villas of Timberwood Offsite Sanitary Sewer Extension  
ATTENTION: Brooke Lindholm, P.E.  
c/o Pape-Dawson Engineers  
2000 NW Loop 410  
San Antonio, TX 78213  
(210) 375-9000
- B. Bid Due Date: Friday, March 6th by 10:00 AM local time.
- C. Bids will be opened publicly.

**1.03 REJECTION**

- A. The Owner reserves the right to reject any and all Bids, and to waive any irregularities or information.

**1.04 DELIVERY OF PROPOSALS**

- A. It is the Bidder's responsibility to deliver the proposal at the proper time to the proper place. The mere fact that a proposal was dispatched will not be considered. The Bidder must have the proposal delivered as specified in 1.02.

**1.05 TIME OF COMPLETION**

- A. Each Bidder shall indicate on his bid the number of calendar days he will require to complete the entire work under the Contract with all possible diligence within the time limit as stipulated in the bid proposal. The Owner considers it imperative that the work be completed at the earliest possible date and consideration will be given to the proposed completion date in determining the Bidders to whom the Contract will be awarded.

**END OF SECTION**

**INSTRUCTIONS TO BIDDERS**

**SUMMARY**

**1.01 SEE AIA A701, INSTRUCTIONS TO BIDDERS AVAILABLE AT \_\_\_\_\_.**

**1.02 THE INSTRUCTIONS IN THIS DOCUMENT AMEND OR SUPPLEMENT THE INSTRUCTIONS TO BIDDERS AND OTHER PROVISIONS OF THE BIDDING AND CONTRACT DOCUMENTS.**

**1.03 DOCUMENT INCLUDES**

- A. Invitation
  - 1. Bid Submission
  - 2. Intent
  - 3. Contract Time
- B. Bid Documents and Contract Documents
  - 1. Definitions
  - 2. Contract Documents Identification
  - 3. Availability
  - 4. Inquiries/Addenda
- C. Site Assessment
- D. Qualifications
- E. Bid Submission
  - 1. Bid Depository
  - 2. Submission Procedure
  - 3. Bid Ineligibility
- F. Bid Enclosures/Requirements
  - 1. Insurance
  - 2. Bid Form Requirements
  - 3. Fees for Changes in the Work
  - 4. Bid Form Signature

**END OF SECTION**

**BID FORM**

**NOTE: QUANTITIES ARE PROVIDED FOR REFERENCE ONLY. CONTRACTOR RESPONSIBLE FOR QUANTITY CONFIRMATION.**

ITEM NO.	DESCRIPTION	UNIT	QTY	UNIT PRICE	AMOUNT
1.	<b>OFFSITE SANITARY SEWER IMPROVEMENTS</b>			<b>SUBTOTAL:</b>	<b>\$ -</b>
2.	Mobilization	LS	1.00		\$ -
3.	Clearing	AC	6.18		\$ -
4.	8" Sanitary Sewer Pipe (SDR 26) (<6')	LF	2,426.00		\$ -
5.	8" Sanitary Sewer Pipe (SDR 26) (6' - 8')	LF	2,541.00		\$ -
6.	8" Sanitary Sewer Pipe (SDR 26) (8'-10')	LF	312.00		\$ -
7.	8" Sanitary Sewer Pipe (SDR 26) (10' - 12')	LF	78.00		\$ -
8.	8" Sanitary Sewer Pipe (SDR 26) (12' - 14')	LF	54.00		\$ -
9.	8" Sanitary Sewer Pipe (SDR 26) (14' - 25')	LF	195.00		\$ -
10.	Standard Manhole	EA	18.00		\$ -
11.	Manhole Extra Depth	VF	27.95		\$ -
12.	Tie Into Existing Sewer Main	EA	1.00		\$ -
13.	Manhole Ring Encasement	EA	18.00		\$ -
14.	Concrete Encasement	LF	450.00		\$ -
15.	Trench Excavation Protection	LF	5,606.00		\$ -
16.	Camera Testing	LF	5,606.00		\$ -
17.	Revegetation & Hydromulch	SY	29,921.00		\$ -
18.	Jack & Bore	LS	1.00		\$ -
19.	24" Steel Casing	LF	81.00		\$ -
20.	Rebuild Concrete Driveway	SY	35.00		\$ -
21.	Rebuild Fences(as needed)	LS	1.00		\$ -
22.	Tree Protection	LS	1.00		\$ -
23.	SWPPP	LS	1.00		\$ -
	<b>BID ALTERNATE</b>			<b>SUBTOTAL:</b>	<b>\$ • -</b>
24.	Jack & Bore Under Concrete Driveway (Copeland	LS	1.00		\$ -
25.	24" Steel Casing	LF	32.25		\$ -
	<b>GRAND TOTAL</b>				<b>#REF!</b>

**Notes:**

**QUANTITIES ARE PROVIDED FOR REFERENCE ONLY. CONTRACTOR RESPONSIBLE FOR QUANTITY CONFIRMATION.**

**SHOP DRAWINGS, PRODUCT DATA AND SAMPLES****PART 1-GENERAL****1.01 SUBMITTALS**

- A. Submit two prints of all Shop Drawings until final acceptance. One print will be returned to the General Contractor after Engineer's review.
- B. Submit a minimum of four copies of all Product Data until final acceptance. Three copies of the Product Data will be returned to the General Contractor after Engineer's review.
- C. Submit a minimum of duplicates of all Samples. Additional samples may be required for specific items for coordination of finishes.
- D. Submit additional copies of Samples and Product Data as necessary for distribution to subcontractors. Contractor shall obtain and distribute required prints of Shop Drawings made from reviewed and stamped reproducible. Exact number of copies of Product Data, Samples and Shop Drawings to be submitted shall be established in the pre-construction conference.
- E. Contractor shall review and stamp with his approval all submittals. Any submittals which do not bear the Contractor's approval stamp shall be returned without review.
- F. Where printed materials describe more than one product or model, clearly identify which is to be furnished.
- G. Shop Drawings shall not be reproductions of Contract Documents.
- H. Contractor shall make any corrections noted on Engineer's reviewed copies of submittals and shall resubmit the required number of corrected copies of Shop Drawings and Product Data or new Samples.
- I. Each Shop Drawing, Sample and Product Data submittal shall be properly identified bearing the name and quality of the material, the manufacturer's name, the Contractor's name, the Subcontractor's name, the name of the Project and the date of submission, and referenced to the applicable Specification Section.
- J. Engineer's checking of Shop Drawings, Samples or Product Data which deviates from the Contract Documents does not authorize changes to the Contract Sum. Submit in writing at the time of submission any changes to the Contract Sum affected by such Shop Drawings, Samples or Product Data, otherwise, claim for extras will not be considered.
- K. Submit schedule of Shop Drawing and Sample Submittals within 15 days after notice to proceed.

**END OF SECTION**

## DEFINITIONS

### PART 1 GENERAL

#### 1.01 SUMMARY

- A. Other definitions are included in individual specification sections.

#### 1.02 DEFINITIONS

- A. Furnish: To supply, deliver, unload, and inspect for damage.
- B. Install: To unpack, assemble, erect, apply, place, finish, cure, protect, clean, start up, and make ready for use.
- C. Product: Material, machinery, components, equipment, fixtures, and systems forming the work result. Not materials or equipment used for preparation, fabrication, conveying, or erection and not incorporated into the work result. Products may be new, never before used, or re-used materials or equipment.
- D. Provide: To furnish and install.
- E. Supply: Same as Furnish.

#### 1.03 ABBREVIATIONS AND NAMES

- A. The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Names are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:
1. AA Aluminum Association
  2. AAMA American Architectural Manufacturers Association
  3. AAN American Association of Nurserymen
  4. AASHTO American Association of State Highway and Transportation Officials
  5. AATCC American Association of Textile Chemists and Colorists
  6. ACI American Concrete Institute
  7. ACIL American Council of Independent Laboratories
  8. ACPA American Concrete Pipe Association
  9. ADC Air Diffusion Council
  10. AFBMA Anti-Friction Bearing Manufacturers Association, Inc.
  11. AGA American Gas Association
  12. AHAM Association of Home Appliance Manufacturers
  13. AI Asphalt Institute
  14. AIA American Institute of Architects
  15. AIA American Insurance Association
  16. AISC American Institute of Steel Construction
  17. AISI American Iron and Steel Institute
  18. AITC American Institute of Timber Construction
  19. ALSC American Lumber Standards Committee
  20. AMCA Air Movement and Control Association
  21. ANSI American National Standards Institute
  22. APA American Plywood Association
  23. APA American Parquet Association
  24. ARI Air Conditioning and Refrigeration Institute
  25. ASC Adhesive and Sealant Council
  26. ASCE American Society of Civil Engineers
  27. ASHREA Architectural Society of Heating, Refrigerating and Air-Conditioning Engineers
  28. ASME American Society of Mechanical Engineers
  29. ASPE American Society of Plumbing Engineers
  30. ASSE American Society of Sanitary Engineers

31. ASTM American Society for Testing and Materials
32. AWI Architectural Woodwork Institute
33. AWPA American Wood-Preservers' Association
34. AWPB American Wood-Preservers Bureau
35. AWS American Welding Society
36. AWWA American Water Works Association
37. BHMA Builders Hardware Manufacturers Association
38. BIA Brick Institute of America
39. BIFMA Business and Institutional Furniture Manufacturer's Association
40. CBM Certified Ballast Manufacturers
41. CDA Copper Development Association
42. CE Corps of Engineers (U.S. Dept. of the Army)
43. CFFA Chemical Fabrics and Film Association, Inc.
44. CFR Code of Federal Regulations
45. CGA Compressed Gas Association
46. CISPI Cast Iron Soil Pipe Institute
47. CLFMI Chain Link Fence Manufacturer's Institute
48. CPSC Consumer Product Safety Commission
49. CRA California Redwood Association
50. CRI Carpet and Rug Institute
51. CRSI Concrete Reinforcing Steel Institute
52. CS Commercial Standard of NBS (U.S. Dept. of Commerce)
53. CTI Ceramic Tile Institute
54. DHI Door and Hardware Institute
55. DLPA Decorative Laminate Products Association
56. DOC Department of Commerce
57. DOT Department of Transportation
58. EIA Electronic Industries Association
59. EPA Environmental Protection Agency
60. FAA Federal Aviation Administration (U.S. Dept of Transportation)
61. FCC Federal Communications Commission
62. FCI Fluid Controls Institute
63. FGMA Flat Glass Marketing Association
64. FHA Federal Housing Administration (U.S. Dept. of HUD)
65. FM Factory Mutual System
66. FS Federal Specification (General Services Admin.)
67. FTI Facing Tile Institute
68. GA Gypsum Association
69. GSA General Services Administration
70. HPMA Hardwood Plywood Manufacturers Association
71. IEEE Institute of Electrical and Electronic Engineers, Inc.
72. IESNA Illuminating Engineering Society of North America
73. IGCC Insulating Glass Certification Council
74. ILI Indiana Limestone Institute of America
75. IMIAC International Masonry Industry All-Weather Council
76. IRI Industrial Risk Insurance
77. ISA Instrument Society of America
78. MBMA Metal Building Manufacturer's Association
79. MCAA Mechanical Contractors Association of America
80. MIA Marble Institute of America
81. MIL Military Standardization Documents (U.S. Dept. of Defense)
82. ML/SFA Metal Lath/Steel Framing Association
83. MSS Manufacturers Standardization Society of the Valve and Fittings Industry

84. NAAMM National Association of Architectural Metal Manufacturers
85. NBGQA National Building Granite Quarries Association
86. NBS National Bureau of Standards (U.S. Dept. of Commerce)
87. NCMA National Concrete Masonry Association
88. NCRPM National Council on Radiation Protection and Measurement
89. NEC National Electrical Code (by NFPA)
90. NECA National Electrical Contractors Association
91. NEII National Elevator Industry, Inc.
92. NEMA National Electrical Manufacturers Association
93. NFPA National Fire Protection Association
94. NFPA National Forest Products Association
95. NHLA National Hardwood Lumber Association
96. NKCA National Kitchen Cabinet Association
97. NOFMA National Oak Flooring Manufacturers Association
98. NPA National Particleboard Association
99. NPCA National Paint and Coatings Association
100. NRCA National Roofing Contractors Association
101. NRMCA National Ready-Mix Concrete Association
102. NSF National Sanitation Foundation
103. NSSEA National School Supply and Equipment Association
104. NTMA National Terrazzo and Mosaic Association
105. NWMA National Woodwork Manufacturers Association
106. OSHA Occupational Safety Health Administration (U.S. Dept. of Labor)
107. PCA Portland Cement Association
108. PCI Prestressed Concrete Institute
109. PDI Plumbing and Drainage Institute
110. PEI Porcelain Enamel Institute
111. PS Product Standard of NBS (U.S. Dept. of Commerce)
112. RFCI Resilient Floor Covering Institute
113. RIS Redwood Inspection Service (Grading Rules)
114. SAMA Scientific Apparatus Makers Association
115. SDI Steel Deck Institute
116. SGCC Safety Glazing Certification Council
117. SHLMA Southern Hardwood Lumber Manufacturers Association
118. SIGMA Sealed Insulating Glass Manufacturers Association
119. SJI Steel Joist Institute
120. SMACNA Sheet Metal and Air Conditioning Contractors' National Association
121. SPIB Southern Pine Inspection Bureau (Grading Rules)
122. SPIB Southern Pine Inspection Bureau
123. SSPC Steel Structures Painting Council
124. SWI Steel Window Institute
125. TCA Tile Council of America
126. TIMA Thermal Insulation Manufacturers Association
127. TPI Truss Plate Institute
128. TxDOT Texas Department of Transportation
129. UBC Uniform Building Code
130. UL Underwriters Laboratories
131. USDA United States Department of Agriculture
132. USPS United States Postal Service
133. WCLIB West Coast Lumber Inspection Bureau (Grading Rules)
134. WRI Wire Reinforcement Institute
135. WSC Water Systems Council
136. WSFI Wood and Synthetic Flooring Institute

- 137. WWPA Western Wood Products Association (Grading Rules)
- 138. WWPA Woven Wire Products Association

#### 1.04 GENERAL SPECIFICATION ABBREVIATIONS

- A. Cubic Foot - cu. ft.
- B. Degree - deg.
- C. Diameter - dia.
- D. Feet or Foot - ft.
- E. Inch - in.
- F. Inside Diameter - i.d.
- G. Kips (1000 pounds) - K
- H. Millimeter mm
- I. Ounce - oz.
- J. Outside Diameter - o.d.
- K. Pound - lb.
- L. Pounds per Cubic Foot - pcf
- M. Pounds per Square Foot - psf
- N. Pounds per Square Inch - psi
- O. Square Foot - sq. ft.
- P. Square Inch - sq. in.

#### 1.05 REFERENCE STANDARDS - GENERAL

- A. Publications of organizations and societies listed in individual Specification Sections shall be considered integral with Contract Documents to extent referenced.
- B. Publications are referred to in text by basic designation only with organizations and societies referenced by abbreviations.
- C. When standard is referenced to in individual Specification Section but is not listed in this Section by title and date, it shall be considered to be latest revision at date of Project Manual issuance.
- D. Make available at site, copies of referenced documents as Engineer or Owner may request.
- E. Following listings include full title and applicable revision date.

#### 1.06 REFERENCE STANDARDS

- A. American Concrete Institute (ACI):
  - 1. 211.1-81 (Revised 1985), Standard Practice for Selecting Proportions for Normal, Heavyweight and Mass Concrete.
  - 2. 211.2-81, Standard Practice for Selecting Proportions for Structural Lightweight Concrete.
  - 3. 211.3-75 (Revised 1987), Standard Practice for Selecting Proportions for No-Slump Concrete.
  - 4. 301-84 (Revised 1987), Specification for Structural Concrete for Buildings.
  - 5. 304R-85, Guide for Measuring, Mixing, Transporting, and Placing Concrete.
  - 6. 306R-77 (Revised 1982), Hot Weather Concreting.
  - 7. 306R-78 (Revised 1983), Cold Weather Concreting.
  - 8. 308-81 (Revised 1986), Standard Practice for Curing Concrete.
  - 9. 309-72 (Revised 1982), Standard Practice for Consolidation of Concrete.
  - 10. 315-80, Details and Detailing of Reinforced Concrete (included in SP-66).
  - 11. 318-83 (Revised 1986), Building Code Requirements for Reinforced Concrete.
  - 12. 347-78 (Reapproved 1984), Recommended Practice for Concrete Formwork.
  - 13. SP-66, ACI Detailing Manual (1980 Edition).

- B. American Institute of Steel Construction (AISC):
1. Code of Standard Practice for Steel Buildings and Bridges (with Commentary), September 1, 1976.
  2. Manual of Steel Construction, Eighth Edition.
  3. Specification for the Design, Fabrication, and Erection of Structural Steel for Buildings (with Commentary), November 1, 1978.
  4. Specification for Structural Joints Using ASTM A325 or A490 Bolts, April 26, 1978.
- C. American Society for Testing and Materials (ASTM)
1. A 36-84a, Specification for Structural Steel.
  2. A 47-84, Specification for Ferritic Malleable Iron Castings.
  3. A 53-84a, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  4. A 82-85, Specification for Steel Wire, Plain, for Concrete Reinforcement.
  5. A 108-81, Specification for Steel Bars, Carbon, Cold-Finished, Standard Quality.
  6. A 116-81, Specification for Zinc-Coated (Galvanized) Steel Woven Wire Fence Fabric.
  7. A 123-84, Specification for Zinc (Hot-Galvanized) Coatings on Iron and Steel Products.
  8. A 153-84, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  9. A 185-85, Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement.
  10. A 242-87, Specification for High-Strength Low-Alloy Structural Steel.
  11. A 307-86, Specification for Carbon Steel Bolts and Studs, 6000 psi Tensile Strength.
  12. A 325-86a, Specification for High-Strength Bolts for Structural Steel Joints.
  13. A 370-86a, Methods and Definitions for Mechanical Testing of Steel Products.
  14. A 416-86, Specification for Steel Strand, Uncoated Seven-Wire Stress-Relieved for Prestressed Concrete.
  15. A 421-80 (1985), Specification for Uncoated Stress-Relieved Wire for Prestressed Concrete.
  16. A 446-85, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Structural (Physical) Quality.
  17. A 475-85, Specification for Zinc-Coated Steel Wire Strand.
  18. A 490-85, Specification for Heat-Treated, Steel Structural Bolts 150 KSI Tensile Strength.
  19. A 500-84, Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  20. A 501-84, Specification for Hot-Formed Welded and Seamless Carbon Steel Structural Tubing.
  21. A 514-87a, Specification for High-Yield Strength, Quenched and Tempered Alloy Steel Plate, Suitable for Welding.
  22. A 525-83, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, General Requirements.
  23. A 572-84, Specification for High-Strength Low-Alloy Columbium-Vanadium Steel of Structural Quality.
  24. A 576-81, Specification for Steel Bars, Carbon, Hot-Wrought, Special Quality.
  25. A 588-87, Specification for High-Strength Low-Alloy Structural Steel with 50,000 psi Minimum Yield Point to 4 in. Thick.
  26. A 611-85, Specification for Steel, Sheet, Carbon, Cold-Rolled Structural Quality.
  27. A 615-87, Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
  28. A 706-84a, Specification for Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
  29. A 775-85, Specification for Epoxy-Coated Reinforcing Steel Bars.
  30. A 633-85, Specification for Electrodeposited Coatings of Zinc on Iron and Steel.
  31. C 31-85, Method for Making and Curing Concrete Test Specimens in the Field.
  32. C 33-86, Specification for Concrete Aggregates.
  33. C 39-86, Test for Compressive Strength of Cylindrical Concrete Specimens.

34. C 42-84a, Methods for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
35. C 90-85, Specification for Hollow Load-Bearing Concrete Masonry Units.
36. C 91-86, Specification for Masonry Cement.
37. C 94-86, Specification for Ready-Mixed Concrete.
38. C 109-86, Test Method for Compressive Strength of Hydraulic Cement Mortars.
39. C 138-81, Test Method for Unit Weight, Yield and Air Content (Gravimetric) of Concrete.
40. C 140-75 (1980), Method of Sampling and Testing Concrete Masonry Units.
41. C 143-78, Test Method for Slump of Portland Cement Concrete.
42. C 144-87, Specification for Aggregate for Masonry Mortar.
43. C 150-85a, Specification for Portland Cement.
44. C 171-69 (1986), Specification for Sheet Materials for Curing Concrete.
45. C 172-82, Method of Sampling Freshly Mixed Concrete.
46. C 173-78, Test Method for Air Content of Freshly Mixed Concrete by the Volumetric Method.
47. C 190-85, Test Method for Tensile Strength of Hydraulic Cement Mortars.
48. C 207-79 (1984), Specification for Hydrated Lime for Masonry Purposes.
49. C 231-82, Test Method for Air Content of Freshly Mixed Concrete by the Pressure Method.
50. C 260-85, Specification for Air-Entraining Admixtures for Concrete.
51. C 270-86b, Specification for Mortar for Unit Masonry.
52. C 309-81, Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
53. C 311-85, Method for Sampling and Testing Fly Ash or Natural Pozzolans for Use as a Mineral Admixture in Portland Cement Concrete.
54. C 330-87, Specification for Lightweight Aggregates for Structural Concrete.
55. C 404-87, Specification for Aggregates for Masonry Grout.
56. C 476-83, Specification for Grout for Reinforced and Non-reinforced Masonry.
57. C 494-86, Specification for Chemical Admixtures for Concrete.
58. C 567-85, Test Method for Unit Weight of Structural Lightweight Concrete.
59. C 595-86, Specification for Blended Hydraulic Cements.
60. C 618-85, Specification for Fly Ash and Raw or Calcined Natural Pozzolan for use as a Mineral Admixture in Portland Cement.
61. C 780-80 (1985), Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
62. C 827-82, Test Method for Early Volume Change of Cementitious Mixtures.
63. C 938-80 (1985), Practice for Proportioning Grout Mixtures for Preplaced-Aggregate Concrete.
64. C 942-86, Test Method for Compressive Strength of Grouts for Preplaced-Aggregate Concrete in the Laboratory.
65. C 989-85a, Specification for Ground Iron Blast-Furnace Slag for Use in Concrete and Mortars.
66. D 98-80, Specification for Calcium Chloride.
67. D 994-71 (Reaffirmed 1982), Standard Specification for Preformed Expansion Joint Filler for Concrete (Bituminous Type).
68. D 1751-83, Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
69. D 1752-84, Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction.
70. D 2092-86, Recommended Practices for Preparation of Zinc-Coated Galvanized Steel Surfaces for Painting.
71. D 2240-86, Test for Rubber Property - Durometer Hardness.
72. D 3034, Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
73. E 164-81, Practice for Ultrasonic Contact Examination of Weldments.

74. E 329-77 (1983), Recommended Practice for Inspection and Testing Agencies for Concrete, Steel, and Bituminous Materials as Used in Construction.
  75. E 447-84, Test Methods for Compressive Strength of Masonry Prisms.
- D. American Welding Society (AWS):
1. A5.1-81, Specification for Carbon Steel Covered Arc-Welding Electrodes.
  2. A5.5-81, Specification for Low-Alloy Steel Covered Arc-Welding Electrodes.
  3. A5.17-80, Specification for Carbon Steel Electrodes and Fluxes for Submerged Arc-Welding.
  4. A5.20-79, Specification for Carbon Steel Electrodes for Flux Cored Arc-Welding.
  5. B2.1-84, Welding Procedure and Performance Qualification.
  6. D1.1-86, Structural Welding Code - Steel.
  7. D1.3-81, Specification for Welding of Sheet Metal in Structures.
  8. D1.4-79, Structural Welding Code - Reinforcing Steel.
  9. QC-1-86, Standard for Qualification and Certification of Welding Inspectors.
- E. Prestressed Concrete Institute (PCI):
1. MNL 116-77, Manual for Quality Control for Plants and Production of Precast Prestressed Concrete Products.
  2. MNL 117-77, Manual for Quality Control of Plants and Production of Architectural Precast Concrete Products
- F. Steel Deck Institute (SDI):
1. Specification for Composite Steel Floor Deck, 1987.
  2. Specification for Non-Composite Steel Form Deck, 1987.
  3. Specification for Steel Roof Deck, 1987.
- G. Steel Joist Institute (SJI):
1. Recommended Code of Standard Practice for Steel Joists, November 4, 1985.
  2. Standard Specification for Joist Girders, November 4, 1985.
  3. Standard Specification for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series, November 4, 1985.
  4. Standard Specification for Open Web Steel Joists, K-Series, November 1, 1985.

**PART 2 PRODUCTS - NOT USED****PART 3 EXECUTION - NOT USED****END OF SECTION**

**TEMPORARY EROSION AND SEDIMENT CONTROL****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 10 00 - Site Clearing: Limits on clearing; disposition of vegetative clearing debris.
- B. Section 31 22 00 - Grading: Temporary and permanent grade changes for erosion control.
- C. Section 31 37 00 - Riprap: Temporary and permanent stabilization using riprap.

**1.03 REFERENCE STANDARDS**

- A. ASTM D4873/D4873M - Standard Guide for Identification, Storage, and Handling of Geosynthetic Rolls and Samples; 2017 (Reapproved 2021).
- B. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- C. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.

**1.04 PERFORMANCE REQUIREMENTS**

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, for Phases I and II, and in compliance with requirements of Construction General Permit (CGP).
- B. Comply with requirements of State of TX Erosion and Sedimentation Control Manual.
- C. Comply with all requirements of TPDES for erosion and sedimentation control.
- D. Best Management Practices Standard: FHWA FLP-94-005.
- E. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- F. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
  - 1. Obtain and pay for permits and provide security required by authority having jurisdiction.
  - 2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.
- G. Timing: Put preventive measures in place before disturbance of surface cover and before precipitation occurs.
- H. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
  - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 25 years.
- I. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
  - 1. Control movement of sediment and soil from temporary stockpiles of soil.

2. Prevent development of ruts due to equipment and vehicular traffic.
  3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- J. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
1. Prevent windblown soil from leaving the project site.
  2. Prevent tracking of mud onto public roads outside site.
  3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
- K. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
- L. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
- M. Open Water: Prevent standing water that could become stagnant.
- N. Maintenance: Maintain temporary preventive measures until permanent measures have been established.

#### 1.05 SUBMITTALS

- A. Erosion and Sedimentation Control Plan:
1. Submit not less than 30 days prior to anticipated start of clearing, grading, or other work involving disturbance of ground surface cover.
  2. Include:
    - a. Site plan identifying soils and vegetation, existing erosion problems, and areas vulnerable to erosion due to topography, soils, vegetation, or drainage.
    - b. Site plan showing grading; new improvements; temporary roads, traffic accesses, and other temporary construction; and proposed preventive measures.
    - c. Where extensive areas of soil will be disturbed, include storm water flow and volume calculations, soil loss predictions, and proposed preventive measures.
    - d. Schedule of temporary preventive measures, in relation to ground disturbing activities.
    - e. Other information required by law.
    - f. Format required by law is acceptable, provided any additional information specified is also included.
  3. Obtain the approval of the Plan by authorities having jurisdiction.
- B. Certificate: Mill certificate for silt fence fabric attesting that fabric and factory seams comply with specified requirements, signed by legally authorized official of manufacturer; indicate actual minimum average roll values; identify fabric by roll identification numbers.
- C. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- D. Maintenance Instructions: Provide instructions covering inspection and maintenance for temporary measures that must remain after Substantial Completion.

## **PART 2 PRODUCTS**

### **2.01 MATERIALS**

- A. Mulch: Use one of the following:
  - 1. Straw or hay.
  - 2. Wood waste, chips, or bark.
  - 3. Erosion control matting or netting.
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use species known to be excessively competitive or prone to volunteer in subsequent seasons.
- C. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams.
  - 1. Color: Manufacturer's standard.
- D. Silt Fence Posts: One of the following, minimum 5 feet (1500 mm) long:
  - 1. Steel U- or T-section, with minimum mass of 1.33 pound per linear foot (1.98 kg per linear m).
- E. Gravel: See Section 31 23 23 for aggregate.
- F. Riprap: See Section 31 37 00.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

### **3.02 PREPARATION**

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

### **3.03 SCOPE OF PREVENTIVE MEASURES**

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
  - 1. Width: As required; 20 feet (7 m), minimum.
  - 2. Length: 50 feet (16 m), minimum.
  - 3. Provide at each construction entrance from public right-of-way.
  - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.
- C. Linear Sediment Barriers: Made of silt fences or rock berms.
  - 1. Provide linear sediment barriers:
    - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
    - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
    - c. Along the toe of cut slopes and fill slopes.
    - d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space as indicated on drawings.
    - e. Across the entrances to culverts and catch basins that receive runoff from disturbed areas.
  - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
    - a. Slope of Less Than 2 Percent: 100 feet (30 m)..
    - b. Slope Between 2 and 5 Percent: 75 feet (23 m).
    - c. Slope Between 5 and 10 Percent: 50 feet (15 m).
    - d. Slope Between 10 and 20 Percent: 25 feet (7.5 m).
    - e. Slope Over 20 Percent: 15 feet (4.5 m).

- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
  - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
  - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
  - 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- H. Temporary Seeding: Use where temporary vegetated cover is required.

### 3.04 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
  - 1. Excavate minimum of 6 inches (150 mm).
  - 2. Place geotextile fabric full width and length, with minimum 12 inch (300 mm) overlap at joints.
  - 3. Place and compact at least 6 inches (150 mm) of 1 1/2 to 3 1/2 inch (40 to 90 mm) diameter stone.
- B. Silt Fences:
  - 1. Store and handle fabric in accordance with ASTM D4873/D4873M.
  - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch (405 mm) high barriers with minimum 36 inch (905 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 4 inches (100 mm) in ground.
  - 3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch (710 mm) high barriers, minimum 48 inch (1220 mm) long posts spaced at 6 feet (1830 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
  - 4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet (6 m), use nominal 32 inch (810 mm) high barriers with woven wire reinforcement and steel posts spaced at 4 feet (1220 mm) maximum, with fabric embedded at least 6 inches (150 mm) in ground.
  - 5. Install with top of fabric at nominal height and embedment as specified.
  - 6. Embed bottom of fabric in a trench on the upslope side of fence, with 2 inches (50 mm) of fabric laid flat on bottom of trench facing upslope; backfill trench and compact.
  - 7. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches (460 mm), with extra post.
  - 8. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
  - 9. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches (300 mm) high with post spacing not more than 4 feet (1220 mm).
- C. Mulching Over Large Areas:
  - 1. Dry Straw and Hay: Apply 2-1/2 tons per acre (6350 kg per hectare); anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
  - 2. Wood Waste: Apply 6 to 9 tons per acre (15,200 to 20,800 kg per hectare).
  - 3. Erosion Control Matting: Comply with manufacturer's instructions.
- D. Mulching Over Small and Medium Areas:
  - 1. Dry Straw and Hay: Apply 4 to 6 inches (100 to 150 mm) depth.
  - 2. Wood Waste: Apply 2 to 3 inches (50 to 75 mm) depth.

3. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
  2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
  3. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch (12 to 25 mm) deep.
  4. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
  5. Repeat irrigation as required until grass is established.

### **3.05 MAINTENANCE**

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall. Follow the requirements of the SWPPP.
- B. Repair deficiencies immediately.
- C. Silt Fences:
  1. Promptly replace fabric that deteriorates unless need for fence has passed.
  2. Remove silt deposits that exceed one-third of the height of the fence.
  3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Clean out temporary sediment control structures weekly and relocate soil on site.
- E. Place sediment in appropriate locations on site; do not remove from site.

### **3.06 CLEAN UP**

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by Engineer.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

**END OF SECTION**

## SPILL RESPONSE

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Guideline for Contractors for handling petroleum hydrocarbon spills and leaks on the project site.

#### 1.02 RELATED SECTIONS -- NOT USED

#### 1.03 REFERENCES

- A. Texas Commission on Environmental Quality Regulations, TAC Ch. 327.
- B. Edwards Aquifer Authority, Ch. 713, Subchapter E.

#### 1.04 SUBMITTALS

- A. Summary report of procedures and operational sequence for review and approval by Pape-Dawson Engineers (Engineer) as Owner's Representative.
- B. Manifest and disposal records.
- C. Testing and laboratory sampling results.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Contractor to pay for any and all testing, excavation, disposal, and consultants/contractors required for the execution of the work.

### PART 3 EXECUTION

#### 3.01 CONDITIONS

- A. Texas Commission on Environmental Quality (TCEQ) and Edwards Aquifer Authority (EAA) regulations require reporting of fuel spills or leaks of 25 gallons or more to the land surface, or any quantity sufficient to create a sheen on surface water. For oils, the reporting requirements are a spill of 210-gallons to the land surface or a quantity sufficient to create a sheen on surface water.
- B. Spills of quantities to the land in excess of 1-gallon, or spills that affect more than 10-square feet of ground surface, although not large enough to require reporting to TCEQ, must be reported by the Contractor to the Engineer and appropriate emergency response actions should be implemented.
- C. Cleanup of any spills related to the project shall be completed to non-detect conditions, unless the constituent is naturally occurring in which case TCEQ State specific background concentrations may be used as cleanup goals, as determined by the Engineer.

#### 3.02 SPILL RESPONSE ACTIONS

- A. Appropriate response actions may vary, depending on the volume spilled or leaked and the location of the spill.
  - 1. In all cases, attempts to minimize the volume lost and the size of the area affected should be made.
  - 2. Spills/leaks on asphalt, concrete or other impervious surface, may be cleaned using absorbent materials, i.e., oil absorbent pads or socks, or granular material.
  - 3. Spills/leaks to soil or bedrock will likely require excavation.
- B. Contractor to take immediate action to contain the spill. Implement emergency response measures to stop and contain leak/spill. Appropriate emergency response measures include, but are not limited to, placement of absorbent materials on top of and downstream of leak/spill or construction of berm downstream of leak/spill to prevent further spread of material.
- C. Contact Fire Department or other appropriate Emergency Management Agency as necessary to minimize loss of property or life.

- D. Notify Engineer within 24 hours of the leak/spill.
- E. Notify TCEQ and EAA if the project is within the Edwards Aquifer Recharge Zone or 5 miles upgrate within 24 hours if quantity of material leaked/spilled meets Section 3.01, A. above.
- F. Follow protocol as shown on attached flow chart that describes some possible scenarios.

### **3.03 CLEANUP**

- A. Impacted material should be segregated from material not impacted by the leak/spill. Impacted materials may include loose material, absorbent material, or excavated material.
- B. Excavated and segregated materials should be stored on plastic and covered with plastic, or stored within a drum, roll-off box, or other covered container, pending characterization and disposal at an approved disposal facility.
- C. The volume of material segregated and disposed should be recorded, and copies of disposal manifests should be provided to the Engineer.
- D. After excavation of impacted soil, the Engineer will evaluate the area excavated and determine if sampling of remaining subgrade will be necessary.
- E. The determination will be made on a site-specific basis and will be a function of volume spilled/leaked, size of area affected, soil type, type of product spilled/leaked, location of spill/leak, etc.
- F. If sampling and analysis indicate constituents of concern are detected in the soil or rock subgrade, then additional excavation will be necessary. The Contractor shall continue to excavate at the direction of the Engineer until further sample and analysis results indicate that constituents of concern are no longer detected.
- G. After Engineers approval, the excavated area may be backfilled.
- H. The Contractor may hire their own environmental consultant/contractor to perform sampling, analysis, and cleanup oversight. In this case the Contractor's consultant must coordinate all their activities with the Engineer prior to each step, phase, or course of action.
- I. The Engineer may collect additional confirmation samples if warranted, and will provide approval that corrective actions are complete before the excavation is backfilled.
- J. Contractor must notify Engineer 48-hours in advance of sample collection and disposal. Contractor must provide Engineer or designated construction observer with opportunity to observe Contractor's implementation of approved cleanup method and to collect and split samples, is so desired by Engineer.

**END OF SECTION**

**WARRANTIES AND BONDS****PART 1 - GENERAL****1.01 SUBMITTAL REQUIREMENTS**

- A. Assemble warranties, bonds and services and maintenance contracts, executed by each of the respective manufacturers, suppliers, and subcontractors.
- B. Review submittals to verify compliance with Contract Documents. Submit to Engineer for review and transmittal to Owner.

**1.02 TIME OF SUBMITTALS**

- A. For equipment or component parts of equipment put into service during progress of construction submit within 10 days after acceptance.
- B. Otherwise make submittals within ten days after Date of Substantial Completion, prior to final request for payment.
- C. For items of work, where acceptance is delayed materially beyond the Date of Substantial Completion, provide updated submittal within ten days after acceptance, listing the date of acceptance as the start of the warranty period.

**END OF SECTION**

**SUBSURFACE INVESTIGATION****PART 1 - GENERAL****1.01 SUMMARY**

- A. If procured by the owner, a Geotechnical Report was used in preparing the design and can be provided by the engineer.
- B. The Geotechnical Report is not a conclusive indication of the soil conditions other than where the borings were taken.
- C. The accuracy of the Geotechnical Report is not guaranteed in any respect by the Owner, and the Owner accepts no responsibility for interpretation of conclusions drawn therefrom.
- D. The information contained in the Geotechnical Report is made available in order that the Contractor may have ready access to the same information available to the Owner as of this date.
- E. Contractor is invited and encouraged to make his own interpretation and evaluation of the information and by starting work shall be assumed to have fully accepted responsibility for the subsurface conditions that may hereafter be encountered in performing the excavation work.
- F. Contractor is to examine the project site and the record of investigation and make, to whatever extent they deem appropriate, his own investigation of existing subsurface conditions to determine the nature, kind and character of materials to be encountered.
- G. Extra payment will not be authorized for work which should have been anticipated or could have been anticipated upon careful examination of the site, or upon soil investigation, or upon consideration of factors generally recognized as being inherent in excavation work of the nature indicated by the Contract Documents.
- H. The Contractor shall advise Engineer of discovery of any unknown or undetermined items.
- I. The Contractor shall make their own investigation into the location and size of existing site utilities whether represented on the drawings or not.

**END OF SECTION**

**CONCRETE FORMING AND ACCESSORIES****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Formwork for cast-in-place concrete, with shoring, bracing and anchorage.
- B. Form stripping.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 20 00 - Concrete Reinforcing.
- B. Section 03 30 00 - Cast-in-Place Concrete.
- C. Section 31 23 16 - Excavation: Shoring and underpinning for excavation.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Measurement and payment of forming work will be by the unit price method.
- B. Formwork (Horizontal Structures): Measure by the square foot (meter). Includes form materials, placement, placing accessories, stripping.

**1.04 REFERENCE STANDARDS**

- A. ACI PRC-347 - Guide to Formwork for Concrete; 2014 (Reapproved 2021).
- B. ACI SPEC-117 - Specification for Tolerances for Concrete Construction and Materials; 2010 (Reapproved 2015).
- C. ACI SPEC-301 - Specifications for Concrete Construction; 2020.

**1.05 SUBMITTALS**

- A. Product Data: Provide data on void form materials and installation requirements.
- B. Shop Drawings: Indicate pertinent dimensions, materials, bracing, and arrangement of joints and ties.
- C. Design Data: As required by authorities having jurisdiction.

**1.06 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with Highways standards of the State of TX.
- B. Maintain one copy of each installation standard on site throughout the duration of concrete work.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver prefabricated forms and installation instructions in manufacturer's packaging.
- B. Store prefabricated forms off ground in ventilated and protected manner to prevent deterioration from moisture.
- C. Protect plastic foam products from damage and exposure to sunlight.

**PART 2 PRODUCTS****2.01 FORMWORK - GENERAL**

- A. Provide concrete forms, accessories, shoring, and bracing as required to accomplish cast-in-place concrete work.
- B. Design and construct concrete that complies with design with respect to shape, lines, and dimensions.
- C. Chamfer outside corners of beams, joists, columns, and walls.
- D. Comply with applicable state and local codes with respect to design, fabrication, erection, and removal of formwork.
- E. Comply with Highways standards of the State of TX.

**2.02 WOOD FORM MATERIALS**

- A. Form Materials: At the discretion of the Contractor.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

**3.02 EARTH FORMS**

- A. Earth forms are not permitted.

**3.03 ERECTION - FORMWORK**

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI SPEC-301.
- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to overstressing by construction loads.
- C. Install stay in place mesh steel formwork in accordance with manufacturer's recommendations.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Coordinate this section with other sections of work that require attachment of components to formwork.

**3.04 APPLICATION - FORM RELEASE AGENT**

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.

**3.05 FORM CLEANING**

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.

**3.06 FORMWORK TOLERANCES**

- A. Construct formwork to maintain tolerances required by ACI SPEC-117, unless otherwise indicated.

**3.07 FIELD QUALITY CONTROL**

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and to verify that supports, fastenings, wedges, ties, and items are secure.

**3.08 FORM REMOVAL**

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms to prevent damage to form materials or to fresh concrete. Discard damaged forms.

**END OF SECTION**

**CONCRETE REINFORCING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Reinforcing steel for cast-in-place concrete.
- B. Supports and accessories for steel reinforcement.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 10 00 - Concrete Forming and Accessories.
- B. Section 03 30 00 - Cast-in-Place Concrete.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Bar Reinforcement: By the ton (metric ton). Includes reinforcement, placement, and accessories.
- B. Welded Wire Reinforcement: By the square foot (square m). Includes welded wire reinforcement, placement, and accessories.

**1.04 REFERENCE STANDARDS**

- A. ACI CODE-318 - Building Code Requirements for Structural Concrete and Commentary; 2019 (Reapproved 2022).
- B. ACI MNL-66 - ACI Detailing Manual; 2020.
- C. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- D. ASTM A184/A184M - Standard Specification for Welded Deformed Steel Bar Mats for Concrete Reinforcement; 2024.
- E. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2025.
- F. ASTM A641/A641M - Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire; 2019 (Reapproved 2025).
- G. ASTM A704/A704M - Standard Specification for Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement; 2024.
- H. ASTM A706/A706M - Standard Specification for Deformed and Plain Low-Alloy Steel Bars for Concrete Reinforcement; 2025.
- I. ASTM A767/A767M - Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement; 2024.
- J. ASTM A996/A996M - Standard Specification for Rail-Steel and Axle-Steel Deformed Bars for Concrete Reinforcement; 2024.
- K. ASTM A1035/A1035M - Standard Specification for Deformed and Plain, Low-Carbon, Chromium, Steel Bars for Concrete Reinforcement; 2024.
- L. ASTM A1064/A1064M - Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete; 2024.
- M. CRSI (P1) - Placing Reinforcing Bars, 10th Edition; 2019.

**1.05 SUBMITTALS**

- A. Shop Drawings: Comply with requirements of ACI MNL-66 Include bar schedules, shapes of bent bars, spacing of bars, and location of splices.
  - 1. Prepare shop drawings under seal of a Professional Structural Engineer experienced in design of work of this type and licensed in the State in which the Project is located.
- B. Manufacturer's Certificate: Certify that reinforcing steel and accessories supplied for this project meet or exceed specified requirements.
- C. Reports: Submit certified copies of mill test report of reinforcement materials analysis.

**1.06 QUALITY ASSURANCE**

- A. Perform work of this section in accordance with ACI SPEC-301.
  - 1. Maintain one copy of each document on project site.

**PART 2 PRODUCTS****2.01 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615/A615M, Grade 60 (60,000 psi) (420 MPa).
  - 1. Plain billet-steel bars.
  - 2. Unfinished.
- B. Reinforcing Steel: ASTM A706/A706M, deformed low-alloy steel bars.
  - 1. Unfinished.
- C. Reinforcing Steel: Deformed bars, ASTM A996/A996M Grade 40 (280), Type A.
- D. Reinforcing Steel: Plain or deformed bars; ASTM A1035/A1035M, Grade 100 (100,000 psi) (690 MPa), Type CL.
- E. Reinforcing Steel Mat: ASTM A704/A704M, using ASTM A615/A615M, Grade 40 (40,000 psi) (280 MPa) steel bars or rods, unfinished.
- F. Stirrup Steel: ASTM A1064/A1064M steel wire, unfinished.
- G. Steel Welded Wire Reinforcement (WWR): Galvanized, deformed type; ASTM A1064/A1064M.
  - 1. Form: Flat Sheets.
  - 2. WWR Style: 4 x 8-W6 x W10 (102 x 203-MW39 x MW65).
- H. Reinforcement Accessories:
  - 1. Tie Wire: Annealed, minimum 16 gauge, 0.0508 inch (1.29 mm).
  - 2. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for adequate support of reinforcement during concrete placement.
  - 3. Provide stainless steel components for placement within 1-1/2 inches (38 mm) of weathering surfaces.

**2.02 RE-BAR SPLICING:**

- A. Dowel Bar Splicer with Dowel-Ins: Mechanical devices for splicing reinforcing bars.
  - 1. Comply with ACI CODE-318 steel reinforcing design strength requirements for splices in tension and compression.
- B. Grout: Cementitious, non-metallic, non-shrink grout for use with manufacturer's grout sleeve reinforcing bar coupler system.

**2.03 FABRICATION****PART 3 EXECUTION****3.01 PLACEMENT**

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position.
- B. Accommodate placement of formed openings.
- C. Comply with applicable code for concrete cover over reinforcement.

**3.02 FIELD QUALITY CONTROL**

- A. An independent testing agency, as specified in Section 01 40 00 - Quality Requirements, will inspect installed reinforcement for compliance with contract documents before concrete placement.

**END OF SECTION**

**PIPE AND TUBE RAILINGS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Stair railings and guardrails.
- B. Free-standing railings at steps.

**1.02 RELATED REQUIREMENTS**

- A. Section 03 30 00 - Cast-in-Place Concrete: Placement of anchors in concrete.
- B. Section 09 91 13 - Exterior Painting: Paint finish.

**1.03 REFERENCE STANDARDS**

- A. ADA Standards - 2010 ADA Standards for Accessible Design; 2010.
- B. ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless; 2024.
- C. ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products; 2024.
- D. ASTM A500/A500M - Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes; 2023.
- E. ASTM E985 - Standard Specification for Permanent Metal Railing Systems and Rails for Buildings; 2024.
- F. AWS A2.4 - Standard Symbols for Welding, Brazing, and Nondestructive Examination; 2020.
- G. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2025.

**1.04 SUBMITTALS**

- A. See Section 01 30 00 - Administrative Requirements, for submittal procedures.
- B. Shop Drawings: Indicate profiles, sizes, connection attachments, anchorage, size and type of fasteners, and accessories.
  - 1. Indicate welded connections using standard AWS A2.4 welding symbols. Indicate net weld lengths.
  - 2. Include the design engineer's seal and signature on each sheet of shop drawings.
- C. Designer's Qualification Statement.
- D. Fabricator's Qualification Statement.

**1.05 QUALITY ASSURANCE**

- A. Structural Designer Qualifications: Professional Structural Engineer experienced in design of this work and licensed in the State in which the Project is located, or personnel under direct supervision of such an engineer.

**PART 2 PRODUCTS****2.01 RAILINGS - GENERAL REQUIREMENTS**

- A. Design, fabricate, and test railing assemblies in accordance with the most stringent requirements of applicable local code.
- B. Comply with ASTM E985.
- C. Allow for expansion and contraction of members and building movement without damage to connections or members.
- D. Dimensions: See drawings for configurations and heights.
- E. Provide anchors and other components as required to attach to structure, made of same materials as railing components unless otherwise indicated; where exposed fasteners are unavoidable provide flush countersunk fasteners.

1. For anchorage to concrete, provide inserts to be cast into concrete, for bolting anchors.
- F. Provide slip-on non-weld mechanical fittings to join lengths, seal open ends, and conceal exposed mounting bolts and nuts, including but not limited to elbows, T-shapes, splice connectors, flanges, escutcheons, and wall brackets.
- G. Welded and Brazed Joints: Make visible joints butt tight, flush, and hairline; use methods that avoid discoloration and damage of finish; grind smooth, polish, and restore to required finish.
  1. Ease exposed edges to a small uniform radius.

## **2.02 STEEL RAILING SYSTEM**

- A. Steel Tube: ASTM A500/A500M Grade B cold-formed structural tubing.
- B. Steel Pipe: ASTM A53/A53M Grade B Schedule 80, black finish.
- C. Non-Weld Mechanical Fittings: Slip-on, galvanized malleable iron castings, for Schedule 40 pipe, with flush setscrews for tightening by standard hex wrench, no bolts or screw fasteners.
- D. Welding Fittings: Factory- or shop-welded from matching pipe or tube; seams continuously welded; joints and seams ground smooth.
- E. Exposed Fasteners: No exposed bolts or screws.

## **2.03 FABRICATION**

- A. Accurately form components to suit specific project conditions and for proper connection to building structure.
- B. Fit and shop assemble components in largest practical sizes for delivery to site.
- C. Fabricate components with joints tightly fitted and secured. Provide spigots and sleeves to accommodate site assembly and installation.
- D. Welded Joints:
  1. Exterior Components: Continuously seal joined pieces by intermittent welds and plastic filler. Drill condensate drainage holes at bottom of members at locations that will not encourage water intrusion.
  2. Interior Components: Continuously seal joined pieces by intermittent welds and plastic filler.
  3. Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A. Verify that field conditions are acceptable and are ready to receive work.

### **3.02 PREPARATION**

- A. Clean and strip primed steel items to bare metal where site welding is required.
- B. Supply items required to be cast into concrete or embedded in masonry with setting templates, for installation as work of other sections.
- C. Apply one coat of bituminous paint to concealed aluminum surfaces that will be in contact with cementitious or dissimilar materials.

### **3.03 INSTALLATION**

- A. Install in accordance with manufacturer's instructions.
- B. Install components plumb and level, accurately fitted, free from distortion or defects, with tight joints.
- C. Install railings in compliance with ADA Standards for accessible design at applicable locations.
- D. Anchor railings securely to structure.
- E. Field weld anchors as indicated on drawings. Touch-up welds with primer. Grind welds smooth.

- F. Conceal anchor bolts and screws whenever possible. Where not concealed, use flush countersunk fastenings.

**3.04 TOLERANCES**

- A. Maximum Variation From Plumb: 1/4 inch (6 mm) per floor level, non-cumulative.
- B. Maximum Offset From True Alignment: 1/4 inch (6 mm).
- C. Maximum Out-of-Position: 1/4 inch (6 mm).

**END OF SECTION**

**SITE CLEARING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Clearing and grubbing.
- B. Selective removal and trimming.
- C. Earth stripping and stockpiling.
- D. Repair and restoration.
- E. Debris removal.

**1.02 RELATED REQUIREMENTS**

- A. Section 02 41 00 - Demolition: Removal of built elements and utilities.
- B. Section 31 10 00.10 - Tree Protection
- C. Section 31 23 23 - Fill: Material for filling holes, pits, and excavations generated as result of removal operations.
- D. Section 01 57 13 - Temporary Erosion and Sediment Control

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Unit Prices:
  - 1. Basis of Measurement for Clearing and Grubbing and Earth Stripping and Stockpiling: By sq yard (sq meter).
  - 2. Basis of Measurement for Selective Removal and Trimming and Restoration of Damaged Vegetation: Per unit.

**1.04 REFERENCE STANDARDS**

- A. Project Geotechnical Report
- B. Storm Water Pollution Prevention Plan
- C. ANSI A300 Part 1 - American National Standard for Tree Care Operations - Tree, Shrub, and Other Woody Plant Management - Standard Practices (Pruning); 2017.
- D. ANSI A300 Part 5 - American National Standard for Tree Care Operations – Tree, Shrub and Other Woody Plant Maintenance Standard Practices (Management of Trees and Shrubs During Site Planning, Site Development, and Construction); 2019.
- E. ANSI A300 Part 6 - Tree, Shrub, and Other Woody Plant Management--Standard Practices (Planting and Transplanting); 2012 (Reapproved 2018).
- F. ANSI Z133 - American National Standard for Arboricultural Operations - Safety Requirements; 2017.

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Preinstallation Meeting: Convene prework meeting one week prior to start of work of this section; require attendance by affected personnel.
- B. Coordinate pre-construction meeting with local jurisdictional authority.
- C. Sequencing: Ensure utility disconnections are in orderly and expeditious manner.

**1.06 QUALITY ASSURANCE**

- A. Clearing Firm Qualifications: Company specializing in performing work of type specified and with at least three years of experience.
- B. Trimming or Pruning Qualifications: Tree Care Industry Association (TCIA) Certified Treecare Safety Professional.

**1.07 FIELD CONDITIONS**

- A. Ambient Conditions: Terminate work during hazardous environmental conditions according to 29 CFR 1910.266.
- B. Existing Conditions: See site and utility survey, geotechnical report, hazardous material survey, existing conditions survey, and site drawing.
- C. Temporary Erosion and Sediment Control: Comply with other requirements specified in Section 01 57 13 - Temporary Erosion and Sediment Control.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Sedimentation Barrier: See Section 01 57 13 - Temporary Erosion and Sediment Control.
- B. Tree Wound Compound: Application capable of sealing vegetation wounds and grafts.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Locate property boundaries and benchmarks and protect monumentation.
- B. Identify potential runoff areas.
- C. Construction Fencing: Make sure construction fencing is installed and maintained.
- D. Erosion and Sediment: Make sure SWPPP Best Management Practices are implemented and maintained.
- E. Identify potential dust sources.
- F. Identify preexisting debris, junk, and trash on-site.

**3.02 PREPARATION**

- A. Coordinate work with utility companies; notify before starting work and comply with local requirements; obtain required permits.
- B. Contact Texas Excavation Safety System at 811 and have all utilities field located. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are to remain.
- E. Protect existing vegetation to remain from damage and monitor according to ANSI A300 Part 5.
  - 1. Photograph vegetation with documentation indicating data, time, weather, and brief description of health condition.
- F. Install sedimentation barriers according to Section 01 57 13 - Temporary Erosion and Sediment Control.
- G. Protect benchmarks, survey control points, and existing structures from damage or displacement.
- H. Develop dust remediation controls and methods. Do not use water if that results in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
- I. Remove preexisting debris, junk, and trash on-site.
- J. Contractor is responsible for complying with State and local requirements related to permitting, storm water control, statutory notification periods, keeping roadways clear of debris, and dust control during operations.
- K. Any existing water wells and septic systems found on the site shall be abandoned or removed as required by the Health Department. The Contractor shall obtain permits for such work from the Health Department.

**3.03 CLEARING AND GRUBBING**

- A. Clearing: Cut trees, stumps, shrubs, downed timber, and other vegetation for removal within identified area as indicated on drawings according to 29 CFR 1910.266. Follow recommendations of ANSI Z133 and best local practices for species involved.
- B. Clear site after relocating vegetation in accordance with ANSI A300 Part 6.
- C. Do not remove or damage vegetation beyond limits indicated on drawings.
  - 1. Building Perimeter: 20 feet (12 m) outside.
  - 2. Paving: 10 feet (3.1 m) each side of surface walkways, patios, surface parking, and utility lines less than 12 inches (305 mm) in diameter.
  - 3. Minor Utility Trenches: 10 feet (3.1 m) each side of utility lines less than 12 inches (305 mm) in diameter.
  - 4. Roadways and Main Utility Trenches: 15 feet (4.6 m) each side.
  - 5. Pervious Paving: 15 feet (4.6 m) outside perimeter.
- D. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum subsoil disturbance.
- E. Grubbing: Remove stumps, roots, buried timber, and other vegetation minimum depth 12 inches (30 cm) from ground. Remove rocks minimum depth 6 inches (15 cm) from ground.

**3.04 SELECTIVE REMOVAL AND TRIMMING**

- A. Selective Removal: Individual tree and shrub identified for removal as indicated on drawings according to 29 CFR 1910.266.
  - 1. Includes trees, stumps, shrubs, downed timber, and other vegetation identified for removal as indicated on drawings.
  - 2. Fell trees away from vegetation identified to remain.
  - 3. Pull stumps, remove roots, buried timber, and other vegetation identified for removal 12 inches (30 cm), minimum depth, from ground. Remove rocks 6 inches (15 cm), minimum depth, from ground.
  - 4. Cut stump neatly and close to ground.
  - 5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and matching existing grade.
- B. Selective Trimming: Individual limbs and branches cut back according to ANSI A300 Part 1 identified for removal as indicated on drawings. Follow recommendations of ANSI Z133 and best local practices for species involved.

**3.05 EARTH STRIPPING AND STOCKPILING**

- A. Stripping:
  - 1. Remove topsoil within identified area:
    - a. 4 inches (10 cm) deep.
    - b. According to soil report.
  - 2. Remove topsoil within identified area as indicated on drawings.
- B. Stockpiling:
  - 1. Place topsoil in identified areas if indicated for reuse:
    - a. Pile depth not to exceed 8 feet (2.5 m).
    - b. Protect piles from erosion.
  - 2. Place rock in identified areas if indicated for reuse.

**3.06 REMOVED VEGETATION PROCESSING**

- A. Do not burn, bury, landfill, or leave on-site.
- B. Trees: Sell if marketable.
- C. Sod: Reuse on-site if possible; otherwise dispose of off-site.
- D. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; give preference to on-site uses.

**3.07 REPAIR AND RESTORATION**

- A. Remaining Existing Facilities, Utilities, and Site Features: If damaged due to this work, repair or replace to original condition.
- B. Vegetation: Replace damaged or destroyed vegetation identified to remain as indicated on drawings at no cost to Owner:
  - 1. Outside removal limits.
  - 2. Inside protection limits.
- C. Apply tree wound compound according to manufacturer's recommendations.

**3.08 DEBRIS REMOVAL**

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and windblown debris from public and private lands.
- D. Remove paving, curbs, and other surface improvements as indicated on the Design drawings.
- E. Remove abandoned utilities unless otherwise noted to remain. Indicate removal termination point for underground utilities on Record Documents.

**3.09 CLEANING**

- A. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.
- B. Do not burn or bury materials on site.
- C. Leave site clean and ready to receive work.

**END OF SECTION**

## TREE PROTECTION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Protection of Existing Trees.

#### 1.02 RELATED REQUIREMENTS

- A. Section 02 41 00 - Demolition
- B. Section 31 10 00 - Site Clearing
- C. Section 31 22 00 - Grading

#### 1.03 PRICE AND PAYMENT PROCEDURES

- A. Tree Protection Fence: By the linear foot. Includes chain link or plastic mesh fence, posts, tie wire, and installation.

#### 1.04 REFERENCE STANDARDS

- A. ANSI A300-2008 Pruning.
- B. Local Municipal Code.

#### 1.05 QUALITY ASSURANCE

- A. Employ certified arborist or landscape architect to supervise or perform tree protection work as required.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Tree Protection Fence: 4 feet high galvanized chain link.
  - 1. Posts: 1-1/2 inch at 6 feet on center, 2 feet deep.
  - 2. Tension Wire: Not less than 12 gauge at top and 6 inches above existing grade.
- B. Tree Protection Fence: 4 feet high heavy gauge orange plastic mesh with 2" openings.
  - 1. Posts: "T" posts at 6 feet on center, 2 feet deep.

### PART 3 EXECUTION

#### 3.01 TREE PROTECTION FENCE

- A. Install at Root Protection Zone of all existing trees to be protected per local jurisdictional requirements; otherwise, as shown on drawing.
- B. Root Protection Zone as defined by the local jurisdiction; otherwise, shall be located 1 foot radius from trunk for every 1 inch diameter of trunk at 4 feet from ground. The diameter of a multi-trunk tree is calculated as the sum of the largest trunk plus half of the sum of additional trunks at 4.5 feet from ground.
- C. Fence may be located a minimum of half of the root protection radius if approved by the regulatory authority, Engineer, or Owner.
- D. Fence Location Detail: See detail as shown on drawings.

#### 3.02 TREE PROTECTION REQUIREMENTS

- A. Install tree protection fence prior to any clearing, excavation, or grading and maintain in good repair for the duration of all construction work unless otherwise directed.
- B. No construction operations are allowed within the Root Protection Zone.
- C. Root Protection Zone shall be sustained in a natural state and shall be free from vehicular or mechanical traffic; no fill, equipment, liquids, or construction debris shall be placed inside the protective barrier.
- D. Root Protection Zone shall be covered with 6" of mulch to reduce moisture stress.

- E. The proposed finished grade and elevation of land within the Root Protection Zone of any trees to be preserved shall not be raised or lowered more than 3 inches. Welling and retaining methods are allowed outside the Root Protection Zone.
- F. Root Protection Zone shall remain pervious, i.e. ground cover or turf at completion of landscape design.
- G. No roots may be cut closer than 6 feet from the base of any tree. Roots cut within the Root Protection Zone will only be allowed on one side of the tree. Any roots that need to be cut within the Root Protection Zone will be cut using a saw-type trencher, and all cut roots will be painted.
- H. All trees impacted by construction shall be fertilized with an organic tree fertilizer prior to construction and again at the end of construction. The area within the protective fencing shall be mulched with about 6 inches of mulch. Water barrels shall be placed within the Root Protection Zone to irrigate these trees if necessary.
- I. No trash or warming fires shall be placed within 50 feet of any tree.
- J. No pedestrian traffic shall occur within dripline of any tree.

### **3.03 DAMAGE TO PROTECTED TREES**

- A. Trim trees and shrubs when doing so will prevent removal or damage. Trimmed or damaged trees shall be treated or repaired under supervision of a certified arborist or landscape architect.
- B. Any damage done to existing tree crowns or root systems shall be repaired immediately under supervision of a certified arborist. All wounds to oaks shall be painted with pruning paint within 20 minutes after damage. Roots exposed during construction operations will be cut cleanly. Cut surfaces shall be painted and topsoil and mulch placed over exposed root area immediately.
- C. Branch Pruning Detail: See detail as shown on drawings.
- D. Contractor shall compensate owner for damage to existing trees designated to remain in the amount of \$200 per caliper inch measured 4 feet from ground. This amount will be deducted from final payment.

**END OF SECTION**

## GRADING

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Rough grading.
- B. Fine grading.

#### 1.02 RELATED REQUIREMENTS

- A. Section 31 10 00 - Site Clearing.
- B. Section 31 23 16 - Excavation.
- C. Section 31 23 16.26 - Rock Removal.
- D. Section 31 23 23 - Fill.

#### 1.03 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices:
  - 1. Basis of Measurement for Rough Grading: By square yard (yard).
  - 2. Basis of Measurement for Fine Grading: By square yard (yard).

#### 1.04 REFERENCE STANDARDS

- A. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).

#### 1.05 SUBMITTALS

- A. Project Record Documents: Accurately record actual locations of utilities remaining by horizontal dimensions, elevations or inverts, and slope gradients.

#### 1.06 QUALITY ASSURANCE

- A. Perform in accordance with State of TX, Highway Department standards.

#### 1.07 FIELD CONDITIONS

- A. Ambient Conditions: Terminate work during hazardous environmental conditions in accordance with 29 CFR 1910.266.
- B. Existing Conditions: See site and utility survey, geotechnical report, hazardous material survey, existing conditions survey, and site drawing.

### PART 2 PRODUCTS

#### 2.01 MATERIALS

- A. Gravel: Excavated on-site.
  - 1. Graded according to ASTM D2487 Group Symbol GW, GP, or SP.
- B. Other Fill Materials: See Section 31 23 23.

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify survey bench mark and intended elevations for grading areas are as indicated.
- B. Verify the absence of standing or ponding water.

#### 3.02 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities.
- E. Provide temporary means and methods to remove standing or ponding water from areas prior to grading.

- F. Protect site features to remain, including but not limited to bench marks, survey control points, and fences.
- G. Remove topsoil in accordance with Section 31 10 00.
- H. Excavate materials in accordance with Section 31 23 16.
- I. Remove rock in accordance with Section 31 23 16.26.
- J. Fill and backfill in accordance with Section 31 23 23.

**3.03 ROUGH GRADING**

- A. Excavate and fill subgrade material to elevations indicated on plans.
- B. Horizontally bench existing slopes greater than 1:4.
- C. Replace displaced subgrade in accordance with Section 31 23 23.
- D. Remove and replace unsuitable materials as specified fill.
- E. See Section 31 23 16 for stockpiling procedures.

**3.04 FINE GRADING**

- A. Scrape and spread subgrade material uniformly smooth and without disruptions.
- B. Slopes: Transition smoothly to adjacent areas.
- C. See Section 31 23 23 and the Geotechnical Report for final compaction.

**3.05 TOLERANCES**

- A. Top Surface: Plus or minus 1/2 inch (13 mm).

**3.06 CLEANING**

- A. Remove unused stockpiled subsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive work.

**END OF SECTION**

## EXCAVATION

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Support and protection.
- B. Dewatering.
- C. Excavation.
- D. Excavation repairs.

#### 1.02 RELATED REQUIREMENTS

- A. Project Geotechnical Report
- B. Section 02 41 00 - Demolition.
- C. Section 31 10 00 - Site Clearing.
- D. Section 31 22 00 - Grading.
- E. Section 31 23 16.13 - Trenching.
- F. Section 31 23 16.26 - Rock Removal.
- G. Section 31 23 19 - Dewatering.
- H. Section 31 23 23 - Fill.

#### 1.03 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices:
  - 1. Basis of Measurement for Unclassified Excavation: By cubic yard (cubic meter).
  - 2. Basis of Measurement for Excavation Classified as Earth: By cubic yard (cubic meter).

#### 1.04 REFERENCE STANDARDS

- A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

#### 1.05 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Independent firm specializing in materials testing.

#### 1.06 FIELD CONDITIONS

- A. Ambient Conditions: Do not perform excavation during periods of heavy rain as directed by Engineer.
- B. Existing Conditions: See site and utility survey, geotechnical report, hazardous material survey, existing conditions survey, and site drawing.
- C. Utility Location: Notify Call Before You Dig (811) before excavation to request approximate underground utility marking.
- D. Stormwater: Comply with requirements, see Section 01 57 13 - Temporary Erosion and Sediment Control.

### PART 2 PRODUCTS - NOT USED

### PART 3 EXECUTION

#### 3.01 EXAMINATION

- A. Verify survey bench mark elevations are as indicated on drawings.
- B. Survey existing adjacent structures and exterior improvements to establish exact elevations at fixed points for bench marking.
- C. Assess adjacent structures and exterior improvements to establish existing conditions. Notify Engineer of existing cracks, sags, or other damages prior to starting work.
- D. Verify prevailing groundwater level is as indicated on drawings.

**3.02 PREPARATION**

- A. See Section 31 10 00 for site clearing and topsoil removal.
- B. Identify required lines, levels, contours, and datum locations.
- C. Protect survey bench marks, control points, and monuments from excavating equipment and vehicular traffic.
- D. Protect existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Protect plants and other features to remain.
- F. Locate and identify known utilities to remain and protect from damage.
- G. Notify utility company to remove and relocate utilities.

**3.03 SUPPORT AND PROTECTION**

- A. Excavation Safety: Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.
- B. Permanently leave in place excavation support and protection systems used as formwork or within 10 feet (3.03 m) of existing foundations unless otherwise noted on drawings.

**3.04 DEWATERING**

- A. Prevent surface water and groundwater from entering excavations and surrounding areas.
- B. Dispose of water without causing surface erosion, sediment buildup, or endangering public health or property.
- C. See Section 31 23 19 for additional dewatering requirements.

**3.05 EXCAVATION**

- A. Grade top perimeter of excavation to prevent surface water collection.
- B. General Excavation:
  - 1. Excavate to indicated contours, elevations, and grades.
  - 2. Unclassified Excavation: Excavate material as indicated on drawings.
  - 3. Classified Excavation: Classify excavated material as rock and earth.
    - a. Earth Excavation: Excavate material as indicated on drawings.
    - b. Rock Excavation: See Section 31 23 16.26.
- C. Excavation for Exterior Improvements:
  - 1. Excavate to subgrade; do not disturb subsoils.
  - 2. Compact subgrade as indicated on the Geotechnical Report.
- D. Excavation to accommodate foundations, underground tanks, and underground utilities.
  - 1. Excavate to specified elevations.
  - 2. Over-excavate to safely install, adjust, and remove forms, bracing, or supports necessary for installation of work.
  - 3. Hand trim excavations. Remove loose matter.
- E. See Section 31 23 16.13 for trenching.
- F. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume work.
- G. Do not interfere with 45-degree bearing splay of foundations.

**3.06 EXCAVATION REPAIRS**

- A. Notify Engineer of over-excavations.
- B. Correct areas over-excavated with native compacted soil.
- C. See Section 31 23 23 for additional requirements.

**3.07 FIELD QUALITY CONTROL**

- A. Resurvey existing adjacent structure and exterior improvement bench marks. Notify Engineer of changes in elevations, positions, or slopes.
- B. Notify Engineer of additional cracks, sags, or other damages to adjacent structures or exterior improvements occurring during work.

**3.08 CLEANING**

- A. Stockpile excavated material for re-use in area designated on-site; see Section 31 22 00.
- B. Remove excavated material unsuitable for re-use from site.
- C. Remove excess excavated material from site.

**3.09 PROTECTION**

- A. Divert surface water away from excavations.
- B. Keep excavations free of standing water.
- C. Maintain stability of banks and loose soils; prevent from falling into excavations.
- D. Maintain excavations in satisfactory, undisturbed condition.
- E. Protect bottom of excavations from freezing.

**END OF SECTION**

**TRENCHING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Trench excavation.
- B. Utility bedding and cover.
- C. Backfill and compaction.
- D. Dewatering.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 05 19 - Geosynthetics for Earthwork.
- B. Section 31 10 00 - Site Clearing.
- C. Section 31 22 00 - Grading.
- D. Section 31 23 16 - Excavation.
- E. Section 31 23 16.26 - Rock Removal.
- F. Section 31 23 19 - Dewatering.
- G. Section 31 23 23 - Fill.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Unit Prices:
  - 1. Basis of Measurement for Trenching: By linear foot (linear meter).

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate trenching with utility installation.

**1.05 SUBMITTALS**

- A. Samples: 10 lb (4.5 kg) sample of each type of fill; submit in air-tight containers to testing laboratory.
- B. Source Quality Control Submittals: Submit name of imported materials source.
  - 1. Results of gradation tests on proposed and actual materials used.
- C. Field Quality Control Submittals:
  - 1. Results of compaction density tests.
- D. Manufacturer's qualification statement.
- E. Installer's qualification statement.
- F. Testing agency's qualification statement.
- G. Compaction Density Test Reports.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with minimum 3 years of experience.
- B. Installer Qualifications: Company specializing in performing work of type specified, with minimum 3 years of experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.
- D. Documents at Project Site: Maintain at project site one copy of manufacturer's instructions, erection drawings, and shop drawings.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver fill to project site in advance of need.
- B. When fill materials need on-site storage, locate stockpiles where indicated on drawings.

1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
2. Prevent contamination.
3. Protect stockpiles from erosion and deterioration of materials.

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIALS**

- A. General Fill: Comprised of sand and gravel; free of shale, clay, friable materials, and debris.
  1. Fill Type General: Complying with State of TX Highway Department standard.
  2. Fill Type General: Subsoil excavated on-site.
    - a. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
    - b. Complying with ASTM D2487 Group Symbol CL.
- B. Granular Fill: Pit-run washed stone; free of shale, clay, friable materials, and debris.
  1. Fill Type Aggregate: Coarse aggregate, complying with State of TX Highway Department standard.
- C. Crushed Stone: Crusher-run, mineral aggregate, free of silt, clay, loam, friable or soluble materials, and organic matter.
  1. Type Aggregate: Complying with State of TX Highway Department standard.
  2. Grade in accordance with ASTM D2487 Group Symbol GM.
- D. Filter Fabric: Geotextile, capable of material separation.
  1. Geotextile: Nonbiodegradable, woven.
  2. Geotextile: See Section 31 05 19.
- E. Sand: Natural river or bank, washed free of silt, clay, loam, friable or soluble materials, and organic matter.
  1. Type Sand: Complying with State of TX Highway Department standard.
  2. Grade in accordance with ASTM D2487 Group Symbol SW.
  3. Sand Equivalent: In accordance with ASTM D2419.
- F. Concrete: Ready mix.
  1. Ready for placement in accordance with ASTM C94/C94M.
- G. Flowable Fill: Controlled low-strength material in accordance with ASTM D6103/D6103M.
- H. General Fill: Subsoil excavated on-site.
- I. Structural Fill: Subsoil excavated on-site.
- J. Granular Fill - Gravel: Pit run washed stone; free of shale, clay, friable material and debris.
  1. Graded in accordance with ASTM C136/C136M.
- K. Granular Fill - Pea Gravel: Natural stone; washed, free of clay, shale, organic matter.
  1. Graded in accordance with ASTM C136/C136M.
- L. Sand: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
  1. Graded in accordance with ASTM C136/C136M.

### **2.02 ACCESSORIES**

- A. Underground Warning Tape: Suitable for direct burial.
  1. Bright-colored, continuously printed plastic ribbon tape, minimum 6 inches (150 mm) wide by 4 mils, 0.004 inch (0.10 mm) thick.
- B. Buried Detection Wire: Copper, single strand, continuously insulated, 12 AWG, suitable for direct burial.

### **2.03 SOURCE QUALITY CONTROL**

- A. Test fill materials in accordance with specified standard before delivery to site.
- B. Nonconforming Materials: Change and retest.

- C. Provide materials of each type from same source or as directed by Engineer.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Verify survey benchmarks and intended elevations for work are as indicated on drawings.
- B. Verify prevailing groundwater level is as indicated on drawings.
- C. Perform assessment of adjacent structures and exterior improvements to establish existing conditions. Notify Engineer of existing cracks, sags, or other damages prior to starting work.

#### **3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum locations.
- B. See Section 31 10 00 for site clearing and topsoil removal.
- C. Protect survey benchmarks, control points, and monuments from excavating equipment and vehicular traffic.
- D. Protect existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.
- E. Protect plants and other features to remain.
- F. Locate and identify existing utilities to remain as indicated on drawings and protect from damage.
- G. Notify utility company to remove and relocate utilities as indicated on drawings.

#### **3.03 SUPPORT AND PROTECTION**

- A. Excavation Safety: Provide Trench Safety Protection. Comply with OSHA's Excavation Standard, 29 CFR 1926, Subpart P.
- B. Contractor is responsible for providing trench box, sheeting, shoring and bracing, as required to maintain stability of excavation. Design of sheeting, shoring and bracing is by the Contractor based on soil profiles per the geotechnical report.
- C. Abandon support and protection systems used as formwork or within 10 feet (3.03 m) of existing foundations, unless otherwise noted on drawings.
  - 1. Remove top 4 feet (1.22 m) below grade.

#### **3.04 DEWATERING**

- A. Prevent surface water and groundwater from entering excavations and surrounding areas.
- B. Dispose of water without causing surface erosion, sediment buildup, or endangering public health or property.
- C. See Section 31 23 19 for additional dewatering requirements.

#### **3.05 TRENCH EXCAVATION**

- A. Grade top perimeter of excavation to prevent surface water collection.
- B. Notify Engineer of unexpected subsurface conditions and discontinue affected work in area until notified to resume.
- C. General: Cut trenches neat and clean.
  - 1. Slope banks of excavations deeper than 4 feet (1.2 m) to angle of repose or less until shored.
  - 2. Do not interfere with 45-degree bearing splay of foundations.
  - 3. Cut trenches wide enough to allow inspection of installed utilities.
  - 4. Hand trim excavations and remove loose matter.
  - 5. Remove large stones and other hard matter that could damage piping or impede consistent backfilling or compaction.
  - 6. Remove lumped subsoil, boulders, and rock up to 1/3 cu yd (0.25 cu m) measured by volume.

7. See Section 31 23 16.26 for rock removal.
- D. Utility Preparation: Rake trench bottom to uniform grade.
  1. Remove unsuitable subgrade and backfill.
  2. Compact subgrade to density equal to or greater than subsequent fill material requirements.
- E. Maintain trenches and prevent loose soil or rocks from entering.
- F. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- G. Slope banks of excavations deeper than 4 feet (1.2 meters) to angle of repose or less until shored.
- H. Do not interfere with 45 degree bearing splay of foundations.
- I. Cut trenches wide enough to allow inspection of installed utilities.
- J. Hand trim excavations. Remove loose matter.
- K. Remove excavated material that is unsuitable for re-use from site.
- L. Remove excess excavated material from site.
- M. Provide temporary means and methods, as required, to remove all water from trenching until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.
- N. Determine the prevailing groundwater level prior to trenching. If the proposed trench extends less than 1 foot (305 mm) into the prevailing groundwater, control groundwater intrusion with perimeter drains routed to sump pumps, or as directed by the Engineer.

### **3.06 UTILITY BEDDING AND COVER**

- A. Maintain trenches and prevent loose soil or rocks from entering.
- B. Crushed Stone: Compact to 95 percent of maximum dry density.
  1. Bedding: Fill to subgrade elevation; rake smooth.
  2. Cover: Completely cover utility.
- C. Sand: Compact in maximum 8-inch (200 mm) lifts to 95 percent of maximum dry density.
  1. Bedding: Fill to subgrade elevation; rake smooth.
- D. Filter Fabric: Position geosynthetic smooth and wrinkle-free on prepared surface; unroll or unfold carefully; avoid stretching.
  1. Wrap around crushed stone and utility assembly; overlap seams.
  2. See Section 31 05 19 for additional requirements.
- E. Concrete: Place in accordance with ACI PRC-304.
- F. Inspect utility for damage from falling rock. Repair or replace damaged utility.

### **3.07 FLOWABLE FILL**

- A. Completely cover utilities in accordance with NRMCA CLSM.
  1. Fill trench to indicated elevation.

### **3.08 PREPARATION FOR UTILITY PLACEMENT**

- A. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- B. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- C. Until ready to backfill, maintain excavations and prevent loose soil from falling into excavation.

### **3.09 BACKFILL AND COMPACTION**

- A. Backfill to contours and elevations indicated on drawings using unfrozen materials.
- B. Fill to subgrade elevations unless otherwise indicated on drawings.
- C. Employ placement method that does not disturb or damage other work.

- D. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen, or spongy subgrade surfaces.
- E. Maintain optimum moisture content of fill materials to attain required compaction density.
- F. General Fill: Place and compact materials in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.
- G. Granular Fill: Place and compact material in equal continuous layers not exceeding 6 inches (150 mm) compacted depth.
- H. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- I. Correct areas that are over-excavated.
  - 1. Thrust-Bearing Surfaces: Fill with concrete.
  - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- J. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
  - 2. At Other Locations: 95 percent of maximum dry density.
- K. Reshape and re-compact fills subjected to vehicular traffic.
- L. Underground Warning Tape:
  - 1. Install 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe if required by the owner.
- M. Buried Detection Wire: Install 6 to 8 inches (150 to 200 mm) below finished grade, directly above buried pipe, if required by the owner.

### **3.10 BEDDING AND FILL AT SPECIFIC LOCATIONS**

- A. Utility Piping, Conduits, and Duct Bank:
- B. At Pipe Culverts:
- C. Over Subdrainage Piping at Foundation Perimeter:
- D. At French Drains:

### **3.11 TOLERANCES**

- A. Maximum Variation from Top Surface of General Backfilling: Plus or minus 1 inch (25 mm) from required elevations.
- B. Maximum Variation from Top Surface of Backfilling Under Paved Areas: Plus or minus 1 inch (25 mm) from required elevations.

### **3.12 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for general requirements for field inspection and testing.
- B. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
- C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D1557 modified proctor, AASHTO T 180, or ASTM D698 standard proctor.
- D. Nonconforming Work: For failed tests, remove work, replace, and retest.
- E. Frequency of Tests: As directed by the Geotechnical Engineer.

### **3.13 CLEANING**

- A. Stockpile excavated material re-used in area designated on-site; see Section 31 22 00.
- B. Remove excavated material that is not required or unsuitable for re-use from site.

- C. Remove excess excavated material from site.

**3.14 PROTECTION**

- A. Divert surface water away from excavations.
- B. Keep excavations free of standing water.
- C. Maintain stability of banks and loose soils; prevent from falling into excavations.
- D. Maintain excavations in neat and square, undisturbed condition.

**END OF SECTION**

**TRENCH EXCAVATION PROTECTION****PART I - GENERAL****1.01 SECTION INCLUDES:**

- A. Trench Excavation Protection required for the construction of all trench excavation protection systems to be utilized in the project and including all additional excavation and backfill necessitated by the protection and backfill necessitated by the protection system.

**1.02 MEASUREMENT AND PAYMENT**

- A. Trench Excavation Protection is to be included in the cost of installation of trenched underground utilities.

**1.03 RELATED SECTIONS**

- A. Trench Excavation Protection shall be accomplished as required by the provisions of Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration Standards and Interpretations.
- B. A copy of the Document is available for review at the office of the Engineer. It shall be construed that this document is included in this Project Manual and shall apply to every Section as if written in full therein.

**PART 2 - PRODUCTS -- NOT USED****PART 3 - EXECUTION****3.01 CONSTRUCTION METHODS**

- A. Trench Excavation Protection shall be accomplished as required by the provisions of, Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration Standards and Interpretations.

**END OF SECTION**

**ROCK REMOVAL****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Removal of identified rock during excavation.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 23 23 - Fill: Fill materials.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Site Rock Removal: By the cubic yard (cubic meter) measured before disintegration. Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.
- B. Trench Rock Removal: By the cubic yard (cubic meter) measured before disintegration. Includes preparation of rock for removal, mechanical disintegration of rock, removal from position, loading and removing from site. For over excavation, payment will not be made for over excavated work nor for replacement materials.

**1.04 DEFINITIONS**

- A. Site Rock: Solid mineral material with a volume in excess of 1/3 cubic yard (0.25 cubic meter) or solid material that cannot be removed with a 3/4 cubic yard (0.57 cubic meter) capacity power shovel without drilling or blasting.
- B. Trench Rock: Solid mineral material with a volume in excess of 1/6 cubic yard (0.13 cubic meter) or solid material that cannot be removed with a 3/4 cubic yard (0.57 cubic meter) capacity power shovel without drilling or blasting.
- C. Rock: Solid mineral material of a size that cannot be removed with a 3/4 cubic yard (0.57 cubic meter) capacity power shovel.

**PART 2 PRODUCTS****PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify site conditions and note subsurface irregularities affecting work of this section.

**3.02 PREPARATION**

- A. Identify required lines, levels, contours, and datum.

**3.03 ROCK REMOVAL**

- A. Excavate and remove rock by mechanical methods only; use of explosives is prohibited.
- B. Mechanical Methods: Drill holes and utilize expansive tools to fracture rock.
- C. Form level bearing at bottom of excavations.
- D. Remove shaled layers to provide sound and unshattered base for footings.
- E. In utility trenches, excavate to 6 inches (150 mm) below invert elevation of pipe and 24 inches (600 mm) wider than pipe diameter.
- F. Remove excavated materials from site.
- G. Correct unauthorized rock removal in accordance with backfilling and compacting requirements of Section 31 23 23.

**3.04 FIELD QUALITY CONTROL**

- A. Provide for visual inspection of foundation bearing surfaces and cavities formed by removed rock.

**END OF SECTION**

**FILL****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and site structures.
- B. Backfilling and compacting for utilities outside the building to utility main connections.
- C. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.
- D. Lightweight concrete fill.

**1.02 RELATED REQUIREMENTS**

- A. Geotechnical report; bore hole locations and findings of subsurface materials.
- B. Section 01 57 13 - Temporary Erosion and Sediment Control: Slope protection and erosion control.
- C. Section 31 05 19 - Geosynthetics for Earthwork.
- D. Section 31 10 00 - Site Clearing.
- E. Section 31 22 00 - Grading: Site grading.
- F. Section 31 23 16 - Excavation: Removal and handling of soil to be re-used.
- G. Section 31 23 16.13 - Trenching: Excavating for utility trenches outside the building to utility main connections.
- H. Section 31 23 16.26 - Rock Removal: Removal of rock during excavating.
- I. Section 31 37 00 - Riprap.
- J. Section 32 11 20 - Subbase and Aggregate Base Courses.
- K. Section 33 41 00 - Subdrainage: Filter aggregate and filter fabric for foundation drainage systems.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. General Fill:
  - 1. Measurement Method: By the cubic yard (cubic meter).
  - 2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- B. Structural Fill:
  - 1. Measurement Method: By the cubic yard (cubic meter).
  - 2. Includes: Excavating existing soil, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- C. Granular Fill:
  - 1. Measurement Method: By the cubic yard (cubic meter).
  - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- D. Aggregates:
  - 1. Measurement Method: By the cubic yard (cubic meter).
  - 2. Includes: Excavating existing material, stockpiling, scarifying substrate surface, placing where required, compacting, and dewatering.
- E. Lightweight Concrete Fill:
  - 1. Measure completed lightweight concrete fill work in place. Do not count wasted material towards total.
  - 2. Measurement Method: By the cubic yard (cubic meter).

3. Includes: Excavating existing material, supplying lightweight concrete fill, scarifying substrate surface, placing lightweight concrete fill where required, compacting other fill adjacent to lightweight concrete, and dewatering.

#### **1.04 DEFINITIONS**

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: 4 inches (100 mm) below finish grade elevations indicated on drawings, unless otherwise indicated.

#### **1.05 REFERENCE STANDARDS**

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).
- B. AASHTO T 180 - Standard Method of Test for Moisture-Density Relations of Soils Using a 4.54-kg (10-lb) Rammer and a 457-mm (18-in.) Drop; 2025.
- C. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates; 2025.
- D. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- E. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- F. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- G. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.
- H. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- I. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2015.
- J. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System); 2017 (Reapproved 2025).
- K. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).
- L. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

#### **1.06 SUBMITTALS**

- A. Product Data for Manufactured Fill.
- B. Soil Samples: 10 pounds (4.5 kg) sample of each type of fill; submit in air-tight containers to testing laboratory.
- C. Materials Sources: Submit name of imported materials source.
- D. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- E. Compaction Density Test Reports.
- F. Lightweight Concrete Test Reports.
- G. Manufacturer's Instructions.
- H. Testing Agency Qualification Statement.

#### **1.07 QUALITY ASSURANCE**

- A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

- B. Copies of Documents at Project Site: Maintain at the project site a copy of each referenced document that prescribes execution requirements.

### **1.08 DELIVERY, STORAGE, AND HANDLING**

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where designated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.

## **PART 2 PRODUCTS**

### **2.01 FILL MATERIALS**

- A. General Fill: Complying with State of TX Highway Department standard.
- B. General Fill: Subsoil excavated on-site.
  - 1. Graded.
  - 2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
  - 3. Complying with ASTM D2487 Group Symbol CL.
- C. Structural Fill: Complying with State of TX Highway Department standard.
- D. Structural Fill: Subsoil excavated on-site.
  - 1. Graded.
  - 2. Free of lumps larger than 3 inches (75 mm), rocks larger than 2 inches (50 mm), and debris.
  - 3. Complying with ASTM D2487 Group Symbol CL.
- E. Concrete for Fill: Lean concrete, compressive strength of 2,500 psi.
- F. Granular Fill: Coarse aggregate, complying with State of TX Highway Department standard.
- G. Granular Fill - Gravel : Pit run washed stone; free of shale, clay, friable material and debris.
  - 1. Graded in accordance with ASTM D2487 Group Symbol GW.
- H. Granular Fill - Pea Gravel: Natural stone; washed, free of clay, shale, organic matter.
  - 1. Grade in accordance with ASTM D2487 Group Symbol GM.
- I. Sand: Complying with State of TX Highway Department standard.
- J. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
  - 1. Grade in accordance with ASTM D2487 Group Symbol SW.
- K. Engineered Fill - Lightweight Concrete:
  - 1. Materials:
    - a. Cement: ASTM C150/C150M.
    - b. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.
    - c. Expansion Material: Manufacturer's recommended expansion material.
    - d. Mix Design: By manufacturer.

### **2.02 ACCESSORIES**

- A. Geotextile: See Section 31 05 19.

### **2.03 SOURCE QUALITY CONTROL**

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.
- C. See Section 31 22 00 for additional requirements.
- D. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.
- E. Verify structural ability of unsupported walls to support imposed loads by the fill.
- F. Verify underground tanks are anchored to their own foundations to avoid flotation after backfilling.
- G. Verify areas to be filled are not compromised with surface or ground water.

**3.02 PREPARATION**

- A. Scarify and proof roll subgrade surface to a depth of 6 inches (150 mm) to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

**3.03 FILLING**

- A. Place fill in compacted lifts in accordance to the Geotechnical Report
- B. Fill to contours and elevations indicated using unfrozen materials.
- C. Fill up to subgrade elevations unless otherwise indicated.
- D. Employ a placement method that does not disturb or damage other work.
- E. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- F. Maintain optimum moisture content of fill materials to attain required compaction density.
- G. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches (150 mm) compacted depth.
- H. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches (200 mm) compacted depth.
- I. Slope grade away from building minimum 2 inches in 10 feet (50 mm in 3 m), unless noted otherwise. Make gradual grade changes. Blend slope into level areas.
- J. Correct areas that are over-excavated.
  - 1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 97 percent of maximum dry density.
  - 2. Other areas: Use general fill, flush to required elevation, compacted to minimum 95 percent of maximum dry density.
- K. Compaction Density Unless Otherwise Specified or Indicated in the Geotechnical Report:
  - 1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
  - 2. At other locations: 95 percent of maximum dry density.
- L. Reshape and re-compact fills subjected to vehicular traffic.
- M. Maintain temporary means and methods, as required, to remove all water while fill is being placed as required, or until directed by the Engineer. Remove and replace soils deemed unsuitable by classification and which are excessively moist due to lack of dewatering or surface water control.

**3.04 ENGINEERED FILL - LIGHTWEIGHT CONCRETE**

- A. Install lightweight concrete fill according to manufacturer's written instructions.

- B. Use batching, mixing, and placing equipment approved by the manufacturer.
- C. Prevent segregation of material.
- D. Tolerance: Finished surface within 2 inches (50 mm) of elevation indicated on drawings.

### 3.05 FILL AT SPECIFIC LOCATIONS

- A. Comply with the Geotechnical Report. If not otherwise indicated in the Geotechnical Report use general fill.
- B. Structural Fill at buildings:
  - 1. Use structural fill.
  - 2. Fill up to subgrade elevations.
  - 3. Maximum depth per lift: 6 inches (150 mm), compacted.
  - 4. Compact to minimum 97 percent of maximum dry density.
- C. Over Subdrainage Piping at Foundation Perimeter:
  - 1. Drainage fill and geotextile: Section 31 05 19.
  - 2. Cover drainage fill with general fill.
  - 3. Fill up to subgrade elevation.
  - 4. Compact to 95 percent of maximum dry density.
- D. Over Buried Utility Piping, Conduits, and Duct Bank in Trenches:
  - 1. Bedding: Use granular fill.
  - 2. Cover with general fill.
  - 3. Fill up to subgrade elevation.
  - 4. Compact in maximum 8 inch (200 mm) lifts to 95 percent of maximum dry density.
- E. At Landscape Areas:
  - 1. Use general fill.
  - 2. Fill up to 4 inches (100 mm) below finish grade elevations.
  - 3. Fill up to subgrade elevations.
  - 4. Compact to 95 percent of maximum dry density.
- F. At French Drains:
  - 1. Use granular fill.
  - 2. Compact to 95 percent of maximum dry density.

### 3.06 TOLERANCES

- A. Top Surface of General Filling: Plus or minus 1 inch (25 mm) from required elevations.
- B. Top Surface of Filling Under Paved Areas: Plus or minus 1/2 inch (12 mm) from required elevations.

### 3.07 FIELD QUALITY CONTROL

- A. See Section 01 40 00 - Quality Requirements, for general requirements for field inspection and testing.
- B. Soil Fill Materials:
  - 1. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, or ASTM D6938.
  - 2. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
  - 3. If tests indicate work does not meet specified requirements, remove work, replace and retest.
  - 4. Frequency of Tests: As recommended by the Geotechnical Engineer.
  - 5. Proof roll compacted fill at surfaces that will be under slabs-on-grade, pavers, and paving.
- C. Engineered Fill - Lightweight Concrete:

1. Testing: Provide third-party testing of samples in accordance with ASTM C796/C796M except do not oven-dry load-test specimens.

**3.08 CLEANING**

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.
- B. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

**END OF SECTION**

## EROSION AND SEDIMENTATION CONTROLS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Permanent erosion and sediment control.

#### 1.02 RELATED REQUIREMENTS

- A. Section 31 05 19 - Geosynthetics for Earthwork: Geotextiles, geogrids, fabrics, reinforcement mats, and other synthetic materials for erosion control.
- B. Section 31 23 23 - Fill: Filling and compaction.
- C. Section 31 37 00 - Riprap: Stabilization using riprap.
- D. Section 32 11 23 - Aggregate Base Courses: Aggregate base course.

#### 1.03 PRICE AND PAYMENT PROCEDURES

- A. Topsoil:
  - 1. Basis of Measurement: By the cubic yard (meter).
  - 2. Basis of Payment: Includes topsoil, placing topsoil.
- B. Grassed Areas:
  - 1. Basis of Measurement: By the square yard (meter).
  - 2. Basis of Payment: Includes preparation of subsoil, placing topsoil, seeding, watering and maintenance to specified time limit.

#### 1.04 REFERENCE STANDARDS

- A. AASHTO M 147 - Standard Specification for Materials for Aggregate and Soil-Aggregate Subbase, Base, and Surface Courses; 2017 (Reapproved 2021).
- B. ASTM D4318 - Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils; 2017, with Editorial Revision (2018).
- C. ASTM D8298/D8298M - Standard Test Method for Determination of Erosion Control Products (ECP) Performance in Protecting Slopes from Continuous Rainfall-Induced Erosion Using a Tilted Bed Slope; 2020.
- D. EPA (NPDES) - National Pollutant Discharge Elimination System (NPDES), Construction General Permit; Current Edition.
- E. FHWA FLP-94-005 - Best Management Practices for Erosion and Sediment Control; 1995.

#### 1.05 SUBMITTALS

- A. Inspection Reports: Submit report of each inspection; identify each preventive measure, indicate condition, and specify maintenance or repair required and accomplished.
- B. Maintenance Instructions: Provide instructions covering inspection and maintenance for preventive measures that must remain after Substantial Completion.

### PART 2 PRODUCTS

#### 2.01 PERFORMANCE REQUIREMENTS

- A. Comply with requirements of EPA (NPDES) for erosion and sedimentation control, as specified by the NPDES, and in compliance with requirements of Construction General Permit (CGP).
- B. Comply with requirements of State of TX TPDES.
- C. Comply with requirements of the local jurisdiction for erosion and sedimentation control.
- D. Best Management Practices Standard: FHWA FLP-94-005.

#### 2.02 MATERIALS

- A. High Performance - Flexible Growth Medium (HP-FGM):
  - 1. Physical Properties:

- a. Water Holding Capacity: Greater than or equal to 1,700 percent when tested in accordance with ASTM D7367.
  - b. Material Color: Green.
  - c. Cure Time: Zero to 2 hours.
  - d. Functional Longevity: Less than or equal to 18 months when tested in accordance with ASTM D5338.
  - e. Cover Factor: Less than or equal to 0.01 when tested in accordance with ASTM D8298/D8298M.
  - f. Application Rate: 3,500 lb per acre (3900 kg per hectare).
  - g. Seed Germination and Vegetation Enhancement: Greater than or equal to 100 percent when tested in accordance with ASTM D7322/D7322M.
- B. Bonded Fiber Matrix (BFM):
1. Physical Properties:
    - a. Water Holding Capacity: Greater than or equal to 1,200 percent when tested in accordance with ASTM D7367.
    - b. Material Color: Green.
    - c. Cure Time: 4 to 24 hours.
    - d. Functional Longevity: Observed, less than or equal to 6 months.
    - e. Cover Factor: Less than or equal to 0.05 when tested in accordance with ASTM D8298/D8298M.
    - f. Application Rate: 3,500 lb per acre (3900 kg per hectare).
- C. Engineered Fiber Matrix (EFM):
1. Physical Properties:
    - a. Water Holding Capacity: Greater than or equal to 1,400 percent when tested in accordance with ASTM D7367.
    - b. Material Color: Green.
    - c. Cure Time: 4 to 24 hours.
    - d. Functional Longevity: Less than or equal to 12 months when tested in accordance with ASTM D5338.
    - e. Cover Factor: Less than or equal to 0.05 when tested in accordance with ASTM D8298/D8298M.
    - f. Application Rate: 3,500 lb per acre (3900 kg per hectare).

### 2.03 ACCESSORY MATERIALS

- A. Fill Material: Soil, concrete, granular fill, sand, crushed stone, or waste materials used to raise an existing grade, acceptable to authorities having jurisdiction, and in compliance with specified performance requirements. See Section 31 23 23.
- B. Geotextiles: Permeable, synthetic fabric used to stabilize loose soil and prevent erosion. See Section 31 05 19.
- C. Mulching Material: Oat or wheat straw, free from weeds, foreign matter detrimental to plant life, and dry. Hay or chopped cornstalks are not acceptable.
- D. Grass Seed for Permanent Cover: Mixture of grass seeds compatible with soil composition in the locality of the work.
- E. Sod for Permanent Cover: Cultivated grass sod, type as indicated; with strong fibrous root system, free of stones, burned or bare spots.
- F. Plants for Permanent Cover: Specie and sizes identified in plant schedule, grown in climatic conditions similar to those in locality of the work.
- G. Crushed Stone and Gravel: See Section 32 11 23 for aggregate.
- H. Riprap: Limestone type; broken stone; solid and nonfriable; 6-inch (150 mm) minimum size, 12-inch (300 mm) maximum size. See Section 31 37 00.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

**3.02 PREPARATION**

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.
- B. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish documentation required to obtain applicable permits.
  - 1. Obtain and pay for permits and provide security required by authority having jurisdiction.
  - 2. Owner will withhold payment to Contractor equivalent to all fines resulting from non-compliance with applicable regulations.
- C. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.

**3.03 FIELD QUALITY CONTROL**

- A. Testing is not required if recent tests are available for imported topsoil. Submit these test results to the testing laboratory for approval. Indicate, by test results, information necessary to determine suitability.

**3.04 INSTALLATION**

- A. Hydroseeding: Apply seeded slurry with a hydraulic seeder at a rate of 300 lbs per acre (136 kg per hectare) evenly in two intersecting directions.
- B. Do not seed areas in excess of that which can be mulched on same day.
- C. Apply water with a fine spray immediately after each area has been mulched. Saturate to 4 inches (100 mm) of soil.
- D. Following germination, immediately reseed areas without germinated seeds that are larger than 36 inches (900 mm).

**3.05 PROTECTION**

- A. Cover seeded slopes where grade is 6 inches per foot (150 mm per m) or greater with geotextile fabric. Roll fabric onto slopes without stretching or pulling.
- B. Lay fabric smoothly on surface, bury top end of each section in 6-inch (150 mm) deep excavated topsoil trench. Provide 12-inch (300 mm) overlap of adjacent rolls. Backfill trench and rake smooth, level with adjacent soil.
- C. Secure outside edges and overlaps at 36-inch (900 mm) intervals with stakes.
- D. Lightly dress slopes with topsoil to ensure close contact between fabric and soil.
- E. At sides of ditches, lay fabric laps in direction of water flow. Lap ends and edges minimum 6 inches (150 mm).

**3.06 MAINTENANCE**

- A. Maintain seeded areas immediately after placement until grass is well established and exhibits a vigorous growing condition.
- B. Immediately reseed areas that show bare spots.
- C. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches (13 mm) or more rainfall at the project site, and daily during prolonged rainfall.
- D. Repair deficiencies immediately.
- E. Place sediment in appropriate locations on site; do not remove from site.

**3.07 CLEAN UP**

- A. Clean out sediment control structures that are to remain as permanent measures.

**END OF SECTION**

**CEMENT SOIL STABILIZATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Concrete materials.
- B. Concrete mixes.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 23 16 - Excavation.
- B. Section 31 23 23 - Fill.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Unit Prices:
  - 1. Basis of Measurement for Soil Cement: By cubic yard (cubic meter).

**1.04 REFERENCE STANDARDS**

- A. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- B. ASTM C1602/C1602M - Standard Specification for Mixing Water Used in the Production of Hydraulic Cement Concrete; 2022.
- C. ASTM D558/D558M - Standard Test Methods for Moisture-Density (Unit Weight) Relations of Soil-Cement Mixtures; 2019.
- D. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- E. ASTM D806 - Standard Test Method for Cement Content of Hardened Soil-Cement Mixtures; 2019.
- F. ASTM D1633 - Standard Test Methods for Compressive Strength of Molded Soil-Cement Cylinders; 2017.
- G. ASTM D6938 - Standard Test Methods for In-Place Density and Water Content of Soil and Soil-Aggregate by Nuclear Methods (Shallow Depth); 2023.

**1.05 SUBMITTALS**

- A. Mix Design: Ratio that will achieve specified requirements.
- B. Test Reports: Compressive strength of mix.
- C. Test Reports: Subsoil water content.
- D. Test Reports: Compressive strength of hardened fill material.
- E. Test Reports: Cement content.
- F. Test Reports: Compaction density.
- G. Installer's qualification statement.
- H. Testing agency's qualification statement.

**1.06 QUALITY ASSURANCE**

- A. Perform work in accordance with geotechnical engineering report.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience.
- C. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of type specified in this section.

**1.07 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver cement to project site in unit containers.
- B. Store cement under cover and elevated above grade.

**1.08 FIELD CONDITIONS**

- A. Do not perform work in wind in excess of 10 mph (16 kph) or when temperature is below 40 degrees F (5 degrees C).
- B. Existing Conditions: See site and utility survey, geotechnical report, hazardous material survey, existing conditions survey, and site drawing.

**PART 2 PRODUCTS****2.01 CONCRETE MATERIALS**

- A. Cement: ASTM C150/C150M, Portland cement, Type I, Normal.
- B. Subsoil: Existing reused.
- C. Water: ASTM C1602/C1602M; clean, potable, and not detrimental to concrete.

**2.02 CONCRETE MIXES**

- A. Proportion materials according to geotechnical engineering report.
- B. Add water to mix to achieve homogeneous damp mixture without lumping and without creating wet plastic consistency.

**2.03 SOURCE QUALITY CONTROL**

- A. Confirm subsoil materials are in accordance with design documents.
- B. Coordination of Other Tests and Inspections: Provide access to accommodate tests and inspections by independent testing agency employed by Owner.

**PART 3 EXECUTION****3.01 EXAMINATION**

- A. Verify subsoil is firm and capable of supporting construction equipment without displacement.
  - 1. Test according to design documents.
- B. Verify that survey bench marks and intended elevations for work are as indicated.
- C. Verify subsoil is dry with correct gradients and elevations.
- D. Verify subsoil is unfrozen and air temperature is above 40 degrees F (4 degrees C).
- E. Preinstallation Testing: Test subsoil according to geotechnical engineering requirements.

**3.02 PREPARATION**

- A. Proof roll subgrade to identify unstable subsoil.
- B. See Section 31 23 16 for removal of unsuitable subsoil.
- C. See Section 31 23 23 for addition of suitable subsoil.
- D. Correct subsoil gradient by scarifying, reshaping, and re-compacting.
- E. Apply water to achieve moisture content of subsoils according to design documents.
- F. Remove excess excavated material from site.

**3.03 APPLICATION**

- A. Cement: Place uniformly and evenly.
  - 1. According to design documents.
- B. Limit application to quantities that can be completed in daylight within six hours of placement.
- C. Maintain moisture content of subsoil according to design documents.
  - 1. Test subsoil in accordance with ASTM D6938.
- D. Restrict equipment access to cement-applied areas except for application equipment.

**3.04 MIXING AND PROCESSING**

- A. Dry mix cement and subsoil to uniform consistency not exceeding 8-inch (200 mm) depth.
- B. Add water to mix to achieve uniform, homogeneous, damp mixture to full depth and width.

- C. Mix to obtain minimum compressive strength of 450 psi (3 MPa) at 7 days.
  - 1. Test mix for compressive strength in accordance with ASTM D1633.

**3.05 COMPACTION AND GRADING**

- A. Commence compaction of mix no later than 60 minutes after mixing and processing.
- B. Shape to required line, grade, and cross section.
- C. Make grade changes gradual. Blend slopes into level areas.
- D. Slope grade away from structures minimum 2 inches in 10 ft (51 mm in 3 m), unless noted otherwise.
- E. Compact mix to minimum of 95 percent of maximum density determined in accordance with ASTM D558/D558M.
- F. Uniformly apply water according to mixes.
- G. At end of day, terminate completed work by forming straight and vertical construction joint.
- H. Finished thickness as indicated on design drawings.

**3.06 CURING**

- A. Prevent rapid drying immediately following compaction of mix:
  - 1. Maintain surface moisture content.

**3.07 TOLERANCES**

- A. Top Surface of Fill: Plus or minus 1/2 inch (12 mm) from required elevations.
- B. Maximum Offset from True Alignment: 1 inches ( 25 mm).

**3.08 FIELD QUALITY CONTROL**

- A. See Section 01 40 00 - Quality Requirements for additional requirements.
- B. Test soils for cement content in accordance with ASTM D806.
- C. Test soils for compaction density in accordance with ASTM D698.
- D. Remove, replace, and retest work that does not meet specified requirements at no cost to Owner.

**END OF SECTION**

**LIME SOIL STABILIZATION****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Excavating, treatment, and placement of lime treated subsoil mix.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 23 16 - Excavation: General site and building excavation.
- B. Section 31 23 16.13 - Trenching: Backfilling of utility trenches.
- C. Section 31 23 16.26 - Rock Removal.
- D. Section 31 23 23 - Fill: General site and building backfilling.
- E. Section 31 23 23 - Fill: Soil and aggregate materials.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Measurement Method: By the square yard (square meter) of lime/subsoil mix, based on a lime/soil mix ratio determined by the geotechnical engineer. Includes supplying ingredient materials, scarifying substrate surface, mixing and placing where required, compacting and curing.

**1.04 REFERENCE STANDARDS**

- A. AASHTO M 216 - Standard Specification for Quicklime and Hydrated Lime for Soil Stabilization; 2022.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method; 2024.
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN-m/m<sup>3</sup>)); 2012 (Reapproved 2021).
- E. NLA Bull 326 - Lime-Treated Soil Construction Manual: Lime Stabilization & Lime Modification; 2004.

**1.05 SUBMITTALS**

- A. Submit mix design and materials mix ratio that will achieve specified requirements.

**1.06 QUALITY ASSURANCE**

- A. Perform Work in accordance with State of TX Highways standards.

**1.07 FIELD CONDITIONS**

- A. Do not install mixed materials in wind in excess of 10 mph (16 k/h) or when temperature is below 40 degrees F (5 degrees C).

**PART 2 PRODUCTS****2.01 MIX MATERIALS**

- A. Subsoil: General fill specified in Section 31 23 23.
- B. Lime: AASHTO M 216 hydrated lime.

**2.02 EQUIPMENT**

- A. Equipment: Capable of excavating subsoil, mixing and placing materials, wetting, consolidation, and compaction of material.

**2.03 LIME/SOIL MIX**

- A. Mix subsoil, lime, sand and aggregate in accordance with Geotechnical Report. Quantity of lime is not to exceed 10 percent of dry mixed materials by volume.

- B. Carefully add water to the mix to achieve a consistent mixture without lumping yet not create a wet plastic consistency.
- C. Obtain approval of the mix by the Geotechnical Engineer before proceeding with placement.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A. Do not place fill over frozen or spongy subgrade surfaces.

#### **3.02 EXCAVATION**

- A. Protect adjacent structures from damage by this work.
- B. Excavate subsoil to depth indicated.
- C. Proof roll subgrade to identify soft areas; excavate those areas.
- D. Do not excavate within normal 45 degree bearing splay of any foundation.
- E. Notify Geotechnical Engineer of unexpected subsurface conditions. Discontinue affected Work in area until notified to resume work.
- F. Stockpile excavated material in area designated on site; remove excess material not being reused from site.

#### **3.03 SOIL TREATMENT AND BACKFILLING**

- A. Site mix subsoil, backfill and compact. Blend treated subsoil mix to achieve mix formulation and required stabilization.
- B. Place mix material in continuous layers not exceeding 12 inches (300 mm) depth.
- C. Maintain optimum moisture content of mix materials to attain required stabilization.
- D. Do not exceed 60 minutes in placing adjacent mixed material.
- E. Commence compaction of mix no later than 60 minutes after placement.
- F. Compact to 95 percent of maximum density determined in accordance with ASTM D698; test in-place density in accordance with ASTM D1556/D1556M.
- G. Slope grade away from building minimum 2 inches in 10 ft (150 mm in 3 m), unless noted otherwise.
- H. Shape to required line, grade, and cross section.
- I. Make grade changes gradual. Blend slope into level areas.
- J. At end of day, terminate completed Work by forming a straight and vertical construction joint.
- K. Replace damaged fill with new mix to full depth of original mix.
- L. Remove surplus mix materials from site.

#### **3.04 TOLERANCES**

- A. Top Surface of Fill: Plus or minus one inch (25 mm) from required elevations.

#### **3.05 FIELD QUALITY CONTROL**

- A. Compression test and analysis of hardened fill material will be performed in accordance with ASTM D698.
- B. If tests indicate Work does not meet specified requirements, remove Work, replace and retest.

**END OF SECTION**

**JACKING, BORING OR TUNNELING PIPE****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Furnishing and installation of pipe by the methods of jacking, boring, or tunneling.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 23 16 - Excavation
- B. Section 31 23 16.14 - {\t#1000010}
- C. Section 33 14 16 - Site Water Utility Distribution Piping
- D. Section 33 31 13 - Site Sanitary Sewerage Gravity Piping
- E. Section 33 42 11 - Stormwater Gravity Piping
- F. Section 33 02 73 - {\t#1000012}

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Jacking, Boring, or Tunneling:
  - 1. Basis of Measurement: By the linear foot.
  - 2. Basis of Payment: Includes excavation; casing, liner plate, jacking pipe with accessories; and grout.

**1.04 REFERENCES**

- A. Texas Department of Transportation (TxDOT) 2004 Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges.
- B. Specification and standards of local authority having jurisdiction.

**1.05 SUBMITTALS**

- A. Product Data: Provide casing, liner plate, jacking pipe plus accessories data.
- B. Shop Drawings: Indicate plan layout, spacing of components, grouting procedures, and schedule of components.

**1.06 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: All products covered under this Section shall be produced by a single manufacturer unless otherwise specified.
- B. Testing: The Contractor shall coordinate all testing required by this Section with the Engineer prior to commencement.

**1.07 DELIVERY, STORAGE AND HANDLING**

- A. Deliver, store and handle products in exact accordance with manufacturer's latest published requirements and specifications.

**PART 2 PRODUCT****2.01 MATERIALS**

- A. Pipe:
  - 1. Types and sizes shown on the plans and shall conform to these specifications.
  - 2. All shipments of pipe shall be accompanied by a certificate of compliance to these specifications prepared by an independent testing laboratory and signed by a registered professional engineer.
- B. Liner Plate: As shown on the project plans.
- C. Grout:
  - 1. Sand cement slurry containing a minimum of seven (7) sacks of Portland Cement per cubic yard of slurry.
  - 2. All slurry shall be plant batched and transit mixed.

**PART 3 EXECUTION****3.01 JACKING**

- A. Jacking Pits
  1. Suitable pits or trenches shall be excavated for the purpose of jacking operations for placing end joints of the pipe.
  2. When trenches are cut in the side of embankment such work shall be securely sheeted and braced.
  3. Backfilled immediately upon completion of jacking operations.
- B. Jacking Operations
  1. Jacking operations shall not interfere with the operation of railroads, streets, highways or other facilities.
  2. Barricades and lights shall be furnished as directed by the Engineer to safeguard traffic and pedestrians.
- C. The pipe to be jacked shall be set on guides to support the section of pipe being jacked and to direct it in the proper line and grade.
- D. Excavation
  1. Embankment material shall be excavated just ahead of the pipe and material removed through the pipe, and the pipe forced through the opening thus provided.
  2. The excavation for the underside of the pipe, for at least one-third (1/3) of the circumference of the pipe, shall conform to the contour and grade of the pipe.
  3. A clearance of not more than two inches (2") may be provided for the upper half of the pipe.
- E. The distance that the excavation shall extend beyond the end of the pipe shall depend on the character of the material, but it shall not exceed two feet (2') in any case.
- F. Pipe shall be jacked from downstream end, unless otherwise noted.
- G. Permissible lateral or vertical variation in the final position of the pipe from line and grade will be within the tolerances of the local utility provider.
- H. Any pipe damaged in jacking operations shall be removed and replaced at the Contractor's expense.

**3.02 BORING**

- A. Boring Pits: Excavation for pits and installation of shoring shall be as outlined under "Jacking Pits".
- B. Boring Operations:
  1. A pilot hole shall be used.
  2. The pilot hole shall be bored the entire length of the crossing and shall be used as a guide for the larger hole to be bored.
  3. Water or drilling fluids may be used to lubricate cuttings.
- C. Variation in line and grade shall apply as specified under "Jacking".

**3.03 TUNNELING**

- A. Tunneling may be used when the size of the proposed pipe or the use of a monolithic system would make the use of tunneling more satisfactory than "Jacking" or "Boring".
- B. The excavation for pits and the installation of shoring shall be as specified under "Jacking".
- C. The lining of the tunnel shall be of the material shown on the plans.
- D. Access holes for grouting shall be spaced a maximum of ten feet (10').

**3.04 PIPE JOINTS**

- A. Shall conform to local specification and standards having jurisdiction for work being performed, or as shown on the project plans or shop drawings.

B. Steel Joints

1. Shall be mill or fabricated steel pipe conforming to AWWA M-11.
2. Shall be welded in accordance with procedures established by the AWS.

**3.05 GROUTING OF BORES OR TUNNELS**

- A. Space between pipe and liner, pipe and limits of excavation, and liner and limits of excavation shall be pressure grouted, unless otherwise specified on the plans.

**3.06 CLEANING**

- A. Properly dispose of all excess material, all debris, trash, containers, residue, remains and scraps which result from the work of this Section.

**END OF SECTION**

**SITE CONCRETE ENCASEMENT, CRADLES, SADDLES AND COLLARS****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. All work required to install and complete all concrete encasements, cradles, saddles and collars.

**1.02 RELATED REQUIREMENTS**

- A. Section {id\#1000003} - {t\#1000003}
- B. Section 31 23 16 - Excavation
- C. Section 31 23 16.13 - Trenching
- D. Section 33 05 61 - Concrete Manholes
- E. Section 33 31 13 - Site Sanitary Sewerage Gravity Piping

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Encasement, Cradles, Saddles, and Collars: By the cubic yard. Includes formwork, concrete, placement accessories, consolidating and curing.

**1.04 REFERENCES**

- A. Texas Department of Transportation Standard Specification, Item 420 – Concrete for Structures.

**1.05 SUBMITTALS**

- A. Product Data: Submit manufacturer's data on manufactured products showing compliance with specified requirements.
- B. Manufacturer's Installation Instructions: Indicate installation procedures and interface required with adjacent construction for concrete accessories.

**1.06 QUALITY ASSURANCE**

- A. The testing laboratory shall sample and test concrete in accordance with geotechnical report unless otherwise indicated.

**PART 2 PRODUCTS****2.01 MATERIALS**

- A. Concrete: Shall conform to Class B in accordance with Item 420, "Concrete for Structures", TxDOT Standard Specifications.
- B. Reinforcement: If required, shall be Grade 60, deformed bars, new billet steel.

**PART 3 EXECUTION****3.01 INSTALLATION**

- A. Concrete Encasement
  1. The trench shall be excavated and fine graded to a depth conforming with details and sections shown on the plans.
  2. The pipe shall be securely tied down to prevent flotation and supported by precast concrete blocks of the same strength as the concrete for encasement.
  3. Encasement shall then be placed to a depth and width conforming with details and sections shown on the plans.
- B. Concrete Cradles
  1. The trench shall be prepared and the pipe supported in the same manner as described in this Section.
  2. Concrete cradles shall be constructed in accordance with details and sections shown on the plans.
- C. Concrete Saddles

1. Pipe to receive concrete saddle shall be backfilled in accordance with Section 31 2316.13 – Trenching to the spring line.
  2. Concrete placed to a depth and width conforming with details and sections shown on the plans.
- D. Concrete Collars
1. Concrete collars shall be constructed in accordance with details and sections shown on the plans.

**3.02 CLEANING**

- A. Properly dispose of all debris, trash containers, residue, remnants and scraps which result from the work of this Section.

**END OF SECTION**

## SITE CASTINGS

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Castings shall include labor, materials, equipment and incidentals to construct manhole frames and covers, catch basin inlet frames and grates, trench drain frames and grates, and area drains.
- B. Castings include metal items which are not a part of the miscellaneous metal fabrications or metal systems in other sections of these specifications.

#### 1.02 RELATED SECTIONS

- A. Section 33 05 61 - Concrete Manholes

#### 1.03 SUBMITTALS

- A. Shop Drawings:
  - 1. Submit Shop Drawings to the Engineer for the fabrication and erection of all casting assemblies. Include plans, elevations, and details of sections and connections. Show anchorage and accessory items.
  - 2. Include setting drawings for location and installation of castings and anchorage devices.
  - 3. Copies of manufacturer's specifications, load tables, dimension diagrams, anchor details and installation instructions.

#### 1.04 QUALITY ASSURANCE

- A. Shop Assembly
  - 1. Preassemble items in the shop to the greatest extent possible, so to minimize field splicing and assembly of units at the site. Disassemble units only to the extent necessary for shipping and handling limitations. Clearly mark units for reassembly and coordinated installation.

### PART 2 PRODUCTS

#### 2.01 MANHOLE FRAMES AND COVERS

- A. Drainage Manholes
  - 1. Material:
    - a. Cast iron conforming to ASTM A 48, Class 30A.
  - 2. Size:
    - a. As shown on the Drawings.
  - 3. Construction:
    - a. Heavy duty suitable for HS-20 loading, with bearing surfaces between frames and covers machined, fitted together, and match marked to prevent rocking.
- B. Sanitary Sewer Manholes
  - 1. Material:
    - a. Cast iron conforming to ASTM A 48, Class 30.
  - 2. Size:
    - a. As shown on the Drawings.
  - 3. Construction:
    - a. Heavy duty suitable for HS-20 loading, with bearing surfaces between frames and covers machined, fitted together, and match marked to prevent rocking.
  - 4. Product and Manufacturer:
    - a. Manhole frames and covers shall be as shown on the Plans, or as manufactured by an approved vendor authorized by the local jurisdictional authority.

#### 2.02 CATCH BASIN INLET FRAMES AND GRATES

- A. Catch Basin Inlets
  - 1. Material:

- a. Ductile iron conforming to ASTM A 536.
2. Size:
  - a. As shown on the Drawings.
3. Construction:
  - a. Heavy duty suitable for HS-20 loading, with machine bearing surfaces.
  - b. Inlet covers shall be bolted down.

### **2.03 TRENCH DRAIN FRAMES AND GRATES**

- A. Trench Drain Frames and Grates
  1. Material:
    - a. Ductile iron conforming to ASTM A536.
  2. Size:
    - a. As shown on the Drawings.
  3. Construction:
    - a. Heavy duty suitable for HS-20 loading, with machine bearing surfaces.
    - b. Trench grate covers shall be secured.
- B. Trench Drain: As shown on the Plans, or as manufactured by an approved vendor authorized by the local jurisdictional authority.

### **2.04 AREA DRAINS**

- A. Area Drains
  1. Material:
    - a. Ductile iron conforming to ASTM A536.
  2. Size:
    - a. As shown on the Drawings.
  3. Construction:
    - a. Heavy duty suitable for HS-20 loading, with machine bearing surfaces.

### **2.05 DESIGN AND FABRICATION**

- A. Design all frames, covers, and grates to prevent rocking and rattling under traffic.
- B. Fabricate castings true to pattern so that component parts fit together.

### **2.06 FINISH**

- A. Shall be in accordance with manufacturer's recommendation, unless shown or specified otherwise.

## **PART 3 EXECUTION**

### **3.01 INSTALLATION**

- A. Follow manufacturer's printed instructions and Shop Drawings.
- B. Set castings accurately to required locations, alignment and elevation, plumb, level, true and free of rack, measured from established lines and levels. Brace temporarily or anchor temporarily in formwork.
- C. Area and planting drains shall be installed in accordance with the manufacturer's recommendations.

**END OF SECTION**

## CONCRETE MANHOLES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. Precast concrete manholes.
- B. Concrete masonry unit manholes.
- C. Cast-in-place concrete manholes.
- D. Cast-in-place concrete base pad.
- E. Polymer concrete manhole inserts.
- F. Grade adjustments.
- G. Frames and covers.

#### 1.02 RELATED REQUIREMENTS

- A. Section 31 23 16 - Excavation.
- B. Section 31 23 23 - Fill.
- C. Section 33 31 13 - Site Sanitary Sewerage Gravity Piping.
- D. Section 33 42 11 - Stormwater Gravity Piping.
- E. Section 33 42 30 - Stormwater Drains.
- F. Section 33 46 00 - Stormwater Management.

#### 1.03 PRICE AND PAYMENT PROCEDURES

- A. Unit Prices: Concrete Manholes
  - 1. Basis of Measurement: By the unit for a nominal depth of 10 feet (3 m).
  - 2. Basis of Payment: Includes excavation, hand trimming, bedding and backfilling, base pad, frame and grate, accessories.

#### 1.04 REFERENCE STANDARDS

- A. AASHTO HB - Standard Specifications for Highway Bridges; 2005, with Errata.
- B. ACI PRC-304 - Guide for Measuring, Mixing, Transporting, and Placing Concrete; 2000 (Reapproved 2009).
- C. ACI PRC-440.1 - Guide for the Design and Construction of Structural Concrete Reinforced with Fiber-Reinforced Polymer Bars; 2015.
- D. ACI SPEC-301 - Specifications for Concrete Construction; 2020.
- E. ASTM A48/A48M - Standard Specification for Gray Iron Castings; 2022.
- F. ASTM C33/C33M - Standard Specification for Concrete Aggregates; 2024a.
- G. ASTM C94/C94M - Standard Specification for Ready-Mixed Concrete; 2025a.
- H. ASTM C150/C150M - Standard Specification for Portland Cement; 2024.
- I. ASTM C260/C260M - Standard Specification for Air-Entraining Admixtures for Concrete; 2024.
- J. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2025a.
- K. ASTM C478/C478M - Standard Specification for Circular Precast Reinforced Concrete Manhole Sections; 2020.
- L. ASTM C494/C494M - Standard Specification for Chemical Admixtures for Concrete; 2024.
- M. ASTM C923/C923M - Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes, and Laterals; 2020.
- N. ASTM C990 - Standard Specification for Joints for Concrete Pipe, Manholes, and Precast Box Sections Using Preformed Flexible Joint Sealants; 2009 (Reapproved 2019).
- O. ASTM D6783 - Standard Specification for Polymer Concrete Pipe; 2005a (Reapproved 2017).

**1.05 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Installation of concrete manholes with piping and other structures.
  - 1. See Section 33 31 13 for site sanitary sewerage gravity piping.
  - 2. See Section 33 42 11 for stormwater gravity piping.
  - 3. See Section 33 42 30 for stormwater drains.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

**1.06 SUBMITTALS**

- A. Product Data: Provide manhole covers, component construction, structural rating, features, configuration, and dimensions.
- B. Shop Drawings: Indicate manhole locations, elevations, piping sizes and elevations of penetrations.
- C. Manufacturer's Installation Instructions: Indicate special procedures for assembly.
- D. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- E. Field Quality Control Submittals: Document results of field quality control testing.
- F. Project Record Documents:
  - 1. Record invert elevations of concrete manholes.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

**1.07 QUALITY ASSURANCE**

- A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years experience.
- B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of experience.

**1.08 FIELD CONDITIONS**

- A. Maintain materials and surrounding air temperature to minimum 50 degrees F (10 degrees C) prior to, during, and 48 hours after completion of masonry work.

**PART 2 PRODUCTS****2.01 CONCRETE MANHOLES**

- A. Weight Rating: HS20 according to AASHTO HB.
- B. Precast Concrete Manholes: Comply with ASTM C478/C478M, reinforced.
  - 1. Wall Thickness: 6 inches (152 mm).
  - 2. Base Thickness: 12 inches (305 mm).
  - 3. Cone Thickness: 6 inches (152 mm).
  - 4. Lid Thickness: 10 inches (254 mm).
  - 5. Reinforcement: Formed steel wire, galvanized finish, wire diameter as indicated on drawings.
  - 6. Joint Sealant: Comply with ASTM C990.
- C. Cast-In-Place Concrete Manholes: Comply with ASTM C94/C94M, reinforced.
  - 1. Wall Thickness: 6 inches (152 mm).
- D. Cast-In-Place Concrete Base Pads: Comply with ASTM C94/C94M, reinforced.
  - 1. Thickness: 12 inches (305 mm).
  - 2. Reinforcement: Formed steel wire, galvanized finish, wire diameter as indicated on drawings.
  - 3. Width: Match outside catch basin diameter.

4. Length: Match outside catch basin diameter.
- E. Cast-In-Place Concrete Materials:
  1. Cement: ASTM C150/C150M, Type II.
  2. Sand: ASTM C33/C33M, fine aggregate.
  3. Crushed Gravel: ASTM C33/C33M, coarse aggregate.
  4. Reinforcement: Formed steel wire, galvanized finish, wire diameter as indicated on drawings.
  5. Water: Potable.
  6. Admixtures, General: Chemical type complying with ASTM C494/C494M, wet mix only.
  7. Air-Entraining Admixture: In accordance with ASTM C260/C260M, wet mix only.
  8. Form Materials: Wood, profiled to suit conditions.
- F. Polymer Concrete Manhole Inserts: Comply with ASTM D6783, reinforced.
  1. Wall Thickness: 7 inches (178 mm).
  2. Base Thickness: 6 inches (152 mm).
  3. Cone Thickness: 5 inches (127 mm).
  4. Lid Thickness: 10 inches (254 mm).
  5. Reinforcement: Fiber-reinforced polymer bars, in accordance with ACI PRC-440.1.
  6. Joint Sealant: Comply with ASTM C990.
- G. Polymer Mortar: Provided by the manufacturer.
- H. Grade Adjustments:
  1. Adjustment Ring: Concrete, 6 inches (152 mm) wide, diameter matching frame dimensions, in accordance with ASTM C478/C478M.
- I. Mortar Mixing:
  1. Thoroughly mix mortar ingredients in accordance with ASTM C270 and in quantities needed for immediate use.
  2. Maintain sand uniformly damp immediately before the mixing process.
  3. Do not use antifreeze compounds to lower the freezing point of mortar.
- J. Frame and Cover: Cast iron construction, ASTM A48/A48M Class 30B, machined flat bearing surface; hinged; sealing gasket.

## 2.02 ACCESSORIES

- A. Steps: If required, formed galvanized steel rungs; 3/4 inch (19 mm) diameter. Formed integral with manhole sections.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Verify items provided by other sections of work are properly sized and located.
- B. Verify that built-in items are in proper location, and ready for roughing into Work.
- C. Verify excavation for manholes is correct.

### 3.02 PREPARATION

- A. Coordinate placement of inlet and outlet pipe or duct sleeves required by other sections.

### 3.03 EXCAVATION AND FILL

- A. Hand trim excavation for accurate placement to indicated elevations.
- B. Backfill with cover fill, tamp in place and compact, then complete backfilling.
- C. See Section 31 23 16 for additional excavation requirements.
- D. See Section 31 23 23 for additional fill requirements.

### 3.04 INSTALLATION

- A. Establish elevations and pipe inverts for inlets and outlets as indicated in drawings.

- B. Precast Concrete Manholes:
  - 1. Place base section plumb and level.
  - 2. Install joint sealant uniformly around section lip.
  - 3. Overlay additional sections on joint sealant.
  - 4. Install cone or lid plumb and level on joint sealant.
- C. Cast-In-Place Concrete Base Pad:
  - 1. Form bottom of excavation walls clean and smooth to correct limits.
  - 2. Install reinforcement in maximum lengths. Offset end laps in both directions. Splice laps with tie wire.
  - 3. Place concrete in accordance with ACI PRC-304.
  - 4. Float base pad top surface level.
- D. Cast-In-Place Concrete Manholes:
  - 1. Form catch basin on concrete base pad plumb and level.
  - 2. Coordinate placement of embedded items with erection of concrete formwork and placement of form accessories.
  - 3. Install reinforcement in maximum lengths. Offset end laps in both directions. Splice laps with tie wire.
  - 4. Place concrete in accordance with ACI PRC-304.
  - 5. Float catch basin top surface level.
- E. Polymer Concrete Manhole Inserts: Install according to manufacturer's instructions.
  - 1. Protect manhole from foreign material entrance.
- F. Grade Adjustments:
  - 1. Lay concrete ring on mortar bed, plumb and level. Top with mortar, plumb and level.
  - 2. Place adjacent materials tight, and smooth following design grades.
- G. Frames and Covers:
  - 1. Place frame plumb and level.
  - 2. Mount frame on mortar bed at indicated elevation.
  - 3. Mount frame on expanded polypropylene ring according to manufacturer's instructions.
  - 4. Place grate in frame securely.

### **3.05 FIELD QUALITY CONTROL**

- A. Perform field inspection for pipe invert elevations.
- B. If inspections indicate work does not meet specified requirements, adjust work and reinspect at no cost to Owner.

**END OF SECTION**

**SITE SANITARY SEWERAGE GRAVITY PIPING****PART 1 GENERAL****1.01 SECTION INCLUDES**

- A. Sanitary sewerage drainage piping, fittings, and accessories.
- B. Connection of building sanitary drainage system to public sewer.
- C. Cleanout access.

**1.02 RELATED REQUIREMENTS**

- A. Section 31 23 16 - Excavation: Excavating of trenches.
- B. Section 31 23 16.13 - Trenching: Excavating, bedding, and backfilling.
- C. Section 31 23 23 - Fill: Bedding and backfilling.
- D. Section 33 05 61 - Concrete Manholes.

**1.03 PRICE AND PAYMENT PROCEDURES**

- A. Pipe and Fittings:
  - 1. Basis of Measurement: By the linear foot (meter).
  - 2. Basis of Payment: Includes hand trimming excavation, bedding, pipe and fittings, connection to building service piping and to public sewer.
- B. Cleanout:
  - 1. Basis of Measurement: By the unit for a nominal depth of 10 feet (3 m).
  - 2. Basis of Payment: Includes hand trimming excavating, foundation pad, unit installation with accessories, connection to sewer piping.

**1.04 DEFINITIONS**

- A. Bedding: Fill placed under, beside and directly over pipe, prior to subsequent backfill operations.

**1.05 REFERENCE STANDARDS**

- A. ASTM A74 - Standard Specification for Cast Iron Soil Pipe and Fittings; 2025.
- B. ASTM A746 - Standard Specification for Ductile Iron Gravity Sewer Pipe; 2018 (Reapproved 2022).
- C. ASTM C14 - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe; 2020 (Reapproved 2025).
- D. ASTM C14M - Standard Specification for Nonreinforced Concrete Sewer, Storm Drain, and Culvert Pipe (Metric); 2020 (Reapproved 2025).
- E. ASTM C76 - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe; 2025.
- F. ASTM C76M - Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe (Metric); 2022a.
- G. ASTM C443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets; 2021.
- H. ASTM C443M - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets (Metric); 2021.
- I. ASTM C564 - Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings; 2020a.
- J. ASTM D1785 - Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120; 2021a.
- K. ASTM D2321 - Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications; 2025.

- L. ASTM D2729 - Standard Specification for Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2021.
- M. ASTM D3034 - Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings; 2024, with Editorial Revision (2025).
- N. ASTM D3350 - Standard Specification for Polyethylene Plastics Pipe and Fittings Materials; 2024.
- O. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings; 2023.

#### **1.06 ADMINISTRATIVE REQUIREMENTS**

- A. Coordination: Coordinate the installation of sanitary sewer with size, location and installation of service utilities.
- B. Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.
- C. Sequencing: Ensure that utility connections are achieved in an orderly and expeditious manner.

#### **1.07 SUBMITTALS**

- A. Product Data: Provide data indicating pipe, pipe accessories, and clean outs.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Manufacturer's Installation Instructions: Indicate special procedures required to install Products specified.
- D. Field Quality Control Submittals: Document results of field quality control testing.
- E. Project Record Documents:
  - 1. Record location of pipe runs, connections, manholes, cleanouts, and invert elevations.
  - 2. Identify and describe unexpected variations to subsoil conditions or discovery of uncharted utilities.

### **PART 2 PRODUCTS**

#### **2.01 SEWER PIPE MATERIALS**

- A. Provide products that comply with applicable code(s).
- B. Cast Iron Soil Pipe: ASTM A74, service type, inside nominal diameter of 6 inches (152 mm), hub and spigot end.
- C. Joint Seals for Cast Iron Pipe: ASTM C564 rubber gaskets.
- D. Ductile Iron Pipe: ASTM A746, Pressure Class 350, with cement-mortar lining, inside nominal diameter of 6 inches (152 mm), bell and spigot end.
- E. Joint Seals for Ductile Iron Pipe: AWWA C111/A21.11; styrene butadiene rubber (SBR) or vulcanized SBR gaskets.
- F. Concrete Pipe: Nonreinforced, ASTM C14 or ASTM C14M, Class 1; inside nominal diameter of 6 inches (152 mm), bell and spigot end joints.
- G. Joint Seals for Concrete Pipe: ASTM C443 (ASTM C443M) rubber compression gaskets.
- H. Concrete Pipe: Reinforced, ASTM C76 (ASTM C76M), Class II with Wall type A; mesh reinforcement; inside nominal diameter of 6 inches (152 mm), bell and spigot end joints.
- I. Plastic Pipe: ASTM D2729, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 6 inches (152 mm), bell and spigot style solvent sealed joint end.
- J. Plastic Pipe: ASTM D1785, Schedule 40, Poly(Vinyl Chloride) (PVC) material; inside nominal diameter of 6 inches (152 mm), bell and spigot style solvent sealed joint end.
- K. Plastic Pipe: ASTM D3350, SDR 25 or 26, High Density Polyethylene (HDPE) material; inside nominal diameter of 6 inches (152 mm), with cell classification of 335434C or better, thermal

butt fusion joints and fittings in accordance with manufacturer's recommendations; pipe and fittings same material utilizing transition fittings when connecting to existing piping.

- L. Joint Seals: Mechanical clamp ring type, stainless steel expanding and contracting sleeve, neoprene ribbed gasket for positive seal.
- M. Fittings: Same material as pipe molded or formed to suit pipe size and end design, in required tee, bends, elbows, cleanouts, reducers, traps and other configurations required.

## **2.02 PIPE ACCESSORIES**

- A. Trace Wire: Magnetic detectable conductor, brightly colored plastic covering, imprinted with "Sewer Service" in large letters.
- B. Casing Spacer: Polyethylene spacer designed to maintain pipe casing integrity.

## **2.03 CLEANOUT MANHOLE**

- A. Lid and Frame: Cast iron construction, hinged lid.
  - 1. Lid Design: meet local requirements.
  - 2. Nominal Lid and Frame Size: 24 inches (600 mm).
- B. Shaft Construction and Concentric Cone Top Section: Reinforced precast Concrete pipe sections, lipped male/female dry joints, cast steel ladder rungs into shaft sections at 12 inches (300 mm); nominal shaft diameter of 48 inches (1,200 mm).
- C. Base Pad: Cast-in-place concrete levelled top surface to receive concrete shaft sections, sleeved to receive sanitary sewer pipe sections.

## **2.04 BEDDING AND COVER MATERIALS**

- A. Pipe Bedding Material: As specified in Section 31 23 23.
- B. Pipe Cover Material: As specified in Section 31 23 23.

## **PART 3 EXECUTION**

### **3.01 GENERAL**

- A. Perform work in accordance with applicable code(s).
- B. Verify that excavations, dimensions, and elevations are as indicated on Drawings.
- C. Notify Architect/Engineer if crossing conflicts occur.

### **3.02 TRENCHING**

- A. See Section 31 23 16.13 for additional requirements.
- B. Hand trim excavation for accurate placement of pipe to elevations indicated.
- C. Backfill around sides and to top of pipe with cover fill, tamp in place and compact, then complete backfilling.
- D. Protect and support existing sewer lines, utilities, and appurtenances.
- E. Place bedding material per the design drawings.

### **3.03 INSTALLATION - PIPE**

- A. Verify that trench cut is ready to receive work and excavations, dimensions, and elevations are as indicated on layout drawings.
- B. Install pipe, fittings, and accessories in accordance with manufacturer's instructions. Seal watertight.
  - 1. Plastic Pipe: Also comply with ASTM D2321.
- C. Lay pipe to slope gradients as indicated on Drawings.
- D. Begin at downstream end of system and progress upstream.
- E. Lay bell-and-spigot pipe with bells upstream.

- F. Lay pipe to slope gradients noted on layout drawings; with maximum variation from true slope of 1/8 inch (3 mm) in 100 feet (30.5 m).
- G. Connect to building sanitary sewer outlet and municipal sewer system , through installed sleeves.
- H. Install trace wire 6 inches (150 mm) above top of pipe; coordinate with Section 31 23 16.13.

#### **3.04 INSTALLATION - CLEANOUTS**

- A. Form bottom of excavation clean and smooth to correct elevation.
- B. Form and place cast-in-place concrete base pad, with provision for sanitary sewer pipe end sections.
- C. Establish elevations and pipe inverts for inlets and outlets as indicated.
- D. Mount lid and frame level in grout, secured to top cone section to elevation indicated.

#### **3.05 FIELD QUALITY CONTROL**

- A. If tests indicate Work does not meet specified requirements, remove Work, replace and retest at no cost to Owner.
- B. Pressure Test: Test in accordance with local requirements.
- C. Infiltration Test: Test in accordance with local requirements.
- D. Deflection Test: Test in accordance with local requirements.

#### **3.06 PROTECTION**

- A. Protect pipe and bedding cover from damage or displacement until backfilling operation is in progress.

**END OF SECTION**