WATER TREATMENT PLANT IMPROVEMENTS
GREENFIELD MUNICIPAL UTILITIES
2026

BID DATE: Tuesday, November 3, 2026 - 2:00 p.m. CST

PLACE TO FILE FOR PROJECT BIDS: GMU Downtown Generation Plant
116 SE Jackson Street
Greenfield, IA 50849

ADDENDUM NO. 2

October 29, 2026

TO ALL PLANHOLDERS:

The following changes, additions, and/or deletions are hereby made a part of the Contract Documents for the above referenced project, as fully and completely as if the same were fully set forth therein. All Bidders submitting a Bid on the above Contract shall carefully read this Addendum and give it consideration in the preparation of their Bid.

This Addendum No. 2 consists of the following:

- Addendum No. 2 pages AD2-1 through AD2-8 (8 pages)
- Specification Section 07 8400 – Firestopping (5 pages)
- Specification Section 22 0523.01 – Gate Valves (2 pages)
- Specification Section 28 4600 – Fire Detection and Alarm (9 pages)
- Specification Section 31 1000 – Site Preparation (5 pages)
- Specification Section 31 2316 – Excavation (4 pages)
- Specification Section 31 2319 – Dewatering (2 pages)
- Specification Section 31 2323 – Fill (5 pages)
- Specification Section 31 5000 – Excavation Support and Protection (2 pages)

PART I – CLARIFICATIONS

None

PART II – SPECIFICATIONS

1. Table of Contents, Division 7 – Add the following section:

   "07 8400 Firestopping"

2. Table of Contents, Division 22 – Add the following section:

   "22 0523.01 Gate Valves"

3. Table of Contents, Division 28 – Electronic Safety and Security – Add the following section:

   "28 4600 Fire Detection and Alarm"

4. Table of Contents, Division 31 – Add the following section:

"31 1000	Site Preparation
31 2316	Excavation
31 2319	Dewatering
31 2323	Fill
31 5000	Excavation Support and Protection"

5. Section 01 1000, paragraph 1.13.C – Replace the last sentence of paragraph 1.13.C with the following:

   "When it is necessary to interrupt services, the Contractor shall notify the Owner's representative, Engineer, and appropriate utility companies ten (10) days in advance of the interruption."

6. Section 03 3000, paragraph 1.05.E.1 – Replace "…South Dakota Department of Transportation." with "…Iowa Department of Transportation."

7. Section 03 3000, paragraph 2.01.A – Replace the first sentence of paragraph 2.01.A with the following:

   "Cement: ASTM C 150, Type I – Normal or Type II – Moderate Portland type, or ASTM C595, Type 1L or 1L (MS)."

8. Section 03 3000, paragraph 2.06.b – Replace paragraph 2.06.b with the following:

   "b. Before adding superplasticizers: 2 to 4 inches."

9. Section 03 4100, paragraph 1.03.A – Replace "…State of South Dakota." with "…State of Iowa."

10. Section 07 8400 – Firestopping – Add the attached specification section.

11. Section 08 4313, paragraph 2.02.A – Add the following to paragraph 2.02.A:

    "4. Tubelite Inc."

12. Section 21 1300, paragraph 2.04.C.2.b – Replace paragraph 2.04.C.2.b with the following: "Provide permanent sign reading "Test Valve" in accordance with Section 22 0553."

13. Section 22 0523.01 – Gate Valves – Add the attached specification section.

14. Section 22 0523.05, paragraph 2.01.Q – Add the following to paragraph 2.01.Q:

    "5. Elite Valve."

15. Section 22 0610.01, paragraph 1.02.B – Replace paragraph with the following: "Valves shall be provided with appropriate tags as per Specification Section 22 0553 – Identification for Plumping Piping and Equipment."

16. Section 220610.01, Valve Schedule (Addendum No. 1) – On the updated Valve Schedule issued as part of Addendum No. 1, change the "Mounting" designation for valves GV-4818, GV-4821, GV-4822, and GV-4823 from "FL" to "MJ".

17. Section 22 1117, paragraph 2.03 – Replace paragraphs 2.03.A and 2.03.B with the following:

    "A. Provide buried pipe materials and fittings in accordance with Division 22 and SUDAS 5010.
    B. For buried piping, furnish fill material and install piping in accordance with SUDAS 3010."

18. Section 22 1117, paragraph 3.03.C – Replace paragraph with the following:

    "Provide system testing in accordance with SUDAS 5030 and requirements specified in Process Mechanical Piping Schedule in Part 3 of this Section."

19. Section 26 0519, paragraph 3.03.E – Replace paragraphs 3.03.E.1 and 3.03.E.2 with the following:

    "1. Provide trenching and backfilling in accordance with SUDAS 3010 – Trench Excavation and Backfill.
    2. <Not Used>."

20. Section 26 0533.13, paragraph 2.01.E – Replace paragraphs 2.01.E with the following:

    "E. Interior, Damp or Wet Locations: Use RMC-Aluminum conduit (RMC-AL)."

21. Section 26 0533.13, paragraph 3.02.J – Replace paragraphs 3.02.J.1 and 3.02.J.2 with the following:

    "1. Provide trenching and backfilling; see SUDAS 3010.
    2. <Not Used>."

22. Section 26 3213, paragraph 2.03.A – Replace paragraph 2.03.A in its entirety (including A.1 through A.4) with the following:

    "A. Upon failure of normal utility power, the generator shall be required to pick up the electrical load of the entire facility. Refer to the one-line diagram and schedules on the Drawings for the loads present."

23. Section 28 4600 – Fire Detection and Alarm - Add the attached specification section.

24. Section 31 1000 - Site Preparation – Add the attached specification section.

25. Section 31 2316 - Excavation – Add the attached specification section.

26. Section 31 2319 - Dewatering – Add the attached specification section.

27. Section 31 2323 - Fill – Add the attached specification section.

28. Section 31 5000 – Excavation Support and Protection – Add the attached specification section.

29. Section 33 1313, paragraph 3.02.G - Replace paragraph 3.02.G with the following:

    "G. Disinfect piping from filter effluent and all piping downstream of the filter effluent including filter backwash supply piping according to AWWA C651 and Section 33 0110.58."

30. Section 44 4256.03, paragraph 2.01 – Add the following to paragraph 2.01:

    "G. KSB"

31. Section 46 3153.04, paragraph 2.04.C.4 – Replace paragraph 2.16.C.4 with the following:

    "4. Maximum Generator Power Consumption, KVA: 15"

32. Section 46 3153.04, paragraph 2.05.B.2 – Add the following paragraph 2.05.B.2.d:

    "d. In lieu of multiple injectors per skid, a single injector per skid, equipped with a VFD, is allowed provided required operating range and turndown performance can be demonstrated through supporting technical data."

33. Section 46 3153.04, paragraph 2.07.C.1.j – Replace paragraph 2.07.C.1.j with the following:

    "j. Manufacturer: Compressor shall be Kaeser Compressors, Inc., Quincy Compressor, or Engineer Approved Equal."

34. Section 46 3383, paragraph 2.16.C – Add ", and 5 mg/L ozonated water" to the end of paragraph 2.16.C.

PART III – DRAWINGS

35. Sheet G-002, General Project Note 5 – Revise final sentence of General Project Note 5 to the following:
    "GREENFIELD MUNICIPAL UTILITIES IS NOT RESPONSIBLE FOR SECURED/ UNSECURED MATERIALS STORED ONSITE."

36. Sheet S-103, General Notes – Revise the General Note 15 to the following:

    "14. ALL METALS SHALL BE GALVANIZED CARBON STEEL, UNO. REPAIR ANY DAMAGED GALVANIZING WITH ZINC RICH COATING AS SPECIFIED."

37. Sheet S-103, Detail 1 – Revise the Foundation Plan Note 15 to the following:

    "14. ALL FRAMING MEMBERS, EMBEDS, CONC ANCHORS AND FASTENERS SHALL BE GALVANIZED CARBON STEEL, UNO. REPAIR ANY DAMAGED GALVANIZING WITH ZINC RICH COATING AS SPECIFIED."

38. Sheet S-501, Concrete Material Schedule – Change the Waterproofing description for Mix 1 Environmental Structures from "AS REQD, SEE SPEC" to "YES – WATER CONTAINING STRUCTURES, N/A – NONWATER CONTAINING STRUCTURES".

39. Sheet A-002 – Revise the first two lines of the Building Data to state the following address:
    "Greenfield Water Treatment Plant
    2130 240th Lane, Greenfield, IA 50849"

40. Sheet A-108, Details 2 and 3 – Change the note pointing to the siding on Details 2 and 3 from "12" FLUSH WALL PANEL, MP-1" to "12" BOX RIB WALL PANEL, MP-1".

41. Sheet A-110 – Change the flooring Product Code on the third line of the Finish Specification Schedule, the Legend, and the Entry Vestibule finish table from "CT-1" to "LVT-1".

42. Sheet A-111 – Change the flooring Product Code on the Legend, and the finish tables for the Atrium, Hallway, Lab, and Office from "CT-1" to "LVT-1".

43. Sheet A-303, Detail 4 – Change the note on Detail 4 pointing to the door from "HOLLOW METAL DOOR & FRAME, SEE SCHEDULE" to "ALUMINUM DOOR & FRAME, SEE SCHEDULE".

44. Sheet P-301, Detail 1 – Add a pipe support to each of the raw water pumps (Typical 6) underneath the straight pipe spool directly adjacent to the concentric expansion joint connected to the pump suction. Add the note "See 6/P-502 Adjustable Pipe Support (Typ 6)".

45. Sheet P-502, Detail 2 – Add the following General Note to Detail 2/P-502:
    "1. METAL COMPONENTS SHALL BE STAINLESS STEEL."

46. Sheet E-103 – Add the following general note: "1. EXISTING PANEL IS CUTLER-HAMMER POW-R-LINE C TYPE PRL2A 200A 277/480V 3 PHASE 4 WIRE, 225A NEUTRAL PANEL FROM 1998."

47. Sheet E-108 – Add disconnect DS-EWH-7036 to west wall of Mechanical Plumbing Storage Room near EWH-7036.

48. Sheet E-108 – Add disconnect DS-CU-7035 to north exterior of building above the clearwells near CU-7035.

49. Sheet E-108 – Add tag AHU-7032 and circuit tag LPD-44-46 to unlabeled rectangular unit shown against the east wall of the Mechanical Plumbing Storage Room.

50. Sheet E-108 – Add disconnect DS-AHU-7032 to the east wall of the Mechanical Plumbing Storage Room near AHU-7032.

51. Sheet E-111 - Relocate disconnect switch DS-D-1543 serving Ozone Destruct Unit #1 to near unit D-1543A & B on the upper ozone building roof, approximately 15' to the West of where currently shown on plan.

52. Sheet E-111 – Change the symbol for LSH-3000 located near the southeast corner of the Ozone Building from a Radar Level Transmitter symbol to a Float symbol. Also move the Float to a location adjacent to the transformer.

53. Sheet E-111 – Show the Ozone Generator Transformer and associated tag "T-OZG" in the southeast corner of the Ozone Building where the associated concrete equipment pad and LSH-3000 are shown.

54. Sheet E-400, Detail 1 – Add the following to the Entry Vestibule:
    - FACP to the east wall of the Entry Vestibule.
        - Power via LPD-20 and add control circuit C-2074.
    - Smoke Detector
    - Manual pull station on east interior side of exit door.
    - Add Knox-box and exterior rated horn/strobe to north exterior door of the Entry Vestibule above card reader.

55. Sheet E-400, Detail 3 – Make the following changes for Sodium Hypochlorite Pumps CP-6413 and CP-6414:
    - Remove disconnect switches DS-6413 and DS-6414.
    - Add two dedicated receptacles on north wall of pump room, LPD-28 and LPC-30.
    - Power CP-6413 via LPD-28 and CP-6414 via LPD-30.
    - Add control circuits circuit C2075 for CP-6413, and C2076 and CP-6414.

56. Sheet E-400, Detail 3 – Add a sprinkler flow switch and a tamper switch to fire suppression sprinkler system riser located near the northwest edge of the Pump Room. See sheet M-102 for location of 2" FP riser.

57. Sheet E-402 – Add the following sentence to the end of Keynote #1:
"Electrical Contractor to provide and coordinate with mechanical contractor for interlocking."

58. Sheet E-502, Standby Generator – Change the sizing note for the Standby Generator from "1000kVA 480V 3PH" to "1000kVA 800KW MINIMUM, 480/277 3PH 4W".

59. Sheet E-502, MCC-3001 – Move "LPF" label to the Lighting Panel in MCC-3001.

60. Sheet E-502, MCC-3001 – Change the breaker size in MCC-3001 serving the Ozone Generator from "20A" to "50A".

61. Sheet E-502, MCC-3001 – Change the breaker size in MCC-3001 serving the Makeup Air Unit (MAU-8001) from "80A" to "70A".

62. Sheet E-502, MCC-2003 – Remove CP-6413 and CP-6414 VFD'S, disconnect, and motor from One-line. Keep buckets as 20A and label as "SPARE".

63. Sheet E-601, Disconnect Switch Schedule – Replace "DS-CU-7025" with "DS-CU-7035" in the Disconnect Switch Schedule.

64. Sheet E-601, Disconnect Switch Schedule – Add the following additional lines to the Disconnect Switch Schedule:

DISCONNECT SWITCH SCHEDULE

PLAN MARK	POLE	VOLTAGE	SWITCH AMPS	FUSE AMPS	ENCLOSURE	ITEM SERVED	AUX CONTACT	REMARKS
DS-BC-2350	3	480	30	-	3R	BRIDGE CRANE	-	
DS-HTR-7038	2	208	60	-	1	MECHANICAL ROOM AHU HEAT COIL #1	-	
DS-HTR-7039	2	208	30	-	1	MECHANICAL ROOM AHU HEAT COIL #2	-	
DS-6405	3	480	30	-	4X	TANKLESS WATER HEATER	-	
DS-EWH-7036	3	480	60	-	1	ELECTRIC WATER HEATER	-	
DS-AHU-7032	2	208	30	-	1	WTP AIR HANDLING UNIT	-	

65. Sheet E-602, Panelboard PCC – Change the breaker size for CKT #s 14, 16, and 18 from "30A" to "40A" for the Electric Water Heater.

66. Sheet E-603, Panelboard LPD – Replace "SPARE" 20A circuit 20 with "FIRE ALARM CONTORL PANEL FACP".

67. Sheet E-603, Panelboard LPD – Replace "SPARE" 20A circuits 28 and 30 with "SODIUM HYPOCHLORITE PUMP CP-6413" and "SODIUM HYPOCHLORITE PUMP CP-6414" respectively.

68. Sheet E-603, Panelboard LPD – Change the breaker size for CKT #s 52 and 54 from "30A" to "25A" for the Mechanical Room AHU heat coil #2.

69. Sheet E-604, Luminaire Schedule – Change the CATALOG NO. for the following LUM. Nos to what is shown in the following table:

LUM. NO.	CATALOG NO.
L0	CPX-2X2-5000LM-80CRI-35K-MIN10-EZT-MVOLT
L0E	CPX-2X2-5000LM-80CRI-35K-MIN10-EZT-MVOLT
H1	RNGD-SZ1-UVOLT-SWW3
H2	RNGD-SZ1-UVOLT-SWW3
H1E	RNGD-SZ1-UVOLT-SWW3 + BLDE40WCP
H2E	RNGD-SZ1-UVOLT-SWW3 + BLDE40WCP

70. Sheet E-604, Luminaire Schedule – Add the following as acceptable ALTERNATIVE MANUFACTURERS for the following LUM. NOs:

LUM. NO.	CATALOG NO.
R0	LIGHTWAY
R1	WAC, EUROFASE
P1	GARDCO, SAP-KW INDUSTRIES
S1	GARDCO, MCGRAW-EDISON

71. Sheet E-605, Cable & Raceway Schedule – Change wire and conduit size of power circuit P404 from “(3)-#10, #10 GND, ¾” ” to “(3)-#6, #6 GND, 1” ”.

72. Sheet E-605, Cable & Raceway Schedule – Change wire and conduit size of power circuit P404A from “(3)-#8, #10 GND, ¾” ” to “(3)-#6, #6 GND, 1” ”.

73. Sheet IC-520, CP-2002 – Add FACP and Ethernet connection.

74. Sheet IC-520 – Remove VFD-6413 and VFD-6414 and retag as CP-6413 and CP-6414. Place CP-6413 and CP-6414 outside of MCC-2003.

75. Sheet IC-601 – Revise Conductors for Circuit # C2019 to be “8-CAT6 TYPE DSC2, #14 GND”.

76. Sheet IC-602 – Replace duplicate C2071, C2072, C2073 “NOT USED” circuits with the following in the Control Cable & Raceway Schedule:

CIRCUIT #	FROM	TAG #	TO	TAG #	CONDUCTORS	CONDUIT
C2074	FIRE ALARM CONTROL PANEL	FACP	WATER PLANT CONTROL PANEL	CP-2000	2- CAT6 TYPE DSC1, #14 GND	3/4"
C2075	SODIUM HYPOCHLORITE CHEMICAL FEED PUMP #1	CP-6413	WATER PLANT CONTROL PANEL	CP-2000	1-CAT6 TYPE DSC1, #14 GND	3/4"
C2076	SODIUM HYPOCHLORITE CHEMICAL FEED PUMP #2	CP-6414	WATER PLANT CONTROL PANEL	CP-2000	1-CAT6 TYPE DSC1, #14 GND	3/4"



I hereby certify that this engineering document was prepared by me or under my direct personal supervision and that I am a duly licensed Professional Engineer under the laws of the State of Iowa.

10/29/2026

HEATH D. PICKEN, P.E.

License No. **16320**

My renewal date is **December 31**, **2027**

Pages or sheets covered by this seal:

Entire Addendum No. 2.

ALL BIDDERS SHALL ACKNOWLEDGE RECEIPT AND ACCEPTANCE OF ADDENDUM NO. 2 BY INCLUDING ITS NUMBER IN THE SPACES PROVIDED IN THE BID FORM.

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SECTION 078400
FIRESTOPPING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Firestopping systems.

B. Firestopping of joints and penetrations in fire-resistance-rated and smoke-resistant assemblies, whether indicated on drawings or not, and other openings indicated.

1.02 RELATED REQUIREMENTS

A. Section 017000 - Execution and Closeout Requirements: Cutting and patching.

B. Section 092116 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.

1.03 REFERENCE STANDARDS

A. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials.

B. ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems.

C. ASTM E1966 - Standard Test Method for Fire Resistive Joint Systems.

D. ASTM E2837 - Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies.

E. ASTM G21 - Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.

F. ITS (DIR) - Directory of Listed Products.

G. FM 4991 - Approval Standard for Firestop Contractors.

H. FM (AG) - FM Approval Guide.

I. UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems.

J. UL (FRD) - Fire Resistance Directory.

1.04 SUBMITTALS

A. See Section 013000 - Administrative Requirements for submittal procedures.

B. Schedule of Firestopping: List each type of penetration, fire rating of the penetrated assembly, and firestopping test or design number.

C. Product Data: Provide data on product characteristics, performance ratings, and limitations.

D. Installer's qualification statement.

1.05 QUALITY ASSURANCE

A. Fire Testing: Provide firestopping assemblies of designs that provide the scheduled fire ratings when tested in accordance with methods indicated, ASTM E119, and ASTM E814.
   1. Listing in UL (FRD), FM (AG), or ITS (DIR) will be considered as constituting an acceptable test report.
   2. Submission of actual test reports is required for assemblies for which none of the above substantiation exists.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.

C. Installer Qualifications: Company specializing in performing the work of this section and:
   1. Trained by manufacturer.
   2. Approved by Factory Mutual Research Corporation under FM 4991, or meeting any two of the following requirements:
   3. Verification of at least five satisfactorily completed projects of comparable size and type.
   4. Licensed by local authorities having jurisdiction (AHJ).

1.06 FIELD CONDITIONS

A. Comply with firestopping manufacturer's recommendations for temperature and conditions during and after installation; maintain minimum temperature before, during, and for three days after installation of materials.

B. Provide ventilation in areas where solvent-cured materials are being installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Firestopping Manufacturers:
   1. 3M Fire Protection Products: www.3m.com/firestop/#sle.
   2. A/D Fire Protection Systems Inc: www.adfire.com/#sle.
   3. Hilti, Inc: www.us.hilti.com/#sle.
   4. Specified Technologies Inc: www.stifirestop.com/#sle.
   5. Substitutions: See Section 016000 - Product Requirements.

2.02 MATERIALS

A. Firestopping Materials: Any materials meeting requirements.

B. Mold and Mildew Resistance: Provide firestoppping materials with mold and mildew resistance rating of zero(0) in accordance with ASTM G21.

C. Primers, Sleeves, Forms, Insulation, Packing, Stuffing, and Accessories: Provide type of materials as required for tested firestopping assembly.

D. Fire Ratings: Refer to drawings for required systems and ratings.

2.03 FIRESTOPPING, GENERAL

A. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.

B. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials and to comply with Part 1 “Performance Requirements” Article. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.

2.04 MATERIALS

A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

B. Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specified diameter of penetrant.

D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized steel sheet.

E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.

F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.

G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.

H. Pillows/Bags: Reusable heat-expanding pillow/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives.

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

J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
   1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and other surfaces requiring a nonslumping, gunnable sealant, unless indicated firestop system limits use to nonsag grade for both opening conditions.
   2. Grade for Horizontal Surfaces: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces.
   3. Grade for Vertical Surfaces: Nonsag formulation for openings in vertical and other surfaces.

2.05 FIRESTOPPING ASSEMBLY REQUIREMENTS

A. Head-of-Wall (HW) Joint System Firestopping at Joints Between Fire-Rated Wall Assemblies and Non-Rated Horizontal Assemblies: Use system that has been tested according to ASTM E2837 to have fire resistance F Rating equal to required fire rating of wall assembly.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

B. Floor-to-Floor (FF), Floor-to-Wall (FW), Head-of-Wall (HW), and Wall-to-Wall (WW) Joints, Except Perimeter, Where Both Are Fire-Rated: Use system that has been tested according to ASTM E1966 or UL 2079 to have fire resistance F Rating equal to required fire rating of the assembly in which the joint occurs.
   1. Movement: Provide systems that have been tested to show movement capability as indicated.

C. Through Penetration Firestopping: Use system that has been tested according to ASTM E814 to have fire resistance F Rating equal to required fire rating of penetrated assembly.

2.06 FIRESTOPPING SYSTEMS

A. Firestopping:
   1. Fire Ratings: See drawings for required systems and ratings.

B. Firestopping at Uninsulated Metallic Pipe and Conduit Penetrations, of diameter 4 inches or less: Any material meeting requirements.
   1. Available UL-Classified Systems: C-BJ-2001-2999 and W-L-2001-2999.

C. Firestopping at Insulated Pipes, of diameter 4 inches or less: Any material meeting requirements.
   1. Available UL-Classified Systems:C-BJ-5001-5999 and W-L-5001-5999.

D. Firestopping at Cable Tray Penetrations: Any material meeting requirements.
   1. Available UL-Classified Systems:W-L-4001-4999.

E. Firestopping at Cable Penetrations, not in Conduit or Cable Tray: Any material meeting requirements.
   1. Available UL-Classified Systems: C-BJ-3001-3999, W-L-6001-6999 and W-L-3001-3999.

F. Firestopping at Control Joints (without Penetrations): Any material meeting requirements.
   1. Available UL-Classified Systems: C-BJ-0001-0999 and W-L-0001-0999.

G. Firestop Systems for Miscellaneous Penetrants: Any material meeting requirements.
   1. Available UL-Classified Systems:W-J-7001-7999 and W-L-7001-7999.

H. Firestop Systems for Groupings of Penetrants: Any material meeting requirements.
   1. Available UL-Classified Systems:C-BJ-8001-8999 and W-L-8001-8999.

2.07 MIXING

A. For those products requiring mixing before application, comply with through-penetration firestop system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify openings are ready to receive the work of this section.

B. Examine substrates and conditions, with Installer present, for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of work.

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

3.02 PREPARATION

A. Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other materials that could adversely affect bond of firestopping material.

B. Remove incompatible materials that could adversely affect bond.

C. Install backing materials to arrest liquid material leakage.

3.03 COORDINATION

A. Coordinate construction of openings, penetrations and construction joiunts to ensure that the fire stop systems are installed according to specified requirements.

B. Coordinate sizing of sleeves, openings, core-drilled holes or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.

3.04 INSTALLATION

A. Install materials in manner described in fire test report and in accordance with manufacturer's instructions, completely closing openings.

B. Do not cover installed firestopping until inspected by authorities having jurisdiction.

C. Install labeling required by code.

3.05 IDENTIFICATION

A. Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, pre-printed vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:
   1. The words "Warning: Through Penetration Firestop System - Do Not Disturb. Notify Building Management of Any Damage."
   2. Contractor's name, address and phone number.
   3. Through-penetration firestop system designation of applicable testing and inspecting agency.
   4. Date of installation.
   5. Through-penetration firestop system manufacturer's name.
   6. Installer's name.

3.06 FIELD QUALITY CONTROL

A. Repair or replace penetration firestopping and joints at locations where inspection results indicate firestopping or joints do not meet specified requirements.

3.07 CLEANING

A. Clean adjacent surfaces of firestopping materials.

3.08 PROTECTION

A. Protect adjacent surfaces from damage by material installation.

END OF SECTION

SECTION 22 0523.01
GATE VALVES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient Seated Gate Valves and Accessories.

1.02 REFERENCES

A. AWWA C500 - Gate Valves for Water and Sewerage Systems.

B. AWWA C509 - Resilient Seated Gate Valves for Water and Sewerage Systems.

C. AWWA C550 - Protective Epoxy Interior Coatings for Valves and Hydrants.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Submit the following as appropriate for each valve provided:
   1. Outline and installation drawings for equipment and fixtures furnished.
   2. Equipment performance data and operating characteristics.
   3. Manufacturer's catalog data, marked to indicate materials being furnished as standard equipment, fixtures, specialties, and accessories.
   4. Shop Drawings on shop-fabricated systems.
   5. Drawings showing arrangement of piping, controls, and accessory equipment furnished.

C. Manufacturer's Certificates: Certify that products of this section meet or exceed specified requirements.

D. Operation and Maintenance Manual as described in Section 01 7800.

1.04 DELIVERY, STORAGE, AND PROTECTION

A. Arrange delivery of products in accordance with construction schedules and to allow inspection prior to installation.

B. Coordinate deliveries to avoid conflict with conditions at site.

C. Deliver products in undamaged condition in original containers or packaging, with identifying labels intact and legible.

D. Clearly mark to identify partial deliveries of component parts to facilitate assembly.

E. Store products immediately on delivery and protect until installed. Storage to be done according to manufacturer's instructions with seals and labels intact and legible.

F. Provide platforms, blocking or skids, or coverings required to protect products from deterioration or damage.

G. Arrange storage in a manner to provide easy access for inspection.

H. Maintain storage conditions to prevent deterioration or damage.

I. Protect products after installation to prevent damage from subsequent operations. Remove when no longer needed.

J. Provide equipment and personnel necessary to handle products by methods to prevent damage to products or packaging.

K. Handle products by methods to prevent bending or overstressing.

1.05 CERTIFICATION FOR APPLICATION IN DRINKING WATER SYSTEM

A. All products shall be certified by an American National Standards Institute (ANSI) accredited third party for conformance with American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 specification and NSF 600, as applicable.

PART 2 PRODUCTS

2.01 GATE VALVES

A. Resilient Seated Gate Valves: AWWA C509. All valves shall be of the iron-body resilient-wedge type with non-rising stems, sizes 3" NPS through 24" NPS in diameter.
   1. All valves by the same manufacturer.
   2. Body, Bonnet, Stuffing Box: Cast iron or ductile iron.
   3. Bolts and Nuts: Stainless steel.
   4. Valve Ends: Flanged for above-ground or Mechanical joint for buried.
   5. Wedge: Cast iron or ductile iron, resilient coated.
   6. Stem: Manganese bronze, non-rising stem.
   7. Seals: Synthetic rubber O-rings.
   8. Stem Extensions: Steel, provide for buried valves with valve boxes; 2" square operating nut, if required.
   9. Operator: Type as noted on the plans and valve schedule, specified in Section 22 0523.60.
   10. Coating: Buried valves shall have manufacturer's standard exterior asphalt or epoxy coating. Above-grade valves shall have manufacturer's standard exterior primer, compatible with epoxy field coating as per Section 09 9000.
   11. Pressure Rating: 200 psi, bubble-tight closure.
   12. Direction of Operation: Counterclockwise to open.
   13. Smooth, unobstructed waterway with a diameter not less than the full nominal diameter of the valve.
   14. Wrap all buried valves with polyethylene encasement in accordance with Section 33 1416.
   15. Approved Manufacturers:
      a. American Flow Control, Model: Series 2500.
      b. Clow, Model: F-6100, F-6102.
      c. Kennedy, Model: Fig. 1561-X, 1571-X.
      d. M & H, Model: Style 3067-01, 3067-02.
      e. Mueller, Model: Resilient Wedge.
      f. US Pipe, Model: AUSP1.
      g. Engineer approved equivalent.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with manufacturer's instructions as shown on the plans by qualified craftsmen.

B. Location, orientation, and quantities as shown on the plans.

C. Include all required related items necessary for a complete installation.

D. Surface preparation shall follow the piping surface preparation specification. Contractor shall be responsible for compatibility of manufacturers shop coating and final finish.

E. Support independently or from piping.

END OF SECTION 22 0523.01

SECTION 28 4600
FIRE DETECTION AND ALARM

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Dedicated-function fire alarm system for supervision of a single wet-pipe sprinkler system, including fire alarm control panel, initiating devices, monitoring equipment, wiring, and conduit.

B. Transmitters for communication with supervising station.

C. Maintenance of fire alarm system under contract for specified warranty period.

1.02 RELATED REQUIREMENTS

A. Section 07 8400 - Firestopping: Materials and methods for work to be performed by this installer.

B. Section 21 1300 - Fire-Suppression Sprinkler Systems: Supervisory, alarm, and actuating devices installed in sprinkler system.

1.03 REFERENCE STANDARDS

A. 36 CFR 1191 - Americans with Disabilities Act (ADA) Accessibility Guidelines for Buildings and Facilities; Architectural Barriers Act (ABA) Accessibility Guidelines.

B. ADA Standards - 2010 ADA Standards for Accessible Design.

C. IEEE C62.41.2 - IEEE Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) AC Power Circuits.

D. NFPA 70 - National Electrical Code.

E. NFPA 72 - National Fire Alarm and Signaling Code.

1.04 SUBMITTALS

A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.

B. Design Documents: Submit all information required for plan review and permitting by authorities having jurisdiction, including but not limited to floor plans, riser diagrams, and description of operation:
   1. Copy (if any) of list of data required by authority having jurisdiction.
   2. NFPA 72 "Record of Completion", filled out to the extent known at the time.
   3. Clear and concise description of operation, with input/output matrix similar to that shown in NFPA 72 Appendix A-7-5-2.2(9), and complete listing of software required.
   4. System zone boundaries and interfaces to fire safety systems.
   5. Location of all components, circuits, and raceways; mark components with identifiers used in control unit programming.
   6. Circuit layouts; number, size, and type of raceways and conductors; conduit fill calculations; spare capacity calculations; notification appliance circuit voltage drop calculations.
   7. List of all devices on each signaling line circuit, with spare capacity indicated.
   8. Manufacturer's detailed data sheet for each component, including wiring diagrams, installation instructions, and circuit length limitations.
   9. Description of power supplies; if secondary power is by battery include calculations demonstrating adequate battery power.
   10. Certification by either the manufacturer of the control unit or by the manufacturer of each other component that the components are compatible with the control unit.
   11. Certification by the manufacturer of the control unit that the system design complies with Contract Documents.
   12. Certification by Contractor that the system design complies with Contract Documents.
   13. Identify the system as a dedicated-function fire alarm system for sprinkler supervisory service. Include sequence of operations for sprinkler waterflow switch, valve supervisory switch, panel smoke detector, and supervising station communications.

C. Inspection and Test Reports:
   1. Submit inspection and test plan prior to closeout demonstration.
   2. Submit documentation of satisfactory inspections and tests.
   3. Submit NFPA 72 "Inspection and Test Form," filled out.

D. Operating and Maintenance Data: See Section 01 7800 for additional requirements; revise and resubmit until acceptable; have one set available during closeout demonstration:
   1. Complete set of specified design documents, as approved by authority having jurisdiction.
   2. Additional printed set of project record documents and closeout documents, bound or filed in same manuals.
   3. Contact information for firm that will be providing contract maintenance and trouble call-back service.
   4. List of recommended spare parts, tools, and instruments for testing.
   5. Replacement parts list with current prices, and source of supply.
   6. Detailed troubleshooting guide and large scale input/output matrix.
   7. Preventive maintenance, inspection, and testing schedule complying with NFPA 72; provide printed copy and computer format acceptable to Owner.
   8. Detailed but easy to read explanation of procedures to be taken by non-technical administrative personnel in the event of system trouble, when routine testing is being conducted, for fire drills, and when entering into contracts for remodeling.

E. Project Record Documents: See Section 01 7800 for additional requirements; have one set available during closeout demonstration:
   1. Complete set of floor plans showing actual installed locations of components, conduit, and zones.
   2. "As installed" wiring and schematic diagrams, with final terminal identifications.
   3. "As programmed" operating sequences, including control events by device, updated input/output chart, and voice messages by event.

F. Closeout Documents:
   1. Certification by manufacturer that the system has been installed in compliance with manufacturer's installation requirements, is complete, and is in satisfactory operating condition.
   2. NFPA 72 "Record of Completion", filled out completely and signed by installer and authorized representative of authority having jurisdiction.
   3. Maintenance contract.

1.05 QUALITY ASSURANCE

A. Designer Qualifications: NICET Level III or IV (3 or 4) certified fire alarm technician or registered fire protection engineer, employed by fire alarm control panel manufacturer, Contractor, or installer , with experience designing fire alarm systems in the jurisdictional area of the authorities having jurisdiction.

B. Maintenance Contractor Qualifications: Same entity as installer or different entity with specified qualifications.

C. Product Listing Organization Qualifications: An organization recognized by OSHA as a Nationally Recognized Testing Laboratory (NRTL) and acceptable to authorities having jurisdiction.

1.06 WARRANTY

A. Provide control panel manufacturer's warranty that system components other than wire and conduit are free from defects and will remain so for 2 years after date of Substantial Completion.

B. Provide installer's warranty that the installation is free from defects and will remain so for 2 years after date of Substantial Completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fire Alarm Control Units and Accessories:
   1. Honeywell Security & Fire Solutions/Notifier: www.notifier.com/#sle.
   2. Siemens Building Technologies, Inc: www.usa.siemens.com/#sle.
   3. Simplex, a Tyco Business: www.simplex-fire.com/#sle.
   4. Provide control units made by the same manufacturer.

B. Initiating Devices and Notification Appliances:
   1. Same manufacturer as control units.

C. Substitutions: See Section 01 6000 - Product Requirements.
   1. For other acceptable manufacturers of control units specified, submit product data showing equivalent features and compliance with Contract Documents.
   2. For substitution of products by manufacturers not listed, submit product data showing features and certification by Contractor that the design will comply with Contract Documents.

2.02 FIRE ALARM SYSTEM

A. Provide a new dedicated-function fire alarm system for supervision of a single wet-pipe sprinkler system.
   1. Provide all components necessary, regardless of whether shown in Contract Documents or not.
   2. Comply with the following; where requirements conflict, order of precedence of requirements is as listed:
      a. ADA Standards.
      b. The requirements of the State Fire Marshal.
      c. The requirements of the local authority having jurisdiction.
      d. Applicable local codes.
      e. Contract Documents (drawings and specifications).
      f. NFPA 72; where the word "should" is used consider that provision mandatory; where conflicts between requirements require deviation from NFPA 72, identify deviations clearly on design documents.
   3. The primary design intent of the system is monitoring a single sprinkler waterflow switch, a single sprinkler valve supervisory switch, one smoke detector at the fire alarm control panel, supervising station communications, and associated alarm functions shown on the Drawings.

B. Fire Alarm Control Panel (FACP) Display:
   1. Minimum of two lines
   2. Indicate location of device initiating alarm, supervisory or trouble condition by device address and by English-language description.

C. Signal Priority, not affected by order of occurrence:
   1. Alarm
   2. Supervisory
   3. Trouble

D. System Trouble or Supervisory Signal:
   1. Sound trouble signal and indicate at FACP.
   2. Record event in system memory.

E. Alarm Signal:
   1. Indicate at FACP.
   2. Record event in system memory.
   3. Operate notification appliances continuously, until silenced.
   4. Operate notification appliances throughout the building. Notification appliances are included to satisfy potential Authority Having Jurisdiction requirements and shall be provided where indicated on the Drawings.

F. System Silencing and Reset:
   1. Controlled by buttons in the FACP.
   2. Subsequent alarm signals reactivate notification appliances.

G. Circuits:
   1. Initiating Device Circuits (IDC): Class B, Style A.
   2. Signaling Line Circuits (SLC) Within Single Building: Class B, Style 4.
   3. Notification Appliance Circuits (NAC): Class B, Style Y.

H. Spare Capacity:
   1. Initiating Device Circuits: Minimum 25 percent spare capacity.
   2. Notification Appliance Circuits: Minimum 25 percent spare capacity.
   3. Fire Alarm Control Units: Capable of handling all circuits utilized to capacity without requiring additional components other than plug-in control modules.

2.03 FIRE SAFETY SYSTEMS INTERFACES

A. Supervision: Provide supervisory signals in accordance with NFPA 72 for the following:
   1. Sprinkler water control valves.

B. Alarm: Provide alarm initiation in accordance with NFPA 72 for the following:
   1. Sprinkler water flow.
   2. Manual stations where indicated on the Drawings.
   3. One smoke detector located within 10 feet of the fire alarm control panel.

2.04 COMPONENTS

A. General:
   1. Provide flush mounted units where installed in finish areas; in unfinished areas, surface mounted unit are acceptable.
   2. Provide legible, permanent labels for each control device, using identification used in operation and maintenance data.

B. Fire Alarm Control Units: Analog, addressable type; listed, classified, and labeled as suitable for the purpose intended.

C. Fire Alarm Control Panel:
   1. Cabinet: Lockable steel enclosure. Arrange interior components so operations required for testing or for normal maintenance of the system are performed from the front of the enclosure. If more than one unit is required to form a complete control panel, fabricate with matching modular unit enclosure to accommodate components and to allow ample gutter space for field wiring and interconnecting panels.
      a. Mounting: Semi-flush.
      b. Keys: Common to all system components.
   2. Password Protection: Multi level.
   3. Communication Format: Digital poll/response protocol with each addressable device. The system shall verify that the type device at each address matches the software configuration.
   4. Event Storage:
      a. The system stores and logs alarm and trouble events. Each recorded event includes the time and date of the event’s occurrence.
      b. The system has the capability of recalling alarms, detector verifications, trouble conditions, acknowledgments, and silencing and reset activities in chronological order for the purpose of recreating an event history.
      c. Memory: Battery protected random access memory.
      d. Alarm Log: 300 events.
      e. Trouble Log: 300 events.
      f. Available Reports:
         1) Alarm, trouble and test conditions including the time and date of each occurrence.
         2) Status of each device in the system.

5. Alarm and Supervisory Systems: Separate and independent in the FACP. Alarm-initiating zone boards consist of plug-in cards. Construction requiring removal of field wiring for module replacement is unacceptable.
    a. Quantity of Simultaneous Alarms: Unlimited.
    b. Maintenance Alert: Automatically warns of a contaminated detector prior to false alarm.
6. Control Modules: Include types and capacities required to perform all functions of fire alarm systems.
7. Indications: Local, visible, and audible indication of alarm, supervisory, and trouble conditions.
8. Resetting Controls: Prevent the resetting of alarm, supervisory, or trouble signals while the alarm or trouble condition still exists.
9. Alphanumeric Display and System Controls:
    a. Display: Liquid-crystal type, two lines, 40 characters per line, minimum. Displays the following:
    b. Alarm, supervisory and component status.
    c. Programming, display and control commands.
    d. Keypad: Arranged to permit entry and execution of programming, display, and control commands.
    e. Bypass Switches: Activation of a bypass switch allows system testing without operation of the bypassed circuit. A trouble condition is generated upon operation of a bypass switch. Provide bypass switches for the following:
        1) Remote monitoring station notification.
10. Programming:
    a. System Memory: Non-volatile, programmable.
    b. Loading or editing of special instructions and operating sequences allowed as required.
    c. Capable of on-site programming to accommodate and facilitate expansion, building parameter changes, or changes as required by local codes.
    d. Provisions for disabling and enabling all addressable devices, and all monitoring, signaling and control circuits individually for maintenance and testing purposes.
11. Digital Alarm Communicator Transmitter:
    a. Listed and labeled under UL 864 and NFPA 72.
    b. Transmit alarm, supervisory, and trouble events to a central monitoring station through a listed dual-path cellular/IP communication system. Loss of communication shall initiate a local trouble signal and retransmission in accordance with NFPA 72.
    c. Located within the FACP if possible. Provide integral batteries with an automatic charger if unit is located remotely from FACP.
12. Power Supply:
    a. Primary: Dedicated branch circuits of the facility power distribution system.
    b. Secondary: Storage batteries.
    c. Battery Capacity: Sufficient to operate entire system for period specified by NFPA 72.
    d. Battery Charger: Solid state, automatic with variable charging rate with capacity for 150 percent of connected system load while maintaining batteries at full charge.

D. Signal Circuit Remote Power Supply
1. Provide where required to support notification appliance loading.
2. General: Filtered, regulated, power limited with trouble indication; with emergency power supply.
3. Cabinet: Lockable steel, surface-mounted enclosure.

E. Initiating Devices:
1. Addressable Systems:
    a. Addressable Devices: Individually identifiable by addressable fire alarm control unit.

b. Provide suitable addressable interface modules as indicated or as required for connection to conventional (non-addressable) devices and other components that provide a dry closure output.

2. Manual Pull Stations:
   a. Single-action.
   b. Constructed of metal or plastic.
   c. Integral addressable module.
   d. Key-operated reset.
3. Smoke Detectors:
   a. 24 Volt, DC
   b. Photoelectric type.
   c. Self-restoring.
   d. Integral addressable module.
   e. LED indicator to show detector status.
   f. Plug-in mounting in fixed detector base.
   g. Magnetically actuated test switch.

F. Addressable Interface Devices:
1. Monitor Module: Allows individual monitoring of non-addressable points.
2. Control Module: Provides a system address to relays for control functions.
   a. Relay: 24 VDC coil; contacts rated 10A, 115 VAC, minimum; suitable for control function required.
3. Provide one monitor module for sprinkler waterflow switch.
4. Provide one monitor module for sprinkler valve supervisory switch.

G. Remote Indicators and Test Switches
1. LED indicator connected to flash when the associated detector is in an alarm or trouble condition.
2. Combined with a keyed detector test switch where indicated.
3. Flush-mounted in a single gang wall plate.

H. Notification Appliances:
1. Combination devices consist of audible and visual devices, factory-assembled as a single assembly. Provide low frequency devices where required by Code. Provide weatherproof devices at outdoor locations or where indicated.
2. Horns: Electronic, multi-tone type, 24 Volt DC, sound pressure of 90 dB measured 10 feet from the horn.
3. Stobes:
   a. Xenon strobe with clear polycarbonate lens.
   b. Rated light output: as selected by the system supplier to provide Code-required coverage of the area where the strobe is located.
   c. Synchronized operation.

I. Circuit Conductors:
1. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 degrees C, color-coded insulation.
   a. Low-Voltage Circuits: No. 14 AWG, minimum.
   b. Line-Voltage Circuits: No. 12 AWG, minimum.
2. Power-Limited Circuits: Types FPL, FPLR, or FPLP, as recommended by manufacturer.

J. Surge Protection: In accordance with IEEE C62.41.2 category B combination waveform and NFPA 70; except for optical fiber conductors.
1. Equipment Connected to Alternating Current Circuits: Maximum let through voltage of 350 V(ac), line-to-neutral, and 350 V(ac), line-to-line; do not use fuses.

2. Initiating Device Circuits, Notification Appliance Circuits, and Communications Circuits: Provide surge protection at each point where circuit exits or enters a building; rated to protect applicable equipment; for 24 V(dc) maximum dc clamping voltage of 36 V(dc), line-to-ground, and 72 V(dc), line-to-line.
3. Signaling Line Circuits: Provide surge protection at each point where circuit exits or enters a building, rated to protect applicable equipment.

K. Locks and Keys: Deliver keys to Owner.

L. Remote annunciator shall not be provided unless specifically required by the Authority Having Jurisdiction.

PART 3 EXECUTION

3.01 INSTALLATION

A. Install in accordance with applicable codes, NFPA 72, NFPA 70, and Contract Documents.

B. Install wiring in metal raceways. Conceal all wiring, conduit, boxes, and supports where installed in finished areas.

C. The locations and spacing of alarm initiating devices and notification appliances indicated on the drawings are approximate. Quantities indicated are minimum. The equipment supplier shall verify device requirements necessary for sprinkler supervisory monitoring and shall add only those devices required by governing authorities for approval of the sprinkler supervisory system. It shall be the responsibility of the equipment supplier or his representative to determine the type of detector required by local authorities for each type of installation.

D. Install the fire alarm system in accordance with approved manufacturer's wiring diagrams. Furnish all conduit, wiring, outlet boxes, junction boxes, cabinets, and similar devices necessary for a complete installation. Boxes shall be installed in accessible spaces without requiring the removal of light fixtures or any other equipment.

E. Coordinate system programming with the authority having jurisdiction.

F. Provide 120 volt power to remote signal circuit power supplies.

G. Coordinate the installation of equipment and devices that pertain to the work of other trades with the appropriate contractors.

H. Install in accordance with applicable codes, NFPA 72, NFPA 70, and the contract documents.

I. Install end-of-line resistors at farthest device from panel or module.

J. Ground cable shields and equipment according to manufacturer's instructions.

K. Install instruction cards and labels.

3.02 DEVICE INSTALLATION

A. Provide devices as indicated on drawings and as required to perform specified functions.

B. Initiating Devices:
1. Smoke Detectors:
   a. Cover all smoke detection devices immediately after installation to maintain cleanliness.
   b. Provide a smoke detector within 10 feet of the fire alarm control panel.
2. Program address for each device as recommended by system supplier or Owner.
3. Program device output text by address and geographic location (zone).

C. Notification Appliances:
1. Where plans indicate a notification appliance installed adjacent to a manual station, install the notification appliance on the wall directly above the manual station.
2. Provide a minimum of one weatherproof visual notification appliance of the same type as other notification appliances provided with the system. Mount device on the building exterior; verify location. Provide a separate circuit for exterior notification appliances.
3. In sprinkled buildings, provide a 120 volt circuit to the fire sprinkler bell location.

D. Control Devices:
   1. Provide control modules and relays as required to implement the required control sequences.

E. Cabinets:
   1. Mount FACP and remote cabinets a maximum of 72 inches above finished floor to the top of the cabinet. Provide a 4-inch space between adjacent cabinets.

3.03 INTERCONNECTION TO OTHER SYSTEMS

A. Alarm Indicating:
   1. Provide (2) Cat 6 cables to the locations indicated on the Drawings. One cable is spare.

B. Fire Protection System:
   1. Connect one sprinkler waterflow switch and one sprinkler valve supervisory switch to the fire alarm control panel through addressable monitor modules.
   2. Provide alarm signal for waterflow switch activation.
   3. Provide supervisory signal for valve supervisory switch activation.
   4. Verify exact quantities and locations of equipment with Fire Protection Contractor.
   5. Transmit alarm, supervisory, and trouble conditions to the supervising station.

C. Waterflow Switch:
   1. Activation of the sprinkler waterflow switch shall:
      a. Initiate alarm condition at the fire alarm control panel.
      b. Activate notification appliances where provided.
      c. Record event in system history.
      d. Transmit alarm signal to supervising station.

D. Valve Supervisory Switch:
   1. Operation of the valve supervisory switch shall:
      a. Initiate supervisory condition at the fire alarm control panel.
      b. Record event in system history.
      c. Transmit supervisory signal to supervising station.

E. Panel Smoke Detector:
   1. Activation of the panel smoke detector shall:
      a. Initiate an alarm condition at the fire alarm control panel.
      b. Record event in system history.
      c. Transmit signal to supervising station.
      d. Activate notification appliances where provided.

F. Trouble Conditions:
   1. Power failure, low battery, charger failure, communication failure, short circuit, open circuit, and ground fault shall generate a trouble signal at the fire alarm control panel and supervising station.

3.04 IDENTIFICATION

A. Paint power-supply disconnect switch or breaker red and label "FIRE ALARM". Provide locking means.

B. Affix the name and telephone number of the local service organization to the inside of the door of the FACP and each remote cabinet.

C. Label each addressable device with its address using laminated tape. See Section 26 0553 Identification for Electrical Systems for tape requirements. Attach label to detector base shroud so it is visible without removing detector or shroud.

D. Label each control module to indicate the equipment controlled.

E. Maintain wiring color codes throughout the system.

3.05 INSPECTION AND TESTING FOR COMPLETION

A. Notify Owner 7 days prior to beginning completion inspections and tests.

B. Notify authorities having jurisdiction and comply with their requirements for scheduling inspections and tests and for observation by their personnel.

C. Provide the services of the installer's supervisor or person with equivalent qualifications to supervise inspection and testing, correction, and adjustments.

D. Prepare for testing by ensuring that all work is complete and correct; perform preliminary tests as required.

E. Provide all tools, software, and supplies required to accomplish inspection and testing.

F. Perform inspection and testing in accordance with NFPA 72 and requirements of local authorities; document each inspection and test.

G. Correct defective work, adjust for proper operation, and retest until entire system complies with Contract Documents.

3.06 CLOSEOUT

A. Closeout Demonstration: Demonstrate proper operation of all functions to Owner.
   1. Be prepared to conduct any of the required tests.
   2. Have at least one copy of operation and maintenance data, preliminary copy of project record drawings, input/output matrix, and operator instruction chart(s) available during demonstration.
   3. Have authorized technical representative of control unit manufacturer present during demonstration.
   4. Demonstration may be combined with inspection and testing required by authority having jurisdiction; notify authority having jurisdiction in time to schedule demonstration.
   5. Repeat demonstration until successful.

3.07 MAINTENANCE

A. See Section 01 7000 - Execution and Closeout Requirements, for additional requirements relating to maintenance service.

B. Provide to Owner, at no extra cost, a written maintenance contract for entire manufacturer's warranty period, to include the work described below.

C. Perform routine inspection, testing, and preventive maintenance required by NFPA 72, including:
   1. Maintenance of fire safety interface and supervisory devices connected to fire alarm system.
   2. Repairs required, unless due to improper use, accidents, or negligence beyond the control of the maintenance contractor.
   3. Record keeping required by NFPA 72 and authorities having jurisdiction.

D. Provide trouble call-back service upon notification by Owner:
   1. Provide on-site response within 2 hours of notification.
   2. Include allowance for call-back service during normal working hours at no extra cost to Owner.
   3. Owner will pay for call-back service outside of normal working hours on an hourly basis, based on actual time spent at site and not including travel time; include hourly rate and definition of normal working hours in maintenance contract.

E. Provide a complete description of preventive maintenance, systematic examination, adjustment, cleaning, inspection, and testing, with a detailed schedule.

F. Maintain a log at each fire alarm control unit, listing the date and time of each inspection and call-back visit, the condition of the system, nature of the trouble, correction performed, and parts replaced. Submit duplicate of each log entry to Owner's representative upon completion of site visit.

G. Comply with Owner's requirements for access to facility and security.

END OF SECTION 28 4600

SECTION 31 1000
SITE PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Clearing and protection of vegetation.

B. Removal of existing debris.

1.02 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Vegetation removal limits.
   2. Areas for temporary construction and field offices.
   3. Areas for temporary and permanent placement of removed materials.

1.03 PROJECT CONDITIONS

A. Scheduling of Work: Coordinate time and manner of demolition work with Owner. Schedule work to coincide with new construction and operational needs of the facility.

B. Minimize production of dust due to demolition operations; do not use water if it will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.
   1. Thoroughly moisten all surfaces as required to prevent dust from being a nuisance to the public, neighbors and concurrent performance of other work on the site.
   2. Provide hoses and water connections for moisture purposes.

C. Maintain haul routes for disposal of material clean and free from debris.

D. Maintaining Traffic:
   1. Ensure minimum interference with roads, streets, driveways, sidewalks and adjacent facilities.
   2. If required by governing authorities, provide alternate routes around closed areas.

E. Perform demolition operations in manner that in no way endangers personnel, public, existing structures, utilities, roadways, or facilities not to be demolished. If damages do occur, the Contractor will be held responsible and shall repair or replace any damage at no additional cost to Owner.

F. Protection:
   1. Protect bench marks, survey control points, and existing structures from damage or displacement.
   2. Protect all streets, curbs, and sidewalks not scheduled for demolition.
   3. Protect existing buildings and other structures to remain.
   4. In the event of damage to objects to remain, immediately make all repairs and replacements necessary to the approval of the Engineer, at no additional cost to the Owner.

PART 2 PRODUCTS

2.01 MATERIALS

A. Fill Material: As specified in Section 31 2323 - Fill.

B. Herbicide: Approved by applicable regulatory agency.

PART 3 EXECUTION

3.01 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
   1. Utility locations shown on the Plans should be considered approximate and may not be complete. Field verify all utility locations.

2. Notice provided to each utility sufficiently in advance of such operations to allow the utility time to mark the location of, relocate, adjust, or otherwise protect their facilities. Reach an agreement with each utility on appropriate action necessary to protect or relocate the utility facilities. The cost of such action to protect the facilities, except for locates, shall be borne by the Contractor. Utilize Digger's Hotline (800-242-8511) for locates for those utilities which subscribe to this service.
3. At all times conduct operations so that necessary clearances are maintained and said utility facilities are protected. Comply with all Local, State, and Federal, or other regulations in performing work near utility facilities.
4. Should the Contractor damage any of the utility facilities during Contractor's operations or determine the work cannot be performed safely, the Contractor shall immediately notify the utility involved and cease work until arrangements are made to prevent further damage or a serious accident. The Owner is not responsible for the cost of any damage, including disruption of service, to any utility facility resulting from Contractor's operation.
5. Failure of the Contractor to provide timely notice to the utility or to conduct operations in such manner that proper clearances are maintained and the utility facilities are protected at all times will be grounds for the issuance of a Stop Work Order.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

F. Mark location and termination of utilities.

G. Disconnect, remove, cap, and identify designated utilities within demolition areas.

H. Unused underground piping may be abandoned in place, provided it is completely drained and capped; remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

I. Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

J. Where there exists the potential for a conflict between the proposed line with an existing utility line, locate and expose any utility in advance of the proposed construction so determinations as to the required adjustments can be made.

3.02 VEGETATION

A. Scope: Remove trees, shrubs, brush, and stumps in areas to be covered by building structure, paving, playing fields, lawns, and planting beds.

B. Remove existing sod without disturbing topsoil.

C. Protect existing trees, plants, landscaping materials, appurtenances, structures, and utilities that are not to be demolished and/or abandoned.
   1. Contractor shall repair or replace such damaged trees without additional compensation.

D. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
   1. Around trees to remain within vegetation removal limits; locate no closer to tree than at the drip line.
   2. Around other vegetation to remain within vegetation removal limits.

E. In areas where vegetation must be removed but no construction will occur other than pervious paving, remove vegetation with minimum disturbance of the subsoil.

F. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
   1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
   2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   3. Existing Stumps: Treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
   4. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
   5. Fill holes left by removal of stumps and roots, using suitable fill material, with top surface neat in appearance and smooth enough not to constitute a hazard to pedestrians.
   6. Apply herbicide to remaining stumps to inhibit growth.

G. Dead Wood: Remove all dead trees (standing or down), limbs, and dry brush on entire site; treat as specified for vegetation removed.

H. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

3.03 EXISTING BUILT ELEMENTS

A. Scope:
   1. Remove existing construction as specified and shown and as required to permit new construction.
   2. Demolition and removal of structures shall include abandoned superstructures, foundation walls, footings, slabs, and other structures. Clear waste, debris, and loose soil from excavation caused by existing foundations, and backfill as specified.
   3. Remove paving, curbs, and sidewalks as required to accomplish new work.
   4. Break up concrete slabs on grade within construction limits indicated on drawings to permit natural moisture drainage; leave pieces not larger than 1 square yard.
   5. At termination of concrete removal, prepare surfaces and cover with cement-water grout paste to present neat finished surface appearance.
   6. Patch openings in walls and foundations caused by demolition. Use materials comparable to adjacent undisturbed surfaces for patching.
   7. Any new construction work that affects existing building structures shall be patched to match existing surrounding materials. This includes roofing, walls, walks, flooring, ceilings, and any other materials that affect structural or architectural integrity of building.
   8. Fill excavations, open pits, and holes in ground areas generated as result of removals, using specified fill; compact fill as required so that required rough grade elevations do not subside within one year after completion.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Comply with applicable requirements of NFPA 241.
   3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Provide temporary barriers at openings or ledges left by demolition.
   7. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   8. Do not close or obstruct roadways or sidewalks without permit.
   9. Do not close or obstruct egress from any building exit.

10. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
11. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
12. Provide and remove adequate temporary fencing for any fences that are disturbed by construction operations. Return all items to equal or better than original condition.

C. Protect existing structures and other elements that are not to be removed.
1. Provide bracing and shoring.
2. Prevent movement or settlement of adjacent structures.
3. Stop work immediately if adjacent structures appear to be in danger.
4. Any portion of existing construction whether structural, or accessory which has become unstable through removal of other parts of construction shall be removed as soon as practicable, and no such unstable part shall be left free-standing or inadequately braced against causes of collapse at end of each day's work.

D. Remove and temporarily reset private mailboxes as necessary for construction. No separate payment will be made for this work.
1. Replace private mailboxes in approximately original location after construction is complete; installation subject to approval of property owner, U.S. Post Office Department, and Owner.

E. Remove and reinstall signs (street signs, parking signs, etc.) and fences within the limits of construction. No separate payment will be made.

F. Hazardous Materials: Comply with 29 CFR 1926 and state and local regulations.

G. Perform demolition in a manner that maximizes salvage and recycling of materials.
1. Dismantle existing construction and separate materials.
2. Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

H. To reduce fire hazards during demolition, Contractor shall carry out the following requirements:
1. Before removing any part of any building, remove volatile or flammable materials, such as fuel oil, gasoline, kerosene, benzene, cleaning fluids, paints, thinners, cloth, loose paper, combustible trash, and similar materials which might serve as ready fuel for small fires.
2. Maintain sufficient number of fire extinguishers to check and extinguish small fires in areas where work is being performed.
3. Wherever cutting torch or other equipment which might cause fire is being use, fire extinguishers shall be kept nearby and ready for instant use. Users of such equipment shall be instructed in proper method of preventing fires and extinguishing fire.
4. Burning of waste lumber and other building materials or trash on site will not be permitted.

I. Partial Removal of Paving and Curbs: Neatly saw cut at right angle to surface.

3.04 DISPOSAL

A. Owner has first right of refusal of salvaged manhole sections, castings, culverts, seal coat, and other salvageable items removed from public right-of-way.
1. Notify Owner 5 days prior to salvage or demolition work to determine the disposition of items to be removed. Owners representative will mark items to be salvaged. Items shall be properly disconnected, removed from foundations, and stored at a location acceptable to the Owner.

B. Remove from project site and dispose of vegetation, rubbish, building materials, concrete, asphalt, culverts, fences, and other non-salvageable materials.

C. Excess material which is not desirable to be incorporated in this project such as vegetation, existing surfacing, broken concrete, etc., shall be disposed of at a disposal site provided by the Contractor. No payment for disposal of excess material or overhaul will be made but shall be considered incidental to the various other work on the project.

3.05 HAUL ROUTES

A. Determine haul roads with approval of agency having jurisdiction over proposed roadway.

B. Make condition survey of haul roads prior to use and document with necessary photographs and written descriptions.

C. Keep dirt, dust, mud, and other debris reasonably free from construction operations.

D. Clean as needed to prevent muddy or dusty conditions.

E. Repair any damaged haul routes to match existing conditions before use.

3.06 DEBRIS

A. Identify a waste and salvage area for placing removed materials.

B. Remove debris, junk, and trash from site.

C. Do not burn or bury materials on site.

D. Maintain public streets, alleys, or other thoroughfares, used in carrying out disposal, free of litter or soil attributal to this operation. Equip and load trucks or other vehicles to prevent leakage, blowing off, or other escape of any portion of whatsoever. The cost being incurred by Owner in cleaning such litter will be charged to Contractor and deducted from monies due or to become due it under this contract.

E. Upon completion of demolition work in each area, thoroughly clean area of all materials not to remain.

F. Remove materials (except paint) adhered to construction to remain.

3.07 WASTE REMOVAL

A. Leave site in clean condition, ready for subsequent work.

B. Storage of materials to be removed and disposed of will not be permitted to accumulate on site. Promptly remove all demolition materials.

C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION 31 1000

SECTION 31 2316
EXCAVATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Excavating for building volume below grade, footings, pile caps, slabs-on-grade, paving, site structures, and utilities within the building.

B. Temporary excavation support and protection systems.

1.02 CLASSIFICATION OF MATERIALS

A. Earth: All material not classified as rock or rubble, includes: clay, silt, sand, gravel, hardpan, disintegrated shale and rock debris, junk, brick, loose stones, and boulders less than 1/3 cubic yards in volume.

B. Rock: Buried boulders larger than 1/3 cubic yards in volume or materials so hard and dense that continuous loosening by pneumatic tools or blasting is required for removal.

C. Rubble: Buried concrete foundations, beams, walls, and other materials which require continuous use of pneumatic tools or blasting.

D. Topsoil: Upper portion of soil profile containing a good supply of humus and a high degree of fertility. Topsoil is free of rocks, clods and other debris larger than 2" in diameter.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that survey bench mark and intended elevations for the work are as indicated.

3.02 PREPARATION

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

B. Locate, identify, and protect utilities that remain and protect from damage.

C. Notify utility company to remove and relocate utilities.

D. Protect bench marks, survey control points, existing structures, fences, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

E. Protect plants, lawns, rock outcroppings, and other features to remain.

F. Grade top perimeter of excavation to prevent surface water from draining into excavation. Provide temporary means and methods, as required, to maintain surface water diversion until no longer needed, or as directed by Engineer.

G. Use special care when excavating under and around existing facilities. Support existing facilities and earth under facilities to prevent settlement resulting from construction operations.

3.03 TEMPORARY EXCAVATION SUPPORT AND PROTECTION

A. Excavation Safety: Comply with OSHA’s Excavation Standard, 29 CFR 1926, Subpart P.
   1. Excavations in stable rock or in less than 5 feet in depth in ground judged as having no cave-in potential do not require excavation support and protection systems.
   2. Depending upon excavation depth, time that excavation is open, soil classification, configuration and slope of excavation sidewalls, design and provide an excavation support and protection system that meets the requirements of 29 CFR 1926, Subpart P:
      a. Sloping and benching systems.
      b. Support systems, shield systems, and other protective systems.

B. Excavation support and protection systems not required to remain in place may be removed subject to approval of Owner or Owner's Representative.
   1. Remove temporary shoring and bracing in a manner to avoid harmful disturbance to underlying soils and damage to buildings, structures, pavements, facilities and utilities.

3.04 EXCAVATING - GENERAL

A. Fill and consolidate to finished grade as directed by Engineer all holes resulting from operations of the Contractor, including removal of posts, utility poles. Fill voids as soon as practical, preferably the day created and not later than the following day. Restore a portion of the right-of-way or project limits disturbed by any such operations to an acceptable condition. Operation considered incidental to other bid items in project.

B. Apply necessary moisture to the construction area and haul roads to prevent the spread of dust. Following excavation and grading on this project the Contractor shall be responsible for disposing of excess material off the project.

C. Excavation and grading shall also include all the grading necessary to slope and shape the parking areas between the back of curb and to the final desired cross-section. This means that the Contractor shall be responsible under this contract to complete all work necessary to finish grade for the right-of-way area adjacent to the paving and not just an area back of the curb on each side. This work shall be considered incidental to the Project.

D. In the event any unsuitable bearing material is encountered at design depth, this condition shall be called to the attention of the Owner, or his representative, by the Contractor and a determination will be made prior to continuance. In the event over-excavation and special backfill are required, the Contractor shall proceed as instructed by the Engineer. If unsuitable bearing subgrade conditions were caused by the Contractor's operations at the site, then the cost of reestablishing suitable bearing conditions shall be at the expense of the Contractor and as directed by the Engineer. If unsuitable bearing conditions are a natural occurrence the extra cost shall be paid by the Owner.

E. Remove topsoil to minimum depth of eight inches (8") and stockpile for reuse to finish earth surfaces. In rural crop land areas, remove topsoil to a minimum depth of twelve inches (12") and stockpile for replacement on top of trench.

F. Provide temporary drainage facilities to prevent damage when necessary to interrupt natural drainage or flow of artificial drains.

G. Use special care when excavating under and around existing facilities and structures. Prevent settlement of existing structures which may result from construction operation.

H. Excavate to accommodate new structures and construction operations.
   1. Excavate to the specified elevations.
   2. Excavate to the length and width required to safely install, adjust, and remove any forms, bracing, or supports necessary for the installation of the work.
   3. Hand trim excavations. Remove loose matter.

I. Notify Engineer of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.

J. Do not interfere with 45 degree bearing splay of foundations.

K. Remove lumped subsoil, boulders, and rock up to 1/3 cubic yard measured by volume.

L. Provide temporary means and methods, as required, to remove all water from excavations until directed by Engineer. Remove and replace soils deemed suitable by classification and which are excessively moist due to lack of dewatering or surface water control.

3.05 SUBGRADE PREPARATION

A. See Section 31 2323 for subgrade preparation at general excavations.

3.06 FILLING AND BACKFILLING

A. Do not fill or backfill until all debris, water, unsatisfactory soil materials, obstructions, and deleterious materials have been removed from excavation.

B. See Section 31 2323 for fill, backfill, and compaction requirements at general excavations.

3.07 REPAIR

A. Correct areas that are over-excavated and load-bearing surfaces that are disturbed; see Section 31 2323.

3.08 EXCAVATION - TOPSOIL

A. Excavate topsoil from areas to be further excavated or re-graded.

B. Stockpile in area designated on site. Remove excess topsoil not being reused from site.

C. Do not excavate wet topsoil.

D. Stockpile to topsoil depth not exceeding 8 feet.

3.09 EXCAVATION - SUBSOIL

A. Excavate subsoil from areas to be further excavated or re-graded.

B. Stockpile in area designated on site. Remove excess subsoil not being reused from site.

C. Do not excavate wet subsoil.

D. Stockpile subsoil to depth not exceeding 8 feet.

E. When excavation through roots is necessary, perform work by hand and cut roots with sharp axe.

3.10 EXCAVATION FOR APPURTENANCES

A. Excavate as required for appurtenances.

B. Carry excavation to firm, undisturbed soil.

C. Unauthorized excavation carried below required depth: Backfill with concrete at no expense to the Owner.

3.11 SHEETING, SHORING, AND BRACING

A. Considered incidental to project.

B. Contractor is solely responsible for complying with OSHA and all other governmental regulations.

C. Construct sheeting, shoring, and bracing required to hold walls of excavation and to provide safety for workers, to protect existing utilities and structures, and to permit dry conditions for construction.
   1. Sheeting: wood or steel.
   2. Construct and maintain sheeting and shoring in accordance with OSHA and all other governmental regulations. Contractor solely responsible for complying with the regulations.

D. Leave in place wood sheeting driven below level of pipe. Remove upper part of wood sheeting to a level 5'-0" (2 m) below finish grade.

E. Pull steel sheeting except where indicated on Drawings.

F. When movable trench shield is used below spring line of pipe, lift shield prior to any forward movement to avoid pipe displacement. Fill void left by removal of shield, between consolidated fill and stable trench wall, with consolidated fill of the same type placed adjacent to the pipe.

3.12 EMBANKMENT CONSTRUCTION

A. Prepare site, place, and compact excavated materials to required elevation and cross section.

B. Scarify, disc, and roll foundation areas as necessary to provide proper bond with first layer of new fill.

C. If soft or yielding materials are encountered, remove unstable materials and replace with suitable materials and compact.

D. Place no roots, brush, grass, or other organic material in embankment; place no material on embankment when material or foundation is frozen.

E. Step or bench all existing slopes greater than five (5) horizontal to one (1) vertical to connect existing grade with new fill.

F. Select material for each portion of embankment with approval of Engineer; select materials to avoid sharp change in texture.

G. Use fill material free of lenses, pockets, streaks or layers, or materials differing from surrounding materials.

H. Construct embankment in horizontal layers not more than eight inches (8") in loose thickness.

I. Deposit each layer over full width of embankment as separate and distinct operation.

J. After layer is deposited, smooth to uniform depth by means of suitable motor patrol or bulldozer.

K. Compact selected materials in horizontal layers with tamping or sheepsfoot roller; use roller designed to provide at least two hundred pounds per square inch (200 psi) distributed on one (1) row of knobs; tamping feet must project not less than six and one-half inches (6-1/2") from face of drum.

L. Compact layer by rolling with tamping type roller until full weight of roller is supported by tamping feet, but with not less than one (1) pass per inch of loose thickness of layer.

M. Roller will be considered to be supported entirely on its tamping feet when feet do not penetrate more than three inches (3") into material being compacted.

N. If soil is wet so that it will not sufficiently compact by one (1) passage of roller per inch of loose thickness, provide minimum of one discing per two inches (2") of loose thickness.
   1. Cut and stir full depth of layer.
   2. Allow interval of not longer than two (2) hours between successive discings, or as directed by Engineer.
   3. After discing is completed, compact layer by specified rolling.

O. If soil is dry so that it will not satisfactorily compact by rolling, moisten material before compaction; manipulate material to secure proper distribution of moisture before compaction.

P. Place fill and compact on all sides of structures to same level as fill operation progresses to protect structures against displacement or other damage.

Q. Areas adjacent to structures which cannot be tamped with rollers: hand tamp with mechanical tamper to same degree of compaction as specified for other parts of embankment.

3.13 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for field inspection and testing.

B. Provide for visual inspection of load-bearing excavated surfaces by Engineer before placement of foundations.

3.14 PROTECTION

A. Divert surface flow from rains or water discharges from the excavation.

B. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.

C. Protect open excavations from rainfall, runoff, freezing groundwater, or excessive drying so as to maintain foundation subgrade in satisfactory, undisturbed condition.

D. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

E. Keep excavations free of standing water and completely free of water during concrete placement.

END OF SECTION 31 2316

SECTION 31 2319
DEWATERING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. All labor, materials, and equipment necessary to dewater all excavations and trenches in accordance with the requirements of the Contract Documents.

1.02 UNIT PRICES

A. Contractor shall determine quantities of work based on drawings and specifications.

B. Basis of Measurement:
   1. No measurement and separate payment will be made for this work. Dewatering shall be considered incidental to excavation and trenching.

1.03 REGULATORY REQUIREMENTS

A. Conform with all city, county, state, and federal requirements and obtain permits for the control and discharge of water from dewatering operations.

B. Coordinate with Owner, other Contractors, Sub-contractors and governmental bodies.

C. Secure all necessary permits to complete the requirements of this Section.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Prior to excavation, submit a detailed plan, operation and removal schedule for dewatering. Contractor may be required to demonstrate the system and to verify that adequate equipment, personnel, and materials are provided to dewater the excavations and trenches at all locations.
   1. Submit the dewatering plan for Owner and Engineer's record. Engineer's review not required.

1.05 QUALITY ASSURANCE

A. Contractor is responsible for controlling discharge rate and effect of the dewatering system.

B. Establish, observe, and record reference points at frequent intervals to detect any settlement of structures adjacent to areas of proposed dewatering. The Contractor is responsible for protecting adjacent structures. Any costs associated with the repair, restoration, or replacement of damaged structures shall be the responsibility of the Contractor.

PART 2 PRODUCTS

2.01 EQUIPMENT

A. Dewatering may include, but not limited to, wells, well points, sumps, temporary pipelines for water disposal, rock or gravel placement, or any combination. Maintain standby pumping equipment on the job site.

PART 3 EXECUTION

3.01 GENERAL

A. Provide and remove all equipment necessary for dewatering. Provide dewatering systems with sufficient pumping equipment and machinery in good working condition and provide at all times, competent workmen for the operation of the systems. Keep adequate standby equipment available at all times to insure continuous and efficient dewatering and maintenance of dewatering operation.

B. Maintain groundwater at least two (2) feet below the bottom of any excavation or trench until entire structure is completed, backfilled, and building drainage system is operational. This includes any sump pumps or storm drains used as an outlet.

C. Commence dewatering for structures and pipelines when groundwater is first encountered, and dewater continuously until such times as water can be allowed to rise in accordance with the provisions of this Section or other requirements.

D. Provide drainage for the site grading at all times. Divert surface runoff from excavations and trenches. Collect surface runoff in shallow ditches around the perimeter, drain to sumps, and pump or drain by gravity to maintain a bottom free from standing water.

E. Preserve the undisturbed bearing capacity of the subgrade soils at proposed bottom of excavation by dewatering.

F. Excavate affected areas and replace with crushed rock, at no additional cost to the Owner, if foundation soils are disturbed or loosened by the upward seepage of water or an uncontrolled flow of water.

G. Provide a clean coarse granular working mat as required to provide a stable working base for construction equipment and to facilitate construction. Any other granular material needed for drainage shall be in addition to the working base provided.

H. Prevent flotation by maintaining a positive and continuous removal of water. Contractor is responsible and liable for all damages which may result from failure to adequately keep excavations and trenches dewatered.

I. Adequately space well points or wells (if used) to provide the necessary dewatering. Sand-pack or by other means to prevent pumping of fine sands or silts from the subsurface. Continuously check to ensure that the subsurface soil is not being removed by the dewatering operation.

J. Dispose of water in a suitable manner without damage to adjacent property. Do not drain water into Work built or under construction. Filter water using an approved method to remove sand and fine-sized soil particles before disposal into any drainage system.

K. Release groundwater to its static level in such a manner as to maintain the undisturbed state of the natural foundation soils, prevent disturbance of compacted backfill and prevent flotation or movement of structures or pipelines.

L. Provide groundwater monitoring wells as necessary.

END OF SECTION 31 2319

SECTION 31 2323
FILL

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Filling, backfilling, and compacting for building volume below grade, footings, slabs-on-grade, paving, and utilities within the building.

B. Filling holes, pits, and excavations generated as a result of removal (demolition) operations.

1.02 RELATED REQUIREMENTS

A. Section 03 3000 - Cast-in-Place Concrete.

B. Section 31 1000 - SITE CLEARING.

C. Section 31 2316 - Excavation: Removal and handling of soil to be re-used.

1.03 REFERENCE STANDARDS

A. ASTM C136/C136M - Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.

B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft3 (600 kN-m/m3)).

C. ASTM D1556/D1556M - Standard Test Method for Density and Unit Weight of Soil in Place by Sand-Cone Method.

D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft3 (2,700 kN-m/m3)).

E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method.

F. ASTM D2487 - Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System).

G. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.

H. ASTM D4491 - Standard Test Method for Water Permeability of Geotextiles by Permittivity.

I. ASTM D4632 - Standard Test Method for Grab Breaking Load and Elongation of Geotextiles.

J. ASTM D4759 - Standard Practice for Determining the Specification Conformance of Geosynthetics.

K. ASTM D4751 - Standard Test Method for Determining Apparent Opening Size of a Geotextile.

1.04 SUBMITTALS

A. See Section 01 3000 - ADMINISTRATIVE REQUIREMENTS, for submittal procedures.

B. Materials Sources: Submit name of imported materials source.

C. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used, including manufactured fill.

D. Compaction Density Test Reports.

1.05 QUALITY ASSURANCE

A. The Contractor shall employ and pay for services of the independent testing laboratory for tests required to show compliance with the specifications. Submit test results directly to the Owner/Engineer. Selection of the testing laboratory is subject to approval of the Owner/Engineer.

B. Determine moisture density relations of soils encountered during construction in accordance with standard proctor method. Provide graph of proctor soil density versus water content for all backfill material.

C. Provide gradation and materials tests for pipe bedding and stabilizing material.

D. Test trench backfill soil density and moisture at one test per lift per 400 SY of trench under paved and/or unpaved areas.

E. Reference to percent maximum density shall mean a soil density not less than the stated percentage of maximum density for soil as determined by ASTM D698, "Moisture Density Relations of Soils" Standard Proctor Method.

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

C. Verify that survey bench marks and intended elevations for the Work are as indicated on Drawings.

PART 2 PRODUCTS

2.01 FILL MATERIALS

A. General Fill material under parking lots, streets, or other paved areas: Use Subsoil excavated on-site or from off-site borrow area. General fill material to be free of foreign substance, debris, large stones, rocks, roots, organic or frozen material, expansive material and other deleterious materials.
   1. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.
   2. Liquid Limit less than 45 and plasticity index less than 22

B. Engineered Fill:
   1. Use for backfill against and under concrete foundations, walls, and slabs.
   2. Medium to coarse-grained sand consisting of clean, well-graded, mineral particles.
      a. Size and Grading: Maximum of 40% passing the #40 sieve and less than 5% passing the #200 sieve.

C. Structural Fill: Subsoil excavated on-site.
   1. Graded.
   2. Free of lumps larger than 3 inches, rocks larger than 2 inches, and debris.

D. Concrete for Fill: Lean concrete.

E. Granular Fill - Gravel : Pit run washed stone; free of shale, clay, friable material and debris.
   1. Graded in accordance with ASTM C136/C136M, within the following limits:
      a. 2 inch sieve: 100 percent passing.
      b. 1 inch sieve: 95 percent passing.

F. Sand: Natural river or bank sand; free of silt, clay, loam, friable or soluble materials, and organic matter.
   1. Graded in accordance with ASTM C136; within the following limits:

G. Topsoil: See Iowa SUDAS Section 2010 - Earthwork, Subgrade, and Subbase

H. Stabilizing Material: Sharp, clean crushed stone; comply with following gradation:
   1. For sieve size of 2-1/2": 100 percent passing.
   2. For sieve size of 2": 90 to 100 percent passing.
   3. For sieve size of 1-1/2": 35 to 70 percent passing
   4. For sieve size of 1": 0 to 15 percent
   5. For sieve size of 1/2": 0 to 5 percent passing.

2.02 ACCESSORIES

A. Filter Fabric: Manufacturer's standard non-woven pervious geotextile fabric of polypropylene, nylon or polyester fibers, or a combination.

1. Provide filter fabrics that meet or exceed the listed minimum physical properties determined according to ASTM D4759 and the referenced standard test methods in parenthesis:
   a. Grab Tensile Strength (ASTM D4632): 100 pounds.
   b. Apparent Opening Size (ASTM D4751): #100 U.S. Standard Sieve.
   c. Permeability (ASTM D 4491): 150 Gallons per minute per square foot.

2.03 SOURCE QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for general requirements for testing and analysis of soil material.

B. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.

C. If tests indicate materials do not meet specified requirements, change material and retest.

PART 3 EXECUTION

3.01 EXAMINATION

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

B. Verify subdrainage, dampproofing, or waterproofing installation has been inspected.

C. Verify structural ability of unsupported walls to support imposed loads by the fill.

D. 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 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. Backfill voids resulting from demolition and excavation to obtain grade required around structures.

B. Fill to contours and elevations indicated using unfrozen materials.

C. Employ a placement method that does not disturb or damage other work.

D. Backfilling around structures:
   1. Prevent displacement of structural components during backfilling operations. Backfill opposite sides simultaneously with a maximum backfill elevation difference of 6 feet.
   2. For walls that are unbraced at the top edge, backfill can be place upon concrete reaching required strength, as noted above.
   3. For walls that are braced at the top edge, backfill can be placed only when the next level floor framing or cover slabs are in place and the concrete has reached the required strength, as noted above.

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. Placement:
   1. Maintain surfaces free of water, debris, and excessively wet, frozen , and other deleterious materials.
   2. Place and compact backfill materials in loose lifts not exceeding 9 inches in thickness

H. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.

I. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.

J. Slope grade away from building minimum 2 inches in 10 ft, unless noted otherwise. Make gradual grade changes. Blend slope into level areas.

K. Correct areas that are over-excavated.
   1. Load-bearing foundation surfaces: Use structural fill, flush to required elevation, compacted to 100 percent of maximum dry density.
   2. Other areas: Use general fill, flush to required elevation, compacted to minimum 97 percent of maximum dry density.

L. 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.
   3. Under Footings: Material shall be compacted to at least 98 percent of its maximum Standard Proctor Dry Density, ASTM D 698.
   4. Wall backfill and backfill adjacent to structures not supporting other structures: Material shall be compacted to at least 95 percent of its maximum Standard Proctor Dry Density, ASTM D 698.
   5. Backfill in non-critical areas: Material shall be compacted to at least 90 percent of its maximum Standard Proctor Dry Density, ASTM D 698.

M. Reshape and re-compact fills subjected to vehicular traffic.

N. 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.

O. Pneumatic tired rollers or heavy vibratory compactors shall not be used within 6 ft. (2 m) of structure, walls, pipes, or other construction which might be damaged by compaction equipment.

3.04 FILL AT SPECIFIC LOCATIONS

A. At Foundation Walls:
   1. Use general fill, except where granular bedding is specified; use no debris, frozen earth, large clods, stones, or other unsuitable material.
   2. Fill up to finish grade elevation as shown on Drawings; dispose of excess excavated material as directed by Engineer.
   3. Do not backfill against unsupported Structures.
   4. Backfill simultaneously on each side of structures; protect structures from damage at all times.

B. Over Subdrainage Piping at Foundation Perimeter and Under Slabs:
   1. Drainage fill and geotextile: Section 31 0519.
   2. Cover drainage fill with general fill.
   3. Compact to 95 percent of maximum dry density.

C. At French Drains:
   1. Use granular fill.
   2. Compact to 95 percent of maximum dry density.

3.05 TOLERANCES

A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.06 FIELD QUALITY CONTROL

A. See Section 01 4000 - 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, ASTM D2922, or ASTM D3017.

C. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with AASHTO T 180, ASTM D 1557 ("modified Proctor"), ASTM D 698 ("standard Proctor"), AASHTO T 180, ASTM D 1557 ("modified Proctor"), ASTM D 698 ("standard Proctor"), AASHTO T 180, ASTM D 1557 ("modified Proctor"), or ASTM D 698 ("standard Proctor").

D. If tests indicate work does not meet specified requirements, remove work, replace and retest.

E. Frequency of Tests:
   1. Take soil density tests uniformly throughout the placing of fill material so that quality control can be maintained at all times. Minimum requirements are as follows:
      a. One field test per day for each type of fill on any day when fill is placed, regardless of quantity.

F. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.07 CLEANING

A. Clean up each portion of construction as it is completed.

B. Remove unused stockpiled materials, rubbish, and debris and leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

C. Leave borrow areas in a clean and neat condition. Grade to prevent standing surface water.

END OF SECTION 31 2323

SECTION 31 5000
EXCAVATION SUPPORT AND PROTECTION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Designing, providing, and maintaining shoring, sheeting, and bracing necessary to support the sides of excavations or trenches and to protect the safety of workers and public, to prevent detrimental settlement and lateral movement of existing facilities, adjacent property, and completed work.

1.02 REFERENCES

A. Iowa Department of Transportation - "Standard Specifications for Highway and Bridge Construction" plus current supplemental specifications and special provisions.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Drawings showing excavation support and movement monitoring plans and materials.
   1. Details of shoring, bracing, sloping, or other provisions for worker protection.
   2. Methods and sequencing of installing excavation support.

PART 2 PRODUCTS

2.01 MATERIALS

A. General: Provide materials that are either new or in serviceable condition.

B. Structural Steel: ASTM A 36/A 36M, ASTM A 690/A 690M, or ASTM A 992/A 992M.

C. Steel Sheet Piling: ASTM A 328/A 328M, ASTM A 572/A 572M, or ASTM A 690/A 690M; with continuous interlocks.

D. Wood Lagging: Lumber, mixed hardwood, nominal rough thickness of size and strength required for application

E. Cast-in-Place Concrete: ACI 301, of compressive strength required for application.

F. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

G. Tiebacks: Steel bars, ASTM A 722/A 722M.

H. Tiebacks: Steel strand, ASTM A 416/A 416M.

PART 3 EXECUTION

3.01 PREPARATION

A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards that could develop during excavation support and protection system operations.

3.02 SHEET PILING

A. Before starting excavation, install one-piece sheet piling lengths and tightly interlock to form a continuous barrier. Accurately place the piling, using templates and guide frames unless otherwise recommended in writing by the sheet piling manufacturer. Limit vertical offset of adjacent sheet piling to 60 inches (1500 mm). Accurately align exposed faces of sheet piling to vary not more than 2 inches (50 mm) from a horizontal line and not more than 1:120 out of vertical alignment. Cut tops of sheet piling to uniform elevation at top of excavation.

3.03 TIEBACKS

A. Tiebacks: Drill, install, grout, and tension tiebacks. Test load-carrying capacity of each tieback and replace and retest deficient tiebacks.

1. Test loading shall be observed by a qualified professional engineer responsible for design of excavation support and protection system. Contractor is responsible for this observation and testing, Owner shall not pay for this testing.
2. Maintain tiebacks in place until permanent construction is able to withstand lateral soil and hydrostatic pressures.

3.04 BRACING

A. Bracing: Locate bracing to clear columns, floor framing construction, and other permanent work. If necessary to move brace, install new bracing before removing original brace.
   1. Do not place bracing where it will be cast into or included in permanent concrete work unless otherwise approved by Architect.
   2. Install internal bracing, if required, to prevent spreading or distortion of braced frames.
   3. Maintain bracing until structural elements are supported by other bracing or until permanent construction is able to withstand lateral earth and hydrostatic pressures.

3.05 REMOVAL AND REPAIRS

A. Remove excavation support and protection systems when construction has progressed sufficiently to support excavation and bear soil and hydrostatic pressures. Remove in stages to avoid disturbing underlying soils or damaging structures, pavements, facilities, and utilities.
   1. Fill voids immediately with approved backfill compacted to density specified in Section 31 2323 - Fill.
   2. Repair or replace, as approved by Engineer, adjacent work damaged or displaced by removing excavation support and protection systems.

END OF SECTION 31 5000