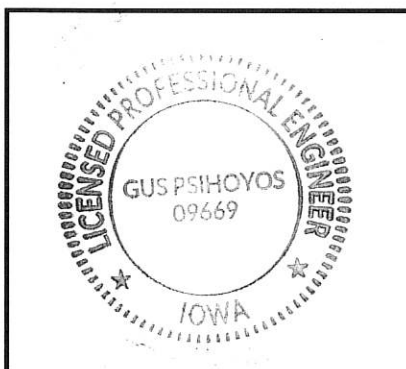


Masterpiece on the Mississippi

**CITY OF DUBUQUE
SUPPLEMENTAL SPECIFICATIONS
TO STATEWIDE URBAN DESIGN
AND SPECIFICATIONS (SUDAS)**

AUGUST 2023



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.

Date: 8-9-23

Gus Psihoyos, P.E.

License Number: 09669

My license renewal date is December 31, 2024

Pages or sheets covered by this seal: All sheets

CITY OF DUBUQUE
ENGINEERING DEPARTMENT
50 WEST 13TH STREET
DUBUQUE, IOWA 52001
ENGINEERING SECTION: (563)589-4270



2007•2012•2013
2017★2019

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General Supplemental Specifications City of Dubuque

The City of Dubuque's project will be constructed in accordance with the SUDAS Standard Specifications, 2023 Edition, and further revised by these General Supplemental Specifications.

Use Forms provided by the Jurisdiction only.

The SUDAS Standard Specification may be viewed at the Iowa SUDAS website
<https://iowasudas.org/manuals/specifications-manual/>
or can be purchased only from:

Iowa State University, Institute for Transportation (InTrans)
SUDAS Program, Beth Richards - ISU Research Park
2711 S. Loop Drive, Suite 4700, Ames, Iowa 50010-8664
Phone: 515-294-2869, Fax: 515-294-0467, E-mail: brich@iastate.edu

Said SUDAS Standard Specifications as adopted for City of Dubuque projects, are hereby amended as follows:

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Table of Contents

Table of Contents	5
(REPLACE) DIVISION 01 - GENERAL CONDITIONS AND COVENANTS	9
Section 1010 - Definitions.....	11
Section 1020 - Proposal Requirements and Conditions	21
Section 1030 - Approval for Award and Award of Contract.....	27
Section 1040 - Scope of Work.....	29
Section 1050 - Control of Work	37
Section 1060 - Control of Materials	43
Section 1070 - Legal Relations and Responsibility to the Public	47
Section 1080 - Prosecution and Progress	67
Section 1090 - Measurement and Payment.....	81
DIVISION 02 – EARTHWORK.....	85
Section 2010 - Earthwork, Subgrade, and Subbase	87
(ADD) Section 2020 - Contaminated Soil and Groundwater Handling	89
DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION.....	93
Section 3010 - Trench Excavation and Backfill	95
Section 3020 - Trenchless Construction	101
DIVISION 04 - SEWERS AND DRAINS.....	107
Section 4010 - Sanitary Sewers	109
Section 4020 - Storm Sewers.....	121
Section 4030 - Pipe Culverts	123
Section 4040 - Subdrains and Footing Drain Collectors	125
Section 4050 - Pipe Rehabilitation	127
(NO CHANGE) Section 4060 - Cleaning, Inspection, and Testing of Sewers	133
DIVISION 05 - WATER MAIN AND APPURTENANCES	135
Section 5010 - Pipe and Fittings	137
Section 5011 - Fusible PVC and HDPE Pipe	153
Section 5020 - Valves, Fire Hydrants, and Appurtenances	155
Section 5030 - Testing and Disinfection.....	181
DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS.....	189
Section 6010 - Structures for Sanitary and Storm Sewers.....	191

Section 6020 - Rehabilitation of Existing Manholes	203
(NO CHANGE) Section 6030 - Cleaning, Inspection, and Testing of Structures	205
DIVISION 07 - STREETS AND RELATED WORK	207
Section 7010 - Portland Cement Concrete Pavement	209
(NO CHANGE) Section 7011 - Portland Cement Concrete Overlays	211
Section 7020 - Hot Mix Asphalt Pavement.....	213
(NO CHANGE) Section 7021 - Hot Mix Asphalt Overlays	215
Section 7030 - Sidewalks, Shared Use Paths, and Driveways	217
Section 7040 - Pavement Rehabilitation	219
(NO CHANGE) Section 7050 - Asphalt Stabilization	221
(NO CHANGE) Section 7060 - Bituminous Seal Coat	223
(NO CHANGE) Section 7070 - Emulsified Asphalt Slurry Seal.....	225
Section 7080 - Permeable Interlocking Pavers	227
(NO CHANGE) Section 7090 - Cold-In-Place Pavement Recycling	229
(NO CHANGE) Section 7091 - Full Depth Reclamation	231
(NO CHANGE) Section 7092 - Crack and Seat Existing PCC Pavement	233
DIVISION 08 - TRAFFIC.....	235
(REPLACE) Section 8010 - Equipment, Lighting, and Signals	237
Section 8020 - Pavement Marking	309
Section 8030 - Temporary Traffic Control	311
Section 8040 - Traffic Signals and Posts	313
DIVISION 09 - SITE WORK AND LANDSCAPE	315
Section 9010 - Seeding	317
Section 9020 - Sodding	319
(NO CHANGE) Section 9030 - Plant Material and Planting.....	321
Section 9040 - Erosion and Sediment Control	323
(NO CHANGE) Section 9050 - Gabions and Revet Mattresses	325
(NO CHANGE) Section 9060 - Chain Link Fence.....	327
(NO CHANGE) Section 9070 - Landscape Retaining Walls	329
(NO CHANGE) Section 9071 - Segmental Block Retaining Walls.....	331
Section 9072 - Combined Concrete Sidewalk and Retaining Wall	333
Section 9080 - Concrete Steps, Handrails, and Safety Rail.....	335
DIVISION 10 - DEMOLITION.....	337
Section 10,010 - Demolition of Building Structures	339

(ADD) Section 10,020 - Waste Management	343
(ADD) Section 10,030 - Hazardous Material Removal - Structures	347
DIVISION 11 - MISCELANEOUS	351
(NO CHANGE) Section 11,010 - Construction Survey	353
(NO CHANGE) Section 11,020 – Mobilization	355
(NO CHANGE) Section 11,030 - Temporary Services During Construction.....	357
(NO CHANGE) Section 11,040 - Temporary Sidewalk Access	359
(NO CHANGE) Section 11,050 - Concrete Washout	361
(ADD) DIVISION 12 - LIFT STATIONS	363
Section 12,010 - Minor Wastewater Lift Station	365

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(REPLACE) DIVISION 01 - GENERAL CONDITIONS AND COVENANTS

DIVISION 01 OF SUDAS IS REPLACED IN IT'S ENTIRETY WITH THE DIVISION 01 IN THIS SUPPLEMENTAL SPECIFICATION.

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Section 1010 - Definitions

Part 1: General

1.08 DESCRIPTION

- A. Wherever the following definitions, terms, and abbreviations, or pronouns in place of them, are used in the plans, specifications, or other Contract Documents, the intent and meaning shall be interpreted as specified in this Section.

1.09 ABBREVIATIONS

- A. Wherever in these specifications and Contract Documents the following abbreviations are used, they shall be understood to mean as follows: The serial designation of each reference shall be the latest year of adoption or revision, unless otherwise specified.
1. AAN - American Association of Nurserymen AAR - Association of American Railroads
 2. AASHTO (or AASHO) - American Association of State Highway and Transportation Officials ACI - American Concrete Institute
 3. AIA - American Institute of Architects
 4. ANSI - American National Standards Institute APWA - American Public Works Association ARA - American Railway Association
 5. AREA - American Railway Engineering Association ASA - America Standards Association
 6. ASCE - American Society of Civil Engineers ASLA - American Society of Landscape Architects
 7. ASTM - American Society for Testing and Materials AWWA - American Water Works Association AWS - American Welding Society
 8. AWWA - American Water Works Association BSC - Bituminous Seal Coat
 9. CFR - Code of Federal Regulations CLSM - Controlled Low Strength Material CPM - Critical Path Method
 10. CRSI - Concrete Reinforcing Steel Institute DNR - Department of Natural Resources DOT - Department of Transportation
 11. EEI - Edison Electric Institute
 12. EPA - Environmental Protection Agency FHWA - Federal Highway Administration FSS - Federal Specification and
 13. Standards ESAL - Equivalent Single Axle Load
 14. GGBFS - Ground Granulated Blast Furnace Slag GRI - Geosynthetic Research Institute
 15. HMA - Hot Mix Asphalt
 16. IAC - Iowa Administrative Code
 17. IEEE - Institute of Electrical and Electronics Engineers IES - Illuminating Engineering Society
ICEA (or IPCEA) - Insulated Cable Engineers Association IMSA - International Municipal Signal Association, Inc.
 18. ISO - Insurance Services Office
 19. ITE - Institute of Transportation Engineers
 20. MUTCD - Manual on Uniform Traffic Control Devices NEC - National Electrical Code
 21. NEMA - National Electrical Manufacturers Association NFPA - National Fire Protection Association
 22. NSF - National Sanitation Foundation
 23. OSHA - Occupational Safety of Health Administration

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

- 24. PCC - Portland Cement Concrete PLS - Pure Live Seed
 - 25. RAP - Recycled Asphalt Pavement SAE - Society of Automotive Engineers SDR - Standard Dimension Ratio
 - 26. SSPC - Steel Structures Painting Council
 - 27. SUDAS - Statewide Urban Design and Specifications UL - Underwriters' Laboratories, Inc.
 - 28. US - United States
 - 29. USC - United States Code
- 1.10 DEFINITIONS AND TERMS
- 30. ADDENDUM. A revision to the Contract Documents written and issued after the notice to bidders, and prior to the time for receipt of proposals. Changes reflected in the Addendum shall govern over all other Contract Documents.
 - 31. AGREED COSTS OF DELAY. Agreed Costs of Delay are a Contract agreed upon amount of damages that will be paid by the Contractor should they not be able to complete the Contract within the time frame designated in the Contract Documents.
 - 32. AGREEMENT. Public Improvement Contract.
 - 33. ALLEY. See Street.
 - 34. APPROVED EQUAL (EQUIVALENT). A product, process, equipment, or material That, upon approval of the Engineer, is determined to meet or exceed the requirements called for by the specifications. Upon approval, the item will be allowed in lieu of the specified material, process, equipment, or product.
 - 35. ARCHITECT. For publicly owned projects, the Architect is a Professional Architect licensed in the State of Iowa and is the authorized representative of the Contracting Authority, unless otherwise designated by the Contracting Authority. For privately contracted projects, with improvements that are to become publicly owned, the Architect is the Professional Architect licensed in the State of Iowa and is the authorized representative of the Jurisdiction ultimately accepting ownership of the improvement unless otherwise designated by the Jurisdiction. For all other projects, the Architect is the Professional Architect licensed in the State of Iowa and is the owner's authorized representative. The Architect may act directly or through duly authorized representatives.
 - 36. ARCHITECT'S REPRESENTATIVE. The person chosen by the Architect to represent its interests or the person designated in the Contract Documents as the party representing the Architect's interest and having the authority to make decisions regarding the administration and oversight of the project.
 - 37. AWARD. The acceptance of the proposal of the lowest responsive, responsible bidder for the work, which shall not be binding upon the Contracting Authority until the Contract for the said work has been executed by the bidder and by the Contracting Authority and bond(s) has been provided by the bidder as required by law.
 - 38. BID. A properly signed and guaranteed written offer of the bidder containing the bid amount to perform the work. Bid is the same as Proposal.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

- 39. **BID AMOUNT.** For unit price contracts the Bid Amount is the aggregate sum obtained by totaling the amounts arrived at by multiplying the quantity of each bid item, as shown on the bid proposal schedule, by the unit price specified on the bid proposal schedule for that bid item, including any lump sum bid items along with any additive or deductive alternate bid prices selected by the Jurisdiction. For lump sum contracts the Bid Amount is the amount offered to complete work by the Contractor, and is the amount used to determine the low bidder, including any additive or deductive alternate bid prices selected by the Jurisdiction.
- 40. **BID ITEM.** A specifically described unit of work for which a price is provided in the proposal. A bid item may also be referred to as a Contract item.
- 41. **BID LETTING.** Opening of bid proposals.
- 42. **BID PROPOSAL FORM.** The document used to submit the bid.
- 43. **BID SECURITY.** The security furnished by the bidder with its bid as guaranty that the bidder will execute the Contract and furnish bond for the work if the proposal is accepted. For bids submitted to Jurisdictions, the bidder shall furnish bid security as defined in Iowa Code Chapter 26
- 44. **BID TERM.** The amount of time allotted to submit a bid to the Jurisdiction.
- 45. **BIDDER.** Any individual, firm, partnership, joint venture, corporation, or association licensed or otherwise authorized by law to do business where the work is located, which has submitted a proposal for the work, acting directly or through a duly authorized representative.
- 46. **CALENDAR DAY.** Every day shown on the calendar.
- 47. **CHANGE ORDER.** A written order to the Contractor signed and approved by the Contracting Authority, ordering a change in the work from that originally shown by the plans and specifications. Change orders duly signed and executed by the Contracting Authority and the Contractor shall constitute authorized modifications of the Contract.
- 48. **CLAIM.** Legal demand or assertion by a claimant for compensation, payment, or reimbursement for a loss under a Contract, or an injury due to negligence as allowed by Chapter 573 of the Iowa Code.
- 49. **COMMENCEMENT OF WORK.** Work will be considered commenced when the Contractor's operations are started on items of work covered by the Contract Documents, or when the Contractor notifies the Engineer, and the Engineer agrees, that the Contractor's equipment and personnel are available to the site but the operations are prevented by conditions outside the Contractor's control.
- 50. **COMPETITIVE QUOTATION.** A properly signed written offer of the Contractor according to Iowa Code Chapter 26.
- 51. **CONTRACT.** The written agreement, between the Contractor and the Contracting Authority, setting forth the terms and conditions under which the work is to be performed. The Contract includes all Contract Documents.
- 52. **CONTRACT AMOUNT.** The bid amount plus approved change orders.
- 53. **CONTRACT DOCUMENTS.** The Contract Documents shall consist of those specifically listed in the Contract.
- 54. **CONTRACTING AUTHORITY.** The body, entity, board, commission, officer, or Jurisdiction having authority to award a Contract.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

- 55. **CONTRACTOR.** The individual, firm, partnership, joint venture, corporation, or association licensed or otherwise authorized by law to do business where the work is located, and the heirs, executors, administrators, successors and assigns thereof, or the lawful agent of any such individual, firm, partnership, joint venture, corporation, association, or the surety thereof under the Contract bond, constituting one of the principals to the Contract and undertaking to perform the work herein specified. Where the pronoun "it" is used as referring to the word "Contractor" it shall mean the Contractor as defined above.
- 56. **CONTRACTOR'S REPRESENTATIVE.** The person chosen by the Contractor to represent its interests or the person designated in the Contract Documents as the party representing the Contractor's interest and having authority to make decisions regarding the administration and oversight of the project.
- 57. **CONTRACT TIME.** The number of days set forth in the Contract Documents within which the Milestone Completion, Substantial and Final Completion dates for the work must be achieved. The Contract time may be adjusted only by change order.
- 58. **CONTROLLING ITEM OF WORK.** The unique activity of a Contract that will determine the duration of the construction period or if a working day is charged. The character of this work may change during the project. It is the work that could be in progress at any time that would have the greatest influence on the duration of the project.
- 59. **DATE OF CONTRACT.** The date assigned and referenced in the first paragraph of Specification Section 00510 - Public Improvement Contract.
- 60. **DAYS.** All calendar days including weekends and holidays.
- 61. **DEPARTMENT OF TRANSPORTATION, (THE DEPARTMENT).** The Department of Transportation, as defined in Iowa Code Chapter 307.
- 62. **DESIGNATED PORTION OF WORK.** Any part of the Project identified by the Jurisdiction in the Contract Documents as a separate and distinct portion of the work that may be issued a separate Substantial and Final Completion Certificate before final acceptance of the entire improvement is granted by the Jurisdiction.
- 63. **EMPLOYEE.** Any person working on the project mentioned in the Contract of which these specifications are a part, and who is under the direction or control, or receives compensation from, the Contractor or Subcontractor.
- 64. **ENGINEER.** For publicly owned projects, the Engineer is a Professional Engineer licensed in the State of Iowa and is the authorized representative of the Contracting Authority, unless otherwise designated by the Contracting Authority. For privately contracted projects, with improvements that are to become publicly owned, the Engineer is the Professional Engineer licensed in the State of Iowa and is the authorized representative of the Jurisdiction ultimately accepting ownership of the improvement unless otherwise designated by the Jurisdiction. For all other projects, the Engineer is the Professional Engineer licensed in the State of Iowa and is the owner's authorized representative. The Engineer may act directly or through duly authorized representatives. The definition of the Engineer also includes other Iowa licensed professionals who have stamped and signed the Contract Documents such as architects.
- 65. **ENGINEER'S REPRESENTATIVE.** The person chosen by the Engineer to represent its interests or the person designated in the Contract Documents as the party representing the Engineer's interest and having the authority to make decisions regarding the administration and oversight of the project.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

- 66. EQUIPMENT. All machinery and equipment, together with the necessary supplies for upkeep and maintenance, and also tools and apparatus necessary for the proper construction and acceptable completion of the work.
- 67. EXTRA WORK. Work not provided for in the Contract, as awarded, but deemed essential to the satisfactory completion of the Contract and authorized by the Engineer. Extra work shall not include additional materials, equipment, and labor used due to natural variations in surface and subsurface conditions, except as specifically provided for elsewhere in the Contract Documents.
- 68. FINAL ACCEPTANCE. Final acceptance of construction shall be defined as final approval of the project only in the sense that it has been constructed, cleaned up, and completed in apparent substantial compliance with the Contract Documents. Said final acceptance is stipulated to mean a written acceptance by the Jurisdiction.
- 69. GENERAL SUPPLEMENTAL SPECIFICATIONS. Specifications approved by the Board of Directors for the Iowa SUDAS Corporation subsequent to publication of the latest edition of the SUDAS Standard Specifications. They involve changes in the SUDAS Standard Specifications and apply only when specified in the Contract Documents
- 70. GOVERNMENTAL ENTITY. As defined in Iowa Code Chapter 26.
- 71. GOVERNMENT ENTITY REPRESENTATIVE. See Jurisdiction Representative.
- 72. HAZARDOUS ENVIRONMENTAL CONDITION. The presence at the Site of Asbestos, PCBs, Petroleum, Hazardous Substance, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons or property exposed thereto.
- 73. HAZARDOUS SUBSTANCE. The term "Hazardous Substance" shall mean those substances regulated as hazardous substances, hazardous materials, hazardous wastes, and regulated substances or materials by the Federal, State, and Local laws and regulations, including, but not limited to, the Comprehensive Environmental Response, Compensation and Liability Act, as amended, the Occupational Health and Safety Act, as amended, the Resource Conservation and Recovery Act, as amended, the Hazardous Materials Transportation Act, and Iowa Code 455B.381. This definition includes, but is not limited to, a "Hazardous condition" as defined by Iowa Code 455B.381.
- 74. IMPROVEMENT. The finished product resulting from following the directions and work instructions contained in the Contract Documents. Shall mean any public improvements as defined in Iowa Code Chapter 26 and shall also include highway, bridge, or culvert projects.
- 75. INCIDENTAL ITEMS. Materials, equipment, or labor essential for the proper completion of the work that are not specified as bid items in the Contract Documents and the cost of which shall be included in other bid items.
- 76. IOWA DEPARTMENT OF TRANSPORTATION (DOT) STANDARD SPECIFICATIONS. The Iowa Department of Transportation Standard Specifications for Highway and Bridge Construction and the General Supplemental Specifications effective at the date of publication of the Notice to Bidders for the public improvement, unless a different effective date is identified in the Contract Documents. Only the Iowa DOT specification sections referred to by specific section numbers are incorporated herein.
- 77. JOINT VENTURE. The joining of two or more qualified Contractors for the purpose of combining equipment, personnel, and finances in order to submit a bid on a single project.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

- 78. JURISDICTION. A governmental entity or the Iowa Department of Transportation, acting through its governing body, or through the authorized representatives of such governing body when so authorized.
- 79. JURISDICTIONAL ENGINEER. See Engineer.
- 80. JURISDICTION REPRESENTATIVE. The person chosen by the Jurisdiction to represent its interests or the person designated in the Contract Documents as the party representing the Jurisdiction's interest and having the authority to make decisions regarding the administration and oversight of the project.
- 81. LABORATORY. The testing laboratory of the Jurisdiction, or any other testing laboratory which may be designated by the Engineer.
- 82. LAWS AND REGULATIONS; LAWS OR REGULATIONS. Any and all applicable laws, rules, regulations, ordinances, codes, and orders of any and all governmental bodies, agencies, authorities, and courts having jurisdiction.
- 83. LIQUIDATED DAMAGES. The dollar amount established by the Contracting Authority and set forth in the Contract Documents as compensation for the damage to the Contracting Authority, or public, for delay in completion of the work, to be paid to the Contracting Authority, or to be deducted from any payments due or to become due the Contractor.
- 84. LUMP SUM. Unit of measurement for a bid item where no direct measurement will be made. The bid item amount is complete payment for all work described in the Contract Documents and necessary to complete the work for that item. The estimated quantities of lump sum work shown in the Contract Documents are approximate.
- 85. LUMP SUM ITEM. Unit of measurement for a bid item where no direct measurement will be made. The bid item amount is complete payment for all work described in the Contract Documents and necessary to complete the work for that item. The estimated quantities of lump sum work shown in the Contract Documents are approximate.
- 86. MATERIALS. Any substances specified for the use in the construction of the project and its appurtenances.
- 87. MATERIALS INSTRUCTIONAL MEMORANDUM (MATERIALS I.M.). This is an instruction prepared by the Iowa DOT's Office of Materials. These may identify approved sources of various qualities or types of materials, sampling, testing, and approval procedures, and conditions for acceptance and use.
- 88. MAY. Confers a power.
- 89. MILESTONE. A principal event specified in the Contract Documents relating to an intermediate completion date or time prior to Substantial Completion of all the Work.
- 90. MINOR IRREGULARITIES. An irregularity is considered minor when the effect on price, quantity, quality, or delivery is negligible compared to the total cost and does not affect the competitive positions of the bidders.
- 91. MOBILIZATION. Mobilization shall consist of preparatory work and operations for all items under the Contract, including, but not limited to, those necessary for the movement of personnel, equipment, supplies, and incidentals to the project site, and for the establishment of all offices, buildings, and other facilities, which must be performed or costs incurred prior to beginning work on the various items on the project site.
- 92. MUST. States a requirement.
- 93. NEW EQUIPMENT. Any equipment installed by the Contractor as required by the Contract Documents and incorporated into the work, and meets the following criteria:

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

- a. Not stored longer than 6 months after the date of manufacture.
 - b. Not refurbished in any way.
 - c. Not previously used or placed into service at any other location other than the project site.
 - d. Comprised only of unused parts.
 - e. Is capable of meeting all factory compliance testing protocols.
 - f. Not previously owned or sold by anyone other than the manufacturer, supplier, or the Contractor.
94. **NEW MATERIALS.** Any material that has been received directly from the manufacturer or supplier that can meet all compliance testing protocols. The material must not be refurbished, recycled, or previously used in any way.
95. **NOTICE OF AWARD.** A written notice to the Contractor issued by the Jurisdiction informing the Contractor it that has been awarded the Contract.
96. **NOTICE OF PUBLIC HEARING.** The public announcement or publication by the Jurisdiction, as required under Iowa Code Chapter 26, notifying the public of the time and place where any interested person may appear and file objections to the proposed plans, specifications, Contract, or estimated cost of the improvement.
97. **NOTICE TO BIDDERS.** The public announcement, publication, or solicitation by the Contracting Authority, inviting bids for work to be performed or materials to be furnished as required by Iowa Code Chapter 26.
98. **NOTICE TO PROCEED.** A written notice to the Contractor issued by the Engineer stating the date, on or before which, the Contractor is to begin the work. The date set forth in this notice shall be considered as the official starting date.
99. **PARTIAL UTILIZATION.** Use by the Jurisdiction of a substantially completed part of the work for the purpose for which it is intended (or a related purpose) prior to Substantial Completion of all of the Work.
100. **PCBs.** Polychlorinated biphenyls.
101. **PERFORMANCE, PAYMENT, AND MAINTENANCE BOND.** The bond submitted by the designated low bidder, in the amount specified in the Contract Documents, for the faithful performance of the Contract and the terms and conditions therein contained, for payment for all labor and materials provided, and for maintenance of improvements in good repair for the specified number of years from the time of acceptance of the improvements by the Jurisdiction.
102. **PETROLEUM.** Petroleum, including crude oil or any fraction thereof which is liquid at standard conditions of temperature and pressure (60 degrees Fahrenheit and 14.7 pounds per square inch absolute), such as oil, petroleum, fuel oil, oil sludge, oil refuse, gasoline, kerosene, and oil mixed with other non-Special Waste and crude oils.
103. **PHYSICAL CONDITION.** An existing man-made structure.
104. **PLANS.** Plans are the official drawings, standard plans, profiles, typical cross-sections, and supplemental drawings or reproductions thereof, approved and furnished by the Jurisdiction, which show the location, character, dimensions, and details of the work. All such documents are to be considered as a part of the plans whether attached to the plans or separate.
105. **PROJECT AREA.** The area of the specified project limits shown on the plans, and any additional area which is necessary for the Contractor to place traffic control devices required by the Contract Documents or necessary to protect the work improvement.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

106. **PROPOSAL.** The proposal is a properly signed and guaranteed written offer of the bidder containing the bid amount to perform the work. Proposal is the same as Bid.
107. **PROPOSAL FORM.** A form provided by the Jurisdiction, to the bidder, containing a listing of the bid items and quantities, and locations to enter unit prices and the bid amount.
108. **RADIOACTIVE MATERIAL.** Source, special nuclear, or byproduct material as defined by the Atomic Energy Act of 1954 (42 USC Section 2011 et seq.) as amended from time to time.
109. **RESIDENT BIDDER.** A person or entity authorized to transact business in the State of Iowa and having a place of business for transacting business within the state at which it is conducting and has conducted business for at least three years prior to the date of the first advertisement for the public improvement. If another state or foreign country has a more stringent definition of a resident bidder, the more stringent definition is applicable as to bidders from that state or foreign country.
110. **RESPONSIVE, RESPONSIBLE BID.** A bid submitted in accordance with the Notice to Bidders by a bidder that acknowledged all addenda, that responded to all proposal requirements, and that agreed to do everything required by the plans and specifications and other bid documents without any conditions, qualifications, or exclusions.
A bid submitted by a bidder that is capable of performing the work, possess the necessary financial and technical capability to perform the work, as well as the ability to complete the work in a timely and acceptable manner as demonstrated by past performance or other appropriate considerations, including but not limited to the ability to obtain and maintain insurance and bonding requirements.
111. **RESPONSIVE, RESPONSIBLE BIDDER.** A bidder that has submitted a bid that has been determined by the Jurisdiction to be both responsive and responsible.
112. **RIGHT-OF-WAY.** The land area of which the right to possession is secured or reserved by the Jurisdiction for the project, including permanent roadway easements.
113. **ROAD.** See Street.
114. **ROADWAY.** The portion of the right-of-way designated or ordinarily used for vehicular travel.
115. **SCHEDULE.** A written plan for performing work and achieving the completion of the improvement by a set of dates which specifies the sequence and time duration for each part of the work.
116. **SCHEDULE OF VALUES.** A schedule, prepared and maintained by the Contractor, allocating portions of the Contract Price to various portions of the work in an accurate manner, at a minimum separated by specification division, and used as the basis of payment for reviewing the Contractor's payment applications for lump sum bid projects.
117. **SHALL.** Imposes a duty.
118. **SHOP DRAWINGS.** Information and details for materials, products, or equipment to be supplied for the project, which are typically delivered to the project in an assembled or ready-to-use condition.
119. **SIDEWALK.** That portion of the street primarily constructed for the use of pedestrians.
120. **SITE.** The lands and other places on, under, in, or through which the Work is to be executed and any other lands or places provided by the Contractor or Jurisdiction for the purposes of constructing the Project together with such other places as may be designated in the Contract Documents or subsequently agreed by the Jurisdiction as forming part of the Site.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

- 121. SPECIAL ENVIRONMENTAL CONDITION. The presence of environmental conditions at the Site including Asbestos, PCBs, Petroleum, Hazardous Substances, or Radioactive Material in such quantities or circumstances that may present a substantial danger to persons, or the environment exposed thereto and requiring unique or special management of the soil, water, materials, or equipment in which they are found.
- 122. SPECIAL PROVISIONS. Additions and revisions to the SUDAS Standard, General, and Supplemental Specifications covering conditions peculiar to an individual project. They only apply to a project when specified in the Contract Documents.
- 123. SPECIALTY ITEMS. Portions of work designated in the Contract Documents requiring equipment, skills, or crafts not ordinarily associated with the expertise of the Contractor or the major types of work covered by the Contract; typically including, but not limited to, earthwork for building construction, electrical, mechanical, masonry, roofing, drywalling, floor covering, glass and glazing, painting, conveying systems, etc.
- 124. SPECIFICATIONS. The general term comprising all the written directions, provisions, and requirements including the SUDAS Standard Specifications and those added or adopted as Supplemental Specifications or Special Provisions all of which are necessary for the proper performance of the Contract.
- 125. STANDARD ROAD PLAN. The Iowa Department of Transportation's manual of detailed drawings showing standardized design features, construction methods, and approved materials.
- 126. STATE. The State of Iowa acting through its authorized representatives.
- 127. STREET. A general term denoting public way for vehicular travel, including the entire area within the right-of-way.
- 128. SUBCONTRACTOR. The subcontractor is any individual, firm, partnership, joint venture, corporation, or association licensed or otherwise authorized by law to do business where the project is located, to whom the Contractor, with the consent of the Jurisdiction, sublets a part of the work.
- 129. SUBSURFACE CONDITION. Existing state of earth material below the surface of the ground.
- 130. SUDAS STANDARD SPECIFICATIONS. The requirements contained herein applying to the Contract, and pertaining to the method and manner of performing the work, or to the quantity and quality of the materials to be furnished under the Contract. Previously referred to as the Iowa Statewide Urban Standard Specifications for Public Improvements.
- 131. SUPERINTENDENT. The Contractor's authorized representative in responsible charge of the work. The Superintendent is considered the same as the Contractor's Representative unless the Contractor has notified the Jurisdiction in writing that another person has been designated as the Contractor's Representative.
- 132. SUPPLEMENTAL CONTRACT (AGREEMENT). Written agreement between the Contractor and Contracting Authority modifying the original Contract pursuant to the Iowa Code.
- 133. SUPPLEMENTAL SPECIFICATIONS. Specifications adopted by a Jurisdiction that involve changes to the SUDAS Standard Specifications. They only apply to a project when specified in the Contract Documents.
- 134. SURETY. The corporation, partnership, or individual, other than the Contractor, Executing a bond furnished by the Contractor.
- 135. TARGET VALUE. When a target or target value is specified, a continuous and determined effort is expected to reach and maintain that value, as a goal.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1010 - DEFINITIONS

136. **UNAUTHORIZED WORK.** Unauthorized work is work done contrary to, in addition to, or regardless of, the Contract Documents, or the instruction of the Engineer; work done without lines, grade, and/or cross-section stakes and grades shown on the plans or as given by the Engineer; or work done in deviation from the Contract Documents without written authority.
137. **UNDERGROUND FACILITIES.** Includes but is not limited to all pipelines, conduits, ducts, cables, wires, manholes, vaults, tanks, or other such facilities or attachments, and any encasement containing such facilities, including those that convey electricity, gasses, steam, liquid petroleum products, telephone or other such communications, cable television, water, wastewater, storm water, other liquids or chemicals, or traffic or other control systems. A Physical Condition is not an Underground Facility.
138. **UNIT PRICE ITEM.** The price bid for one unit of work as defined by the specifications.
139. **UTILITY.** Includes all privately, publicly, municipally, or co-operatively owned structures and systems for supplying water, sewer, electric lights, street lights and traffic lights, gas, power, telegraph, telephone, communications, transit, pipelines, and the like.
140. **UTILITY AGENCY.** Means and includes (1) all franchised utilities having utility system facilities within the Jurisdiction, including but not limited to gas, electric, telephone, cable television, and communications; (2) communications systems licensed by the Jurisdiction; and (3) all governmental agencies owning or operating governmental utility systems, including but not limited to water, sewer, traffic control, and communications.
141. **WORK.** The work shall mean the furnishing of all labor, materials, equipment, and other incidentals necessary for construction of the improvement, successful completion of the Contract, and the carrying out of all duties and obligations imposed by the Contract, including the submission of all necessary paperwork relating to payrolls, sales tax, warranties, owner's manuals, maintenance manuals, and the like.
142. **WORKING DAY.** Any calendar day, exclusive of Saturdays, Sundays, or a recognized legal Jurisdiction holiday, on which weather or other conditions (not under control of the Contractor) will permit construction operations to proceed for not less than $\frac{3}{4}$ of a normal work day in the performance of a controlling item of work.

END OF SECTION

Section 1020 - Proposal Requirements and Conditions

Part 1: General

1.01 QUALIFICATION OF THE BIDDERS

- B. The bidder must be qualified by experience, financing, and equipment to do the work described in the Contract Documents. Whenever required in the special provisions, the bidder shall furnish a statement of its construction experience and its general ability to perform the work contemplated and shall submit same along with its proposal.
- C. The Jurisdiction shall have the right to take such action as it may deem necessary in determining the ability of the bidder to perform the work satisfactorily. The Jurisdiction reserves the right to reject any bid that is not responsive to the proposal form or Contract Documents, or not submitted by a responsive, responsible bidder.
- D. Upon request of the Engineer, the bidder, whose bid is under consideration for award of a contract, shall submit evidence of its financial resources, construction experience, and organization available for performance of the proposed work. A bidder's inability to promptly secure the required bonds and insurance coverages for the proposed work, as well as the bidder's demonstrated inability to continuously maintain insurance coverages on past projects, may be considered an indication of financial responsibility and the bidder's qualification as a responsive, responsible bidder.
- E. Alternatively, the Jurisdiction may require the qualification or prequalification of bidders pursuant to a program adopted by the Jurisdiction.

1.02 CONTENTS OF THE PROPOSAL FORMS

- A. Each prospective bidder will be furnished with a proposal form showing the location and description of the proposed work, the approximate quantities of work to be performed for which bid prices are requested, and the completion provisions. The Contract Documents will contain any special provisions that shall apply to the work to be performed.
- B. The purpose of the Contract Documents is to require the furnishing of highest quality equipment, material, and workmanship, and best accepted construction practice. The Bidder is expected to base its bid on materials and equipment complying fully with the Contract Documents. Each bidder, in submitting its bid, acknowledges its willingness to comply with the terms of these Contract Documents.

1.03 QUANTITIES AND UNIT PRICES

- A. Bidders shall submit a lump sum bid or unit bid price, as required by the proposal for the work covered by the Contract Documents. Prices shall cover complete work and include all costs incidental thereto.
- B. When unit prices are requested in the proposal form, the quantities indicated on the proposal form are approximate only, and do not constitute a warranty or guarantee by the Jurisdiction as to the actual quantities involved in the work. Such quantities are to be used for the purpose of comparison of bids and determining the amount of bid security, contract, and performance, payment, and maintenance bond. In the event of discrepancies between unit prices and unit price extensions listed in a bidder's proposal, unit prices shall govern and unit price extensions shall be corrected, as necessary, for agreement with unit prices. The Jurisdiction expressly reserves the right to increase or decrease the quantities during construction as outlined in Section 1040, 1.06 - Increase or Decrease of Work, and to make reasonable changes in design, provided such changes do not materially change the intent of the contract. The amount of work to be paid for shall be based upon the actual quantities performed.
- C. The proposal may have a lump sum item for mobilization. The bidder will indicate its bid price in dollars, and this will be the contract price for mobilization.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1020 - PROPOSAL REQUIREMENTS AND CONDITIONS

- D. Materials, equipment, or labor essential for the proper completion of the work that are not specified as bid items in the Contract Documents and are incidental, and the cost of which shall be included in other bid items.

1.04 EXAMINATION OF THE CONTRACT DOCUMENTS AND SITE OF WORK

- A. By submission of a proposal on the work, the bidder represents that it has carefully examined the site of the proposed work; the plans, specifications, and all other Contract Documents; and that the bidder is fully informed concerning the requirements of the contract, the Physical Conditions to be encountered in the work, and the character, quality, and the quantity of work to be performed, as well as materials to be furnished. The Contractor will not be entitled to additional compensation if it subsequently finds that conditions require methods or equipment other than that anticipated by the Contractor in making its proposal, except as provided in Section 1040, 1.09 - Changed Site Conditions.
- B. The attention of the bidder is directed to the fact that contracts for work, other than the proposed work, may have been awarded or may be awarded in the future. Completion of the proposed work may be contingent upon certain work by others or covered by other contracts being performed on the project in advance of this work; likewise, completion of work by others or covered by other contracts may be dependent upon completion of the proposed work. The bidder is expected to become familiar with work already in progress or previously let on this project, the contract periods, the progress being made, and any other conditions regarding work that may affect the bid or the bidder's performance under this contract.
- C. The bidder on this work acknowledges the facts set out in the preceding paragraph and agrees it is in the public interest to have the work of other contracts and agencies performed concurrently rather than consecutively. The bidder further agrees to cooperate and coordinate the work with other Contractors or agencies to the mutual interest of all parties doing work on the project.
- D. By the submission of a bid on this work, the bidder acknowledges and agrees investigation and inquiry has been made regarding the contracts for work with which this work must be coordinated. In the event disputes arise between Contractors or other agencies doing work on the project as to their mutual rights or obligations, the Engineer will define the rights of all interested parties regarding the work.
- E. The Jurisdiction does not warrant, impliedly or explicitly, the nature of the work, the conditions that will be encountered by the bidder, the adequacy of the Contract Documents for the Contractor to perform the work, or the conditions or structures to be encountered under any surface. Any such data supplied in the plans or other Contract Documents, or interpretation thereof by the Engineer, are merely for the convenience of the prospective bidders, who are to rely upon their own explorations of the site and of latent or subsurface site conditions except as notated in the Site Condition Information Section of the Contract Documents before completing and filing their proposal, unless as otherwise provided in Section 1040, 1.09 – Changed Site Conditions.

1.05 INTERPRETATION OF THE CONTRACT DOCUMENTS

- A. Prior to submission of the bid, if any prospective bidder is in doubt as to the true meaning of any parts of the Contract Documents, the bidder may request an interpretation from the Engineer. Any interpretation of the Contract Documents will be made only by addendum. It is the responsibility of all prospective bidders to ensure that they have received all addenda prior to the submitting of their bid.

1.06 ADDENDUM

- A. The Jurisdiction will post addenda at the website detailed in the Notice to Bidders and at the location of Contract Documents distribution. It is the bidder's responsibility to be aware of all Addenda to the Contract Documents, and to take any steps necessary to obtain a complete set of Contract Documents.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1020 - PROPOSAL REQUIREMENTS AND CONDITIONS

1.07 PREFERENCE FOR LABOR AND MATERIALS

- A. By virtue of statutory authority, preference will be given to products and provisions grown and coal produced within the State of Iowa, and to Iowa domestic labor, to the extent lawfully required under Iowa Code Chapters 73 and 73A.
- B. Such preferences will not be given where funding requirements, federal or otherwise, prohibit the giving of such preferences.

1.08 TAXES

- A. Sales Tax Exemption Certificate: The Jurisdiction, as a designated exempt entity awarding construction contracts, will issue Sales Tax Exemption Certificates to contractors and subcontractors allowing them to purchase, or withdraw from inventory, materials for the contract free from sales tax pursuant to Iowa Code Sections 423.2 and 423.45 and Iowa Administrative Code rule 701-219(423). This Sales Tax Exemption Certificate may also allow a manufacturer of building materials to consume materials in the performance of a construction contract without owing tax on the fabricated cost of those materials.
- B. Upon award of contract, the Jurisdiction will register the contract, Contractor, and each subcontractor with the Iowa Department of Revenue and Finance; and distribute Sales Tax Exemption Certificates and authorization letters to the Contractor and each subcontractor duly approved by the Jurisdiction according to Section 1080, 1.01 - Subletting or Assignment of Contract. These documents allow the Contractor and subcontractors to purchase materials for the contract free from sales tax. The Contractor and subcontractors may make copies of the Sales Tax Exemption Certificate and provide a copy to each supplier providing construction material. These Sales Tax Exemption Certificates and authorization letters are applicable only for the work under the contract.
- C. At the time the Contractor requests permission to sublet according to Section 1080, 1.01 - Subletting or Assignment of Contract, the Contractor shall provide a listing to the Jurisdiction identifying all subcontractors. For each subcontractor, include the Federal Employee Identification Number (FEIN), contact information, the name of a representative for the organization, a description of the work to be sublet, and the associated cost.
- D. The Contractor and each subcontractor shall comply with said Iowa Code sales tax requirements, shall keep records identifying the materials and supplies purchased and verify they were used on the contract, and shall pay tax on any materials purchased tax-free and not used on the contract.
- E. Income Tax: The bidder who is awarded the contract will be subject to payment of Iowa income tax on income from this work in amounts prescribed by law. If such bidder is a non-Iowa partnership, individual, or association, it shall furnish evidence, prior to execution of contract, that bond or securities have been posted with the State of Iowa Department of Revenue in the amount required by law and shall file a certificate issued by the Department, as provided in Iowa Code Section 422.17, releasing the Jurisdiction from withholding any and all sums required by the provision of Iowa Code Section 422.17.

1.09 PREPARATION OF THE PROPOSAL

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1020 - PROPOSAL REQUIREMENTS AND CONDITIONS

- A Proposal: Proposals shall be legibly written in ink or typed on the forms provided by the Jurisdiction and shall be completely executed by the bidder with the requisite full signatures. The bidder must indicate in the proposal whether the proposal is submitted by an individual, partnership, joint venture, limited liability company, or a corporation. If the proposal is submitted by an artificial entity, it must be executed by an officer of such entity with authority to bind such bidder to perform the contract upon award. The business address of the bidder shall be typed or printed on the proposal. If the bidder does not qualify as a resident bidder, the nonresident bidder shall specify on the project proposal whether any preference to resident bidders, including but not limited to any preference to bidders, the imposition of any type of labor force preference, or any other form of preferential treatment to bidders or laborers from that state or foreign country is in effect in the nonresident bidder's state or country of domicile at the time of a bid submittal.
- B Unit Price Attachment: The Engineer, at its option, may allow the bidder to submit a computer-generated attachment, hereinafter referred to as unit price attachment, in lieu of completing that portion of the proposal identifying the bid items, description, unit, quantity, and unit prices. If the Jurisdiction decides to allow this unit price attachment option, it will so state by special provision.
- C If a unit price attachment is submitted, it shall be attached to the proposal and shall include the following minimum information at the top of each page: project title, letting date, bidder's company name.
- 1 The unit price attachment shall have the same columns as the proposal; e.g. item number, description, unit, quantity, unit price, bid amount, etc. for each item. The bid item numbers and order on the unit price attachment shall follow that of the proposal.
 - 2 The total amount bid shall be entered below the last bid item on the unit price attachment.
 - 3 The unit price attachment page and print size shall be approximately the same as the proposal. Solid lines for separating the columns and lines need not be printed. Pages should be numbered by page number of the total pages (e.g. Page 1 of 4).
 - 4 The bidder's company name, as well as the authorized person signature, name, and title, shall be in ink and shall follow the total amount bid; and shall be the same person that signs the proposal.
 - 5 In case of discrepancy in the item number, description, unit, or quantity between the unit price attachment and the proposal, the proposal shall govern. The unit price shown on the unit price attachment shall govern.
 - 6 The bidder is solely responsible for the content, completeness, and accuracy of all the information contained in the unit price attachment. If the information in the unit price attachment is incomplete, the bid must be considered incomplete and be rejected.
 - 7 When evaluating and tabulating the bids, the Jurisdiction shall utilize only the unit price as shown on the unit price attachment, and the item number, description, unit, and quantity as shown on the proposal.
 - 8 The bidder, as a business organization, shall comply with the requirements of Section 1070,a.1.11 - Business Organization Requirements.
- D When unit prices are requested, they shall be submitted on each and every item of work included for which bids are requested. The format for unit prices will be in dollars and whole cents only. In case of discrepancy, the unit price figures shall govern.

1.10 BIDDERS CERTIFICATION

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1020 - PROPOSAL REQUIREMENTS AND CONDITIONS

- A By the submission of its proposal, the bidder certifies its bid is genuine and is not made in the interest of, or on behalf of, any undisclosed person, firm, or corporation; the bidder has not directly or indirectly induced or solicited any other bidder to put in a false or sham bid; the bidder has not solicited or induced any person, firm, or corporation to refrain from bidding; and the bidder has not sought, by collusion or otherwise, to obtain for itself any advantage over any other bidder or over the Jurisdiction.

1.11 IRREGULAR AND NONRESPONSIVE PROPOSALS

- A Proposals will be considered irregular and may be rejected for any unauthorized changes in the proposal form or for any of the following reasons:
- 1 If the bid or bid bond is submitted on a form other than that furnished by the Jurisdiction, or if the form is altered or any part thereof is detached or missing;
 - 2 If the bidder submits an obviously unbalanced bid. An unbalanced bid shall be defined as a bid containing lump sum prices or unit bid prices that do not reflect reasonable actual costs plus a reasonable proportionate share of the bidder's anticipated profit, overhead costs, and other indirect costs to complete that item;
 - 3 If the proposal does not contain a unit price for each pay item listed, except in the case of authorized alternate pay items; or
 - 4 If the bidder submits more than one proposal for the same work under the same or different names.
- B Proposals will be considered nonresponsive and shall be rejected for any of the following reasons:
- 1 If there are unauthorized additions, conditional or alternate bids of any kind on the Bid Proposal Form, or irregularities that affect the bid amount in any way.
 - 2 If the bidder adds any provisions reserving the right to accept or reject an award or to enter into contract pursuant to an award;
 - 3 If a bid on one project is tied to a bid on any other project, except as specifically authorized on the proposal form by the Jurisdiction;
 - 4 If the bidder makes corrections or alterations to the unit and lump sum prices it submits and such corrections or alterations are not initialed by the bidder prior to the time for filing bids. The Jurisdiction may require the bidder to identify any corrections or alterations so initialed;
 - 5 If the bidder makes any omission of prices on items shown on the proposal forms, or any addition in writing to the form of the bid, or any condition or limitation on its proposal.
- C If the bidder notes a requirement in the Contract Documents it believes will require a conditioned or unsolicited alternate bid, it shall immediately notify the Engineer in writing identifying such requirement. If the Engineer finds that such a requirement does exist in the Contract Documents, the Jurisdiction will make corrections thereto by an addendum.
- D Proposals will be evaluated by the Jurisdiction pursuant to the provisions of Section 1030,1.01 - Acceptance or Rejection of Proposals.

1.12 SUBMISSION OF THE PROPOSAL, IDENTITY OF BIDDER, AND BID SECURITY

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1020 - PROPOSAL REQUIREMENTS AND CONDITIONS

- A The proposal shall be sealed in an envelope, properly identified as the proposal with the project title and the name and address of the bidder, and deposited with the Jurisdiction at or before the time and at the place provided in the Notice to Bidders. It is the sole responsibility of the bidder to see its proposal is delivered to the Jurisdiction prior to the time for opening bids, along with the appropriate bid security sealed in the separate envelope identified as bid security and attached to the outside of the bid proposal envelope. Any proposal received after the scheduled time for the receiving of proposals will be returned to the bidder unopened and will not be considered. If the Jurisdiction provides envelopes for proposals and bid security, bidders shall be required to utilize such envelopes in the submission of their bids.
- B A corporation, limited liability company, or limited partnership shall bid in the name under which it is registered with the Iowa Secretary of State. A partnership shall bid in the name under which it is registered with the County recorder. An individual operating under a trade name shall bid using the trade name registered with the County recorder if such registration is required. The bidder's exact name as registered, if required, shall appear as the "principal" on any bid bond and shall appear on any cashier's check or share draft submitted to fulfill the bid security requirement. A bidder's failure to satisfy these requirements may be grounds for rejection of the bidder's proposal.

1.13 WITHDRAWAL OR REVISION OF THE PROPOSAL PRIOR TO OPENING OF PROPOSALS

- A A bidder may request, without prejudice, to withdraw its proposal after it has been deposited with the Jurisdiction, provided such request is made in writing to the Jurisdiction prior to the time set for receiving proposals.
- B Modifications or corrections to proposals may be made on the withdrawn proposal, provided such modifications or corrections are initialed by the Bidder and are received by the Jurisdiction prior to the time set for receiving proposals. Modifications or corrections to a proposal will not be accepted if the modifications or corrections render the bid security inadequate or if not accompanied by sufficient additional bid security.
- C If a bidder has requested in writing to withdraw its proposal, said bidder may submit a different proposal and bid security at that time or any time prior to the time set for receiving proposals.
- D A bidder will not be allowed to withdraw its proposal after the time set for receiving proposals except as specified in Section 1020, 1.15.

1.14 OPENING OF PROPOSALS

- A At the time and place set forth in the Notice to Bidders, proposals will be opened and read aloud. Proposals will be rejected if not accompanied by a bid security submitted in a separate, marked envelope if required by the Contract Documents. Submittals that do not include acknowledgement of each addendum to the Contract Documents may be rejected. Bid openings will be open to the public.

1.15 LIMITATION ON WITHDRAWAL OF PROPOSALS AFTER OPENING OF PROPOSALS

- A bidder shall not withdraw its proposal for period of 60 calendar days after the date designated for opening of proposals. However, in those projects involving special assessments, and confirmation by the District Court, no bidder shall withdraw its proposal for a period of 30 calendar days after the confirmation of the assessments by the Court.

END OF SECTION

Section 1030 - Approval for Award and Award of Contract

Part 1: General

1.01 ACCEPTANCE OR REJECTION OF PROPOSALS

- A The Jurisdiction reserves the right to accept the proposal that, in its judgment, is the lowest responsive, responsible bid; to award the contract by sections, if so specified in special provisions; to reject any or all proposals; to reject irregular or nonresponsive proposals as defined in Section 1020, 1.11 - Irregular and Nonresponsive Proposals; and to waive irregularities and/or technical deficiencies in the proposals to the extent allowed by law.
- B An individual, firm, partnership, corporation, or any association under the same or different names shall not submit more than one proposal. When reasonable evidence exists that a bidder has submitted more than one proposal at any letting for the same work under the same or different names, said proposals may be rejected.
- C Any or all proposals may be rejected if there is reason to believe collusion exists among bidders. Proposals received from participants in such collusion may not be considered for the same work if re-advertised.
- D Proposals may be rejected if the bidder has failed to promptly meet financial obligations undertaken in connection with other work under contract, or is in default on a previous contract, or has an unsatisfactory record of performance and cooperation on any such previous contract, or has failed to maintain satisfactory progress on work already under contract.
- E In the event the bid specifies the use of materials, workmanship, methods, or equipment not in conformance with the Contract Documents, the bid will be rejected. In the event the bid was based on, but did not specify, the use of materials, workmanship, methods, or equipment not in conformance with the Contract Documents, the bidder will be held responsible for furnishing or using materials, workmanship, methods, and equipment in conformance with the Contract Documents at no change in the bid price.
- F When a contract for a public improvement is to be awarded to the lowest responsible bidder, a resident bidder shall be allowed a preference as against a nonresident bidder from a state or foreign country if that state or foreign country gives or requires any preference to bidders from that state or foreign country, including but not limited to any preference to bidders, the imposition of any type of labor force preference, or any other form of preferential treatment to bidders or laborers from that state or foreign country. The preference allowed shall be equal to the preference given or required by the state or foreign country in which the nonresident bidder is a resident. In the instance of a resident labor force preference, a nonresident bidder shall apply the same resident labor force preference to a public improvement in this state as would be required in the construction of a public improvement by the state or foreign country in which the nonresident bidder is a resident.
- G Promptly after the proposals are opened and evaluated, the Jurisdiction shall give careful consideration to its needs, available funding, and other project considerations; and shall either designate the lowest responsive, responsible bidder and proceed with award of contract, or reject all bids and reconsider the project.

1.02 RELEASE OF BID SECURITY

- A After the proposals are opened, verified, and duly considered, the Jurisdiction will promptly release the bid security of all except the lowest responsive and responsible bidder awarded the Contract by the Jurisdiction. That bid security will be promptly released after the Jurisdiction has approved and executed the Contract. If all bids are rejected, all bid security will be promptly released.
- B Bid security shall be released to bidders, either by making such bid security available for retrieval by bidders, or, if requested by a bidder, by mailing the bid security to the bidder.

1.03 AWARD OF CONTRACT

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1030 - APPROVAL FOR AWARD AND AWARD OF CONTRACT

- A Contract Document Submittal: Within 10 calendar days after Receipt of Notice of Award from the Jurisdiction and before any work at the site is started, unless otherwise provided in the Contract Documents, the Contractor shall present the signed and executed Contract Documents, including contract, performance, payment and maintenance bond; certificate of insurance; and all other items required by the Contract Documents. The performance, payment, and maintenance bond and insurance certificate shall meet the requirements of Section 1070, Part 3 – Bonds and Insurance as required by the Jurisdiction. The Jurisdiction will thereupon receive and file such documents and execute the contract.
- 1 Evidence of Insurance: Before any Work at the Site is started, Contractor and Jurisdiction shall each deliver to the other, with copies to each additional insured identified in the Supplementary Conditions, certificates of insurance (and other evidence of insurance which either of them or any additional insured may reasonably request) which Contractor and Jurisdiction respectively are required to purchase and maintain in accordance with Article 5. Contractor shall deliver to Jurisdiction with Agreement and Bonds consistent with the Agreement, with copies to each additional insured or loss payee identified in the Contract Documents Insurance Requirements – Section 00700, Jurisdiction approved copies of certificates of insurance, copies of endorsements, and other evidence of insurance which either of them or any additional insured or loss payee may reasonably request, which Contractor is required to purchase and maintain in accordance with the Contract Documents Control of Work – Section 1050 Paragraph 3.04. Jurisdiction shall deliver to Contractor with copies to each additional insured or loss payee identified in these General Conditions certificates of insurance, copies of endorsements, and other evidence of insurance which either of them or any additional insured or loss payee may reasonably request, which Jurisdiction is required to purchase and maintain in accordance with the Contract Documents Control of Work – Section 1050 Paragraph 3.05.
- B Deferred Award: The Jurisdiction reserves the right to defer award of any contract for a period not to exceed 60 calendar days from the date of opening of proposals. No claims for compensable delay shall arise as the result of delay in the approval of award.
- C Failure to Execute the Contract: It is agreed by the bidder that upon its failure to enter into the contract and furnish the necessary insurance certificate and performance, payment and maintenance bond within 10 calendar days after Receipt of Notice of Award from the Jurisdiction, the amount of the bidder's bid security may at the Jurisdiction's option be forfeited and shall become the property of the Jurisdiction, to be retained not as a penalty, but as Agreed Costs of Delay. The award of the contract may then, at the discretion of the Jurisdiction, be made to the next lowest responsive, responsible bidder, or the work may be re-advertised or may be constructed by the Jurisdiction in any legal manner.
- D Disclosure of Subcontractors:
- 1 The lowest responsive, responsible bidder shall be required to file a list of the names and subcontract amounts of all subcontractors who are expected to work on the project according to Section 1080, 1.01 - Subletting or Assignment of Contract.
- 2 If after award of the contract a subcontractor is replaced, or the subcontract price or the work under the subcontract is changed, the bidder shall disclose the name of the new subcontractor, the revised subcontract price, or the change in the scope of subcontract work.
- 3 If a new subcontractor is added after award of the contract, the Contractor shall disclose the name of the new subcontractor.

END OF SECTION

Section 1040 - Scope of Work

Part 1: General

1.01 INTENT OF THE CONTRACT DOCUMENTS

- A These SUDAS Standard Specifications have been prepared to provide construction utilizing the best general practices and construction methods, utilizing first quality materials and work. The Contractor shall be responsible for providing or undertaking all work, labor, materials, equipment, tools, transportation, supplies, and activities included in these specifications, unless the responsibility for undertaking or providing same is specifically assigned to an identified party other than the Contractor.
- B The intent of the Contract Documents is to provide for the construction and completion in every detail of the work described or as may be amended. The Contractor shall furnish all labor, materials, equipment, tools, transportation, and supplies required to complete the work according to the plans, specifications, and terms of the Contract Documents. The silence or omission of the Contract Documents as to any detail shall be regarded as meaning only the best general practice is to prevail and only first quality materials and work are to be used.
- C To prepare the plans, specifications, and Contract Documents, the Engineer may have performed exploratory work to gain information relative to surface and subsurface conditions. This information, when shown in the Contract Documents, represents a summary of conditions as of the date the survey was made; it is only an approximate estimation of the site conditions made for the Jurisdiction to identify construction conditions and quantities and classes of work. This information in the Contract Documents does not guarantee that these and only these conditions will be encountered at the time of construction. The Bidder's bid shall be prepared based upon its examination of the site and its exploratory work.
- D Before making whatever additional investigations it feels are advisable, a bidder should contact the Engineer to determine available project area. If the Jurisdiction has not obtained right-of-entry for such investigation, the bidder shall be responsible to secure right-of-entry to any parcels where the Jurisdiction has not previously obtained right-of-entry before doing any investigation work. The bidder shall also be responsible for any traffic control necessary for any investigation work. The bidder shall further be responsible to obtain prior utility locates necessary to conduct such investigations.

1.02 CORRELATION OF THE CONTRACT DOCUMENTS

- A The plans and specifications are intended to supplement each other so any work shown on the plans and not mentioned in the specifications, or vice versa, shall be as binding and shall be completed as if that work was mentioned or shown on both and to the true intent and meaning of said plans and specifications.

1.03 COORDINATION OF SPECIFICATIONS, PLANS, AND SPECIAL PROVISIONS

- A In case of any discrepancy between the various items included in the Contract Documents, the items shall prevail, or govern, in the following descending order:
 - 1 Change Orders
 - 2 Addenda
 - 3 Proposal and Contract
 - 4 Special Provisions
 - 5 Plans, including plan notes
 - 6 Supplemental Specifications (Jurisdictional document)
 - 7 General Supplemental Specifications (SUDAS)
 - 8 SUDAS Standard Specifications
- B The Contractor shall not take advantage of any apparent error or omission in the plans or specifications or of any discrepancy between the plans or specifications.
- C Certain Iowa Department of Transportation (IDOT) specifications and details are incorporated into the SUDAS standard specifications and the Jurisdiction's supplemental specifications and special provisions. Only those IDOT Specifications referred to by specific section numbers in the Plans and Contract Documents Manual are incorporated herein. IDOT

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1040 – SCOPE OF WORK

Specifications not referred to by specific section numbers are not part of the SUDAS standard specifications or the Jurisdiction's supplemental specifications or special provisions and may not be utilized or relied upon under any circumstance by the Contractor.

- D Contractor shall only use forms required for the execution of the work that are contained in the Contract Documents Manual.

1.04 CONFORMITY WITH THE CONTRACT DOCUMENTS

- A Reasonably Close Conformity: All work performed and all materials furnished shall comply with the lines, grades, cross sections, dimensions, and material requirements, including tolerances, shown in the Contract Documents. Where tolerances are not specified, work shall comply with reasonable and customary manufacturing and industry standards. The Engineer may, in the Engineer's sole discretion, accept variations beyond such requirements or tolerances where they will not materially affect the value or utility of the work and interests of the Jurisdiction.
- B Defective Work: Work not in reasonably close conformity with the contract documents, or requirements thereof that, in the sole discretion of the Engineer, has resulted in inferior or unsatisfactory work. Defective work shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.
- C Deficient Work: Work not in reasonably close conformity with the contract requirements but that, in the sole discretion of the Engineer, may be accepted and allowed to remain in place with a price adjustment and/or extended warranty period. In the event the Engineer agrees to accept deficient work with a price adjustment/extended warranty, the Engineer will document the basis of acceptance by contract modification making appropriate adjustments in the contract price for such work or materials.

1.05 PLANS

- A The final plans on file in the Jurisdiction show the location, typical construction details, and dimensions of the work contemplated. The work shall be performed in conformity therewith, except in case of error or unforeseen contingency.

1.06 INCREASE OR DECREASE OF WORK

- A Unforeseen work made necessary by the Engineer's changes of the Contract plans or specifications, or work that is necessary for completion of the project, but for which no price is provided in the Contract, shall be done in accordance with the requirements of the specifications and as directed by the Engineer. The Jurisdiction reserves the right to make such alterations in the plans or in the quantities of work as may be considered necessary. Such alterations must be in writing by the Engineer in the form of a change order and shall not be considered as a waiver of any conditions of the Contract Documents or to invalidate any of the provisions thereof.
- B The Engineer shall notify the Contractor of the necessity for such extra work, stipulating its character and extent, and shall notify the Contractor as to whether the Engineer wants the Contractor to propose a unit price or, instead, a lump sum, for the extra work. Within 5 days of receipt of such notification, the Contractor shall advise the Engineer, in writing, of the compensation (as a unit price or lump sum, whichever has been requested by the Engineer) that the Contractor requests as compensation for the required extra work.
- C The Contractor's request shall be itemized and reasonably detailed, and shall include all known or anticipated direct and indirect costs of the work, including but not limited to, the costs of all safety and other equipment, small tools, labor, subcontractor quotes, consumables, field office overhead, insurance, bonding, and profit.
- D Unless such alterations, increases, or decreases materially change the character of the work to be performed or the cost thereof, the altered work shall be paid for at the same unit prices as listed on the bid proposal form. If the total pay quantity of an item varies from the bid quantity by 25% or less, payment for that item will be made at the original contract unit price therefor. If, however, the character of the work or if either the unit or lump sum costs thereof are materially changed, due to changed site conditions, an allowance for extra work shall be

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1040 - SCOPE OF WORK

made on such basis in the form of a written change order, in accordance with Section 1040, Articles 1.06 and 1.07 in advance of the performance of the work.

- E Extra Work: Extra work ordered by the Engineer, of a quality or class not covered by the contract, will be paid for either at an agreed price or on at the option of the Engineer, on a cost-plus basis.
 - 1 Agreed Price Basis - For extra work ordered by the Engineer and performed on an agreed price basis, the Engineer and the Contractor shall enter into a written change order before the work is undertaken. This written agreement shall describe the extra work that is to be done and shall specify the agreed price or prices therefore.
 - 2 Cost-plus Basis - Payment for such work shall be based either on a unit price or on a lump sum, to be agreed upon before the extra work is started; or, if no agreement as to price can be reached, the Engineer may order that the work will be completed and paid for on a cost-plus basis in accordance with the terms of Section 1040, Article 1.10.
- F Eliminated Items: If an item is entirely eliminated from the Contract, the Jurisdiction will pay the Contractor only for costs which it incurred in connection with the eliminated item prior to the date upon which the Engineer provided the Contractor with written notice of said elimination. If the Contractor had ordered project materials (that conformed to all pertinent Contract requirements) prior to the aforesaid date of notification, and if the orders for said materials could not have been canceled within 2 business days after the date of notification, the Jurisdiction shall pay the Contractor for said materials at their actual cost to the Contractor. In such a case, the materials shall become property of the Jurisdiction and the actual cost of any further handling necessary to deliver them to the Jurisdiction shall be assumed by such.
 - 1 If the materials are returnable to their vendor and if the Engineer so directs, the Contractor shall return the materials to the vendor and the Jurisdiction shall reimburse the Contractor (i) for any reasonable charges made to the Contractor by the vendor for the return of the materials, and (ii) for the actual costs to the Contractor of its handling the materials in returning them to the vendor. Such charges or actual costs to be paid by the Jurisdiction shall be computed as though the work was being paid for on a cost-plus basis under Section 1040, Article 1.06 C.
 - 2 Should the Engineer determine any Contract items, or portion of project work contained in a lump sum item, to be unnecessary for completion of the Project, the Engineer may eliminate such items or portion of work from the Contract. Such action shall in no way invalidate the Contract; and no allowance for any items, or portion of work contained in a lump sum item so eliminated, will be made by the Engineer in making final payment to the Contractor, except for (a) such actual work as may have been done on the items, or portion of work contained in a lump sum item, prior to the Engineer's notice to the Contractor that the items or work had been eliminated; and (b) such related material as may have been purchased for the Project prior to said notice. Such charges or actual costs to be paid by the Jurisdiction shall be computed as though the work was being paid for on a cost-plus basis under Section 1040, Article 1.06 C.

1.07 CHANGE ORDERS

- A Field Directive: The Engineer or Jurisdiction Representative shall have authority to give field directives for minor or incidental changes in the work not involving extra cost and not inconsistent with the proposed purpose of the work. The Engineer or Jurisdiction Representative shall issue the field directive in writing and it must be signed by the Engineer/Jurisdiction Representative and the Contractor's Representative.
- B Written Change Orders: The Engineer may in his/her discretion, and subject to formal approval by the Jurisdiction, issue written change orders changing the scope of the work and/or adjusting the amount to be paid to the Contractor for performing such work; however,

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1040 – SCOPE OF WORK

the Engineer may, in case of emergency of endangering life or property, orally authorize by field directive such a change order without formal approval by the Jurisdiction. Each written change order for extra work shall be explicit in its instruction and shall be duly executed by the Engineer/Contractor/Jurisdiction. One copy of said change order shall be filed with each. Each change order shall stipulate the amount and method of payment.

- C Cost of Extra Work: If a mutually agreeable price cannot be reached by the Contractor and Jurisdiction, a percentage markup will be allowed to the Contractor for extra work performed on a cost-plus basis and shall be in accordance with the following:
- 1 For all extra work costs listed below, the Contractor's fee for overhead and profit shall be 15%.
 - a These costs included shall be regular payroll costs including salaries and wages plus the cost of fringe benefits.
 - b Cost of all materials and equipment used and incorporated into the Work.
 - 2 For all extra work costs listed below the Contractor's fee for overhead and profit shall be 5%.
 - a Payments made by Contractor to a subcontractor for work performed by a subcontractor.
 - b Payments made by a subcontractor to a subcontractor for work performed by a subcontractor. The actual subcontractor completing the work will be allowed to mark up their direct costs by 15% as in 1.07.C.1 above.
 - 3 No markup fee shall be payable to the Contractor for:
 - a Special consultants employed to provide professional, testing and inspection type services directly related to accomplishing the Work.
 - b Transportation and travel costs incurred by the Contractor's employees.
 - c Rental and maintenance of any construction equipment, hand tools, or similar related in any way to constructing the extra work.
 - d Cost fuel, utilities, sanitary facilities or similar.
 - e The purchase of additional insurance or bonding to maintain the requirements of the Contract.
 - f Any other direct cost not specifically mentioned in Section 1040, Article 1.07.C.
 - 4 Documentation of extra work costs: For all work performed on a cost-plus basis, the Contractor shall furnish documentation and records that clearly establish the true cost of the extra work. Documentation and records shall meet the standards of generally accepted accounting practices.
 - 5 If a contract price deduction is due to the Jurisdiction, than actual costs of the deducted work will be calculated plus a deduction in the Contractor's fee for overhead and profit in the amount equal to 5% of the calculated deduction will be added to the total contract price deduction.
 - 6 Costs not allowed:
 - a No part of the salary or expenses of anyone connected with the Contractor's forces above the grade of Site Superintendent, who provides general supervision of project work, will be included in the above payment calculations. The Engineer reserves the right to determine the number and type of personnel to be employed for the cost-plus Project work.
 - b The Jurisdiction will not pay rental rates for small tools needed to complete the cost-plus Project work.
 - c Any type of office cost other than those for the Contractor's office at the work site.
 - d Any cost due to Contractor's negligence.

1.08 SITE CONDITIONS

- A The Contractor is required by Section 1020, 1.04 -Examination of the Contract Documents and site of the work to make reasonable investigation and examination to determine latent

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1040 - SCOPE OF WORK

and subsurface conditions at the site of the work prior to preparing its proposal. The Jurisdiction makes no guarantee of any conditions, latent or subsurface, at the site of the work. The Jurisdiction is not obligated to make any payments to the Contractor if latent or subsurface conditions are not consistent with the technical reports or other information provided by the Engineer in the Contract Documents.

- B Failure of the Contractor in determining adverse site conditions prior to filing its proposal, or in any phase of its performance of the work, shall be grounds for refusal by the Jurisdiction to agree to pay for additional work by the Contractor necessitated by such site conditions.

1.09 CHANGED SITE CONDITIONS

A Latent or Subsurface Conditions:

- 1 If the Contractor encounters latent or subsurface conditions differing materially from those indicated in the Contract Documents which the Contractor could not have discovered by a reasonable site investigation and examination of the type customarily undertaken by prudent and competent contractors, and if these changed conditions are considered by the Contractor as a basis for extra work in addition to the contract price, the Contractor shall within two working days after discovery thereof notify the Engineer of its claim in writing. Before disturbing the site at which the latent or subsurface condition is alleged to exist, the Contractor shall give the Engineer the opportunity to inspect the same.
- 2 After inspection by the Engineer, the Jurisdiction may, in its discretion, authorize the Contractor to proceed with or abandon the work. The Contractor shall resume construction operations pending a decision regarding its claim by the Jurisdiction. Failure of the Contractor to give written notice within two working days of discovering the conditions and to give the Engineer full opportunity to inspect the subsurface condition before disturbing the site shall be deemed a waiver by the Contractor of all claims for extra work arising out of the alleged condition.
- 3 Latent or subsurface conditions that do not materially differ from those shown on the plans shall not form the basis for additional compensation. No additional compensation or extension of time shall be provided for conditions that do not materially differ, regardless of the nature of the condition encountered.

B Compensation:

- 1 If the Engineer determines the condition could not reasonably have been discovered, the Contractor is entitled to additional compensation by reason of increased expense caused by the condition, and said condition requires work not contemplated by the contract, a change order will be executed by the parties providing for additional compensation for such amount as the parties may agree upon.
- 2 If the Engineer determines the condition to be such as to justify an extension in contract time, such additional time will be granted according to Section 1040, 1.11 - Delays Caused by the Jurisdiction and Section 1080, 1.09 - Extension of Time.
- 3 Notice: If the Contractor thinks that any subsurface or physical condition that is uncovered or revealed:
 - a Is of the nature as to establish that any technical documents or Contract Documents provided to the Contractor is found to differ materially; or
 - b Is of the nature to require a change in the Contract Documents;Then Contractor shall, after becoming aware of and before disturbing the subsurface or physical conditions or performing any Work involving the changed condition, barring an emergency situation, notify the Jurisdiction and Engineer in writing about such condition. Contractor shall not disturb the concerning subsurface or physical conditions until confirmation of how to proceed is received from the Jurisdiction and Engineer in a written order.
- 4 Limited Reliance by Contractor on Technical Documents Authorized: Contractor may rely upon the accuracy of the technical documents contained in such reports and

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1040 – SCOPE OF WORK

drawings, but such reports and drawings are not Contract Documents. Except for such reliance on such technical documents, Contractor may not rely upon or make any claim against Jurisdiction or Engineer, or any of their officers, directors, members, partners, employees, agents, consultants, or subcontractors with respect to:

- a the completeness of such reports and drawings for Contractor's purposes, including, but not limited to, any aspects of the means, methods, techniques, sequences and procedures of construction to be employed by Contractor and safety precautions and programs incident thereto; or
 - b other data, interpretations, opinions and information contained in such reports or shown or indicated in such drawings; or
 - c any Contractor interpretation of or conclusion drawn from any technical documents or any such other data, interpretations, opinions or information.
- 5 Contractor shall not be responsible for any Special Environmental Condition uncovered or revealed at the Site which was not shown, or identified in the Contract Documents to be within the scope of the Work. Contractor shall be responsible for a Special Environmental Condition created with any materials brought to the Site by Contractor, Subcontractors, Suppliers, or anyone else for whom Contractor is responsible.
- 6 If Contractor encounters a Special Environmental Condition or if Contractor or anyone for whom Contractor is responsible creates a Special Environmental Condition, Contractor shall immediately: (i) secure or otherwise isolate such condition; (ii) stop all Work in connection with such condition and in any area affected thereby (except in an emergency); and (iii) notify Jurisdiction and Engineer (and promptly thereafter confirm such notice in writing). If necessary, Jurisdiction will contact relevant regulatory agencies to report a Special Environmental Condition and obtain required permits. If the Special Environmental Condition encountered by Contractor was not identified or indicated in the technical documents listed in the Contract Documents Section 00775 Paragraph 775.1 and 775.2 – Site Condition Information, Jurisdiction shall promptly consult with Engineer concerning the necessity for Jurisdiction to retain a qualified expert to evaluate such condition or take corrective action, if any. Promptly after consulting with Engineer, Jurisdiction shall take such actions as are necessary to permit Jurisdiction to timely obtain required permits and provide Contractor the written notice required by Paragraph 1.09.A.3.
- 7 Contractor shall not be required to resume Work in connection with such condition or in any affected area until after Jurisdiction has obtained any required permits related thereto and delivered written notice to Contractor: (i) specifying that such condition and any affected area is or has been rendered safe for the resumption of Work; or (ii) specifying any special conditions under which such Work may be resumed safely. Contractor shall not be allowed any adjustment to Contract Price or Contract Times if such condition was caused by Contractor or anyone for whom Contractor is responsible. If Jurisdiction and Contractor cannot agree as to entitlement to or on the amount or extent, if any, of any adjustment in Contract Price or Contract Times, or both, as a result of such Work stoppage or such Special Environmental Conditions under which Work is agreed to be resumed by Contractor, either party may make a claim.
- 8 If after receipt of such written notice Contractor does not agree to resume such Work based on a reasonable belief it is unsafe, or does not agree to resume such Work under such Special Environmental Conditions, then Jurisdiction may order the portion of the Work that is in the area affected by such condition to be deleted from the Work. If Jurisdiction and Contractor cannot agree as to entitlement to or on the amount or

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1040 - SCOPE OF WORK

extent, if any, of an adjustment in Contract Price or Contract Times as a result of deleting such portion of the Work, then either party may make a claim. Jurisdiction may have such deleted portion of the Work performed by Jurisdiction's own forces or others in accordance with the Contract Documents Control of Work – Section 1050 Paragraph 1.04.

- 9 If the introduction onto the Project Site of a Hazardous Substance is identified or exacerbation of unknown Special Environmental Conditions was not caused by the Contractor or any of its subcontractors or suppliers of any tier, or any person or entity under the control of the Contractor or any of its subcontractors or suppliers of any tier, the Jurisdiction shall indemnify and hold harmless Contractor, Subcontractors, and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all direct claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work in any area affected by Hazardous Substance. Nothing in this Paragraph 1.09.A.9 shall obligate Jurisdiction to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence to the extent allowed by law.
- 10 To the fullest extent permitted by Laws and Regulations, Contractor shall indemnify and hold harmless Jurisdiction and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to a Hazardous Environmental Condition created by Contractor or by anyone for whom Contractor is responsible. Nothing in this Paragraph 1.09.A.10 shall obligate Contractor to indemnify any individual or entity from and against the consequences of that individual's or entity's own negligence.
- 11 Regardless of fault and regardless of any other clause in this Agreement, the Contractor shall not, as a result of the Hazardous Substance encountered on Site, be entitled to any compensatory damages, including without limitation, damages for delay, disruption, liquidated damages, including without limitation, damages for delay, disruption, agreed costs of delay, or consequential damages or any type, including lost profits. If the Hazardous Substance introduction is caused by the Jurisdiction or was located at the Project Site and was not shown or indicated in the Contract Documents to be within the Scope of Work before Work commenced on the Project, the Contractor shall only be entitled to an extension of the Contract Time and the Jurisdiction shall assume responsibility for the remediation of such substances.
- 12 If the Contractor, or any of its subcontractors or suppliers of any tier, or any person or entity under the control of the Contractor or any of its subcontractors or suppliers of any tier, is responsible for (i) introducing and discharging Hazardous Substance onto the Site which was not otherwise specified by the Contract Documents; and/or (ii) disturbing Hazardous Substance clearly identified in the Contract Documents, the Contractor shall hire a qualified remediation contractor at Contractor's sole cost to eliminate the condition as soon as possible. Under no circumstances shall the Contractor perform Work for which it is not qualified. Jurisdiction, in its sole discretion, may require the Contractor to retain at its cost an independent testing laboratory.
- 13 The Contractor shall indemnify and hold harmless Jurisdiction and Engineer, and the officers, directors, members, partners, employees, agents, consultants, and subcontractors of each and any of them from and against all claims, costs, losses,

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1040 – SCOPE OF WORK

and damages (including but not limited to all fees and charges or engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or resulting from (a) use, disturbance or storage of Hazardous Substance or execution of the Work; and (b) disturbing any Hazardous Substance found on the Site, provided that the Contractor had prior notice of the existence and location of the Hazardous Substance.

14 When the Contractor notifies the Jurisdiction of Hazardous Substance at the Project Site, the Contractor shall include with its notice a written and pictorial delineation of the affected area where the Contractor claims that the Work must stop. If the Jurisdiction objects to the delineation of the affected area, the Jurisdiction shall respond to the Contractor in writing within one business day explaining the objections and providing the Jurisdiction's delineation, if any, of the affected area.

15 The provisions of the Contract Documents Section 00775 Paragraph 775.1 and 775.2 – Site Condition Information do not apply to a Hazardous Environmental Condition uncovered or revealed at the Site.

1.10 DELAYS CAUSED BY THE JURISDICTION

A If the Jurisdiction or its agents should cause a delay in any part of the work or in the Final Completion of the job, this fact shall not make void the provisions of the contract as to liquidated damages; but the Contractor will promptly be given such extension of time for the Final Completion of the job as the Jurisdiction may deem proper to compensate the Contractor for such delay.

1.11 ORAL AGREEMENTS, CONVERSATIONS, AND INFORMAL COMMUNICATIONS

A No oral agreement or conversation made or had with any officer, agent, or employee of the Jurisdiction, and no informal written communication from any officer, agent, or employee of the Jurisdiction, occurring either before or after execution of the contract, shall affect or modify any of the terms or obligations contained in any of the Contract Documents. Such oral contact and such informal writings shall be considered as unofficial information and in no way binding upon the Jurisdiction. Only written change orders, as set forth in Section 1040, Article 1.07 shall be used to modify the contract.

1.12 ERRORS OR OMISSIONS

A The Contractor shall examine the Contract Documents before beginning construction work. If errors or omissions are discovered in the Contract Documents, the Contractor shall call them to the attention of the Engineer before proceeding with the work. In case revised Contract Documents of a supplementary or explanatory nature are necessary or desirable for clarification, or to correct any errors or omissions, they will be issued by the Engineer with approval of the Jurisdiction in accordance with Section 1040, Article 1.07.

END OF SECTION

Section 1050 - Control of Work

Part 1: General

1.01 AUTHORITY OF THE ENGINEER

- A The work included in the contract is to be completed to the satisfaction of the Engineer & Jurisdiction, and the decision of the Engineer as to the true construction and meaning of the Contract Documents, plans, specifications, estimates, and as to all questions arising as to proper performance of the work, shall be final, except as provided in Section 1040, 1.10 - Disputed Claims for Extra Compensation.
- B The Engineer shall determine the unit quantities and the classification of all work done and materials furnished under the provisions of the Contract Documents, and the Engineer's determination thereof shall be final except as provided in Section 1040, 1.10 - Disputed Claims for Extra Compensation.
- C The Engineer & the Jurisdiction shall decide any and all questions that may arise regarding the quality or acceptability of materials furnished and work performed, the rate of progress of the work, including cleanup and restoration, acceptable fulfillment and performance of the contract on the part of the Contractor, and compensation due. The decision of the Engineer in such matters shall be final except as provided in Section 1040, 1.10 - Disputed Claims for Extra Compensation.
- D Nothing contained in this section or in the Contract Documents shall be construed as requiring or permitting the Engineer to direct the means, methods, sequences, or procedures, including safety measures, of performing any work under the contract or Contract Documents, except to ensure the quality of work conforms to these specifications and other provisions of the Contract Documents and the contract will be completed as scheduled.

1.02 AUTHORITY AND DUTIES OF THE ENGINEER'S AUTHORIZED REPRESENTATIVE

- A The Engineer may appoint a representative to monitor any or all materials used and work done. Such observation may extend to any or all parts of the work and to the preparation or manufacture of the materials to be used. The Engineer's authorized representative will not be authorized to revoke, alter, enlarge, or relax the provisions of these specifications. When placed on the work, the Engineer's authorized representative will keep the Engineer informed as to the progress and quality of the work and the manner in which it is being done.
- B Results of tests and examinations may be available to the Contractor on an informational basis. Absence or presence of representative test data does not alter the Contractor's responsibility for compliance with the Contract Documents. The Engineer's authorized representative will call to the attention of the Contractor any lack of compliance with the Contract Documents. However, failure of the Engineer's authorized representative or the Engineer to call the attention of the Contractor to faulty work or to lack of compliance with the Contract Documents shall not constitute acceptance of such work.
- C The Engineer's authorized representative will not be authorized to approve or accept any portion of the work or to issue instructions contrary to the Contract Documents. The Engineer's authorized representative will act under the authority of the Engineer to reject defective work or material, and to suspend any work that is not being properly performed, subject to the final decision of the Engineer.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1050 - CONTROL OF WORK

- D The Engineer's authorized representative will not act as supervisor or perform other duties for the Contractor, nor improperly interfere with management of the work. The Engineer's authorized representative will exercise such additional authority as may, from time to time, be delegated by the Engineer.

1.03 COOPERATION BY THE CONTRACTOR

- A A set of approved plans, specifications, Contract Documents, and any special provisions and authorized alterations will be supplied to the Contractor, and the Contractor shall have them available on the job site at all times.
- B A designated, competent Superintendent (the Superintendent) of the Contractor shall be present on the site of the work continually during its progress. This Superintendent must be capable of reading and thoroughly understanding the Contract Documents and experienced in the type of work being performed. This Superintendent shall supervise, direct, and control the Contractor's operations, personnel, and work, and oversee the Subcontractor's operations.
- C The Contractor shall give the Engineer written notification of the name of the Superintendent. The Superintendent shall receive from the Engineer all explanations and directions necessary for the satisfactory prosecution and completion of the work.
- D The Contractor shall not cause any unnecessary delay or hindrance to other Jurisdiction contractors on the work and shall be required to cooperate with other Jurisdiction contractors to the fullest extent.

1.04 COOPERATION WITH OTHER JURISDICTION CONTRACTORS

- A The Jurisdiction reserves the right to award other contracts in connection with this work and the total improvement. The Contractor is required to become fully informed of the conditions relating to construction and labor under which the work will be or is now being performed, and the Contractor shall employ, as far as possible, such methods and means in the carrying out of its work as will not cause any interruption or interference with any other Contractor or agency. The Contractor shall give other contractors reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly integrate, incorporate, and/or coordinate its work with theirs.
- B If any part of the Contractor's work depends on proper execution or results on the work of any other Jurisdiction Contractor, the Contractor shall inspect and promptly report to the Engineer any defect in such work by another Jurisdiction Contractor that renders it unsuitable for such proper execution and results. The Contractor's failure to inspect and report such defects shall constitute an acceptance of the other Jurisdiction Contractor's work as fit and proper for the integration or incorporation of its work, except as to defects that may develop in the other Jurisdiction Contractor's work after the execution of the Contractor's work.
- C Wherever work being done by the Jurisdiction's forces or by other Jurisdiction contractors is contiguous to work covered by the contract, the respective rights of the various interests involved shall be established by the Engineer, in order to secure the completion of the various portions of the work in general harmony.

1.05 SHOP DRAWINGS, CERTIFICATES, AND EQUIPMENT LISTS

- A Submission of Drawings:
 - 1 The Contractor shall submit to the Engineer all shop drawings and equipment drawings or lists as called for in the Contract Documents or as requested by the Engineer. Drawings and listings shall be complete and shall contain all required detail information conveyed according to the latest recommended standards for detailing.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1050 - CONTROL OF WORK

- 2 The Contractor shall make any corrections required by the Engineer and submit the revised shop or equipment drawings or listings for review. After review by the Engineer, the shop or equipment drawings or listings will be so marked, dated, signed by the Engineer, and forwarded to the Contractor for reproduction and distribution.
 - B Submission of Equipment Lists:
 - 1 If specified in the Contract Documents, as soon as practicable after award of contract and before any items of material or equipment are purchased, the Contractor shall submit to the Engineer for review a complete list of the principal fixtures and equipment to be incorporated into the work.
 - 2 The Contractor shall also submit applicable brochures, technical data, catalogs, cuts, diagrams, manufacturer's drawings and installation instructions, samples if required, and other descriptive data including the complete description, trade name, model number, type, size, and rating.
 - C Engineer's Review:
 - 1 Review by the Engineer shall not be construed as a complete check but will indicate only that the general method of construction and detail is satisfactory. The Engineer assumes no responsibility for errors in dimensions in the shop drawings and assumes the Contractor will use material complying with requirements of the Contract Documents or, where not specified, those of sound and reasonable quality, and will erect the subjects of such shop drawings according to recognized standards of first quality work or, when specified, according to standards of the Contract Documents.
 - 2 Any work done or material ordered by the Contractor prior to review by the Engineer shall be at the Contractor's risk.
- 1.06 EXAMINATION OF MATERIALS AND WORK
- A The Contractor shall furnish the Engineer and its agents every reasonable opportunity to ascertain whether the work and materials are in conformity with the Contract Documents. At any time before final acceptance of the work, at the request of the Engineer, the Contractor shall remove or uncover portions of the work for examination. After examination, the Contractor shall restore such portions of the work to the standards required by the Contract Documents.
 - B Should the work thus exposed and examined prove acceptable, the uncovering, removing, and replacing of such work shall be paid for as specified in Section 1090, 1.04 - Payment for Change Orders. Should the work thus exposed and examined prove unacceptable, the uncovering, removing, and replacing of such work shall be at the Contractor's expense.
- 1.07 REMOVAL OF DEFECTIVE WORK AND MATERIALS
- A Defective work or materials may be rejected by the Engineer any time before the Final Completion of the Project. Notice of such rejection must be given in writing by the Engineer. Such rejected work shall be corrected to the satisfaction of the Engineer. Failure or neglect on the part of the Engineer to reject unsatisfactory material or reject inferior workmanship shall not release the Contractor, nor shall it be construed as an acceptance of such work, nor shall the final acceptance of such work bar the Jurisdiction from recovering damages on account thereof.
 - B Any defective work shall be removed and replaced at the Contractor's expense. Should the Contractor fail or refuse to remove defective work when so ordered by the Engineer, the Engineer shall have authority to order the Contractor to suspend further operations, and may withhold payment on estimates until such defective work has been removed and replaced according to the Contract Documents.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1050 - CONTROL OF WORK

- C Continued failure or refusal on the part of the Contractor to correct defective work promptly shall be sufficient cause for the Jurisdiction to declare the contract in default. No compensation will be paid to Contractor for defective work or materials, or for the satisfactory removal, correction, or disposal thereof.
 - D No compensation will be paid to Contractor for defective work or materials, or for the satisfactory removal, correction, or disposal thereof.
- 1.08 UNAUTHORIZED WORK
 - A Unauthorized work is work done contrary to the work shown in the Contract Documents. The Jurisdiction will not pay for unauthorized work.
 - B Unauthorized work may be ordered by the Jurisdiction in its sole discretion to be removed and replaced immediately at the Contractor's expense.
- 1.09 PROTECTION OF LINE AND GRADE STAKES
 - A The work shall be performed in strict conformity with the Contract Documents and to the lines and grades as fixed by the Engineer, and shall be according to such instructions as may be given by the Engineer. When such stakes or lines are given by the Engineer, the Jurisdiction will be responsible for the correctness thereof, and the Contractor will be responsible for their proper use, interpretation, and preservation.
 - B The Contractor shall protect and preserve in their original position all stakes, points, or marks set for the work by the Engineer. Where the Engineer shall consider such stakes, points, or marks to have been unnecessarily altered or destroyed, the Engineer may cause the expense of correcting or replacing them to be charged to the Contractor and the amount of such costs deducted from any monies due or which may become due to the Contractor under the contract.
- 1.10 PROVIDING JOB SITE UTILITIES
 - A The Contractor shall make all necessary arrangements for the provision to the job site of all required utilities for the execution of the work on the project. The Contractor shall arrange its work so it will not be delayed because such regulations or requirements relating to the use of utilities. All costs for the provision of utilities for the execution of the work on the project shall be borne by the Contractor.
 - B Fire hydrants shall not be used by the Contractor or its subcontractors unless authorization for such use has been obtained from the appropriate water utility agency.
- 1.11 SALVAGE
 - A When the Contract Documents specify salvage of materials for the Jurisdiction as part of the work, the material to be salvaged shall be carefully salvaged and delivered to the designated location in the best condition and ready for storage. When the Contract Documents provide for salvage of such materials by the Contractor, the Contractor shall salvage such materials and promptly remove them from the site.
 - B The Contractor shall not allow inspection or sale of salvage materials to third parties at the site without written approval of the Jurisdiction.
- 1.12 PROTECTION OF WATER QUALITY AND WETLANDS
 - A The Contractor shall comply with the requirements of the Clean Water Act (33 U.S.C. 1344 and 33 CFR 323) and Executive Order 11990. When it becomes necessary for the Contractor to work in waters of the United States, the Contractor shall be aware that a Section 404 permit may be required.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1050 - CONTROL OF WORK

- B When required, the Contracting Authority will obtain a Section 404 permit for essential work on the right-of-way prior to the award of the contract. The Contractor shall adhere to the requirements of the permit. Activities occurring in or across waters of the United States not specifically reviewed and approved in the permit are not authorized. If the Contractor desires to use construction methods that are not specifically approved by the permit, the Contractor shall be responsible for obtaining approval in the form of a new Section 404 permit from the U.S. Army Corps of Engineers and possibly Iowa DNR. The Contractor shall not use construction methods that require additional mitigation by the Contracting Authority. The Contractor will not be granted additional compensation or contract time due to their request for a new permit. If, however, due to no fault of the Contractor, a Section 404 permit modification involving activities within the right-of-way is deemed necessary by the Engineer, additional contract time and/or compensation may be considered.

1.13 FINAL INSPECTION AND ACCEPTANCE

- A As soon as practicable after the completion of the work and the Contractor deems the project ready for its intended use, the Contractor shall notify the Engineer in writing that the project is complete and request the Substantial Completion inspection by the Engineer. The Engineer, Jurisdiction, and Contractor shall promptly make a joint inspection of the completed work so that the Engineer can make a determination if the project is Substantially Complete.
- B If the inspection reveals any defects in the work as contemplated by the Contract Documents, the Engineer shall notify the Contractor in writing that the work is not Substantially Complete and shall provide a list of such defects. The defective work shall be repaired or corrected so that it meets the requirements of the Contract Documents. The cost of all such repairs and replacement shall be borne by the Contractor, and no extension of the contract time shall be granted because of the time required to remedy such defects.
- C After the Substantial Completion Inspection is held and the Engineer determines that the requirements for Substantial Completion have been satisfied, the Engineer will prepare a dated "Notice of Substantial Completion". Attached to the Notice will be a list of items not yet complete or needing correction. The Notice shall be provided to the Jurisdiction for their review. Upon receipt of the Notice, the Jurisdiction will have seven days to provide the Engineer with written objection to the Notice or to the attached list of items. The Engineer will then have seven days to consider the Jurisdiction's objections and either issue the Substantial Completion Certificate with a final list of items to complete and correct, or notify the Contractor that the work is not Substantially Complete and provide an explanation why.
- D In order for the Project or a designated portion of work to be deemed Substantially Complete by the Engineer, one of the following must occur:
- 1 Completion of the work on the public improvement project, or the highway, bridge, or culvert project, or when the work on the public improvement or the highway, bridge, or culvert project has been substantially
 - 2 completed in general accordance with the terms and provisions of the contract.
 - 3 The work on the public improvement or on the designated portion is substantially completed in general accordance with the terms of the contract so that the Jurisdiction or the department can occupy or utilize the public improvement or designated portion of the public improvement for its intended purpose. This subparagraph shall not apply to highway, bridge, or culvert projects.
 - 4 The public improvement project or the highway, bridge, or culvert project is certified as having been substantially completed by either of the following:
 - 5 The Architect or Engineer authorized to make such certification.
 - 6 The authorized contract representative

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1050 - CONTROL OF WORK

- 7 The Jurisdiction or the department is occupying or utilizing the public improvement for its intended purpose. This subparagraph shall not apply to highway, bridge, or culvert projects.
- E When the Contractor has completed all work items listed with the Substantial Completion Certificate, the Contractor shall prepare a written notice requesting final inspection and issuance of the Certificate of Final Completion. Once the Engineer determines that the Project may be finally complete, the Engineer shall inspect the work as soon as practical. After the Final Completion inspection is held and the Engineer determines that the requirements for Final Completion have been satisfied, the Engineer will prepare a "Tentative Notice of Final Completion". If the Engineer's inspection determines that the work is incomplete or defective, the Engineer shall notify the Contractor in writing that the work is not ready for Final Completion and shall provide a list of the defects.
- F Once the Tentative Notice of Final Completion is issued, the final payment shall be processed in accordance with Section 1090, Article 1.08. After the final payment application has been received and approved by the Jurisdiction, it shall proceed to request that the Jurisdiction's City Council approve the acceptance of the Project and the City Engineer's recommendation to issue the Certificate of Final Completion.

END OF SECTION

Section 1060 - Control of Materials

Part 1: General

1.01 MATERIALS SOURCE OF SUPPLY AND QUALITY REQUIREMENTS

- A Materials used in the work shall meet all quality requirements of the Contract Documents. In order to expedite inspection and testing of materials, the Contractor shall notify the Engineer in writing of the proposed sources of those materials requested by the Engineer promptly after being awarded the contract. Any material shall be produced with a reasonably uniform quality and within requirements specified; the producer shall perform quality control tests and evaluations the producer believes necessary to control the product adequately. All materials for use in the project are subject to inspection and tests at any time prior to being incorporated into the work.
- B For the convenience of the Contractor, and when convenient to the Engineer, materials may be inspected at the site of production. Materials tested and found in compliance at the site of production may be later inspected for reasonably close conformity and normally will not be rejected except for obvious mistakes, contamination, quality change, or mishandling.
- C At the option of the Engineer, approval of the source, or approval of materials at the source prior to delivery, may be required. If it is found after trial that sources of supply for previously approved materials do not produce specified products or when conditions are such that use of unfit materials cannot be prevented except by extraordinary inspection methods, the Contractor shall furnish materials from other sources. Before delivery, and at any time during the process of preparation and use, materials shall be subject to the approval of the Engineer.
- D Materials not previously inspected will be inspected at the project site. Acceptance at that time will be based on sampling and testing, producer's certifications, visual inspection, or any combination of these at the discretion of the Engineer.
- E Use of materials on the basis of the producer's certification, quality control tests, and evaluations may be permitted or required. The Engineer may require specific data obtained by qualified persons and procedures be provided with the material, when delivered. Certified gradation testing by a certified aggregate technician will be required for all aggregates to be furnished by the Contractor, and shall be done according to the current Iowa DOT Materials I.M. 209 and as specified in Section 3010, Article 1.05.

1.02 ALTERNATE PROCESSES, EQUIPMENT, OR MATERIALS

- A General: In order to establish a basis of quality for the work, performance, or economy of operation, certain processes, types of machinery and equipment, or kind of material may be referenced in the Contract Documents by designating a manufacturer by name and referring to its brand or model numbers. Such reference is not intended to foreclose other processes, equipment or materials that will in the sole discretion of the Engineer meet, or exceed, the designated standards. There may be instances where the Engineer will not consider alternate processes, equipment, or materials.
- B Consideration:
 - 1 The Jurisdiction may consider alternate processes, equipment, or materials for those specified in the Contract Documents; however, it is only an indication that the Jurisdiction will not foreclose consideration of the bidder's/Contractor's request and is not an approval. Following are the steps for consideration of alternate processes, equipment, or materials:
 - a If a bidder/Contractor desires to use alternate processes, equipment, or materials, the bidder/Contractor shall contact the Engineer to confirm the Jurisdiction would consider alternate processes, equipment, or materials for those as specified in the Contract Documents.
 - b Support/requirements for submissions of alternatives:

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1060 - CONTROL OF MATERIALS

- i The Engineer will consider and evaluate other products, equipment, methods, and systems only when such items are accompanied by full and complete technical data, test data, code compliance, and other relevant information, including samples and finishes where appropriate.
- ii The bidder/Contractor shall submit design information, material compatibility, performance, durability, laboratory tests, chemical analysis, color, manufacturer's specifications, and other relevant information as proof of quality and integrity when presenting proposed alternatives to the Engineer for consideration. The bidder/Contractor must include the kind, quality, design, and performance of the proposed materials and equipment.
- iii If alternate methods are proposed, the Contractor shall furnish complete engineering plans covering the proposed change.
- iv It is the sole responsibility of the Contractor to pre-qualify any alternate product proposed for its intended use for compliance with all applicable codes within the Jurisdiction prior to submittal to the Engineer for consideration. In making an alternative request, the Contractor shall be responsible for all costs including reimbursing the Engineer for services furnished and any time required to review the proposed change.
- v If the bidder/Contractor desires to use alternate processes, equipment, or materials for those as specified in the Contract Documents, the bidder/Contractor shall secure the written approval of the Engineer before entering an order therefore.
- c If the bidder/Contractor desires to use alternate processes, equipment, or materials for those as specified in the Contract Documents, the bidder/Contractor shall secure the written approval of the Engineer and the Jurisdiction before entering an order therefore.
- d Proposed alternative processes, equipment, or materials that will in the discretion of the Engineer and the Jurisdiction meet, or exceed, the designated standards may be given written approval to be used on the project as an "Approved Equal" or "Equivalent" to the specified item.
- e If approval as an "Approved Equal" or "Equivalent" is given by the Engineer and the Jurisdiction, such approval will be on the condition that the bidder/Contractor shall be fully responsible for producing construction work in conformity with contract requirements.
- f In order to ensure fair competitive bidding, it is critical that all bidders base their bids on providing the material, equipment or process (including those trade named) fully complying with the Contract Documents.
- g The Contractor shall not be entitled to any additional compensation if the Engineer and the Jurisdiction do not approve the Contractor's request for alternate processes, equipment, or materials after the contract is awarded. The bidder/Contractor is solely at risk until the Engineer and the Jurisdiction issue written notification of "Approved Equal" or "Equivalent."
- h The Jurisdiction reserves the right to adjust the contract price when the cost of an "Approved Equal" or "Equivalent" is less than the cost of the specified item. The Contractor shall estimate the net savings of the proposed alternate and if the Engineer and the Jurisdiction approve the proposal, a change order may be processed to reduce the contract by a negotiated amount agreed to by the Jurisdiction and the Contractor.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1060 - CONTROL OF MATERIALS

- 2 If the Contract Documents state that the Jurisdiction will not consider alternate processes, equipment, or materials, the bidder/Contractor shall not propose any alternates to those specified in the Contract Documents.
- 3 Consideration of Alternate Processes, Equipment, or Materials by the Jurisdiction or the Engineer shall not constitute a basis for delay or productivity claims if timely approval of the substitute is not granted. If consideration or use of alternative processes, equipment or materials will impact the Contractor's schedule adversely, the Contractor must proceed with the work by complying with the approved Contract Documents.

1.03 SAMPLES AND TESTING

- A No materials for which samples are required by the Contract Documents shall be incorporated into the work, until the samples have been tested and approved by the Engineer for use on the project. The Contractor shall coordinate the collection, forwarding and testing of samples as the Contract Documents and Engineer require.
- B It is the Contractor's responsibility to provide samples in a timely manner that allow time for testing without delaying the work. If necessary, work will be delayed or suspended, at no cost to the Jurisdiction, to permit the completion of all specified tests and examinations. Tests made on the samples of materials utilized on the project shall be paid for as specified in the Contract Documents.
- C All tests shall be made by the Jurisdiction's designated testing laboratory or at an independent testing laboratory that the Engineer shall approve in advance of any testing of samples. Except as otherwise specified, the testing of materials furnished for use under these specifications shall be done according to the methods described in the specific ASTM, AASHTO, AWWA, or other authorized specifications for each material. Results of all tests shall be submitted to the Engineer for review.
- D The Contractor must employ a professional Engineer, licensed in the State of Iowa, for the purpose of conducting proctor testing on all aggregates and soil materials to be incorporated into the project. The proctor test results must be provided to the Jurisdiction, and will be used by the Jurisdiction for density testing during the project. The proctor test must be conducted no more than 30 days prior to the start of the work. Additional sampling and testing may be conducted by the Jurisdiction at its sole discretion during the project to verify conformity of the materials.

1.04 STORAGE OF MATERIALS

- A The Contractor shall be responsible for care and storage of materials and equipment delivered to the work site or purchased for use and stored off site. Materials and equipment delivered to the work site and damaged to an extent that it no longer meets the contract specifications before actual incorporation in the work shall be rejected by the Engineer even though they may have been previously acceptable. The Contractor shall store all materials for the Project in a way that ensures that their quality and fitness for the Project will be preserved, and that the Engineer will have easy and prompt access to them for inspection purposes. Materials shall be kept on wooden platforms or on other hard, clean surfaces and not on the ground.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1060 - CONTROL OF MATERIALS

- B Offsite storage and partial payment of such materials and equipment is allowed only if approved in advance, at the sole discretion of the Engineer. In order for the Engineer to consider allowing off-site storage and payment, the materials and equipment must be segregated from other materials, clearly labeled as being owned by the Jurisdiction for use on the identified Project, otherwise handled in compliance with this Article, and stored in accordance with the manufacturer's recommendations. All such materials and equipment must be readily-available for inventory and inspection by the Engineer. Proof of insurance meeting the requirements of the Contract Documents must be provided in advance of the Engineer's approval.

1.05 UNACCEPTABLE MATERIALS

- A All materials not conforming to the requirements of the specifications at the time they are to be used shall be considered unacceptable, and all such materials will be rejected and shall be removed immediately from the work site unless otherwise instructed by the Engineer. No rejected material, the defects of which have been corrected, shall be used until approval has been given by the Engineer.

1.06 MATERIALS SUPPLIED BY THE JURISDICTION

- A When any materials are to be furnished by the Jurisdiction, the designation of such materials and the time of availability will be included in the Contract Documents.

1.07 MATERIALS SUPPLIED BY THE CONTRACTOR

- A Unless otherwise stated in the Contract Documents, all materials and equipment needed for, or to become a part of, the work shall be furnished by the Contractor. The Contractor shall assume full responsibility for ordering materials and equipment of the quality specified and of the quantity necessary and shall be responsible for payment of the purchase and/or delivery cost of such materials and equipment.
- B All materials and equipment that become the property of the Jurisdiction as specified in the Contract Documents shall be unused and newly produced or manufactured with original materials, shall be state of the art for that material or equipment, and shall be properly stored to protect the integrity of the material and equipment.

END OF SECTION

Section 1070 - Legal Relations and Responsibility to the Public

Part 1: LEGAL RELATIONS

1.01 MUNICIPAL REGULATIONS, STATE, AND FEDERAL LAWS AND REGULATIONS

- H The Contractor shall at all times observe and comply with all applicable Federal, State, County, or City laws, ordinances, orders, and regulations.
- I References in these specifications to particular chapters or sections of the above referenced laws, ordinances, orders & regulations shall be as they appear in their current version at the time of Contract Award. In the event such chapters or sections are subsequently amended, the specifications shall be deemed to refer to those chapters or sections as amended. If as a result of such amendment, the Contractor incurs additional cost or delay the conditions of Section 1040 shall apply.
- J For all projects the following shall apply:
 - 1 During the performance of this contract, the Contractor (for itself), its assignees, and successors in interest (hereinafter referred to as the "Contractor") agrees as follows:
 - 2 Compliance with Regulations: The Contractor shall comply with the Regulations relative to non-discrimination in Federally assisted programs of the DOT Title 49, Code of Federal Regulations, Part 21, as they may be amended from time to time, (hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.
 - 3 The City of Dubuque in accordance with Title VI of the Civil Rights Act of 1964, 78 Stat. 252, 42 U.S.C. 2000d-2000d-4 and Title 49, Code of Federal Regulations, Department of Transportation, Subtitle A, Office of the Secretary, Part 21, Nondiscrimination in Federally assisted programs of the Department of Transportation issued pursuant to such Act, hereby notifies all bidders that it will affirmatively insure that in any contract entered into pursuant to this advertisement, minority business enterprises will be afforded full opportunity to submit bids in response to this invitation and will not be discriminated against on the grounds of race, color, national origin, sex, age, or disability in consideration for an award.
 - 4 Nondiscrimination: The Contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, national origin, sex, age, or disability in the selection and retention of subcontractors, including procurement of materials and leases of equipment. The Contractor shall not participate either directly or indirectly in the discrimination prohibited by Section 21.5 of the Regulations, including employment practices when the contract covers a program set forth in Appendix B of the Regulations.
 - 5 Solicitations for Subcontracts, Including Procurement of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the Contractor for work to be performed under a subcontract, including procurement of materials or leases of equipment, each potential subcontractor or supplier shall be notified by the Contractor of the Contractor's obligations under this contract and the Regulations relative to non-discrimination on the grounds of race, color, national origin, sex, age, or disability.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- 6 Information and Reports: The Contractor shall provide all information and reports required by the Regulations 01' directives issued pursuant there to, and shall allow access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Jurisdiction, the Iowa DOT, or FHWA to be pertinent to ascertain compliance with such Regulations, orders and instructions. Where any information required of a Contractor is in the exclusive possession of another who fails or refuses to furnish this information the Contractor shall so certify to the Jurisdiction, the Iowa DOT, or the FHWA as appropriate, and shall set forth the efforts it has made to obtain the information.
 - 7 Sanctions for Noncompliance: In the event of the Contractor's noncompliance with the nondiscrimination provisions of this contract, the Jurisdiction, the Iowa DOT, or the FHWA shall impose such contract sanctions as they may determine to be appropriate, including, but not limited to:
 - 8 Withholding of payments to the Contractor under the contract until the Contractor complies, and/or
 - 9 Cancellation, termination, or suspension of the contract, in whole or in part.
 - 10 Incorporation of Provisions: The Contractor shall include the provisions of paragraphs (1) through (7) in every subcontract, including procurement of materials and leases of equipment, unless exempt by the Regulations, or directives issued pursuant thereto. The Contractor shall take such action with respect to any subcontract or procurement as the Jurisdiction, the Iowa DOT, or the FHWA may direct as a means of enforcing such provisions including sanctions for non-compliance: Provided, however, that, in the event a Contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the Contractor may request the Jurisdiction or the Iowa DOT to enter into such litigation to protect the interests of the Jurisdiction or the Iowa DOT; and, in addition, the Contractor may request the United States to enter into such litigation to protect the interests of the United States.
- 1.02 GOVERNING LAW
- H The law of the State of Iowa shall govern this contract and all subcontracts for materials and services entered into by the Contractor.
- 1.03 PERMITS AND LICENSES
- H The Contractor shall procure and pay for all necessary permits and licenses needed to construct the work that have not already been procured by the Jurisdiction at the time of project award, including but not limited to Building Demolition, Building, Mechanical, Electrical, Plumbing, Permit to work in Public Right Of Way. The Contractor shall be responsible, including payment of any penalties, for all violations of the law, licenses or permits for any cause in connection with the construction of the work or caused by the obstruction of roads, streets, highways or sidewalks. The Contractor shall provide a copy of all requisite notices and issued violations to the Jurisdiction.
- 1.04 PATENTS AND ROYALTIES
- H The Contractor shall defend, indemnify, and save the Jurisdiction harmless against all claims arising from alleged infringements of patents and royalties covering tools, machinery, processes, appliances, devices, or materials used in connection with the work. Unit prices provided in the proposal shall include payment of all necessary royalties or licenses.
- 1.05 USE AND OCCUPANCY PRIOR TO COMPLETION OF CONTRACT

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

H The Contractor shall complete any portion or designated portion of work in such order and at such time as the Contract Documents require. The Jurisdiction shall have the right to use any Substantially or Finally Completed portions of the work at any time in accordance with Articles 573.15A and 573.28 of the Iowa Code and Section 1050, Article 1.14 of these supplemental specifications, but such possession and use shall not be deemed a Final Acceptance of the work so used or any part thereof. If the Jurisdiction requests partial utilization prior to Substantial Completion of any portion of the work and such use increases the cost of or delays the work, the Contractor shall be entitled to such extra compensation or extension of time, or both, in accordance with Section 1040, Article 1.06. When improvements are released to the Jurisdiction, at the Jurisdiction's sole request, for public or Jurisdiction use prior to Substantial Completion and Final Completion unless specified in the Contract Documents, the Contractor shall be relieved of the responsibility for damages due to exposure to weather elements or due to ordinary use, but only for the released and used portion of the work. Such release by the Contractor to the Jurisdiction for use shall be directed in writing by the Jurisdiction.

1.06 CONTRACTOR'S RESPONSIBILITY FOR THE WORK

H Until the Substantial Completion Certificate is issued by the Jurisdiction, the project shall be in the custody of and under the charge, care, and control of the Contractor, who shall take every precaution against damage to the work by action of the weather elements or any other cause. The Contractor shall rebuild, repair, restore, and make good at its own expense, all damages to any portion of the work before the Substantial Completion Certificate is issued by the Engineer. Issuance of any estimate or partial payment for work done, will not be considered final acceptance of any work completed.

1.07 RESPONSIBILITY FOR DAMAGE CLAIMS

H The parties agree that it is their intent that there be no third-party beneficiaries to this contract. No provision of this contract or of any addendum, materials instructional memorandums, plans, proposal, special provision, developmental specification, supplemental specification, or general supplemental specification shall be construed as creating any third-party beneficiaries.

1.08 PERSONAL LIABILITY OF PUBLIC OFFICIALS

H Neither the Engineer nor the Engineer's authorized representatives, agents, or assistants shall have any liability, either personally or as officials of the Jurisdiction, in carrying out any of the provisions of the Contract or in exercising any power or authority granted to them thereby. It being understood that in such matters they will act as the agents and representatives of the Jurisdiction.

1.09 WAIVER OF LEGAL RIGHTS

H The Jurisdiction shall not be precluded or estopped by any measurement, estimate, or certificate made either before or after the completion and final acceptance of the work and payment therefore, from showing the true amount and character of the work performed and the materials furnished by the Contractor, or from showing that any such measurement, estimate, or certificate is untrue or incorrectly made, or from showing that the work or materials do not in fact conform to the Contract Documents.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- I The Jurisdiction shall not be precluded or estopped, notwithstanding any such measurement, estimate, or certificate and payment in accordance therewith, from recovering from the Contractor and its surety such damages as it may sustain, and all outlay and expense it incurs, by reason of the Contractor's failure to comply with the terms of the Contract. The Final Acceptance by the Jurisdiction or any of its representatives, any payment for final acceptance of the whole, or any Substantially Completed designated portion of work, or any extension of time, or any possession taken by the Jurisdiction, shall not operate as a waiver of any portion of the contract, or any powers herein reserved, or any right to damages herein provided. A waiver of any breach of the contract shall not be a waiver of any other subsequent breach.
- J The Contractor hereby waives any claims it may hereafter be entitled to assert against the Jurisdiction, its officers, agents, employees, or consultants, on its behalf or on behalf of its employees, agents, subcontractors, sub-subcontractors, and suppliers, for loss of or damage to personal property, tools, or equipment owned by it or its employees, agents, subcontractors, sub-subcontractors, and suppliers, which loss or damage is sustained on the Jurisdiction's project property, or which occurs during work on the project, and the Contractor agrees to assume liability or responsibility for such claims and to procure insurance to cover its exposure in that regard.

1.10 ACCEPTANCE BY THE JURISDICTION
NOT A WAIVER OF CONTRACTOR'S OBLIGATIONS OR A WAIVER OF THE
JURISDICTION'S RIGHTS

- H In various provisions of the Contract Documents, the Jurisdiction or the Engineer may to test or inspect materials, equipment, or manufactured assemblies and to accept or reject those and other elements of the work.
- I In various provisions of the Contract Documents, the Jurisdiction or the Engineer may require the Contractor's preparation of shop drawings for review and has the authority to accept or reject same. If required by the contract documents, no payment for shop drawings will be made. If unanticipated and either unusual or complex construction procedures or site conditions occur, the Jurisdiction or the Engineer may require the Contractor to submit shop drawings as necessary to satisfactorily complete the proposed construction. If shop drawings are required by the Engineer or Jurisdiction and are not required by the Contract Documents, payment shall be made in accordance with section 1040, 1.06.
- J Acceptance or approval by the Engineer of the shop drawings as therein provided shall not operate to relieve the Contractor of its obligation (1) to perform the work as required by the Contract Documents in a workmanlike manner and according to the standards for construction applicable to the type of work covered by this contract; and (2) to provide materials and equipment meeting the quality requirements as provided in the Contract Documents. The Jurisdiction assumes no responsibility for errors in shop drawings and assumes the Contractor will use materials complying with requirements of the Contract Documents or, where not specified, those of sound and reasonable quality, and will erect the content of such shop drawings according to recognized standards of first quality work or, when specified, according to standards of the Contract Documents.
- K No such acceptance of the shop drawings by the Jurisdiction shall constitute a waiver by the Jurisdiction of its right to subsequently reject defective work, materials, or equipment. Further, no such acceptance of the shop drawings by the Jurisdiction or the Engineer shall be deemed a waiver by the Jurisdiction of its right to recover from the Contractor all losses, damages, outlay, or expense it incurs, which is attributable to such defective work, materials or equipment, or manufactured assemblies, nor shall such acceptance or approval of the shop drawings be deemed a waiver of the Jurisdiction's right to indemnity from the Contractor for damage or injury to third parties occasioned by such defective work, materials, or equipment.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

1.11 BUSINESS ORGANIZATION REQUIREMENTS

H The bidder, or Contractor, as a business organization shall comply with the following:

- 1 A corporation, limited liability company, limited partnership, or other type of business organization governed under Iowa statutes must be registered with the Iowa Secretary of State, must use the name under which it is registered with the Iowa Secretary of State, must be authorized to do business in Iowa, and must be registered as a Contractor with the Iowa Department of Labor.
- 2 A partnership, sole proprietorship, company operating under a trade name, or other type of business organization not governed under Iowa statutes should be registered in the Office of the County Recorder where it is located or where the work is to be performed, must use the name under which it is registered, and must be registered as a Contractor with the Iowa Department of Labor. Prior to entering into contract, the designated low bidder, if it is not required to be registered with the Iowa Secretary of State, shall provide to the Jurisdiction the name and address of its registered agent or lawful representative upon whom legal notices and processes may be served. The registered agent or lawful representative must be an Iowa resident, an Iowa profit or nonprofit corporation, or a foreign profit or nonprofit corporation qualified to do business in Iowa.
- 3 A foreign business organization, organized under the laws of a state other than Iowa, shall file with the Engineer's documentation that it has complied with all the provisions of this section prior to entering into a contract.
- 4 If a bid is proposed to be submitted by two persons or entities as a joint venture, the names of the two persons or entities appearing on the documents must be followed by the notation – "a joint venture." In that instance, the bid must also be signed by authorized agents of both entities, and the bid security must indicate that it "applies to and covers the proposal for construction of (Project Name) submitted by the (principal on bond) and (name of other company), submitted as a joint venture proposal." A bid submitted by two persons or entities without any indication they are submitting it as a joint venture, without being signed by authorized representatives of both entities, and without bid security covering both entities as a joint venture, will be rejected.

1.12 DISPUTE RESOLUTION PROCEDURE

- H In any case where the Contractor believes extra compensation is due for work or materials beyond the scope of the work required by the Contract Documents and not ordered by the Engineer as extra work as defined herein, the Contractor shall notify the Engineer and Jurisdiction in writing of its intention to make claim for such extra compensation before beginning the work on which the claim is based.
- I In any case where the Contractor deems that extra compensation is due from the Jurisdiction as damages resulting from such performances, nonperformances, or delays, the Contractor shall notify the Engineer and Jurisdiction in writing at the time the delay occurs. If the Contractor fails to notify the Jurisdiction within seven calendar days of the commencement of the initiating activity that is the cause of the delay claim, then the claim shall be deemed null and void.
- J The Jurisdiction shall be responsible for damages attributable to the performance, nonperformance, or delay, of any other Contractor, governmental agency, utility agency, firm, corporation, or individual authorized to do work on the project under direct contract with the Jurisdiction only when such damages result from negligence on the part of the Jurisdiction, its Engineer, its Contractor, or any of its officers or employees.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- K Performance During Dispute: Unless otherwise directed by the Jurisdiction, pending the resolution of any controversy, claim or dispute arising out of this Contract, the Contractor must proceed diligently with the performance of the Work under this Contract.
- L Basis of Claim for Extra Compensation:
- 1 The claim, when filed, shall be in writing and in sufficient detail to permit auditing and evaluation by the Jurisdiction and for them conclude that a change order is warranted. The claim shall be supported by such documentary evidence as the Contractor has available and shall be verified by affidavit of the Contractor or other person having knowledge of the facts.
 - 2 Regardless of whether the required notice is given, if the Engineer is not allowed access to the Contractor's books and records used for keeping strict account of actual costs as defined for cost-plus construction or extra work, then the Contractor thereby waives its claim for extra compensation for such work. Such notice by the Contractor, and the fact the Engineer has kept account of the cost as aforesaid, shall not be construed as establishing the validity of the claim.
- M Presentation and Consideration of Claim
- 1 Review by Jurisdiction: If the claimant wishes an opportunity to present its claim in person, the claim shall be accompanied by a written request to do so. Where the claimant asks for an opportunity to present its claim in person, the Jurisdiction within 30 calendar days of the filing of the claim, shall fix a time and place for a meeting between the claimant and the Jurisdiction or its designated representative(s). The Jurisdiction shall 30 calendar days after the filing of the claim or after the meeting above referred to, whichever is later, rule upon the validity of the claim and notify the claimant, in writing, of its ruling together with the reasons therefore. In case the claim is found to be just, in whole or in part, a change order shall be authorized within 15 days after the find and the claim shall be allowed and paid to the extent so found.
 - 2 The dispute resolution procedures outlined below shall be utilized by the Contractor and Jurisdiction to resolve all disputes related to the Contract for the Project.
 - 3 Request for Mediation: In the event a claimant's claim as outlined in the above procedure has been disallowed, in whole or in part, the Contractor or Jurisdiction shall, within 30 calendar days from the date the ruling of the Jurisdiction is mailed, make a written request to the other party that the claim or claims be submitted to Mediator. If mediation is requested, the Contractor and the Jurisdiction will each propose four people to act as the Mediator. The Contractor and Jurisdiction will rank both their own selections and the selections of the other party. The individual with the highest overall ranking of the four lists of names shall be selected as the Mediator. If there is a tie score, the individual whose last name is first in alphabetical order shall be the Mediator.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- 4 The mediation shall be completed within 45 days of the Mediator selection. The mediation shall be held in the place where the Project is located, unless another location is mutually agreed upon. All parties involved in the dispute will cooperate in good faith during the mediation. The Mediator will collaborate with the parties involved with the dispute to determine the rules for mediation. If the parties cannot agree to certain mediation rules, then the Mediator will make the determination regarding the rules. In no case shall the mediation last more than three working days unless agreed to by all parties involved in the dispute. Jurisdiction and Contractor shall share the mediator's fee and any filing fees equally. Jurisdiction and Contractor will bear their own attorney's fees, expert witness's fees, costs and expenses in the mediation. The Mediator shall make a non-binding decision and provide the written decision to the parties no later than 30 days after the conclusion of the mediation session. Agreements reached in mediation shall be enforceable as settlement agreements in any court having jurisdiction thereof.
- 5 If the Claim is not resolved by mediation, the Jurisdiction's action under this Article 1.12, B, 1 shall become final and binding 60 days after termination of the mediation session unless, within that period, the Jurisdiction or Contractor:
- 6 a Elects in writing to demand arbitration of the Claim, or
- 7 Agrees with the other party to submit the Claim to another dispute resolution process.
- 8 Request for Binding Arbitration: All claims or counterclaims, disputes, or other matters in question between the Jurisdiction and Contractor arising out of or relating to the Contract Documents or the breach thereof, if not resolved by the procedures listed above, shall be decided by a board of arbitrators. Within 30 calendar days from the date the ruling of the Mediator is mailed, the Jurisdiction or Contractor may make a written request to each other that its claim or claims be submitted to a board of arbitration. This agreement to arbitrate and any other agreement or consent to arbitrate entered into will be specifically enforceable under the prevailing law of any court having jurisdiction.
- 9 Arbitration or litigation of the claim will be subject to Rule 1.281 of the Iowa Rules of Civil Procedure for Expedited Civil Actions.
- 10 Jurisdiction, at its sole discretion, may consolidate an arbitration conducted under this Contract with any other arbitration to which it is a party provided that the arbitration's to be consolidated substantially involve common questions of law or fact and the arbitration's employ materially similar procedural rules and methods for selecting arbitrator(s).
- 11 Jurisdiction, at its sole discretion, may include by joinder persons or entities substantially involved in common questions of law or fact whose presence is required if complete relief is to be accorded in arbitration.
- 12 Contractor may not consolidate claims involving its subcontractors with claims involving Jurisdiction without the consent of the Jurisdiction.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

N Board of Arbitration:

- 1 The board of arbitration shall consist of three persons - one to be appointed by the Jurisdiction, one to be appointed by the Contractor, and the third to be appointed by the two arbitrators thus chosen.
- 2 The arbitrators selected shall be persons experienced and familiar with construction, engineering, or legal practices in the general type of work involved in the contract, but shall not have been an employee, direct relative of an employee, or an individual retained as a consultant by either party at the time the claim arose or at the time of arbitration.
- 3 The fees and expenses of the arbitrators and any arbitration service or proceedings shall be shared equally by the Jurisdiction and Contractor.

O Arbitration Proceedings: The board of arbitration shall make its own rules of procedure, in accordance with Article 1.12,A,6 above, and shall have authority to examine records kept by the Jurisdiction and the Contractor. Notification of arbitration proceedings shall be made by the arbitration board to both the Jurisdiction and the Contractor, and each shall have the opportunity to attend all sessions of the arbitration board. In determining the findings and award, a majority vote of the board shall govern. Copies of the findings and award, signed by arbitrators, shall be filed with the Jurisdiction and the Contractor. The board of arbitration shall fix the cost of the proceedings, including a reasonable compensation to the arbitrators, and shall share equally the total cost between the parties.

P Jurisdiction of Board of Arbitration: The board of arbitration shall have jurisdiction to pass upon questions involving compensation to the Contractor for work actually performed or materials furnished and upon claims for extra compensation that have not been allowed by the Jurisdiction.

Q The board's jurisdiction shall not extend to a determination of quality of workmanship or materials furnished, or to an interpretation of the intent of the plans and specifications except as they relate to matters of compensation. Jurisdiction of the board shall not extend to setting aside or modifying the terms or requirements of the contract.

R Determination of Board of Arbitration Final: The findings or award, or both, of the arbitration board, shall be final and become a basis for final payment. Judgment may be entered upon it in any court having jurisdiction thereof, and it will not be subject to modification or appeal, subject to provisions of the Controlling Law relating to vacating or modifying the arbitral award.

1.13 SEVERABILITY

H It is the intent of the Jurisdiction and the Contractor that the lawful provisions of this contract shall be severable from any provisions of this contract that are hereafter declared to be illegal or void by a court of competent jurisdiction.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

Part 2: PART 2 - RESPONSIBILITIES TO THE PUBLIC AND JOBSITE SAFETY

2.08 SANITATION

- H The Contractor shall arrange for the necessary sanitary conveniences, properly secluded, for the workers on the project. These shall be maintained in a manner inoffensive to the public and in compliance with the local health regulations.

2.09 CONVENIENCE AND SAFETY

- H Use of Streets: The Contractor is granted the privilege of using Jurisdictional roads, streets, or highways, as shown on the plans, for the purpose of doing work specified in the contract, but is not granted exclusive use of such roads, streets, or highways.
- I Protection of Workers and the Public: The Contractor shall erect and maintain good and sufficient guards, barricades, and signals at or near the work according to the latest version of the MUTCD and all applicable laws, regulations, ordinances, and plans and specifications in the Contract Documents so that all members of the public are kept safe. The Contractor shall, in all cases, maintain safe passageways at all sidewalks, private property entrances, driveways, road crossings, crosswalks, and street intersections according to the latest version of the MUTCD and shall do all other things necessary to protect the public and prevent an accident or loss of any kind.
- J Convenience and Access: The Contractor shall handle the work in a manner that will cause the least inconvenience and annoyance to the general public and to the property owners abutting the work area. The Contractor shall also provide access to the abutting property to the greatest extent practicable.
- K Project Area and Work Site Safety:
 - 1 Project Area:
 - a In accordance with Section 1070, 1.06, until the work is Finally Complete, the work shall be in the custody of and under the charge, care, and control of the Contractor. The Contractor is also responsible for the project area or work site. The Contractor is solely responsible for the safety of everyone on its work site.
 - b The Jurisdiction or the Engineer may assign some or all of the duties and responsibilities of the Jurisdiction or the Engineer to an authorized representative for a given project. Nothing contained in this section or in the Contract Documents shall be construed as requiring or permitting the Jurisdiction or the Engineer to direct the means, methods, sequences, or procedures, including safety measures, of performing any work under the contract or Contract Documents, except to assure that the quality of work conforms to these specifications and other provisions of the Contract Documents and that the contract will be completed as scheduled.
 - c The Jurisdiction or Engineer may appoint an authorized representative on the work site to monitor the materials used and the work done by the Contractor. The Jurisdiction or Engineer's authorized representative is not a safety inspector and is not responsible for monitoring, directing, or otherwise ensuring the safety of the Contractor, its subcontractors, its suppliers, or any others that may be on the work site.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

L Work Site Safety:

- 1 Worker Safety: The Contractor shall comply with all current and future federal and state OSHA requirements. Nothing in this contract or any action by the Jurisdiction shall be interpreted or construed as a waiver of OSHA requirements. It is the Contractor's obligation to follow OSHA requirements and standards at all times.
- 2 The Contractor shall have a written safety program; and must submit that safety program to the Jurisdiction within seven days of the Notice of Award date and prior to Jurisdiction's issuance of the Notice to Proceed. The Jurisdiction will not approve the Contractor's safety program. The Contractor shall maintain a safe worksite and is solely responsible for the enforcement of its safety program. The Jurisdiction, Engineer or their staff will not be responsible for enforcement of the Contractor's safety program.
- 3 Construction of the work included in the contract is by its nature dangerous work; and the Contractor is hereby notified that it is the Contractor's sole responsibility to provide as safe a working site as possible given the nature of the work. It is the Contractor's responsibility to notify and advise its employees, subcontractors, suppliers, and everyone on the worksite of the dangers associated with the work, and provide them with appropriate safety information to protect them from those dangers.
- 4 All personnel on the work site shall wear, at a minimum, ANSI 107 Class 2 apparel at all times when exposed to traffic or construction equipment in the street right-of-way, unless otherwise directed by the MUTCD. Where the MUTCD requires more restrictive apparel or measures, the Contractor must comply with the MUTCD.
- 5 Safety Representative: Contractor shall designate a qualified and experienced health and safety officer or representative (HSO) for the site whose duties and responsibilities shall be the prevention of accidents and the maintaining and supervising of health and safety precautions and programs. The HSO shall have at least 3 years of experience as a safety officer in the construction or similar industry to include the direction, approval, development, implementation, and enforcement of safety and health programs, personnel protection programs, and health monitoring programs. The HSO shall have formal training in occupational safety and health. The HSO shall visit the site on a regular basis and at other key times when the nature of the work at the site change.
- 6 Contractor shall provide Jurisdiction and Engineer the phone number of the safety representative for the project who will have 24/7 response/availability.
- 7 Contractor shall keep at the Site at all times during the progress of the Work a competent person who is capable of identifying existing and predictable hazards in the surroundings, or working conditions that are unsanitary, hazardous or dangerous to employees, including but not limited to those associated with trench and excavation requirements, and who has authorization to take prompt corrective measures to eliminate them. Each day the contractor shall notify the Jurisdiction Representative to inform them who the competent person is on site for each work day.
- 8 Hazard Communication Programs: Contractor shall be responsible for coordinating any exchange of safety data sheets or other hazard communication information required to be made available to or exchanged between or among employers at the Site in accordance with established Laws or Regulations.
 - a Contractor shall comply with Jurisdiction's Hazardous Communication Program.
 - b Contractor shall immediately notify Jurisdiction's Representative and Engineer of all emergency situations associated with Contractor's Work.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

2.10 WORK AREA

- H The Contractor shall confine its work to the Jurisdiction's premises, including construction easements, construction limit lines, and identified project limits, as shown in the Contract Documents as verified by the Engineer. The Contractor shall not enter upon or place materials on any private property for which the Jurisdiction has not obtained an easement for such use. The Contractor agrees to defend, indemnify, and hold the Jurisdiction harmless from all suits and actions of every kind and description resulting from the Contractor's use of private property. Before beginning construction, the Contractor shall check with the Engineer for any special instructions concerning easements.
- I Temporary buildings, storage sheds, shops and office, etc., may be erected by the Contractor only with the prior approval of the Engineer and shall be built with labor and materials furnished by the Contractor without expense to the Jurisdiction. Such temporary buildings and utilities shall remain the property of the Contractor and shall be removed by the Contractor, at its expense, after the completion of the work.

2.11 PROJECT AREA FOR THE WORK

- H Acquisition: Existing and proposed additional right-of-way or easements shown on the plans and/or in the Contract Documents will provide, without cost to the Contractor, adequate space for the performance of the work. If the Contract Documents do not contain a notice to the Contractor of non-acquired additional right of way or easements, as shown on the plans, and the Contractor provides documentation acceptable to the Engineer, compensation will be allowed for loss or damage occasioned by delays in securing said right-of-way or easements; and, if the need to acquire such additional right-of-way or easements is the sole and only cause of the impossibility of completing the work within the specified time, the Jurisdiction may grant an extension of time if requested by the Contractor. Before beginning construction, the Contractor shall obtain from the Engineer a list of any easements or right-of-way not acquired and any special instructions pertaining to properties affected by the work.
- I Location: Property lines, limits of easements, and limits of construction permits are indicated on the plans, and it shall be the Contractor's responsibility to confine its construction activities within those limits.
- J Use: The Contractor shall confine its equipment, storage of materials, and operation of work to the limits indicated by laws, ordinances, permits, or direction of the Engineer and shall not unreasonably encumber the premises with its materials. The Contractor shall comply with the Contract Documents regarding signs and advertisements.
- K Encroachments: Any damage resulting to persons or property from the Contractor's encroachment beyond the specified limits shall be the sole responsibility of the Contractor.
- L Working Hours: The Contractor shall confine its operations to the times permitted by the City of Dubuque Code of Ordinances Section 6-5-1 governing prohibited noises and construction work hours including, but not limited to the following:
 - M Construction Noises The creation of any loud or excessive noise resulting from erection, excavation, demolition, alteration or repairs related to any structure, infrastructure, or building is prohibited, except between the hours of 7:00 a.m. and 8:00 p.m., Monday through Friday, and 9:00 a.m. and 6:00 p.m. on Saturday and Sunday.
 - N Pile Drivers & Pneumatic Hammers The operation of any pile driver, pipe ramming, pneumatic hammer, or similar construction equipment, except between the hours of 8:00 a.m. and 6:00 p.m., Monday through Friday, and 9:00 a.m. and 6:00 p.m., Saturday and Sunday, and when so permitted, only if equipped with an effective muffling device.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- O The City's Health Services Department issues variances for the Construction Work Noise Ordinance. Contractor must submit a Noise Variance Application and receive approval from the City's Health Services Department before deviating from the Working Hours listed above. The application to the Health Services Department shall be submitted at least 2 working days prior to the requested variance start date.

2.12 EXPLOSIVES

- H Use: The Contractor shall not blast any rock or other materials or allow the same to be done in the prosecution of the work, unless specifically authorized in the Contract Documents.
- I Safety: The Contractor is solely responsible for all damage resulting from blasting operations performed by the Contractor or its agents. The Contractor shall use the utmost care to not endanger life or damage property; and whenever ordered by the Engineer, the number and size of the charges shall be reduced. Suitable coverages or mats shall be provided to confine all materials lifted by blasting within the limits of the excavation or trench. All explosives shall be stored in a secure manner and clearly marked according to all applicable laws and regulations.
- J Regulations: The Contractor shall abide by all existing Federal, State, and Local regulations regarding the use of explosives, including, but not limited to, Uniform Fire Code, Article 77, and National Fire Protection Association 495, Explosive Materials Code of the National Fire Codes.

2.13 TRAFFIC CONTROL

- H General:
 - 1 The Contractor shall maintain traffic and shall provide and maintain traffic control devices according to the Contract Documents. If there is no specific traffic control plan, then the Contractor's traffic control devices shall meet the requirements of and be placed according to the current edition of MUTCD.
 - 2 During construction, areas to be maintained for traffic shall be kept clear of all hazardous materials, including but not limited to construction debris, dust, and mud.
- I Closing Streets to Traffic:
 - 1 Upon the Engineer's approval, the Contractor may close streets or parts of streets to vehicular traffic as soon as the construction work is started; such streets or parts of streets shall remain closed as long as construction work or condition of the finished work requires. The Engineer will determine how many streets or parts of streets may be closed by the Contractor at one time, and may refuse to allow the closing of additional streets until some of the improvement is finished and opened to traffic.
 - 2 The Contractor must notify the Engineer 48 hours in advance (excluding weekends or Jurisdiction holidays) of closing any roads, streets, travel lanes, alleys, or public thoroughfares. No road, street, travel lane, alley or thoroughfare shall be closed without prior approval from the Engineer.
 - 3 The Contractor shall not remove, relocate, or reset any permanent Jurisdictional traffic control devices unless authorized to do so by the Engineer or Contract Documents. If a sign must be removed or relocated for any phase of construction, the Contractor shall notify the Engineer of the necessity for removal. The Engineer shall arrange for the removal, relocation, or resetting of permanent traffic control devices by Jurisdictional personnel as needed to allow the work to proceed. If Jurisdictional personnel are not available, the authorized Jurisdictional representative may give authorization to the Contractor to remove, relocate, or reset the permanent traffic control devices.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- 4 In the event the Contractor removes or relocates a traffic control sign(s) without prior notice to or authorization from the Engineer, the Contractor shall bear all responsibility and liability, to any person sustaining bodily injury or property damage on account thereof. At its sole cost, the Contractor must replace the traffic control sign(s) in its original condition if directed to do so by the Engineer or the Jurisdiction.

2.14 PROTECTION OF ABOVEGROUND AND UNDERGROUND FACILITIES

- H The Engineer has attempted to show on the plans all aboveground and underground facilities, including public and private utilities, which may be affected by the work. The location, depth, and size of each such facility shown on the plans is approximate only and is not guaranteed. Other underground facilities may exist and their location may not be presently known or identified. It is the Contractor's responsibility to determine the existence and exact location of all such facilities located within the construction area to avoid damage.
- I Where existing facilities are shown in the Contract Documents or encountered within the construction area, it shall be the responsibility of the Contractor to notify the operators of those facilities prior to beginning any construction activities. The Contractor shall allow access to those facilities for necessary modification of services. The Contractor shall support, sustain, and protect existing pipes, conduits, poles, wires, and other apparatus located under, over, along, across, or adjacent to the work site. If such utilities are damaged through Contractor's negligence, they will be repaired by the agencies having control of same, but the cost of such repairs shall be paid by the Contractor.
- J The Contractor shall, prior to commencing any excavation or other operation that may affect underground facilities, notify the "Iowa One Call" underground facility locate system, established pursuant to Iowa Code Chapter 480. The Contractor may, if requested by the operator of an underground facility, assist in the location of its facilities; provided, however, the Jurisdiction shall not be responsible to the Contractor or to any operator of an underground facility for the cost of locating such facility, or for any damage to such facility that occurs in attempting to locate it, or for any damage to the facility occasioned by the Contractor's performance of work under the contract.
- K Claims for additional compensation will not be allowed to the Contractor for any interference, delay, or additional work occasioned by the location or adjustment of aboveground or underground facilities, or connections thereto.

2.15 PROTECTION OF PROPERTY

- H The Contractor shall continuously maintain adequate protection of all its work from damage and shall protect the Jurisdiction's property and adjacent private property from injury or loss arising in connection with the work. The Contractor shall repair or restore any such damage, injury, or loss to Jurisdiction property or adjacent private property.
- I The Contractor shall protect existing facilities, trees, and shrubs to remain in place. Contractor shall not disturb soil within 10 feet of the drip line of trees without notifying the Engineer. The Contractor shall mark the 10 foot limit from the drip line, prior to any excavation in the surrounding area. Any damage to existing trees or shrubs, branches, and root systems to remain and to be protected shall be repaired and/or pruned by an experienced tree surgeon or arborist at the Contractor's expense. If any tree or shrub damaged by the Contractor dies during the prosecution of the work or within the maintenance bond period, the Contractor shall replace the tree or shrub at their expense.

2.16 LAND MONUMENTS

- H The Contractor will be required to preserve all center stones, land monuments, or other property marks the Contractor may find in prosecuting the work. The Contractor shall notify the Engineer of the finding of any land monuments and shall not remove or disturb same until permission is given to do so, at which time the Contractor shall properly remove said landmarks under the direction of the Engineer.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- I For every land monument lost or destroyed by the Contractor, the Contractor may be charged, and such amount shall be deducted from any monies due or may become due to the Contractor under the contract.
- 2.17 DUST CONTROL
 - H During construction operations, the Contractor shall be responsible for the control of dust to a degree compatible with the area in which the work is being performed, and in compliance with all environmental permits and regulations, and with the City of Dubuque Code of Ordinances. In the event the Contractor does not control dust as specified, the Jurisdiction reserves the right to order dust control to be performed by other forces and withhold the cost thereof from any monies due or may become due to the Contractor under the contract.
- 2.18 ENVIRONMENTAL AND HISTORIC ITEMS
 - H If contaminated soils, historical artifacts, or other environmental or historic items are encountered, stop work and notify the Engineer.
 - I If contaminated soils that are not expected or described in the Contract Documents are encountered, stop work and notify the Engineer and Jurisdictional Representative.
- 2.19 RAILROAD CROSSINGS
 - H The authority for performing work beneath, at grade, or over railroad tracks will have been previously secured by the Jurisdiction. It shall be the Contractor's responsibility to contact the railroad company officials prior to beginning the work on railroad property or easements. The Contractor shall perform the work without damage to the facilities and property of the railroad or its lessees, and in strict observance of requirements for the safety of the railroad property and operations. All such work will be subject to the inspection of the railroad's representative. The Contractor shall protect, indemnify, and hold the Jurisdiction harmless from any and all damages resulting from its operations on railroad property or easements or in the construction of railroad crossings according to Section 1070, Part 3 - Bonds and Insurance.
- 2.20 BORROW AND WASTE SITES
 - H Unless borrow or waste sites are designated on the plans or specified in the special provisions, the Contractor shall secure and operate such sites at its own expense.
 - I In all cases, borrow and waste sites shall be operated in such a manner as to meet Federal, State, and local safety, environmental, and health requirements. Site operations, or the result of such operation, that create a nuisance or result in damage to public or private property will not be permitted. In all cases, sites shall be approved by the Engineer before use.
- 2.21 MAINTAINING POSTAL SERVICE
 - H It shall be the Contractor's responsibility to contact the U.S. Postal Service to ascertain its requirements for the maintenance of postal service to residents or businesses in the vicinity of the work site according to the instructions of the Postal Service. The Contractor shall be responsible for mailboxes at temporary locations designated by the Postal Service, and at the completion of the work, the Contractor shall replace all mailboxes in locations and conditions satisfactory to the Postal Service.
 - I Not less than 24 hours prior to removing any mailbox, the Contractor shall notify each affected resident or business addressee in writing advising them of the move and the location of their temporary mailbox during construction.
 - J For each residential or business address affected by the work, the Contractor shall place a temporary mailbox at a location preapproved by the United States Postal Service. Temporary mailboxes shall be in place so postal service is maintained at all times. Any permanent mailbox that must be removed shall be stored on the property from which it is removed and at a sufficient distance from the work area to ensure it will not be damaged by construction activities and shall be reinstalled to its original or like new condition at the conclusion of the work.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

2.22 FINISHING AND CLEANUP REQUIREMENTS

- H From time to time, as may be ordered by the Engineer, and immediately after completion of the improvement, the Contractor shall, at its expense, cleanup and remove all refuse and unused materials of any kind resulting from the work. Upon failure to do so within three working days after such request by the Engineer, the work may be done by the Jurisdiction and the cost thereof charged to the Contractor and deducted from its final payment. Upon completion of the work, the Contractor shall remove all its equipment and put the area of the work in a neat and clean condition and do all other cleaning necessary to complete the work in a workmanlike manner satisfactory to the Engineer.

Part 3: BONDS AND INSURANCE

3.08 PERFORMANCE, PAYMENT, AND MAINTENANCE BOND

- H The lowest responsive, responsible bidder shall be required to file, before the contract is executed, a surety bond for performance, payment, and/or maintenance on a form provided by the Jurisdiction and in penal sum equal to the total contract amount. Said bond shall be executed by a corporation authorized to contract as a surety in the state of Iowa. Said bond shall be provided in the specified number of copies as a part of the executed Contract Documents for the Jurisdiction's approval and execution.
- I Said bond shall provide that the Contractor shall well and satisfactorily perform and execute the work in all respects, according to the Contract Documents therefore, and according to the time and conditions of the Contract Documents, and also that the Contractor shall pay all debts incurred by it in the prosecution of such work, including those for labor and materials furnished. Said bond may also provide for the maintenance of the improvement for the number of years stipulated in the Contract Documents, and shall remain in full force for the entire maintenance period. Said bond shall in all cases comply with the laws of the State of Iowa and shall be subject to the approval of the Jurisdiction.
- J Within the time period specified in the maintenance portion of the bond, the Contractor shall, as and when ordered in writing by the Jurisdiction, repair, replace, or rebuild such portions of the work found to be faulty because of materials, equipment or workmanship. After being notified of the need for repairs, the Contractor shall submit, within ten calendar days, a written report stating its intentions and schedule for completing the repairs for approval by the Jurisdiction. If the Contractor fails to submit such written report or to make the repairs as approved by the Jurisdiction, the Jurisdiction shall have the right to make such repairs and to collect from the Contractor or its surety all outlay and expense the Jurisdiction incurs in making the repair, and in attempting to enforce the terms of the contract and the bond against the Contractor and its surety. Persistent failure by the Contractor to make such repairs may constitute grounds for disqualification of the Contractor as a not responsible bidder from bidding on future Jurisdiction projects.
- K Products and completed work must be maintained for the duration of the project work and until the Substantial Completion Certificate is issued, and must be maintained for a period of two (2) years after Final Acceptance of the Project as detailed in the Contract Documents Manual Section 00600 - Performance, Payment and Maintenance Bond. If any warranty language in a special provision conflicts with the requirement of the project's Performance, Payment and Maintenance Bond, the language in the Performance, Payment, and Maintenance Bond will supersede the warranty requirements. Any other provisions in the warranty language not in conflict with the Performance, Payment, and Maintenance Bond shall survive and remain in full force and effect during the warranty period.

3.09 INSURANCE REQUIREMENTS

- H The Contractor must purchase and maintain insurance for the project in accordance with the City of Dubuque Insurance Schedule F located in the Construction Documents Manual.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- I See Insurance Schedule F provided by the Jurisdiction, located in the Contract Documents Manual.
- 3.10 CONTRACTOR'S INDEMNITY - CONTRACTUAL LIABILITY INSURANCE
 - H See Insurance Schedule F provided by the Jurisdiction, located in the Contract Documents Manual.
- 3.11 CONTRACTOR'S INSURANCE FOR OTHER LOSSES; WAIVER OF SUBROGATION
 - H The Contractor shall assume full responsibility for all loss or damage from any cause whatsoever to any tools owned by the mechanics; or any tools, machinery, equipment, or motor vehicles owned or rented by the Contractor, its subcontractors or consultants, suppliers, third parties, or the agents, officers, or employees of any of them; or to any shed or other temporary structures, scaffolding and stagings, protective fences, and bridges belonging to the Contractor, its subcontractors or consultants, suppliers, third parties, or the agents, officers, or employees of any of them, not covered by the Jurisdiction's Builders Risk Insurance.
 - I Contractor shall cause each of its subcontractors, consultants, suppliers, third parties, or the agents of any of them, to carry insurance as required by the Jurisdiction's Insurance Schedule F, to cover all loss to such materials, tools, motor vehicles, and equipment. All insurance carried by the Contractor, or its subcontractors, consultants, suppliers, third parties or the agents of any of them, covering risk of loss or damage to materials, tools, motor vehicles, and equipment used in the performance of the Work, shall provide a waiver of subrogation against the Jurisdiction. To the extent that any subcontractors, consultants, suppliers, third parties or the agents of any of them, do not provide such coverages, any uninsured loss shall be the sole responsibility of the Contractor.
- 3.12 PROPERTY INSURANCE
 - H When stated in the special provisions, the Jurisdiction shall purchase and maintain property insurance, a.k.a. Builder's Risk Insurance, in the amount of the initial bid amount, or in an amount equal to the estimated value of actual building construction, whichever is less, as well as applicable modifications thereto for the entire work at the site on a replacement cost basis. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final acceptance of the work by the Jurisdiction. The insurance shall include interests of the Jurisdiction, the Contractor, subcontractors, and sub-subcontractors in the work. This property insurance covering the work will have a deductible of \$5,000 for each occurrence, or as stated in the special provisions, which will be the responsibility of the Contractor. This property insurance covering the work will have a deductible of \$25,000 for each occurrence, or as stated in the special provisions, which will be the responsibility of the Contractor.
 - I Property insurance shall be on an all-risk policy form and shall insure against the perils of fire and extended coverage and physical loss or damage including, without duplication of coverage, flood and earthquake, theft, vandalism, malicious mischief, collapse, falsework, temporary buildings and debris removal, including demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for the Jurisdiction's services and expenses required as a result of such insured loss. Coverage for other perils shall not be required unless otherwise provided in the Contract Documents.
 - J Unless otherwise provided in the Contract Documents, this property insurance shall cover portions of the work stored off the site, after written approval of the Jurisdiction, at the value established in the approval, and portions of the work in transit. Coverage for work stored off the site and in transit will be not less than 10% of the policy amount.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- K Boiler and Machinery Insurance: The Jurisdiction, at the Jurisdiction's option, may purchase and maintain Boiler and Machinery Insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Jurisdiction; this insurance shall include interest of the Jurisdiction, Contractor, subcontractors, and sub-subcontractors in the work, and the Jurisdiction and Contractor shall be named insureds.
- L Loss of Use Insurance: The Jurisdiction, at the Jurisdiction's option, may purchase and maintain insurance to insure the Jurisdiction against loss of use of the Jurisdiction's property due to fire or other hazards, however caused. In the event the Jurisdiction purchases such insurance, the Jurisdiction shall waive all rights of action against the Contractor for loss of use of the Jurisdiction's property, including consequential losses due to fire or other hazards, however caused.
- M If the Contractor requests in writing that insurance for risks other than those described herein or for other special hazards be included in the property insurance policy, the Jurisdiction shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate change order.
- N If during the project construction period, the Jurisdiction insures properties, real or personal or both, adjoining or adjacent to the site by property insurance under policies separate from those insuring the project or if after final acceptance, property insurance is to be provided on the completed project through a policy or policies other than those insuring the project during the construction period, the Jurisdiction shall waive all rights according to the terms of Section 1070, 3.05, I, for damages caused by fire or other perils covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.
- O Before an exposure to loss may occur, the Jurisdiction shall file with the Contractor a copy of each policy that includes insurance coverages required by this section. Each policy shall contain all generally applicable conditions, definitions, exclusions, and endorsements related to this project. Each policy shall contain a provision that the policy will not be cancelled or allowed to expire until at least 30 calendar days prior written notice has been given to the Contractor.
- P Waivers of Subrogation: The Jurisdiction and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents, and employees, each of the other, and (2) the Jurisdiction's consultants, separate contractors, if any, and any of their subcontractors, sub-subcontractors, agents, and employees, for damages caused by fire or other perils to the extent covered by property insurance obtained pursuant to this section or other property insurance applicable to the work, except such rights as they have to proceeds of such insurance held by the Jurisdiction as fiduciary. The Jurisdiction or Contractor, as appropriate, shall require of the Jurisdiction's consultants, separate contractors, if any, and the subcontractors, sub-subcontractors, agents, and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- Q A loss insured under the Jurisdiction's property insurance shall be adjusted by the Jurisdiction as fiduciary and made payable to the Jurisdiction as fiduciary for the insureds, as their interest may appear, subject to requirements of any applicable mortgagee clause and of Section 1070, 3.05, K. The Contractor shall pay subcontractors their shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require subcontractors to make payments to their sub-subcontractors in a similar manner.
- R The Jurisdiction as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five calendar days after occurrence of loss to the Jurisdiction's exercise of this power; if such objection be made, arbitrators shall be chosen according to Section 1040, 1.10, D, 1070, 1.12, provided one arbitrator shall be appointed by the Jurisdiction, one by the party in interest making objection, and the third to be appointed by the two arbitrators thus chosen. Arbitration shall thereafter proceed as provided in Section 1040, 1.10, E through G. 1070, 1.12. The Jurisdiction as fiduciary shall, in that case, make settlement with insurers according to the direction of such arbitrators. If distribution of insurance proceeds by arbitration is required, the arbitrators will direct such distribution.
- S Partial occupancy or use of the work shall not commence until the insurance company or companies provided property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Jurisdiction and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse, or reduction of insurance.
- T Installation Floater: Under contracts where the Jurisdiction does not provide Builders Risk Insurance, the Jurisdiction may by special provision require the Contractor to provide coverage under an "Installation Floater" covering all materials, fixtures, equipment, and supplies provided for the job. Such insurance shall be on an "all risk" form in an amount equal to the maximum value of such materials, equipment, or supplies covered on the job site, off-premises at any temporary storage location, or in transit. The Installation Floater covering the equipment shall have a maximum deductible no greater than \$5,000 for each occurrence, which will be the responsibility of the Contractor.
- 3.13 ENDORSEMENT NAMING JURISDICTION AS AN ADDITIONAL INSURED / CANCELLATION AND MATERIAL CHANGE / GOVERNMENTAL IMMUNITIES ENDORSEMENT
- H See Insurance Schedule F provided by the Jurisdiction, located in the Contract Documents Manual.
- 3.14 PROOF OF INSURANCE
- H See Insurance Schedule F provided by the Jurisdiction, located in the Contract Documents Manual.
- 3.15 NOTIFICATION IN EVENT OF LIABILITY OR DAMAGE
- H Upon the occurrence of any event, the liability for which is herein assumed by the Contractor, the Contractor agrees to forthwith notify the Jurisdiction in writing of such happening, which notice shall give the details as to the happening, the cause as far as can be ascertained, the estimate of loss or damage done, the names of witnesses, if any, and stating the amount of any claim.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

- I In the event the Jurisdiction has or obtains actual knowledge of any event that may result in a claim, the liability for which is herein assumed by the Contractor, the Jurisdiction agrees to notify the Contractor of such event within a reasonable period of time after acquiring knowledge thereof; provided however, the Jurisdiction shall have no duty to inspect the project to obtain knowledge of such events; and provided further the Jurisdiction's failure to so notify the Contractor shall not relieve the Contractor of any liability or obligation herein assumed by the Contractor.

3.16 3.09 SAMPLE INSURANCE FORMS

- H Sample forms will be provided by the Jurisdiction and included in the Contract Documents Manual.

END OF SECTION

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1070 - LEGAL RELATIONS AND RESPONSIBILITY TO THE PUBLIC

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Section 1080 - Prosecution and Progress

Part 1: General

1.01 SUBLETTING OR ASSIGNMENT OF CONTRACT

A Work by Contractor:

- 1 The Contractor shall not assign this Contract to another person, firm, or corporation without the prior consent of the Jurisdiction. The Jurisdiction may refuse to approve a proposed assignment of contract if such assignment would not be in the best interests of the Jurisdiction, or if such assignment would be contrary to law or public policy. An assignment of contract and all subcontracts shall be in writing.

B Permission to Sublet:

- 1 The Contractor shall not sublet, assign, or otherwise dispose of any portion of the contract, except for the furnishing and transportation of materials, without a written "permission to sublet" order duly approved by the Jurisdiction.
- 2 Requests for permission to sublet, assign, or otherwise dispose of any portion of the contract shall be in writing and shall provide the name, address, telephone number, and representative of the organization that will perform the work, a description of the work is to be sublet, and the associated cost. When requested by the Engineer, the Contractor shall provide a written report showing the organization that will perform the work is particularly experienced and equipped for such work.
- 3 Consent to sublet, assign, or otherwise dispose of any portion of the contract shall not be construed to relieve the Contractor of any responsibility for the fulfillment of the contract or in any way create any contractual relationship between the subcontractor and the Jurisdiction.

C Subcontracts:

- 1 Prior to commencing work at the site, the Contractor shall provide a complete list of all subcontractors that will be performing work on the Project that includes the name of the company, business address, site superintendent or person in charge, their email address and 24-hour mobile phone number. For any subcontract, subletted or otherwise disposed of portion of the Contract, the Contractor shall provide in writing a description of the work to be performed by each subcontractor, and the associated cost. When requested by the Engineer, the Contractor shall provide a written report showing the organization that will perform the work is particularly experienced and equipped for such work.
- 2 Upon request of the Jurisdiction, the Contractor shall provide a copy of each subcontract agreement and proof of insurance within 5 business days of receiving the request.
- 3 The Contractor shall be responsible to include all conditions and requirements of the Contract Documents in all its subcontracts and enforce said requirements with its subcontractors.

1.02 CONTRACT TIME

- ##### A
- In accordance with the completion dates specified in the contract Section 00800 of the Contract Documents, the contract time shall be the time starting 10 calendar days after the date listed in the Notice to Proceed to the date specified for completion as shown in Section 00800, both dates inclusive. The contract time may be extended by the Jurisdiction by change order as provided in these specifications, in which event the contract time shall include the new extension of working days or completion dates. If the Contractor fails to complete the Contract by said time, the Agreed Costs of Delay will be assessed against it as specified in Section 1080, 1.12.

1 Completion Date Contracts:

- a The Contractor shall complete the contract on or before the completion dates listed in the construction documents manual. The Contractor may commence work any time after but not before receipt of the Jurisdiction's signed Notice to

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AND PROGRESS

Proceed. Section 1080, 1.06 shall not apply to Completion Date Contracts. Agreed Costs of Delay will be assessed according to Section 1080, 1.12 for each calendar day beyond the contract times stipulated in the Contract Documents that the Project remains uncompleted. The work must not start unless the Contract is fully executed by the Contractor and Jurisdiction.

2 Working Day Contracts:

a Specified Start Date: Working days will be charged to the Contractor starting 10 calendars after the date listed on the Notice to Proceed. Approval to start work prior to the specified start date will be considered by the Jurisdiction upon written request, from the Contractor. If approval is authorized, working days will be charged when the work starts. The work must not start unless the Contract is fully executed by the Contractor and Jurisdiction.

B Milestone dates may be designated for completion of a specific item or certain designated portions of the work. The contract times and the agreed costs of delay, for each milestone will be listed in Section 00800 of the Contract Documents.

1.03 WORK PROGRESS AND SCHEDULE

A The progress of the work shall be at a rate sufficient to complete the contract within the time allowed. The Contractor's sequence of operations shall be such as to cause as little inconvenience to the general public as possible.

B After being awarded the contract, and as specified in the Contract Documents, the Contractor shall immediately prepare and submit to the Engineer for approval a progress schedule that will ensure the completion of the project within the time specified. Adequate equipment and forces shall be made available by the Contractor to start work immediately upon issuance of the Notice to Proceed by the Jurisdiction and to prosecute the work to completion according to schedule and within the time specified. The Contractor shall create and maintain the progress schedule in accordance with associated special provision.

C If it appears the rate of progress is such that the Project will not be completed within the contract time, or if the work is not being executed in a satisfactory and workmanlike manner, the Jurisdiction may order the Contractor to take such steps as necessary to complete the Project within the contract time specified or to prosecute the work in a satisfactory manner. If the Contractor fails to comply with such order within two weeks after receipt of the order, the Jurisdiction will have the right to declare the contract in default.

D Unless otherwise specified in the Contract Documents, the Contractor shall give notice to all utilities, and public agencies time for starting and for completion of its work.

E Unless otherwise specified in the Contract Documents, the Contractor shall give notice to all utilities, and public and private agencies, abutting property owners, and all others affected by its operations notice of any detours, locations of alleys to be closed. Such notice shall include the names of streets impacted by the detour, duration of the detour, and when possible the detour routes. Notification shall be made three business days in advance to provide proper re-routing of traffic and erecting of signs before the work is to begin.

F The Contractor shall properly coordinate and expedite its work in such a manner as to cause the least amount of conflict and interference between its operations and those of all others affected by its operations. Any or all damages or claims resulting from the improper or insufficient notification of all others affected by its operations shall be the responsibility of the Contractor.

1.04 PROJECT SCHEDULE – FOR CONTRACT AWARD AMOUNTS LESS THAN \$3,000,000

A Initial Acceptance of Preliminary Project Schedule: No later than 5 days after the date of the Notice to Proceed, Contractor shall submit a schedule to the Jurisdiction and Engineer in electronic format for review. After receipt of comments on the schedule by the Jurisdiction and Engineer, Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedule. No progress payment shall be

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AN PROGRESS

made to Contractor until an acceptable Preliminary Project Schedule is approved by either Jurisdiction or Engineer.

- 1 The Preliminary Project Schedule will be acceptable if it:
 - a Presents the Contractor's planned work for the first 90 calendar days of the project. The balance of the contract duration may be summary in nature but must show the planned starting and ending dates for the various parts of work, including milestones.
 - b The Preliminary Project Schedule will be a critical path schedule prepared utilizing acceptable industry standard scheduling practices.
 - c A proposed listing of subcontractors and major materials and equipment suppliers. The list shall include any proposed material or equipment substitutions.
 - d The preliminary Progress Schedule submittal shall include:
 - i PDF printout of the Contractor's schedule.
 - ii Electronic copy of the schedule submittal file in native backup format (*.pdf, *.xlsx, *.mpp, *.xer, *.stx, *.prx etc.);
 - iii A Schedule of Values if requested by the Jurisdiction.
 - 2 Approval of the schedule shall not create for Jurisdiction or Engineer any responsibility for the Project Schedule, including but not limited to sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
- B Final Project Schedule: Within 45 calendar days after the Date of the Notice to Proceed (unless otherwise specified), the Contractor shall submit to Engineer for timely review:
- 1 A Final Project Schedule indicating the times (numbers of days and dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents representing the Contractor's planned work for the duration of the project.
 - a The Final Project Schedule shall be a critical path schedule prepared utilizing acceptable industry standard scheduling practices.
 - b Each activity shall include the planned duration to complete the work.
 - c Schedule of required project submittals for the project's full duration.
 - d The Final Project Schedule submittal shall include:
 - e An electronic copy of the schedule submittal file (*.pdf, *.xlsx, *.mpp, etc.)
- C Acceptance of Final Project Schedule: Within 10 calendar days of the Final Schedule submission, Jurisdiction and Engineer shall submit comments to Contractor. Contractor shall have an additional 10 calendar days to make corrections and adjustments and to complete and resubmit the schedule. After the Final Project Schedule is due to be initially submitted, no progress payment shall be made to Contractor until an acceptable Final Project Schedule is approved by either the Jurisdiction or Engineer.
- 1 The Final Project Schedule will be acceptable to Jurisdiction or Engineer if it:
 - a Provides an orderly progression of the Work to completion within the Contract Times and completion dates. Such acceptance will not impose on Jurisdiction or Engineer responsibility for the Project Schedule in any way, including but not limited to sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor; and
 - b Meets the requirements outlined in Section 1080, 1.04.; and
 - c Contractor's Schedule of Submittals will be acceptable to Jurisdiction or Engineer if it provides a workable arrangement for reviewing and processing the required submittals. The schedule for shop drawings shall show all submittals complete before 25% of completion of the Work and the schedule for required maintenance manuals shall show all submittals complete before 50% of completion of the Work.

1.05 PROJECT SCHEDULE – FOR CONTRACT AWARD AMOUNTS \$3,000,000 OR GREATER

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AN PROGRESS

- A Initial Acceptance of Preliminary Project Schedule: No later than 10 days after the date of the Notice to Proceed, Contractor shall submit a schedule to the Jurisdiction and Engineer in electronic format for review. After receipt of comments on the schedule by the Jurisdiction and Engineer, Contractor shall have an additional 10 days to make corrections and adjustments and to complete and resubmit the schedule. No progress payment shall be made to Contractor until an acceptable Preliminary Project Schedule is approved by either Jurisdiction or Engineer.
- 1 The Preliminary Project Schedule requirements:
 - a The schedule shall present in detail, the Contractor's planned work for the first 90 calendar days of the project. The balance of the contract duration may be summary in nature but must show the planned starting and ending dates for the various parts of work, including milestones.
 - b The Preliminary Project Schedule will be a critical path schedule prepared utilizing acceptable industry standard scheduling practices and software.
 - c Each activity will include the planned quantities of work in place and the planned man-hours to complete the work.
 - d The Preliminary Project Schedule submittal shall include:
 - i PDF printout of the Contractor's schedule.
 - ii A written narrative identifying the Contractor's plan to execute the work, including the planned critical path, major equipment required, and major phasing/sequence required to complete the work.
 - iii An initial schedule of required project submittals for the project's full duration.
 - iv A proposed listing of subcontractors and major material and equipment suppliers. The list shall include any proposed material or equipment substitutions.
 - v A Schedule of Values if requested by the Jurisdiction.
 - vi Electronic copy of the schedule submittal file in native backup format (*.mpp, *.xer, *.stx, *.prx etc.);
 - 2 The Preliminary Project Schedule will be acceptable if it:
 - a Provides a reasonable sequence for the Work to be completed within the Contract Times and completion dates.
 - b Approval of the schedule shall not create for Jurisdiction or Engineer any responsibility for the Project Schedule, including but not limited to sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor.
 - 3 Contractor's Schedule of Submittals will be acceptable to Jurisdiction or Engineer if it provides a workable arrangement for reviewing and processing the required submittals. The schedule for shop drawings shall show all submittals complete before 25% of completion of the Work and the schedule for maintenance manuals shall show all submittals complete before 50% of completion of the Work.
 - 4 Contractor's Schedule of Values will be acceptable to the Jurisdiction if it distributes the Contract Price to the major schedule activities in justifiable amounts, proportional to their cost of the work.
- B Final Project Schedule: Within 45 calendar days after the Date of the Notice to Proceed (unless otherwise specified), the Contractor shall submit to Engineer for timely review:
- 1 A Final Project Schedule indicating the times (numbers of days and dates) for starting and completing the various stages of the Work, including any Milestones specified in the Contract Documents representing in detail, the Contractor's planned work for the duration of the project.
 - a The Final Project Schedule shall be a critical path schedule prepared utilizing acceptable industry standard scheduling practices and software.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AND PROGRESS

- b Each activity shall include the planned quantities of work in place and the planned man-hours to complete the work.
 - c The Final Project Schedule submittal shall include:
 - i PDF printout of the Contractor's schedule.
 - ii A written narrative identifying the Contractor's plan to execute the work, including the planned critical path, major equipment required, and major phasing/sequence required to complete the work.
 - iii Electronic copy of the schedule submittal file in native backup format (*.mpp, *.xer, *.stx, *.prx etc.)
 - C Acceptance of Final Project Schedule: Within 14 calendar days of the Final Schedule submission a conference attended by Contractor, Engineer, and others as appropriate will be held to review the schedules submitted in accordance with Article 1.05.B. Contractor shall have an additional 10 calendar days to make corrections and adjustments and to complete and resubmit the schedules. After the Final Project Schedule is due to be initially submitted, no progress payment shall be made to Contractor until an acceptable Final Project Schedule is approved by either the Jurisdiction or Engineer.
 - 1 The Final Project Schedule will be acceptable to Jurisdiction or Engineer if it:
 - a Provides an orderly progression of the Work to completion within the Contract Times and completion dates. Such acceptance will not impose on Jurisdiction or Engineer responsibility for the Project Schedule in any way, including but not limited to sequencing, scheduling, or progress of the Work, nor interfere with or relieve Contractor from Contractor's full responsibility therefor; and
 - b Meets the requirements outlined in Section 1080, Article 1.05.; and
 - 2 Contractor's Schedule of Submittals will be acceptable to Jurisdiction or Engineer if it provides a workable arrangement for reviewing and processing the required submittals. The schedule for shop drawings shall show all submittals complete before 25% of completion of the Work and the schedule for required maintenance manuals shall show all submittals complete before 50% of completion of the Work.
 - 3 Contractor's Schedule of Values will be acceptable to the Jurisdiction if it distributes the Contract Price to the major schedule activities in justifiable amounts, proportional to their cost of the work.
- 1.06 PRECONSTRUCTION CONFERENCE
 - A Before starting any work at the site, the Engineer shall coordinate and lead a preconstruction conference. The Engineer, Jurisdiction, Contractor and the intended subcontractors, if known, shall participate in this conference. The Engineer may invite representatives of railroads, utilities and others having responsibilities or interest in the work. The Engineer shall determine the agenda for the conference and the Contractor shall prepare and provide information requested by the Engineer for the conference. Items to be included on the agenda include but are not limited to review of the Preliminary Project Schedule, the process to submit and review required submittals, finalization of authorized representatives for the parties by completion of Section 00101- Project Directory Page, pay application processing, and keeping of as-built records.
- 1.07 NOTICE TO PROCEED
 - A The return of the signed and executed contract to the Contractor shall serve as notice the contract bond is acceptable, the contract is in force, and the Contractor may complete arrangements for materials and other work according to the Contract Documents.
 - B The Contractor shall begin work as specified in the Notice to Proceed issued by the Jurisdiction and shall prosecute the work vigorously and continuously to completion, except when it is physically impossible to do so due to weather conditions or other unavoidable delays. The necessity of discontinuing and resuming work on any portion of the contract shall be determined solely by the Jurisdiction.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AN PROGRESS

- C The Jurisdiction may, if provided for in the Contract Documents, give a limited Notice to Proceed as to any portion of the work under the contract.
- 1.08 WEEKLY RECORD OF WORKING DAYS
- A On contracts with completion provisions based upon working days, the Engineer will furnish the Contractor a weekly statement showing the number of working days charged to the Contractor for the preceding week, the number of working days specified for completion of the project, the number of working days remaining to complete the contract, and the revised date for completion.
- B Working days will be charged under the following circumstances:
- 1 Prior to Commencement of Work: Beginning on the date designated in the Notice to Proceed, or beginning on the specified starting date or as soon thereafter as provided in the specifications, a working day will be charged for every calendar day other than Saturday, Sunday, or a recognized legal holiday. Working days will be charged for Saturdays if a mandatory six-day work week is specified in the Contract Documents.
 - 2 After Commencement of Work: One full working day will be charged for any weekday, exclusive of Saturdays, Sundays, or a recognized legal holiday, when weather or other conditions (not under control of the Contractor) will permit construction operations to proceed for not less than 3/4 of a normal workday in the performance of a controlling item of work as determined by the Engineer. If such conditions allow operations to proceed for at least 1/2 but less than 3/4 of the normal working hours, one-half working day will be charged.
 - 3 Upon written notice to the Contractor, the Engineer may suspend charging of working days on substantially completed contracts for up to 30 calendar days when only cleanup of the project site or minor work items remain. If the designated time has expired and the remaining work items and site cleanup remain uncompleted, the Engineer may restart charging of working days effective at the end of the designated period by providing written notice to the Contractor.
 - 4 Working days will not be charged for Saturdays, Sundays, and recognized Jurisdiction legal holidays that the Contractor does not work (unless a mandatory extended work week is specified in the Contract Documents). Working days will be charged for Saturdays, Sundays, and recognized legal holidays that the Contractor does work.
- C Any objection by the Contractor to such weekly determinations shall be deemed waived and shall not thereafter be made the basis of any claim, unless the Contractor shall, within seven calendar days after receipt of a weekly statement, file with the Engineer its written protest setting forth its objections and reasons. If the Contractor's objection to the working day count is made on the grounds it was unable to work due to causes beyond its control, the Contractor shall state its reasons in writing, furnish proof to establish its claim, and state the approximate number of calendar days it estimates it was delayed. The Engineer shall then determine the appropriate number of working days to be charged under the contract.
- 1.09 WORK ON SUNDAYS OR LEGAL HOLIDAYS
- A Except when an accelerated work schedule is required in the Contract Documents, no work requiring inspection will be allowed on Saturdays, Sundays or holidays observed by the Jurisdiction unless permission is obtained from the Engineer in advance of the work. The Contractor is responsible for obtaining a list of holidays observed by the Jurisdiction for consideration in developing their bid and progress schedule.
- B Work that may be required to properly maintain or protect completed or partially completed construction, or to maintain lights and barricades, will be permitted on Saturdays, Sundays or holidays without specific permission of the Engineer.
- 1.10 TEMPORARY SUSPENSION OF WORKING DAYS

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AND PROGRESS

- A When, in the judgment of the Engineer, unfavorable weather makes it impractical to secure acceptable results or other conditions warrant an order to suspend working days, the Engineer shall issue to the Contractor a written order to suspend working days wholly or on any part of the contract. When conditions are again favorable for prosecution of the working days, the Engineer shall issue to the Contractor a written order to resume the suspended working days. Orders to suspend working days will not be written for short intermittent shutdowns of three (3) days or less due to weather conditions. The Contractor shall take every precaution to prevent any damage or unreasonable deterioration of the work during the time of suspended operations.

1.11 EXTENSION OF TIME

- A Allowances for Delays: The Contractor expressly covenants and agrees that in undertaking to complete the work within the contract time, it has taken into consideration and made allowance for all delays and hindrances that would ordinarily be anticipated in performing such work.
- B Request for Extension of Time:
- 1 Where Contractor is prevented from completing any part of the Work within the Contract Times due to delay beyond the control of Contractor, the Contract Times will be extended in an amount equal to the time lost due to such delay if a Claim is made therefore as provided in Section 1080 – Prosecution and Progress 1.09 B. Delays beyond the control of Contractor shall include, but not be limited to, acts or neglect by Jurisdiction, acts or neglect of utility owners or other contractors performing other work as contemplated by Section 1050 – Control of Work 1.04, fires, floods, epidemics, abnormal weather conditions, or acts of God.
 - 2 If Jurisdiction, Engineer, or other contractors or utility owners performing other work for Jurisdiction as contemplated by Section 1050 – Control of Work 1.04, or anyone for whom Jurisdiction is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Contract Time. Contractor's entitlement to an adjustment of the Contract Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Contract Times.
 - 3 If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal weather conditions, acts of God, acts or failures to act of utility owners not under the control of Jurisdiction, or other causes not the fault of and beyond control of Jurisdiction and Contractor, then Contractor shall be entitled to an equitable adjustment in Contract Times, if such adjustment is essential to Contractor's ability to complete the Work within the Contract Times. Such an adjustment shall be Contractor's sole and exclusive remedy for these delays.
 - 4 Jurisdiction, Engineer, and their officers, directors, members, partners, employees, agents, consultants, or subcontractors shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or in connection with any other project or anticipated project.
 - 5 Contractor shall not be entitled to an adjustment in Contract Price or Contract Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed to be delays within the control of the Contractor.
 - 6 Whenever the Contractor becomes aware of its inability to complete the work under the contract within the contract period; it shall request an extension in writing no later than seven (7) calendars after the event that occurred to cause such delay. The request shall be submitted to the Engineer for consideration by the Jurisdiction. The request for an extension of time is the sole and exclusive remedy for the Contractor

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AN PROGRESS

for the events listed below, except for time extensions granted in approved change orders. The submission of a request for extension of time shall not guarantee such extension will be granted by the Jurisdiction.

- 7 The following items, when they impact the project's critical path, may be a justification for extension of time:
 - a Weather: Extension of time due to abnormal weather conditions at the site may be requested when conditions are so unusual or severe as not to be reasonably anticipated when considering local annual weather records and patterns. An average or usual number of inclement working or calendar days when work cannot proceed are to be anticipated during the construction time and are not to be considered as warranting an extension of time.
 - b Other Jurisdiction Work: An extension of time may be requested for delays caused by the noncompletion of work by the Jurisdiction or other Jurisdiction contractors, provided such noncompletion is the sole and only cause of delay, and where the Contractor has available on the site of the work all equipment, material, and labor necessary to proceed with the work.
 - c Change Orders: An extension of time may be requested for delays caused by the issuance of a change order, where the work occasioned by the change order is the sole and only cause of the impossibility to complete the work within the specified time. Any extension of time must be requested, approved and incorporated into the change order, at the time all parties sign the change order.
 - d Work Stoppage: An extension of time may be requested for delays caused by a general work stoppage in the area or a work stoppage affecting this project that is beyond the control of the Contractor, or where the Contractor has taken in good faith all steps made available to it by law to resolve the causes thereof and to terminate such work stoppage. Such an extension of time must be requested within fourteen (14) calendar days of the first day of the work stoppage.
 - e Acts by U.S. Government: An extension of time may be requested for delays caused by any act taken by the United States Government that would affect fabrication or delivery of materials or equipment to the work site. Such an extension of time must be requested within fourteen (14) calendar days from the first day the Contractor becomes aware of the government act.
 - f Court Proceedings: An extension of time may be requested for delays caused by any court proceedings. Such an extension of time must be requested within fourteen (14) calendar days of the conclusion of any court proceedings.
 - g Other Delays: Such an extension of time may be requested for other delays encountered by the Contractor beyond its control and that make it impossible for the Contractor to complete the contract within the specified time. An extension of time must be made within seven (7) calendar days of the first day the Contractor becomes aware of the event causing the delay.
- C Time Extension Request - Submittal Requirements: Contractor shall provide a Request for Time Extension Narrative containing the following for a determination by the Jurisdiction:
 - 1 Justification of the Delay
 - a Entitlement. Demonstrate there is entitlement for the delay in the form of a narrative.
 - b Show that Float time is used in full. In order for an impact to be considered, the float time in the affected activities must be consumed and exceeded by the delay event.
 - c Entitlement. Demonstrate there is entitlement for the delay in the form of a narrative.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AND PROGRESS

- d No concurrent delay. Evaluate the as-built schedule to insure no concurrent delays were ongoing during the delay period which are the responsibility of the Contractor.
- 2 Submission Requirements. The Contractor shall prepare and include in its Request for Time Extension the following:
 - a Time Impact Narrative. The prepared narrative shall include the following:
 - i Affected Activities. A list of affected activities with their associated project schedule activity number.
 - ii Explanation of the causes of the change. Provide a description of the change and the resulting impact to the subsequent activities.
 - iii Analysis of Time Impact. See "3. Time Impact Analysis" below.
 - iv Sub-network of the Affected Area.
 - b Time Impact Analysis Reports. Include the following schedule generated:
 - i Critical Path and Affected Sub-network. In the "Pre-Impact" schedule, filter and include only the Critical Path and Affected Sub-network and reflect in a Gantt Chart view with logic ties shown.
 - ii Delay Fragnet: In the "Pre-Impact" schedule, filter and include only the Delay Fragnet and reflect in a Gantt Chart view with logic ties shown.
 - iii "Pre-Impact" vs "Post Impact" Long Path Target Comparison. In the "Post Impact" schedule, filter and include only the Critical Path and Affected Sub-network and reflect in a Gantt Chart view with logic ties shown. Include a Target Comparison to the "Pre-Impact" schedule.
 - iv "Pre-Impact" vs "Post Impact" Target Comparison. In the "Post Impact" schedule, filter and include only the activities in progress or not started at the commencement date of the delay, and reflect in a Gantt Chart view with logic ties shown. Include a Target Comparison to the "Pre-Impact" schedule.
 - c Electronic Schedule Files. Provide the electronic schedule files, in native format, utilized in the preparation of the Time Impact Analysis.
- 3 Time Impact Analysis. For requests of time extensions less than 2 weeks, use the most recent schedule update at the time the construction direction was issued or event causing the delay commenced. For requests of time extensions over 2 weeks, see "4. Additional Analysis Requirements" below.
 - a Schedule Update for Analysis.
 - i Identify the appropriate update for use in the analysis.
 - ii The analysis should begin at the time the issue or delay was encountered. Therefore, the appropriate update to be used is the previous update before the issue or delay event is encountered. This update is considered the 'Pre-Impact' update.
 - iii In other words, if a delay began on July 14, 2014, the July 01, 2014 update would be the appropriate schedule update to be used.
 - b Identify the Critical Path and the Affected Sub-network of the "Pre-Impact" update. Code the original activities that are affected, preceding and succeeding, with a "TIA#" (Time Impact Analysis Number) activity code for filtering and sorting.
 - c Fragnet Development. A fragnet represents a series of activities which identify the activities and timeline associated with the delay.
 - i Develop applicable fragnet including but not limited to:
 - RFI/notice response time, if applicable
 - Issuance of Cost Proposal Request (CPR)
 - Proposal response preparation time by Contractor
 - Jurisdiction review and approval time (contract duration, typically 14 calendar days)

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AND PROGRESS

- Jurisdiction Work Change Directive or Change Order preparation time
 - Submittal preparation time
 - Jurisdiction Submittal review time (contract duration, typically 14 calendar days)
 - PO/Subcontract negotiation period as required
 - Material Procurement duration
 - Additional Scope of Work performance
 - ii While developing a fragnet for delays already incurred, reflect the actual durations and dates in the fragnet.
 - d Delay Calculation. The following steps outline the delay calculation process:
 - i Identify the project completion date contained in the "Pre-Impact" update.
 - ii Insert the developed fragnet into a copy of the appropriate ("Pre-Impact") update.
 - iii Tie the fragnet with logic to the "Affected Activities".
 - iv Do not make any other logic or duration changes to the schedule.
 - v Re-calculate the "Impacted" update.
 - vi Evaluate the inserted fragnet and affected activities to insure the dates reflect the as built condition.
 - vii Compare the completion date of the "Impacted" updated to the "Pre-Impact" update.
 - viii The variance is the delay.
 - e Concurrency Analysis. In the event the appropriate update is from a prior period, copy the most recent update and apply the fragnet to determine any concurrent issues.
- 4 Additional Analysis Requirements. For requests of time extensions over 2 weeks, the Jurisdiction may request an interim schedule update be produced by the Contractor with the Data Date equivalent to the date the delay commenced in order to reflect the status of the project at that time.
- D Claims for Damages: The Contractor shall have no claim for damages for any extensions or delays provided or mentioned in the preceding portions of this section; but the Contractor shall, in such cases, be allowed to petition for such extension of time as the Jurisdiction may grant in writing on account of such delay, provided, however, the claim for such extension of time is made by the Contractor in writing to the Jurisdiction immediately after any such delay occurs.
- E Documentation Required for Extension: No extension of time shall be granted or recognized except as specifically approved by the Jurisdiction in writing to the Contractor. Oral representations or agreements by Jurisdiction agents or employees regarding time extension shall not be binding on the Jurisdiction. No extension of time will be granted unless the Contractor provides clear, sufficient schedule documentation justifying the need for such extension. In order for an extension of time to be granted, the Contractor must properly demonstrate that the critical path schedule for the Project has been impacted. Claims relating to time shall be made in accordance with applicable provisions of Section 1080, Article 1.09.
- F Extension of Time Granted: No extension of time shall be granted or recognized unless specifically approved by the Jurisdiction in a written change order to the Contractor. Oral representations or agreements by Jurisdiction agents or employees regarding time extension shall not be binding on the Jurisdiction.
- 1.12 CONTRACTOR'S EMPLOYEES, METHODS, AND EQUIPMENT
- A Superintendent:
- 1 All work under the contract shall be performed under the continuous supervision of competent personnel, thoroughly experienced in the class of work specified.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AND PROGRESS

- 2 Prior to beginning work, the Contractor shall give the Engineer, in writing, the name of the Contractor's official representative or superintendent for the project. The superintendent shall be capable of providing adequate supervision of the project and shall be responsible for receiving instructions, notices, and written orders from the Engineer or Jurisdiction Representative. A change of the superintendent shall only be allowed in instances where there is an extreme hardship on the Contractor or their superintendent. Before the superintendent is removed from the Project, the Contractor must submit a request in writing to the Engineer and the Jurisdiction that includes supporting information to substantiate the request. Failure to provide adequate supervision of the project or removing the superintendent from the Project without prior written authorization shall be grounds for the Jurisdiction to stop work and require a change in supervision before allowing the work to proceed. Such change shall not be in any way be a basis for a claim.
The superintendent shall be responsible for reporting to the Engineer any inconsistencies, omissions, or lack of definite detail in the plans, special provisions, or Contract Documents that may be discovered. The superintendent shall be present at the work site at least 50% of the time while the work is being performed.
 - 3 The lack of proper supervision by the Contractor or by its supervisory personnel shall be just cause for termination of the contract.
- B Workers:
- 1 The Contractor shall employ competent and efficient workers for every kind of work. The Jurisdiction reserves the right to direct the suspension or discharge from the work any worker, employee, agent, overseer, foreman, or superintendent in the employ of the Contractor, who, in the sole opinion of the Jurisdiction, is determined to be incompetent, negligent, unfaithful, insubordinate, unsafe, rude, disrespectful, hostile, intolerant, racist, embarrassing to the project, or disorderly, and any such person shall immediately be suspended or discharged by the Contractor and not be allowed to return to the site, whenever so directed by the Jurisdiction.
 - 2 The Contractor must not employ or hire any employees of the Jurisdiction.
- C Methods and Equipment:
- 1 The methods and equipment used by the Contractor shall produce a satisfactory quality of work and shall be adequate to maintain the schedule of progress specified. Equipment used on any portion of the project shall be such, and its use so regulated, that no serious or irreparable damage to the roadway, adjacent property, or other streets or highways will result from its use. If damage does occur to the street or highway, suitable repairs shall be made at the Contractor's expense.
 - 2 When the methods and equipment to be used by the Contractor in accomplishing the construction are not prescribed in the Contract Documents, the Contractor is free to use any methods or equipment that will accomplish the contract work in conformity with the requirements of the Contract Documents, as demonstrated to the satisfaction of the Engineer.
 - 3 When the Contract Documents specify that the construction be performed by use of certain methods and equipment, such methods and equipment shall be used unless others are authorized by the Engineer.
 - 4 If the Contractor desires to use a method or type of equipment other than specified in the Contract Documents, the Contractor may request authority from the Engineer to do so. The request shall be in writing and shall include a full description of the method and equipment proposed to be used and an explanation of the reasons for desiring to make the change. If approval is given, it will be on the condition that the Contractor shall be fully responsible for producing construction work in conformity with contract requirements.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AN PROGRESS

- 5 If after trial use of the substituted methods or equipment, the Engineer determines the work produced does not meet the requirements of the Contract Documents, the Contractor shall discontinue use of the substitute method or equipment and shall complete the remaining construction with the specified methods and equipment. The Contractor shall remove the defective work and replace it with work of specified quality, or take such other corrective action as the Engineer may direct. No change will be made in basis of payment for the construction items involved, or in contract time, as a result of authorizing a change in methods or equipment under these provisions.

1.13 CONTRACTOR'S EQUIPMENT IDENTIFICATION

- A All vehicles and major construction equipment utilized on Jurisdiction's projects, with the exception of vehicles used for personal purposes and rented equipment bearing the name, address, and telephone number of the rental company, shall exhibit the Contractor's name in at least two locations on each piece of equipment. This identification can be either a decal or painted lettering of a type and size, and with a contrasting color, rendering it legible from a distance of no less than 50 feet.

1.14 AGREED COSTS OF DELAY

- A Time is of the essence of this contract. As delay in the diligent prosecution of the work may inconvenience the public, obstruct traffic, interfere with business, and/or increase costs to the Jurisdiction such as engineering, administration, and inspection, it is important the work be prosecuted vigorously to completion. Should the Contractor, or in case of default the surety, fail to complete the work within the contract time plus such extensions of time as may be allowed by the Jurisdiction, a deduction at the Agreed Costs of Delay rate specified in the Contract Documents will be made for each and every calendar day or working day, whichever is specified, that such the Contract remains uncompleted after expiration of the contract times. In either event, the Contractor or the Contractor's surety shall be responsible for all costs incident to the completion of the work, and shall be required to pay to the Jurisdiction the Agreed Costs of Delay stipulated in the Contract Documents.
- B The Agreed Costs of Delay rate specified in the Contract Documents is hereby agreed upon as the true and actual damages due the Jurisdiction for loss to the Jurisdiction and to the public due to obstruction of traffic, interference with business, and/or increased costs to the Jurisdiction such as engineering, administration, and inspection after the expiration of the contract time, or extension thereof. Such Agreed Costs of Delay shall be deducted from any money due or to become due to the Contractor under the contract, and the Contractor and its surety shall be liable for any additional costs or damages in excess of the amount due to the Jurisdiction.
- C Allowing the Contractor to continue and finish the work, or any part of it, after the expiration of the contract times or extension thereof shall in no way operate as a waiver on the part of the Jurisdiction of any of its rights or remedies under the contract, including its right to Agreed Costs of Delay pursuant to this provision.

1.15 BREACH OF CONTRACT

- A The Contractor's failure to perform in any of the following particulars shall constitute a breach of contract:
- 1 Failure by the Contractor to begin work at the time specified;
 - 2 Failure by the Contractor to complete the work within the contract period or any extension thereof;
 - 3 Failure or refusal by the Contractor to comply with an order of the Engineer within a reasonable time;
 - 4 Contractor's persistent disregard of laws, ordinances, or instructions of the Engineer;
 - 5 Contractor's repeated failure to provide sufficient workers, equipment, or materials to ensure the proper and timely completion of the work;
 - 6 Failure or refusal by the Contractor to remove rejected materials;

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AND PROGRESS

- 7 Failure or refusal by the Contractor to replace, perform anew, or correct any defective or unacceptable work;
 - 8 Contractor's discontinuance of the work without authorization by the Jurisdiction;
 - 9 Bankruptcy or insolvency of the Contractor, or the making of an assignment for the benefit of creditors by the Contractor; or
 - 10 Failure by the Contractor to carry on the work in an acceptable manner.
- B Upon Contractor's breach of the contract in any particular above, the Jurisdiction shall be entitled to give notice of default to the Contractor. The notice of default shall indicate how the contract has been breached and shall indicate what action the Contractor must take to cure such breach.
- C If the Contractor or its surety does not, within the time for cure provided in the notice of default, take action to cure such breach, the Contractor shall, at the direction of the Engineer, relinquish possession and control of the work, and the Jurisdiction shall thereupon have full power and authority, without violating the contract or bond, to take over the completion of the work, to appropriate or use any or all materials and equipment at the site that may be suitable and acceptable, to enter into agreements with others for the completion of said contract according to the terms and provisions thereof, or to use such other methods as in the Jurisdiction's opinion may be required for the completion of said contract in an acceptable manner.
- D The Contractor and its surety shall be liable for all outlay and expense incurred by the Jurisdiction, together with the costs of completing the work, and such costs may be deducted from any monies due or which may become due to the Contractor. In case the outlay and expense incurred by the Jurisdiction in completing the work is less than the sum that would have been payable under the contract if it had been completed by the Contractor, then the Contractor will be entitled to receive the difference. In case such outlay and expense exceeds the sum that would have been payable under the contract, then the Contractor and its surety shall be liable for and shall pay to the Jurisdiction the amount of said excess.
- E Neither the Jurisdiction, nor any officer, agent, or employee thereof, shall be in any way liable or accountable to the Contractor or the Contractor's surety for the method by which the completion of said work, or any portion thereof, may be accomplished, or for the price paid therefore. Neither by taking over the work nor by declaring the contract in default shall the Jurisdiction forfeit the right to recover damages from the Contractor or the Contractor's surety for failure to complete the entire contract.
- F The Contractor shall be liable for the Jurisdiction's attorney fees incurred as a result of the Contractor's breach of contract.
- 1.16 TERMINATION OF CONTRACTOR'S RESPONSIBILITY
- A The contract will be considered completed when the work has been accepted in writing by the Jurisdiction as provided in Section 1090, 1.08 - Acceptance and Final Payment hereof. Such final acceptance shall release the Contractor from all further obligation with respect thereto, except as to conditions and requirements as set forth in the bond and Jurisdiction's specifications regarding insurance.

END OF SECTION

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1080 - PROSECUTION AN PROGRESS

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Section 1090 - Measurement and Payment

Part 1: General

1.01 MEASUREMENT

- A The determination of quantities of work performed under the contract will be made by the Engineer, based upon the lines and grades as shown on the plans and as given during the progress of the work or as evidenced by approved tickets for weight or liquid measure or by measurements made by the Engineer. All items will be computed in the units shown in the contract.

1.02 SCOPE OF PAYMENT

- A The Contractor shall receive and accept the compensation provided in the contract at unit prices, if it be a unit price contract; or at the lump sum price, if it be a lump sum price contract, except as may be modified by change orders. The compensation provided for in the contract shall constitute full payment for furnishing all labor, equipment, tools, and materials and for performing all work contemplated and embraced under the contract; for all loss or damage arising out of the nature of the work or from the action of the elements; for all expenses incurred by, or in consequence of, the suspension or discontinuance of the said prosecution of the work or from any unforeseen difficulties or obstructions that may arise or be encountered during the prosecution of the work; and for all risks of every description connected with the prosecution of the work until the final acceptance of the work by the Jurisdiction.
- B Neither the payment of any progress payment nor of any retained percentage shall relieve the Contractor of any obligation to make good any defective work or material. Payment will be made only for materials actually incorporated in the work, except as provided in Section 1090, 1.05 - Progress Payments.
- C The contract price for any item shall be full compensation for all labor, materials, supplies, equipment, tools, and all things of whatsoever nature required for the complete incorporation of the item into the work the same as though the item were to read "in place," unless the Contract Documents shall provide otherwise.

1.03 LUMP SUM BREAKDOWNS

- A If the contract is based on a lump sum bid price, or contains one or more lump sum items for which progress payments are to be made, the Contractor shall prepare and submit a schedule of values (breakdown estimate) covering each lump sum item to the Engineer for approval. The schedule of values shall show the estimated value of each category or item of work. The sum of the lump sum items listed in the schedule of values shall equal the contract amount. Overhead, profit, insurance and bonds shall not be listed as separate items.
- B The schedule of values shall be approved by the Engineer prior to the start of the work and before any progress payments are processed. An unbalanced schedule of values providing for overpayment to the Contractor for items of work to be completed first will not be approved, but shall be revised by the Contractor and resubmitted until deemed acceptable by the Engineer.

1.04 PAYMENT FOR CHANGE ORDERS

- A The Contractor's claims for extra work will not be paid unless the extra work covered by such claims was authorized by a change order as specified in Section 1040, 1.07 - Change Orders.
- B Payment for extra work shall be made in one or more of the following ways as determined by the agreement between the parties to the contract prior to the starting of the work.
 - 1 Unit Prices: By unit prices contained in the Contractor's original proposal and incorporated in the construction contract, so far as the same may apply.
 - 2 Supplemental Schedule: By supplemental schedule of prices to include costs of all equipment, material, labor, supervision, management, insurance, overhead, and incidentals, said schedule to be submitted by the Contractor to the Engineer and to be accepted by the Jurisdiction.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1090 - MEASUREMENT AND PAYMENT

- 3 Lump Sum: By an acceptable lump sum proposal from the Contractor.
- 1.05 PROGRESS PAYMENTS
- A Limits: Progress payments for work under the Contract shall be processed once monthly, shall be made according to Iowa Code Chapter 573, and shall be made on the basis of monthly estimates of labor performed, equipment and materials delivered and incorporated in to the work, as determined by the Engineer. Payment may be made for materials delivered to the project area but not incorporated into the project if they can be specifically identified and cost verified by invoice and in accordance with Section 1060, Article 1.04.
 - B Retainage: The Jurisdiction shall retain from each monthly progress payment 5% of the amount determined to be due according to the calculation of the Engineer. Early release of retained funds may be requested by the Contractor according to Iowa Code Chapter Sections 573
 - C Quantities: Quantities used for progress payments shall be considered as only approximate and provisional and shall be subject to recalculation, adjustment, and correction by the Engineer in subsequent partial payments and in the final payment. Inclusion of any quantities in a progress payment, or failure to disapprove the work at the time of any progress payment, shall not be construed as acceptance of the corresponding work or materials.
- 1.06 PAYMENT OF RETAINAGE
- A Retained funds shall be retained by the Jurisdiction for a period of 30 calendar days after the completion and final acceptance of the improvement by the Jurisdiction. If at the end of the 30 calendar day period claims are on file as provided, the Jurisdiction shall continue to retain from the unpaid funds, a sum equal to double the total amount of all claims on file. The remaining balance of the unpaid fund, or if no claims are on file, the entire unpaid fund, shall be released and paid to the Contractor.
 - B The Jurisdiction, the Contractor, any claimant for labor or material who has filed a claim, or the surety on any bond given for the performance of the contract, may, at any time after the expiration of 30 calendar days, and not later than 60 calendar days, following the completion and final acceptance of said improvement, bring action in equity in the county where the improvement is located to adjudicate all rights to said fund, or to enforce liability on said bond, pursuant to Iowa Code Chapter 573. Upon written demand of the Contractor, served in the manner prescribed for original notices, on the person filing a claim, requiring the claimant to commence action in court to enforce the claim, an action shall be commenced within 30 calendar days, otherwise the retained and unpaid funds due the Contractor shall be released to the Contractor.
 - C After issuance of the Substantial Completion Certificate of the whole project or if a designated portion of the Project has been specified in the Contract Documents, the Contractor may request an early release of retainage. The Contractor must provide the request for early release of retainage in accordance with Iowa Code Section 573.28. The request shall be accompanied by a sworn statement of the Contractor that, ten calendar days prior to filing the request, notice was given as to all known subcontractors, sub-subcontractors, and suppliers.
 - D If labor and materials are yet to be provided at the time the request for the release of the retained funds is made, an amount equal to two hundred percent of the value of the labor or materials yet to be provided, as determined by the Jurisdiction's authorized contract representative, may be withheld until such labor or materials are provided. Retained funds that are approved as payable shall be paid at the time of the next monthly payment or within thirty days of receipt of the Contractor's request, whichever is sooner. If partial retained funds are released pursuant to the Contractor's request, no retained funds shall be subsequently held based on that portion of the work. An itemization of the labor or materials yet to be provided, or the reason that the request for release of retained funds is denied, shall be provided to the Contractor in writing within thirty calendar days of the receipt of the request for release of retained funds.

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1090 - MEASUREMENT AND PAYMENT

- E The Contractor shall release retained funds to the subcontractor or subcontractors and suppliers in the same manner as retained funds are released to the Contractor by the Jurisdiction. Each subcontractor shall pass through to each lower tier subcontractor or supplier all retained fund payments from the Contractor.

1.07 ACCEPTANCE AND FINAL PAYMENT

- A Final payment will be based on the actual final total amount of the work accomplished and finally accepted by the Jurisdiction under the Contract. Under no circumstances or conditions will the Contractor be paid anything for anticipated profits for the work, nor will it be paid for any work not actually included in the Project. Payments shall be based on the actual units installed and work completed. The Jurisdiction will not give final acceptance of the work until the Contractor has submitted all documentation required by the Contract Documents.
- B The Engineer shall, after determining the work on the Project has been finally and fully completed according to the Contract Documents, make a final calculation of the amount of work done and the value thereof.
- C Final acceptance of construction shall be defined as final approval of the project only in the sense that it has been constructed, cleaned up, and completed in apparent substantial compliance with the Contract Documents. Said final acceptance is stipulated to mean a written acceptance by the Jurisdiction.
- D It is mutually agreed between the parties to the contract that a certificate of completion of the project, submitted by the Engineer and approved by the Jurisdiction, shall constitute final acceptance of the work and materials included in the contract on the date of such approval, subject to the provision any such approval, acceptance, or payment as herein provided shall not constitute an acceptance of any unauthorized or defective work, or of any improper material.

END OF SECTION

DIVISION 01 - GENERAL CONDITIONS AND COVENANTS
SECTION 1090 - MEASUREMENT AND PAYMENT

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DIVISION 02 – EARTHWORK

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Section 2010 - Earthwork, Subgrade, and Subbase

Part 1: GENERAL

1.07 SPECIAL REQUIREMENTS

(ADD) Below are the common names of Iowa DOT granular material gradations at the Dubuque area quarries:

- 1 $\frac{3}{4}$ " Dense base pile – passes for the following:
 - a Class A base (gr11),
 - b Special backfill (gr30)
 - c Choke stone (gr13b)
- 2 Modified subbase pile – passes for the following:
 - a Modified (gr14)
 - b Special backfill (gr 30)
 - c Granular backfill (gr32)
- 3 Granular subbase pile – passes for the following:
 - a Granular Sub. (gr12a)
 - b Special back (gr 30)
 - c Gran. back (gr32)
- 4 Macadam (3"clean) pile – passes for the following:
 - a Macadam (gr13a)
- 5 Modified macadam pile – passes for the following:
 - a 3" Breaker run.
- 6 Porous backfill pile – passes for the following:
 - a $\frac{3}{8}$ " Washed chips (gr29)
 - b Cover aggregate (21)
- 7 Man sand pile - passes for the following:
 - a Granular backfill (gr 32)
- 8 Erosion Stone or Gabion Stone – passes for the following:
 - a 3"-9" size material

1.08 MEASUREMENT AND PAYMENT

E Class 10, Class 12 or Class 13 Excavation:

- 1 Measurement:
 - b (NO CHANGE)
 - 2) (REPLACE) The truck count method is not allowed as an acceptable method measurement.

F (REPLACE) Below Grade Excavation (Core Out): If unsuitable or unstable soils are encountered at or below the subgrade elevation as a result of proof rolling in accordance with 2010 3.06 B.1, the unsuitable or unstable soil shall be removed and replaced as directed by engineer and according to 2010 3.06 B.2 except that granular stabilization materials meeting section 2010 2.04 B.1 will be used.

- 1 Measurement: Will be in cubic yards per field measurements or in tons of granular stabilization material used per obtained from load tickets.
- 2 Payment: Will be made at the bid unit price per cubic yard or ton.
- 3 Includes: but is not limited to equipment, tools, labor, disposal of unsuitable or unstable soils, dewatering, furnishing and placement of granular stabilization material (2010 2.04 B.1), compaction, finishing of the excavated area, and all other incidental work as may be required.

J Subbase:

- 1 (REPLACE) Measurement: Will be in tons of granular material used as obtained from load tickets.
- 2 (REPLACE) Payment: Will be made at the bid unit price per ton.

L (REPLACE) Filling and Plugging of Culverts, Pipes and Conduits:

DIVISION 02 - EARTHWORK

SECTION 2010 - EARTHWORK, SUBGRADE, AND SUBBASE

- 1 (REPLACE) Known pipe culverts, pipes and conduits.
 - a Measurement: The quantity of flowable mortar used to fill and abandon the culverts, pipes or conduits will be computed from the load tickets in cubic yards.
 - b Payment: Will be at the bid unit price for flowable mortar.
- 2 (REPLACE) Unknown pipe culverts, pipes, and conduits:
 - a Measurement: The quantity of flowable mortar used to fill and abandon the culverts, pipes or conduits will be computed from the load tickets in cubic yards.
 - b Payment: Will be at the bid unit price per cubic yard for flowable mortar.
Filling and plugging of all private utility lines is the responsibility of the respective utility agency and will not be measured or paid.

Part 2: PRODUCTS

2.04 FOUNDATION MATERIALS

B Granular Stabilization Material:

- 1 (REPLACE) Course aggregate subbase (3" Breaker Run)

Part 3: EXECUTION

3.07 SUBGRADE TREATMENT

A (MODIFY) Delete "Asphalt"

END OF SECTION

(ADD) Section 2020 - Contaminated Soil and Groundwater Handling

Part 1: GENERAL

1.01 SECTION INCLUDES

- A Handling of contaminated soil that is expected to be encountered at the site.
- B Pumping and dewatering of contaminated groundwater that may be encountered at the site.
- C Protection methods and safety practices for workers that may come into contact with contaminated soil and groundwater.

1.02 DESCRIPTION OF WORK

- A Excavation and trenching of contaminated soils.
- B Replace clean backfill in trench.
- C Provide Jurisdiction with safe access to trench so groundwater samples can be obtained.
- D Dewatering of excavated trenches.

1.03 SUBMITTALS

- A Comply with Division 1 – General Provisions and Covenants
- B Provide the Jurisdiction Representative 48 hours advanced notice prior to any work at the site.
- C Submit to the Jurisdiction a Health and Safety Plan prior to preceding with work at the site.
- D Submit to the Jurisdiction within 10 days disposal documentation (including manifests) at the end of the work.
- E Prior to the start of any work, submit OSHA First Responder Awareness Training Certificate for designated site supervisor. Operators of machinery that will be handling any contaminated materials or groundwater must meet all of the requirements of an OSHA First Responder Awareness Training.

1.04 SUBMITTALS

- A Comply with Division 1 – General Provisions and Covenants

1.05 DELIVERY, STORAGE, AND HANDLING

- A Comply with Division 1 – General Provisions and Covenants

1.06 SCHEDULING AND CONFLICTS

- A Comply with Division 1 – General Provisions and Covenants

1.07 SPECIAL REQUIREMENTS

- A Comply with soil and groundwater environmental report recommendations

1.08 MEASUREMENT AND PAYMENT

- A Excavation, Contaminated, Hauling & Stockpiling: Excess class 10, 12, or 13 contaminated excavation spoils are to be stockpiled on site, or an alternate stockpiling site that has been identified in the contract documents. The contractor must haul the excavated material and place in a uniformly shaped stockpile, where the engineer will conduct testing of the materials. Measurement and Payment for excavating, hauling and stockpiling Contaminated material will be as follows:
 - 1 Measurement: Topographic survey of the completed stockpile will be made. The volume will be calculated, in cubic yards, with a shrinkage factor of 1.35 applied. Truck load counts are not an acceptable method of measurement.
 - 2 Payment: Payment will be at the unit price per cubic yard of stockpiled soils.
 - 3 Includes: Unit price includes but is not limited to excavation, hauling, and stockpiling the suspect soils. The stockpile must be placed on two layers of 6 mil plastic and covered with a single layer of 6 mil plastic with the cover layer of 6 mil plastic. The cover layer of plastic must be secured. This item also includes removal of all soils, from equipment and trucks, prior to leaving the site(s).
- B Excavation, Contaminated, Hauling & Disposal: Areas identified in the contact documents as contaminated Class 10, 12, or 13 excavated materials must be excavated and disposed of according to the environmental report recommendations. Measurement and Payment for excavating, hauling and disposal of Contaminated Class 10, 12, or 13 material will be as follows:

DIVISION 02 - EARTHWORK

(ADD) SECTION 2020 - CONTAMINATED SOIL AND GROUNDWATER HANDLING

- 1 Measurement: Measurement will be in tons for the quantity disposed. Certified scale tickets must be provided to the Engineer, for each load. Truck load counts are not an acceptable method of measurement.
 - 2 Payment: Payment will be at the unit price per ton of soil disposed of.
 - 3 Includes: Unit price includes but is not limited to excavation, hauling, and disposal according to the environmental report. If the identified disposal site is the Dubuque Metropolitan Area Solid Waste Agency Landfill, Tipping fees will be paid directly by the City and must not be included in this bid item.
- C Dewatering, Lowering Groundwater Levels: This unit price is for site dewatering efforts. Dewatering is defined as groundwater pumping efforts to lower the subsurface groundwater levels, in advance of excavation, to prevent groundwater seepage into the excavation. The contractor must submit their dewatering plan to the City, for review and coordination with the city's environmental engineering consultant. The review may take one to two weeks. City will provide sampling and testing of the discharge water.:
- 1 Measurement: Measurement will be in days of dewatering efforts (pumping).
 - 2 Payment: Payment will be at the unit price per day.
 - a In the event this item is not needed, no payment will be made.
 - 3 Includes: Unit price includes but is not limited to all equipment, labor, materials, and fuel to provide, install, operate, and maintain an effective dewatering operation and discharging into an identified storm sewer(s) or ,in the case of contaminated ground water, sanitary sewer(s). The unit price also includes ground and structure monitoring throughout the dewatering efforts and the complete removal of the dewatering system including proper abandonment of the dewatering wells.
 - a Sump pumping, within an excavation, is not included in this dewatering Item and is incidental to the item being installed.

Part 2: PRODUCTS

- A None

Part 3: EXECUTION

3.01 GENERAL

- A Contractor must review all previously completed environmental reports that are listed in Section 00775. Reports will provide information on locations of materials that have been identified at the site, such as lead, ethylbenzene xylenes, diesel, gasoline, arsenic, barium, and chromium. These reports will also identify any limiting conditions experienced during the assessment. Care should be taken to observe, characterize, and segregate any suspect materials encountered during the work.
- B Mitigate exposure risk: Provide appropriate protection to the general public and to all employees working outside of the contaminated area as required by Local, State, and Federal regulations. Additionally, all employees entering the contaminated area must be properly trained, certified, and wearing the appropriate personal protective equipment (PPE) as required by Local, State, and Federal regulations.

3.02 CONTRACTOR-EMPLOYEE REQUIREMENTS

- A Employees must be properly trained and licensed to perform work.
- B Project foremen, supervisors, and managers that will be at the site that are responsible for completion of work covered by this specifications section must meet all of the requirements of an OSHA First Responder Awareness Training and this training must include a minimum 4-hour training course.
- C The contractor must comply with OSHA health and safety regulations. Beyond typical construction Personal Protective Equipment (PPE) OSHA requires additional PPE for employees working around contaminated soil and groundwater.
- D Any personnel involved with the handling of groundwater or excavation activities working at the site shall wear disposable nitrile gloves, safety glasses, and rubber safety boots. An employee may wear standard steel toe boots if disposable latex covers are worn over them.

- E Rubber boots should be cleaned at the end of the work day while still at the project site.
- F Nitrile gloves/latex boot covers should be replaced and disposed of as needed. Nitrile gloves/latex boot covers should also be discarded at the end of day. The receptacle for discarding and disposal of these gloves and boot covers shall be designated, signed and labeled for hazardous materials.
- G Personal hygiene practices while excavating potentially contaminated soil are also important. Before eating, drinking, smoking, or using the restroom, workers shall wash their hands and arms.

3.03 EXCAVATION REQUIREMENTS

- A Testing of the soil must be conducted when hazardous materials are suspected or known to be present. Coordinate with the Jurisdiction Representative to allow for test samples to be collected.
- B Contractor shall restore the site to original elevation and follow the first out, last in protocol for replacing excavated soils. Soils must be separated and stockpiled based on depth of excavation. Place the first 0-2 feet of excavated material in a stockpile. Place soils from 2-6 feet in a separate stock pile. Place the soils from 6-10 feet in another stockpile. The method of stockpiling shall segregate the original location of the soils within the excavated area.
- C Other vertical or horizon designations and methods of stock piling are acceptable based on varying fill horizons and changes in natural soil type within the excavated area.
- D The contractor must document how soil is stockpiled and sorted at the project site.
- E If dust is generated during excavation activities, watering of excavation area and stockpiles by method of spraying must be implemented as a means to control dust.
- F If rain is anticipated while the excavation work is occurring contaminated material stockpiles must be covered with 4 mil plastic and storm water BMPs such as silt fence, straw, or hay bales, must be employed around covered stockpiles and project site to contain contaminated material, to prevent erosion and cross contamination between stockpiles.
- G All excess soils from the project site must be disposed in the State of Iowa. All excess soils shall become the property of the contractor unless otherwise indicated in the contract documents.

3.04 ENVIRONMENTAL REQUIREMENTS

- A If strong petroleum or chemical odors are noted, or if the color of soils are suspect (black or green) the suspect portions of excavated soils must be containerized or segregated in a stockpile until the soil can be appropriately sampled.
 - 1 The contractor shall utilize a rock box or similar to containerize suspect soils. Any storage container should be covered until results of sampling are obtained. Alternatively, durable 4 mil plastic sheeting shall be placed under and over top of the suspect soils, this sheeting must be weighted down and storm water BMPs should be employed around the pile.
 - 2 Jurisdiction Representative must be notified within 1 hour upon discovering suspect material and an environmental professional shall be mobilized to the site to field measure the soils using a photo-ionization detector and sample the soils for laboratory analysis.
- B All contaminated soils that are to be transported off site must be fully covered.
- C Any equipment leaving project site must have soil and any excess materials removed to prevent contamination from leaving the site.

3.05 MATERIAL DISPOSAL

- A Hazardous Materials and Building Material Segregation: If material is encountered during the excavation that is suspected or known to be hazardous then excavation activities must stop to allow for appropriate sampling, removal, segregation, and disposal of the material by a licensed professional.
- B For any soil not placed back into excavation, the contractor shall coordinate to have it tested by an environmental professional. After testing the soil the Jurisdiction Representative shall

DIVISION 02 - EARTHWORK

(ADD) SECTION 2020 - CONTAMINATED SOIL AND GROUNDWATER HANDLING

receive these results and take control of any contaminated material and arrange for offsite disposal.

3.06 GROUNDWATER PUMPING

- A If dewatering is necessary, the Jurisdiction Representative and an environmental professional must be notified 48 hours in advance.
- B The Jurisdiction Representative shall coordinate to have an environmental professional mobilize to the site to sample the groundwater for laboratory analysis before any dewatering can occur.
- C Groundwater sample results shall be used to determine if and at what flow rate discharge to the storm sewer or sanitary sewer is allowable.

END OF SECTION

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION

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Section 3010 - Trench Excavation and Backfill

Part 1: PART 1 - GENERAL

1.05 DELIVERY, STORAGE, AND HANDLING

- A (ADD) All deliveries of granular materials to be incorporated into the project must follow IDOT 2001-07 A and must have a scale ticket completely filled out according to IDOT Materials IM 209.
- B (ADD) All certified granular materials, specified by gradation, must have a sieve analysis report submitted to the engineer during the submittal process. The report must be from the most recent crushing operation.

1.07 SPECIAL REQUIREMENTS

(ADD) Below are the common names of Iowa DOT granular material gradations at the Dubuque area quarries:

- 1 $\frac{3}{4}$ " Dense base pile – passes for the following:
 - a Class A base (gr11),
 - b Special backfill (gr30)
 - c Choke stone (gr13b)
- 2 Modified subbase pile – passes for the following:
 - a Modified (gr14)
 - b Special backfill (gr 30)
 - c Granular backfill (gr32)
- 3 Granular subbase pile – passes for the following:
 - a Granular Sub. (gr12a)
 - b Special back (gr 30)
 - c Gran. back (gr32)
- 4 Macadam (3"clean) pile – passes for the following:
 - a Macadam (gr13a)
- 5 Modified macadam pile – passes for the following:
 - a 3" Breaker run.
- 6 Porous backfill pile – passes for the following:
 - a $\frac{3}{8}$ " washed chips (gr29)
 - b Cover aggregate (21)
- 7 Man sand pile - passes for the following:
 - a Granular backfill (gr 32)
- 8 Erosion Stone or Gabion Stone – passes for the following:
 - a 3"-9" size material

1.08 MEASUREMENT AND PAYMENT

- A General
 - 2 (REPLACE) Removal and disposal of unsuitable material during standard trench excavation will be paid as part of replacement of unsuitable backfill material.
 - 4 (REMOVE) Furnishing and placing granular bedding material.
- D Replacement of Unsuitable Backfill Material:
 - 1 (REPLACE) Measurement: Will be in tons of granular material used, obtained from load tickets.
 - 2 (REPLACE) Payment: Will be made at the bid unit price per ton.
 - 3 (REPLACE) Includes: Includes hauling and off-site disposal of unsuitable material.
- G (ADD) Bedding Material:
 - 1 Measurement: Will be in tons of granular material used, obtained from load tickets.
 - 2 Payment: Will be made at the bid unit price per ton.
 - 3 Includes: Includes hauling and off-site disposal of unsuitable material, and engineering fabric for Class I bedding materials.
- H (ADD) Pipe Anchors – Concrete:
 - 1 Measurement: Each concrete pipe anchor installed will be counted.

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3010 - TRENCH EXCAVATION AND BACKFILL

- 2 Payment: Will be made at the bid unit price for each.
- 3 Includes: Includes but is not limited to, furnishing, hauling and placing concrete, form work, and reinforcing steel according to the plans.
- 4 Not applicable to water mains.
- I (ADD) Hydraulically Compacted Backfill:
 - 1 Measurement: Will be in tons of backfill material used, obtained from load tickets.
 - 2 Payment: Will be made at the bid unit price per ton.
 - 3 Includes: Includes but is not limited to equipment, tools, labor, disposal of excavated material, furnishing and placement of backfill material, furnishing water for hydraulic compaction, finishing of the excavated area, and all other incidental work as may be required.
 - 4 Not applicable to water mains.
- J (ADD) Trenching, 26" Depth:
 - 1 Measurement: Will be per lineal foot of trench excavation.
 - 2 Payment: Will be made at the bid unit price per linear foot.
 - 3 Includes: Includes but is not limited to equipment, tools, labor for trench excavation, disposal of excavated material, placement of backfill material, finishing of the excavated area, and all other incidental work as may be required per the City of Dubuque's Excavation Policy. Does not include conduit. See section 8010.4.
 - 4 Not applicable to water mains.
- K (ADD) Trenching, 48" Depth:
 - 1 Measurement: Will be per lineal foot of trench excavation.
 - 2 Payment: will be made at the bid unit price per linear foot.
 - 3 Includes: Includes but is not limited to equipment, tools, labor for trench excavation, disposal of excavated material, placement of backfill material, finishing of the excavated area, and all other incidental work as may be required per the City of Dubuque's Excavation Policy. Does not include conduit. See section 8010.
 - 4 Not applicable to water mains.
- L (ADD) Rigid Insulation Board:
 - 1 Measurement: Will be per square foot of insulation board installed.
 - 2 Payment: Will be made at the bid unit price per square foot.
 - 3 Includes: Includes but is not limited to equipment, tools, labor, furnishing and installation of the insulation as identified on the plans or as directed by the engineer.
- M (ADD) Pipe Insulation Wrap:
 - 1 Measurement: Will be per foot of insulation wrap installed.
 - 2 Payment: Will be made at the bid unit price per linear foot.
 - 3 Includes: Includes but is not limited to equipment, tools, labor, furnishing and installation of the insulation as identified on the plans or as directed by the engineer.
 - 4 Not applicable to water mains.

Part 2: PRODUCTS

2.02 BEDDING MATERIAL

- A Class I Material:
 - 1 (REPLACE) 1 inch commercial clean stone (screened but not washed).
 - 2 (REPLACE) IDOT Specification 4115, Gradation 3, PCC Coarse Aggregate.
 - 3 (REPLACE) IDOT Specification 4131, Gradation 29, Porous Backfill.
 - 5 (ADD) Engineering fabric shall be placed at the interface between Class I Bedding Material including haunching and backfill containing fines being placed above.
- B (ADD) Class II Bedding Material:
 - 1 IDOT Specification 4132.02, Gradation 30, Special Backfill (for water mains only).
 - 2 IDOT Specification 4133, Gradation 32, Granular Backfill (not applicable for water mains).
 - 3 IDOT Specification 4121, Gradation 12a, Granular Subbase.

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3010 - TRENCH EXCAVATION AND BACKFILL

2.03 BACKFILL MATERIAL

B (REPLACE) Imported Granular Backfill Materials

- 1 Class II Materials - For use as Haunch Support, Primary and Secondary Backfill
 - a 1 inch commercial clean stone (screened but not washed).
 - b IDOT Specification 4115, Gradation 3, PCC coarse aggregate.
 - c IDOT Specification 4131, Gradation 29, Porous Backfill.
 - d IDOT Specification 4121, Gradation 12a, Granular Subbase
 - e IDOT Specification 4133, Gradation 32, Granular Backfill (not applicable for water mains).
 - f IDOT Specification 4132.02, Gradation 30, Special Backfill.
 - g Do not use gradations 12a, 30, and 32 where water conditions in trench may cause instability.
 - h Engineering fabric shall be placed at the interface between the 1 inch clean stone, and gradation 3 or 29 material and backfill containing fines being placed above.
- 2 Class III Materials - For use as Final Backfill
 - a IDOT Specification 4132.02, Gradation 30, Special Backfill.
 - b IDOT Specification 4133, Gradation 32, Granular Backfill (not applicable for water mains).
 - c IDOT Specification 4131, Gradation 29, Porous Backfill.
 - d IDOT Specification 4121, Gradation 12a, Granular Subbase.
 - e Do not use gradations 12a and 30 where water conditions in the trench may cause instability.
- 3 Class IV Material - Hydraulically Compacted Sand:
 - a IDOT Specification 4133.05, Gradation 35, Floodable Backfill (natural sand/gravel).
 - b IDOT Specification 4133.05, Gradation 36, Floodable Backfill (natural sand).
 - c When approved by the Engineer.
 - d Only for backfilling conduit and structures listed in Section 8010.
 - e Not applicable for water mains

C (REPLACE) Excavated Sand/Gravel-For Final Backfill Material:

- 1 Clean gravels excavated on-site.
 - a 1-1/2 inch maximum, less than 50% passing number 4 sieve, and less than 5% passing the number 200 sieve.
 - b ASTM D2487 soil group GW or GP.
- 2 Clean sands excavated on-site.
 - a 1-1/2 inch maximum, more than 50% passing number 4 sieve, and less than 5% passing the number 200 sieve.
 - b ASTM D2487 soil group SW or SP.
- 3 Borderline clean gravels and sands excavated on-site.
 - a 1-1/2 inch maximum and less than 12% passing the number 200 sieve.
 - b ASTM D2487 soil group GW, GC, SP, and SM.
- 4 For use as final backfill only with specific approval of the Engineer.
 - a Only for final backfill in areas not to be hard surfaced.
 - b Representative sampling by Contractor, sieve analysis by Engineer.
 - c Compaction testing by Contractor as required by the Engineer.
 - d For water mains only.

D (REPLACE) Excavated Sands/Gravels with Fines For Final Backfill Material:

- 1 Coarse-Grained Soils with Fines, ASTM D2487 Soil Groups:
 - a GM-Silty gravels and gravel-sand-silt mixtures.
 - b GC-Clayey gravels and gravel-sand-clay mixtures.
 - c SM-Silty sands and sand-silt mixtures.

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3010 - TRENCH EXCAVATION AND BACKFILL

- d SC-Clayey sands and sand-silt mixtures.
 - 2 For use as final backfill only with the specific approval of the Engineer.
 - a Consideration requires an evaluation by the Engineer.
 - b Use must be cost effective versus imported final backfill material.
 - c Only for final backfill in areas not to be hard surfaced.
 - d Do not use where water conditions in trench may cause instability.
 - e Compaction testing by the Contractor as required by the Engineer.
 - f For water mains only.
- E (REPLACE) Excavated Fine-grained Inorganic Soils for Final Backfill Materials.
 - 1 Fine-grained Soils, ASTM D2487 Soil Groups:
 - a ML-Inorganic silts and very fine sands, rock flour, silty and clayey fine sands, silts with slight plasticity.
 - b CL-Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clay and lean clay.
 - 2 For use as final backfill only with specific approval of the Engineer.
 - a Consideration requires an evaluation by the Engineer.
 - b Use must be cost effective versus imported final backfill material.
 - c Only for final backfill in areas not to be hard surfaced.
 - d Do not use where water conditions in the trench may cause instability.
 - e Compaction testing by Contractor as required by the Engineer.
 - f For water mains only.
 - 3 ASTM D2487 Soil Group MH and CH are not approved as trench backfill.
- 2.05 STABILIZATION (FOUNDATION) MATERIALS
 - A (REPLACE) Coarse aggregate subbase (3 inch breaker run).
 - C (REMOVE) Crushed concrete may be used, if approved by the Engineer, if it is within + 5% of the gradation for each size of material.
- 2.06 SPECIAL PIPE EMBEDMENT AND ENCASEMENT MATERIAL
 - C (REMOVE) CLSM
 - D (REMOVE) Foamed Cellular Concrete
- 2.07 (ADD) RIGID INSULATION BOARD
 - A 2" extruded polystyrene, Owens Corning Formula NGX 250 R-Value 10 or equal.
- 2.08 (ADD) PIPE INSULATION WRAP
 - A 3/8" Thick Pipe Insulation Wrap (not applicable to water mains)
- Part 3: EXECUTION
- 3.01 TRENCH EXCAVATION
 - B In areas to be reseeded, remove topsoil to a minimum depth of 6 inches and stockpile.
 - C (NO CHANGE)
 - 3 (REPLACE) Grade spoil piles to drain. Do not allow spoil piles to obstruct drainage. Stabilize stockpiles and provide erosion and sediment control around stockpiles.
- 3.03 TRENCH PROTECTION
 - C (ADD) Shall be placed in accordance with OSHA 29 CRF 1926.
- 3.04 DEWATERING
 - C Discharged Water:
 - 3 (ADD) If dewatering discharge is overwhelming an approved sewer, waterway, or street or is causing damage in any way, the Engineer may stop the dewatering efforts or require the rate of discharge to be reduced at no additional cost to the Jurisdiction.
- 3.05 PIPE BEDDING AND BACKFILL
 - A General
 - 3 (REPLACE) Adjust the moisture content of excessively wet, but otherwise suitable, backfill material by spreading, turning, aerating, and otherwise working material as necessary to achieve required moisture range and tested In accordance with ASTM 2216.

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3010 - TRENCH EXCAVATION AND BACKFILL

- 6 Special Pipe Embedment and Encasement Materials:
 - c (REPLACE) Trench waterstop shall be excavated (or imported) fine grained inorganic soil (soil group ML or CL). Obtain required compaction within a soil moisture range of optimum moisture to 4% above optimum moisture content. If trench stabilization material is used, extend waterstop through stabilization material to the bottom of the trench.
- 7 (ADD) The Figures applicable to water mains and force mains shall be:
 - a Figure 3010.101; the 12 inches of secondary backfill above the top of the water mains and force mains shall be Class II Backfill Material. Bedding material below the pipe shall have a minimum thickness of 4 inches.
 - b Figure 3010.104; water mains and force mains shall have Class P-3 Embedment installation plus 12 inches of secondary backfill above the pipe. Embedment material shall be Class I or Class II bedding and then Class II Backfill Material.
 - c Figure 3010.105; for Portland Cement Concrete encasement when required and for clay waterstops when required.
- B Pipe Bedding:
 - 1 Granular Material:
 - a (REPLACE) Class I or Class II Bedding Materials as indicated in these Supplemental Specifications is required for all gravity mains, and for all water mains, and force mains.
 - b (ADD) Refer to 3.05.A.7 above for Figure modifications required for water mains.
 - g (ADD) Engineering Fabric shall be placed at the interface between 1 inch clean stone, Gradations 3 and 29 materials and final backfill containing fines being placed above.
 - h (ADD) Do not use Class II Bedding Material where water conditions in the trench may cause instability.
- C Haunch Support:
 - 1 Granular Material
 - a (REPLACE) Place Class I and II Bedding Material and Class II Backfill Materials as defined in this Supplemental Specification in lifts no greater than 6 inches.
- D Primary and Secondary Backfill:
 - 1 General
 - a (REPLACE) Primary backfill shall be Class I or Class II bedding material or Class II backfill as defined in this Supplemental Specification. Place from spring line of the pipe to the top of the pipe.
 - b (REPLACE) Secondary backfill shall be the same as required for Primary Backfill. Place from the top of the pipe to 1 foot above the top of the pipe.
 - 2 Granular Material:
 - b (REPLACE) Compact to at least 65% relative density or 95% of standard Proctor density at -1% to +4% of optimum moisture content.
 - 3 Suitable Backfill Material:
 - b (REPLACE) All primary and secondary backfill material to 1 foot above the top of the pipe shall be granular material. See 3.05.D.2.
 - c (REPLACE) Compact primary and secondary backfill to one foot above the top of the pipe as required in 3.05.D.2.
- E Final Trench Backfill:
 - 1 (REPLACE) Place specified backfill material as indicated in the Special Provisions or as approved by the Engineer, from 1 foot above the top of the pipe to the top of the trench (less allowance for topsoil or pavement structure).
 - 3 Class II and Class III Granular Backfill Material:

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3010 - TRENCH EXCAVATION AND BACKFILL

- a (REPLACE) Compact to at least 95% of standard Proctor density within right-of-way or under any paved surface or within two feet thereof. Moisture content shall be -1% to +3% of optimum.
 - b (REPLACE) Compact to at least 90% of standard Proctor density outside right-of-way. Moisture content shall be -1% to +3% of optimum.
 - 4 (REPLACE) Alternate Final Backfill Material: Final backfill material as may be approved by the Engineer including clean excavated sand/gravel, excavated sand/gravel with fines, and excavated fine grained/inorganic soils.
 - a (REPLACE) Not allowed under hard surfacing.
 - b (REPLACE) Compact to at least 90% of standard Proctor density or as indicated in the Special Provisions.
 - c (REPLACE) Compact at -1% to +3% of optimum moisture content.
- 3.07 (ADD) Rigid Insulation Board
 - A Insulate any water mains or water services that are less than 5.5 feet below final ground surface elevations.
 - 1 The total thickness of the insulation shall be as indicated in the Special Provisions or on the drawings, based on the final depth of cover and location.
 - 2 Center the 4 foot wide insulation on the water line at the top of the water line primary backfill.
 - 3 Install vertical insulation on both sides of the water lines, at the edge of the horizontal insulation to a depth of 2 feet to 4 feet below the top of the pipe (depending on the pipe size).
 - B Insulate between any water mains or water services and storm water pipes.
 - 1 Install insulation below water mains or water services at crossings above storm sewers or culverts.
 - 2 Insulation shall be centered on the water line shall extend 4 feet beyond the width of the drainage pipe.
- 3.08 (ADD) Pipe Insulation Wrap
 - 1 Insulate all water service lines that are exposed across the entire length of the excavation. If the water service is less than 5'-6" below the existing grade additional 2" rigid insulation shall be placed above the water service across the entire length of the excavation. Pipe Insulation Wrap Material shall be 3/8" thick.
 - 2 Not applicable to water mains.

END OF SECTION

Section 3020 - Trenchless Construction

Part 1: GENERAL

1.03 SUBMITTALS

- C (REPLACE) Shop drawings for casing, casing spacers and proposed spacing, and end seals.
- E (ADD) Soil borings when required in the Contract Documents or Special Provisions.

1.07 SPECIAL REQUIREMENTS

- A (ADD) Shall be per Contract Documents
- B (ADD) Comply with applicable Iowa DOT, Dubuque County, or railroad requirements and permit conditions when working on DOT, County, or railroad right-of-way.

1.08 MEASUREMENT AND PAYMENT

(REMOVE) All items of work contained in this section are incidental to the underground utility pipe being installed and will not be paid for separately.

- A (ADD) Sanitary Sewer Gravity Main installed by trenchless methods without casing is not allowed.
- B (ADD) Sanitary Sewer Gravity Main with casing pipe, trenchless
 - 1 Refer to Section 4010-1.08.B.2 and applicable Supplemental Specifications
- C (ADD) Sanitary Sewer Force Main, Trenchless
 - 1 Refer to Section 4010-1.08.C.2 and applicable Supplemental Specifications
- D (ADD) Sanitary Sewer Force Main with casing pipe
 - 1 Refer to Section 4010-1.08.D.2 and applicable Supplemental Specifications
- E (ADD) PVC Water Main installed by trenchless methods without casing is not allowed. DIP Water Main installed by trenchless methods without casing pipe may be approved by the Water Department.
 - 1 Refer to Section 5010-1.08.A.2 and applicable Supplemental Specifications.
- F (ADD) Water Main with Casing Pipe, Trenchless.
 - 1 Refer to Section 5010-1.08.B.2 and applicable Supplemental Specifications.
- G (ADD) Conduit, Trenchless/Directional Drilling with Conduit.
 - 1 Measurement: Will be per linear foot of directional drilling completed from face of excavation to face of excavation. Installation of multiple conduits with a single bore will be considered one bore.
 - 2 Payment: Will be made at bid unit price per linear foot for one or multiple conduits per boring.
 - 3 Includes: Includes but not limited to conduit(s), equipment, tools, labor, disposal of excess excavated material, placement of backfill, finishing excavated area, and all other incidental work as may be necessary.
- H (ADD) Trenchless/Directional Drilling with Pipe by Others.
 - 1 Measurement: Will be per linear foot of directional drilling completed from face of excavation to face of excavation.
 - 2 Payment: Will be made at the bid unit price per linear foot for the directional drilling and installation (but not furnishing) the pipe/conduit, induct, and/or cable that is provided by others.
 - 3 Includes: Includes but not limited to equipment, tools, labor, disposal of excess excavated material, placement of backfill, finishing excavated area, and all other incidental work as may be necessary.

Part 2: PRODUCTS

2.01 2.01 CARRIER PIPE

- A Carrier Pipe Installed within Casing Pipe
 - 1 (REPLACE) Sanitary Sewer Gravity Main
 - a Refer to Section 4010-2.01.A, 2.01.B, and 2.01.G and Supplemental Specifications for approved carrier pipe in casing.
 - b Restrained joints are required for all gravity sewer pipe within casing pipe.

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3020 - TRENCHLESS CONSTRUCTION

- i Restrained joints for PVC gravity sewer pipe shall be Cascade Style CCS-JR stainless steel joint restraint casing spacers or City approved alternate. PVC sewer joint restraint shall prevent joint separation and joint over-insertion.
 - ii Restrained joints for DIP shall be Sure Stop 350 restraining gaskets, Cascade Style CCS-JR casing spacers, TR-Flex, or City approved alternate.
 - 2 (REPLACE) Sanitary Sewer Force Main
 - a Restrained Joint DIP: Comply with Section 4010-2.02 and Supplemental Specifications.
 - i Restrained joints for DIP shall be Sure Stop 350 restraining gaskets, TR-Flex, MJ retainer gland, or approved alternate
 - b Restrained Joint PVC Pipe: Comply with Section 4010-2.02
 - i Restrained joints for PVC pipe shall be Bulldog System or Eagle Loc 900 with EBAA 5000 over-insertion stop, Certa-Lok RJIB/RJ, or approved alternate.
 - 3 (REPLACE) Storm Sewer: Comply with Section 4020.2.01 and supplemental Specifications
 - a Storm sewer in casing pipe shall be ASTM D3034 or ASTM F679 solid wall PVC with 115 PSI stiffness or City approved alternate
 - b Joints in PVC storm sewer shall be restrained as required for PVC sanitary sewer. See 2.01.A.1.b of this Supplemental Specifications.
 - 4 (REPLACE) Culverts
 - a Comply with requirements for storm sewers in casing pipe. See 2.01.A.3 of this Supplemental Specification.
 - 5 (REPLACE) Water Main:
 - a Restrained Joint Ductile Iron Pipe: Comply with requirements for DIP Sanitary Sewer Force Main. See 2.01.A.a.1) of this Supplemental Specification.
 - b Restrained Joint PVC Pipe: Comply with requirements for PVC pipe Sanitary Sewer Force Main. See 2.01.A.2.b.1) of this Supplemental Specification.
 - c Fusible pipe for water mains is not allowed.
- B Carrier Pipe Installed without a Casing Pipe:
 - 1 (REPLACE) Sanitary Sewer Gravity Main without a casing pipe is not allowed.
 - 2 (REPLACE) Sanitary Sewer Force Main
 - a Restrained Joint Ductile Iron Pipe without a casing pipe may be installed only with approval of the City Engineer. Restrained joints shall be Sure Stop 350 restraining gasket, TR-Flex, or approved alternate.
 - b Restrained Joint PVC Pipe without a casing pipe may be installed only with approval of the City Engineer. Restrained joints shall be Bulldog System or Eagle Loc 900 with EBAA 5000 over-insertion stop, Certa-Lok RJIB.RJ or City approved alternate.
 - c High Density Polyethylene (HDPE) 1-1/4" through 3"
 - i Comply with Supplemental Specifications for Section 4010.2.02.G, 2.02.H, and 2.02I.
 - 3 (REPLACE) Storm Sewer and Culverts without Casing Pipe are not allowed.
 - 4 (REPLACE) Water Main:
 - a Restrained Joint Ductile Iron Pipe: Comply with requirements for DIP sanitary Sewer Force Main. See 2.01.B.2.a of this Supplemental Specification.
 - b Restrained Joint PVC Pipe without a casing Pipe is not allowed.
 - c Fusible Pipe for Water Main is not allowed.
 - 5 (ADD) Electrical Conduit:
 - a Comply with Section 8010-2.01.B
 - 6 (ADD) Fiber Optic Conduit:
 - a Comply with Section 8010-2.01.B

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3020 - TRENCHLESS CONSTRUCTION

2.02 CASING PIPE

- A (REPLACE) Pipe: Use only new steel pipe meeting the requirements of ASTM A 139, Grade B; ASTM A 252, Grade 2; ASTM A 53, Grade B; or API 5L, X Grade. Pipe may be welded or seamless. Wall thickness shall be as specified by DOT, County or railroad requirements with the minimum thickness per the following table:

Part 3: Nominal Casing Diameter	Wall Thickness for Highways/Streets	Wall Thickness for Railroads
8"-14"	0.250"	0.250"
16"	0.250"	0.281"
18"	0.250"	0.312"
20"	0.250"	0.344"
22"	0.250"	0.344"
24"	0.281"	0.375"
30"	0.312"	0.469"
46"	0.344"	0.532"
42"	0.344"	0.625"
48"	0.344"	0.687"

- C (REPLACE) Pipe Diameter: Minimum inside diameter as specified in the Contract Documents. If diameter is not specified use a minimum inside casing diameter of at least six inches to 8 inches larger than the outside diameter of the carrier pipe bells and as required to accommodate casing spacers, pipe joint restraints, and over-insertion collars.

2.03 CASING SPACERS

- A (REPLACE) Use manufactured casing spacers to position carrier pip in the center of the casing and restrain against transverse movement. Do not use wood skids.
- B (REPLACE) Meet the following requirements:
- 1 Shall be made in the USA.
 - 2 Fabricated of stainless steel with stainless steel fasteners.
 - 3 Polyethylene glides.
 - 4 Spacers shall be 8 inch wide for carrier pipes up to 20 inch and 12 inch wide for 24 inch and larger carrier pipes.
 - 5 Cascade Waterworks Mfg. Style CCS-RJ with joint restraint and Style CCS elsewhere, or approved equal.
 - 6 Casing spacers shall be installed at intervals that comply with the manufacturer's recommendations based on the carrier pipe and casing pipe selection.

2.04 BACKFILL FOR ABANDONED TUNNELS

- B (REPLACE) Flowable mortar according to Section 3010-2.06.

2.05 BACKFILL MATERIAL

- A (REPLACE) Excavated Materials: Use excavated materials for backfill of trenchless installations as indicated in the Supplemental Specifications for Section 3010-2.03.B when such material is approved by the Engineer or in the Special Provisions.
- 1 Excavated materials that may be approved or specified are:
 - a Clean excavated sand/gravel and borderline clean gravels and sands.
 - b Excavated sands/gravels with fines.
 - c Excavated fine-grained inorganic soils.
- B (REPLACE) Special Fill Materials: For use when specified in Special Provisions:
- 1 PCC: Use Iowa DOT Class C concrete with approximately 4 inch slump.
 - 2 Flowable Mortar: Comply with Section 3010-2.06.
 - 3 CLSM is not allowed.
 - 4 Foamed Cellular Concrete is not allowed.
 - 5 Class III Backfill material as indicated in Section 3010-2.03.A.2

2.06 CASING END SEALS

- A (REPLACE) Manufactured: In USA

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3020 - TRENCHLESS CONSTRUCTION

- 1 Made of 1/8 inch thick EPDM or Neoprene rubber with stainless steel bands and fasteners.
- 2 GPT/PSI Model R, Advance AMCE, or approved equal molded cone seals for carrier pipes up to 12 inches nominal diameter and casing to 24 inches.
- 3 Cascade Waterworks style CCES or approved equal for carrier pipes larger than 12 inches and casing larger than 24 inches.
- 4 Alternate of double wrap of woven geotextile. Secured with stainless steel bands or #14 insulated copper wires, when approved by the Engineer.

Part 3: EXECUTION

3.01 3.01 Excavation

- B (REPLACE) Remove topsoil to a minimum depth of 8 inches and stockpile.

3.04 TRENCHLESS INSTALLATION

- A (REPLACE) General: The method of trenchless installation shall be as indicated in the Special Provisions based on anticipated soil conditions and 1) to allow the pipe to be installed to the desired line and grade (alignment and slope) within the tolerances specified in this Supplemental Specification; 2) prevent heaving and settlement of the ground surface or nearby facilities; and 3) prevent damage to the carrier pipe and any lining material within the carrier pipe.

- 1 (REPLACE) Installation Methods: Refer to SUDAS 3020-3.04.A.1 for descriptions of trenchless installation methods.
 - a Auger Boring: Auger boring of casing pipe is an approved method.
 - b Directional Drilling: Directional drilling may be approved by the Engineering/Water Department
 - i Intermediate high points shall be minimized or air releases installed.
 - ii Installation shall be by a Contractor with water main and force main experience satisfactory to the Water Dept. and/or the Engineering Dept.
 - iii The annular space around the carrier pipe shall be filled with a suitable drilling fluid such as bentonite slurry.
 - iv "Pot Holes" for elevation verification are required.
 - c Open-ended Pipe Ramming: Open ended pipe ramming is not allowed.
 - d Pipe Jacking: Pipe jacking is allowed if part of auger boring installation of casing pipe.
 - e Microtunneling: The use of microtunneling is not anticipated without specific Water Dept. and/or Engineering Dept. approval.
 - f Utility Tunneling: The use of utility tunneling is not anticipated without specific Water Dept. and/or Engineering Dept. approval.
 - g Other: Any other installation methods must have specific approval from the Water Dept. and/or the Engineering Dept.
- 2 (REPLACE) Line and Grade:
 - a Install pipe at line and grade (horizontal alignment and slope) that will allow the carrier pipe to be installed at its true starting elevation and slope within the maximum deviation of the pipe centerline indicated in this Supplemental Specification.
 - b Maximum deviations tolerances of the carrier pipe shall be:
 - i Gravity Pipe tolerances are unchanged.
 - ii Water Mains and Force Mains
 - (i) Horizontally: + or - 2.0 feet
 - (ii) Vertically: + or - 0.2 feet Intermediate high points are not allowed without air release.
 - (iii) Maintain the minimum depth specified in the Contract Documents.

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3020 - TRENCHLESS CONSTRUCTION

- c Greater deviation or interference with other identified facilities may be cause for rejection or may require corrections as required by the Water Dept. and/or Engineering Dept.
 - 3 Deviation from Line and Grade:
 - a (REPLACE) Provided adequate clearance remains for proper installation of the carrier pipe, the Contractor will be allowed to correct deviations in grade/slope of a casing pipe in order to achieve design grade/slope of the carrier pipe by shimming the carrier pipe with casing spacers to a uniform grade/slope. Pouring a concrete invert is not allowed.
 - B Casing Pipe or Uncased Carrier Pipe Installation:
 - 7 (ADD) Electrical Conduit
 - a Multiple conduits shall be installed with a single bore when possible.
 - 8 (ADD) Fiber Optic Conduit
 - a Four 1-1/2 inch conduits shall be installed with a single bore.
 - C Carrier Pipe Installation through Casing:
 - 2 (REPLACE) Install stainless steel casing spacers on carrier pipe section as necessary to support the pipe barrel according to the spacer manufacturer's recommendations, subject to the following:
 - a Install a casing spacer within one foot of the end of the casing.
 - b Install casing spacers with joint restraint when required. In general install spacers at 6-foot intervals on AWWA C900 PVC pipe (3 per pipe segment) and at 10-foot intervals for AWWA C151 DIP (2 per pipe segment). Consult spacer manufacturer.
 - c Do not allow carrier pipe to be supported by joint bells.
 - d Apply lubricant to casing spacers if recommended by spacer manufacturer. Do not use petroleum-based lubricants or oils.
 - 3 (REPLACE) Restrained joints of the carrier pipe shall be properly engaged per the pipe manufacturer's recommendations after installation in the casing to resist thrust loads of the connected pipe. Installation methods for PVC carrier pipe shall prevent over insertion of the plain end into the bell. The carrier pipe with restrained joints shall be pulled into the casing. Pipe collars shall be installed to prevent joint over insertion. Do not install concrete thrust collars or blocks.
 - D (REPLACE) Annular Space Grouting: Do not fill the annular space between the carrier pipe and the casing pipe with flowable mortar, sand, or alternate unless mandated by the DOT, County, or railroad. If mandated by agency, follow agency required fill procedures.
- 3.05 PIT RESTORATION
 - B (REPLACE) When the carrier pipe extends beyond the limits of the trenchless installation and into the bore pits. Place bedding, haunch support, primary backfill, secondary backfill and final backfill according to Section 3010-3.05 as modified by the Supplemental Specifications.
 - C (REPLACE) Place final backfill material in the pits as required in Section 3010-3.05 as modified by the Supplemental Specifications. Apply the testing requirements of Section 3010-3.06.

END OF SECTION

DIVISION 03 - TRENCH AND TRENCHLESS CONSTRUCTION
SECTION 3020 - TRENCHLESS CONSTRUCTION

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DIVISION 04 - SEWERS AND DRAINS

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Section 4010 - Sanitary Sewers

Part 1: GENERAL

1.04 SUBMITTALS

(REPLACE) All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction.

1.08 MEASUREMENT AND PAYMENT

A Sanitary Sewer Gravity Main:

1 Trenched:

- a (REPLACE) Measurement: Each type and size of pipe installed in a trench will be measured along the centerline of the pipe from inside face of manhole to inside face of manhole.
- c (REPLACE) Includes: Unit price includes, but is not limited to, trench excavation, dewatering, placing and compacting bedding and backfill material, pipe joints, pipe connections, including connection to private building services and municipal sewer, testing, and inspection.

2 (REMOVE) Trenchless:

B Sanitary Sewer Gravity Main with Casing Pipe:

1 Trenched:

- c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, trench excavation, dewatering, placing and compacting bedding and backfill material, furnishing and installing annular space fill material (ONLY if shown on plans), casing spacers, end seals, pipe joints, testing, and inspection.

2 Trenchless:

- c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, trenchless installation, materials and equipment, pit excavation, dewatering, placing and compacting backfill material, furnishing and installing annular space fill material (ONLY if shown on plans), casing spacers, end seals, testing and inspection.

C Sanitary Sewer Force Main:

1 Trenched:

- a (REPLACE) Measurement: Each type and size of pipe installed in a trench will be measured along the centerline of the pipe from the inside face of the pump station to the inside face of manhole or inside face of manhole to inside face of manhole.
- c (REPLACE) Includes: Unit price includes, but is not limited to, trench excavation, dewatering, placing and compacting bedding and backfill material, pipe joints, joint restraints, pipe connections, including connection to private building services and municipal sewer, testing and inspection.

2 Trenchless:

- c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing pipe, trenchless installation, materials and equipment, pit excavation, dewatering, placing and compacting backfill material, pipe connections, including connection to private building services and municipal sewer, testing and inspection.

D Sanitary Sewer Force Main with Casing Pipe:

1 Trenched:

- c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, trench excavation, dewatering, placing and compacting bedding and backfill material, furnishing and installing annular space fill material (ONLY if shown on plans), casing spacers, end seals, pipe joints, joint restraints, testing, and inspection.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

- 2 Trenchless:
 - c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, trenchless installation, materials and equipment, pit excavation, dewatering, placing and compacting backfill material, furnishing and installing annular space fill material (ONLY if shown on plans), casing spacers, end seals, testing and inspection.
- E (REPLACE) Sanitary Sewer Service Stub: The portion of the sanitary sewer service from the main to the right of way or property line, or as specified in the contract documents (see figure 4010.201)
 - 1 Trenched:
 - a Measurement: Each type and size of pipe will be measured in linear feet from the pipe connection to the end of pipe installed along with its associated cleanout.
 - b Payment: Payment will be made at the unit price per linear foot for each type and size of sanitary sewer service stub, and cleanout completed.
 - c Includes: Unit price includes, but is not limited to, hand excavation, trench excavation, placing and compacting bedding and backfill material, cleanout complete, tap, fittings, testing and inspection.
 - 2 Trenchless:
 - a Measurement: Each type and size of pipe installed will be measured along the centerline of the pipe from the face of the wye or tee fitting to the end of the service pipe or reconnection point to the existing service pipe.
 - b Payment: Payment will be made at the unit price per linear foot for each type and size of sanitary sewer service pipe.
 - c Includes: Unit price includes, but is not limited to, furnishing and installing pipe, trenchless installation, materials and equipment, pit excavation, dewatering, placing and compacting backfill material, pipe connections, including connection to private building services and municipal sewer, testing, and inspection.
 - 3 Sanitary Sewer Service Pipe Only:
 - a Measurement: Each type and size of pipe installed in a trench will be measured along the centerline of the pipe from the face of the wye or tee fitting to the end of the service pipe or reconnection point to the existing service pipe.
 - b Payment: Payment will be made at the unit price per linear foot for each type and size of sanitary sewer service pipe.
 - c Includes: Unit price includes, but is not limited to, hand excavation, trench excavation, dewatering, placing and compacting bedding and backfill material, pipe joints, pipe fittings, pipe connections, including connection to private building services and municipal sewer, testing, and inspection.
- F Sanitary Sewer Service Relocation:
 - 1 (REPLACE) Measurement: Each type and size of pipe will be measured in linear feet from the pipe connection to the end of pipe installed along with its associated cleanout.
 - 2 (REPLACE) Payment: Payment will be made at the unit price per linear foot for each type and size of sanitary sewer service relocated.
 - 3 (REPLACE) Includes: Removal of existing pipe, hand excavation, trench excavation, furnishing new pipe, placing and compacting bedding and backfill material, connection back to existing service, compaction, cleanout, complete if shown in contract documents, tap, fittings, testing and inspection.
- H Removal of Sanitary Sewer:
 - 1 (ADD) Measurement: Pipe removal will not be measured for reconstruction on the same alignment or on spot repair projects.
- I (REPLACE) Sanitary Sewer Cleanout:
 - 1 Double Sweep Cleanout:

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

- a Measurement: Each complete sanitary sewer double sweep cleanout will be counted.
 - b Payment: Payment will be made at the unit price for each cleanout, complete.
 - c Includes: Unit price includes, but is not limited to, plug at the end of the main, double sweep tee, fittings, riser pipe, cap with screw plug, casting, and concrete casting pad encasement.
- 2 LMK Vac-A-Tee Cleanout:
- a Measurement: Each complete cleanout will be counted.
 - b Payment: Payment will be made at the unit price for each cleanout, complete.
 - c Includes: Unit price includes, but is not limited to, excavation via vacuum or hydro excavation, installation of approved saddle to existing sewer service, riser pipe, cap with screw plug, casting, and concrete casting pad encasement.
- K (REPLACE) Sanitary Sewer Abandonment, Plug: Plugging sanitary sewers is incidental to other work and will not be paid for separately.
- L Sanitary Sewer Abandonment, Fill and Plug:
- 1 (REPLACE) Measurement: Each pipe filled and plugged will be measured in cubic yards of fill material used, obtained from load tickets.
 - 2 (REPLACE) Payment: Payment will be at the bid unit price per cubic yard of fill material used.
- M (ADD) Sanitary Sewer Lateral Connection:
- 1 Wye Fitting:
 - a Measurement: Each sanitary sewer wye will be counted.
 - b Payment: Payment will be made at the unit price for each wye installed.
 - c Includes: Unit price includes, but is not limited to, excavation, placing and compacting bedding and backfill material, wye, bedding and backfill material will be paid separately, at the bid unit price.
 - 2 Saddle Tee:
 - a Measurement: Each sanitary sewer saddle tee will be counted.
 - b Payment: Payment will be made at the unit price for each saddle tee installed.
 - c Includes: Unit price includes, but is not limited to, excavation, placing and compacting bedding and backfill material, wye, bedding and backfill material will be paid separately, at the bid unit price.
- N (ADD) Sanitary Sewer Service Stub, Force Main, 1 1/4" to 3" HDPE:
- 1 Measurement: Each type and size of force main service stub will be measured in lineal feet along the centerline of the force main service, from the stop box to the connection point at the E-One pump.
 - 2 Payment: Payment will be made at the unit price per lineal foot of force main service pipe installed.
 - 3 Includes: Unit price includes, but is not limited to, excavation, boring, placing and compacting bedding and backfill material, connection to the pump and curb stop. Bedding and backfill material will be paid separately, at the bid unit price.
- O (ADD) Sanitary Sewer Service Stub, Force Main, Curb Stop with Box:
- 1 Measurement: Each type and size of force main service curb stop will be counted.
 - 2 Payment: Payment will be made at the unit price for each curb stop installed.
 - 3 Includes: Unit price includes, but is not limited to, excavation, placing and compacting bedding and backfill material, connection fittings, curb stop and box, curb box extensions. Bedding and backfill material will be paid separately, at the bid unit price.
- P (ADD) Sanitary Sewer Service Stub, Force Main, E-One Pump System:
- 1 Measurement: Each type and size of Environmental One (E-One) Pump System will be counted
 - 2 Payment: Payment will be made at the unit price for each of E-One Pump System installed.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

- 3 Includes: Unit price includes, but is not limited to, complete installation of the E-One pump system according to manufacturer's instructions, E-One Pump system (E-One Extreme Simplex Pump "D" Series 240v, tank, alarm disconnect panel, wiring from the panel to the pump), connection of the owner supplied power source to the alarm disconnect panel, excavation, placing and compacting bedding and backfill material, furnishing and placing concrete ballast, installing a redundant check valve, connection to existing gravity lateral, fittings, Permits and fees. Bedding and backfill material will be paid separately at the bid unit price.
- Q (ADD) Pump, Clean and Abandon Septic Tank(s):
 - 1 Measurement: Measurement will be in gallons of waste removed and disposed of at the sewage treatment plan and will be obtained from the manifest received at the time of disposal.
 - 2 Payment: Payment will be made at the unit price per gallon of waste removed.
 - 3 Includes: Unit price includes, but is not limited to: equipment, labor and materials to completely remove the contents of the existing septic tank(s) and to flush with contractor supplied water to remove any remaining residue; Completely collapse the lid into the septic tank and fill the septic tank with compacted sand or flowable mortar.
- R (ADD) Special Gaskets:
 - 1 Measurement: Each type and size of gasket installed will be counted.
 - 2 Payment: Payment will be made at the unit price for each gasket Installed.
 - 3 Includes: Unit price includes, but is not limited to, equipment, labor and materials required for complete installation of the gasket
- S (ADD) Sanitary Sewer Main Fittings by Weight:
 - 1 Measurement: The weight of each type and size of fitting installed will be calculated.
 - 2 Payment: Payment will be made at the unit price for the weight of each fitting installed.
 - 3 Includes: Unit price includes, but is not limited to, equipment, labor and materials required for complete installation of the fitting.
- T (ADD) Sanitary Sewer Main Fittings by Count:
 - 1 Measurement: Each type and size of fitting installed will be counted.
 - 2 Payment: Payment will be made at the unit price for each fitting installed.
 - 3 Includes: Unit price includes, but is not limited to, equipment, labor and materials required for the complete installation of the fitting.
- U (ADD) Joint Restraint:
 - 1 Measurement: Each type and size of joint restraint installed as specified in the contract documents or as required for proper installation of the water main will be counted.
 - 2 Payment: Payment will be made at the unit price for each type and size of Joint Restraint.
 - 3 Includes: Unit price includes, but is not limited to, complete installation of the Joint Restraint

Part 2: PRODUCTS

2.01 SANITARY SEWER (Gravity Mains)

- A Solid Wall Polyvinyl Chloride Pipe (PVC): 8 inch to 15 inch:
 - 1 (REPLACE) 8 Inch to 15 inch SDR-26 only
 - 2 (NO CHANGE)
 - b (REMOVE) SDR 35: Minimum pipe stiffness of 46 psi.
 - 5 (ADD) PVC only allowed with nitrile gaskets in areas under or potentially under the influence of poly-hydrocarbons. Comply with Section 4010.2.07.
 - 6 (ADD) See Section 3020.2.01.A.1.b of Supplemental Specifications for PVC sanitary Sewer joint restraint for trenchless construction (w/ casing).
- B Solid Wall Polyvinyl Chloride Pipe (PVC): 18 inch to 27 inch:

- 2 (REPLACE) Pipe stiffness per ASTM D2412, 115 psi.
 - 3 (ADD) PVC only allowed with nitrile gaskets in areas under or potentially under the influence of poly-hydrocarbons. Comply with Section 4010.2.07.
 - 5 (ADD) See Section 3020.2.01.A.1.b of Supplemental Specifications for PVC sanitary Sewer joint restraint for trenchless construction (w/ casing).
 - C (REMOVE) Corrugated Polyvinyl Chloride Pipe (PVC) 8 inch to 36 inch:
 - D (REMOVE) Closed Profile Polyvinyl Chloride Pipe (PVC) 21 inch to 36 inch:
 - E (REMOVE) Polyvinyl Chloride Composite Pipe (truss type PVC) 8 inch to 15 inch:
 - F (REPLACE) Reinforced Concrete Pipe (RCP) 18 inch to 144 inch:
 - 2 (NO CHANGE) Pipe Lining:
 - a (REMOVE) Epoxy Coal Tar:
 - d (ADD) CIPP: CIPP liner shall comply with Section 4050.
 - G Ductile Iron Pipe (DIP) 8 inch to 54 inch:
 - 1 General:
 - b (REPLACE) Minimum Thickness Class 51
 - c (ADD) Ductile iron pipe shall be US made.
 - 2 Interior Linings:
 - e (ADD) Cement mortar lining is not allowed.
 - f (ADD) Ceramic Epoxy
 - i The ceramic epoxy shall be Tnemec Series 431 Perma-Shield PL or Protecto 401.
 - ii The pipe and fittings manufacturer(s) or the pipe fabricator shall provide for ceramic epoxy lining by an applicator approved/certified by the paint manufacturer to have sufficient training and experience. Applicator shall perform surface preparation and coating application in full compliance with the coating manufacturer's requirements.
 - 5 (REPLACE) Fittings: Fittings shall be USA made compact ductile iron.
 - a Conform to AWWA C153 or AWWA C110.
 - b Mechanical joint (MJ) nuts, bolts, gaskets and glands shall be USA made.
 - c Nuts and bolts shall be high strength low alloy steel and be marked to identify material, size and producer.
 - d Nuts and bolts shall have a ceramic filled, baked-on fluorocarbon resin coating (Cor-Blue)
 - 6 Polyethylene Encasement:
 - d (ADD) Polyethylene Encasement shall be translucent or black
 - H (REMOVE) Vitrified Clay Pipe (VCP) 8 inch to 42 inch:
 - H Double Walled Polypropylene Pipe 12 inch to 30 inch:
 - 4 (ADD) Only allowed with the written approval of the City Engineer.
 - I Triple Walled Polypropylene Pipe 30 inch to 36 inch:
 - 4 (ADD) Only allowed with the written approval of the City Engineer.
- 2.02 SANITARY SEWER FORCE MAINS
- C (REPLACE) Fusible High Density Polyethylene (HDPE) Pipe:
 - 1 Small Diameter HDPE 1 1/4" TO 3":
 - a Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4.
 - b The resin material will meet the specifications of ASTM D3350-99 with a cell classification of PE: 345464C.
 - c Pipe shall have a manufacturing standard of ASTM F714.
 - d Pipe shall be DR 11 (160psi WPR) unless otherwise specified on the plans.
 - e The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

- f Outside diameters shall be based on iron pipe size (IPS).
 - g Pipe shall be manufactured from a PE 3408 resin.
 - h Butt Fusion Fittings:
 - i Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99.
 - ii Butt Fusion Fittings shall have a manufacturing standard of ASTM D3261.
 - iii Molded & fabricated fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
 - iv Fabricated fittings are to be manufactured using a Data Logger. Temperature, fusion, pressure and a graphic representation of the fusion cycle shall be part of the quality control records.
 - b Electrofusion Fittings:
 - i Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99.
 - ii Electrofusion Fittings shall have a manufacturing standard of ASTM F-1055.
 - iii Fittings shall have the same pressure rating as the pipe unless otherwise specified on the plans.
- 2 HDPE 4" to 24" Diameter: Comply with AWWA C906 with ductile iron pipe equivalent outside diameters.
 - a Material Designation Code: PE4710.
 - b Minimum Wall Thickness: DR 9.
 - i 4 inch through 24 inch sizes: DR 9.
 - ii Sizes over 24 inch: As specified in the contract documents.
 - c 3. Pipe Manufacturing:
 - i Provide pipe extruded with plain ends square to the pipe, free of any bevel or chamfer, and without bells or gaskets of any kind.
 - ii Pipe for potable water use to be black in color with two blue stripes.
 - d Markings on Pipe:
 - i Name of manufacturer.
 - ii Size and class.
 - iii NSF International (NSF) seal.
- C (REPLACE) Sewage Air Release Valves:
 - 1 Comply with Section 12010.2.05.E.
- E (REPLACE) Tracer Wire: Comply with Figure 5010.102
 - 1 Tracer wire will be required on all force mains
 - 2 Tracer Wire: Stranded 10-gauge copper wire conductor
 - a Insulation Material: linear low density polyethylene (LLDPE) insulation suitable for direct burial applications
 - b Insulation Thickness: 30 mil
- F Tracer Wire Station:
 - 5 (ADD) Install tracer wire with tracer wire stations at both ends of the force main and at 500-foot intervals along the forcemain. Tracer wire access stations shall be Mini-Test Station by C.P. Test Services or approved alternate. Install traffic rated valve or cleanout box when access station is installed in streets or sidewalks. Tracer wire systems do not require ground rods.
- G (ADD) Joint Restraint:
 - 1 Force main pipe shall have push-on joints per AWWA C900 (ASTM D3139 joints and ASTM F477 gaskets) and restrained joints as necessary.
 - a Restrained joints in PVC pipe shall be integral and internal to the pipe bell, Eagle Loc 900 or equal; or may be by use of a joint harness, EBAA 1500TD or 1600TD with stainless steel bolts, rods and nuts; or Romac 611; or equal.
 - 2 Retainer Gland:

- a Wedge type retainer gland
 - b DIP: EBAA Iron, Inc. Megalug Series 1100 or USA made approved equal
 - c Special restraining pipe joints integral to the DIP with approval of the Engineer.
 - d Restrained joints for fittings in PVC force mains shall be mechanical joint wedge type retainer gland, EBAA Series 2000PV, Tyler-Union domestic Series 2000, or Romac RomaGrip for PVC.
- 3 Joint Harness:
- a Wedge type restraint harness
 - b High strength low alloy (Corten) rods and nuts
 - c Cor-Blue split ring assembly tee bolts
 - d EBAA Iron, Inc. Series 1700 Megalug Restraint Harness or USA made approved equal.
 - e Special restraining pipe joints integral to the DIP with approval of the Engineer
 - f Joint restraint shall conform to ASTM F1674. Harnesses shall be polyethylene wrapped.
- 4 (ADD) Concrete Thrust Block:
- a Not allowed without design engineer justification and written approval from the jurisdiction.
- H (ADD) Fittings
- 1 Force main fittings shall be compact ductile iron per AWWA C153 with mechanical joints per AWWA C111. Fittings shall have a ceramic epoxy lining including pumping station DIP and fittings. All fittings shall be polyethylene wrapped per AWWA C105. Mechanical joint tee bolts shall be series 304 stainless steel with anti-galling coating. Gaskets shall be SBR unless nitrile is required unless otherwise specified on the plans.
 - 2 Refer to Section 5010 of SUDAS specifications and City Supplemental Specifications.
- 2.04 SANITARY SEWER SERVICES
- A Connection to Main:
- 1 (REPLACE) PVC Main:
 - a Preformed tee, wye-tee or wye service fittings with integral bell and spigot joints with elastomeric seals. Fittings shall be SDR 26 (up to 15" diameter sewer) and comply with ASTM D3034 and comply with ASTM F1336. Gasket joints shall comply with ASTM D3212 with gaskets conforming to ASTM F477. Fittings shall be Westlake H Series, GPK, or equal.
 - b When approved by the Engineering Department, preformed flexible saddle tee or saddle wye conforming to ASTM D5926 with 4" or 6" branch, stainless steel band clamps (with extensions if required) and pressure kit accessory. Fernco TST or TSW with TSPK pressure kit, or City approved equal.
 - c Rigid PVC plastic shall comply with ASTM D1784, cell classification 12454 or 13343.
 - d PVC main connections shall withstand sewer low pressure air testing.
 - 2 (REMOVE) PVC Composite Main:
 - 3 (REPLACE) RCP Main:
 - a Resilient sleeve installed into a cored hole in the sewer wall designed for use in concrete sanitary sewer pipe, with stainless steel band clamps meeting ASTM C923.
 - b Fernco Qwik-Seal QS-4 or QS-6 with branch for ASTM D3034 PVC sewer service line.
 - c RCP main connections shall withstand sewer low pressure air testing.
 - 4 (REMOVE) VCP Main:
 - 5 (REPLACE) DIP Main:

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

- a Install ductile iron tee or wye mechanical joint fittings complying with AWWA C153 or AWWA C110.
 - i Ductile iron fittings shall be ceramic epoxy lined as required for DIP sewer.
 - ii Ductile iron sewer connection fittings shall utilize an MJ by PVC (SDR35/26) transition gasket for the branch connection.
 - b When approved by the Engineering Department, preformed flexible saddle tee or saddle wye as specified for PVC sanitary sewers may be installed.
 - i Any damage to the interior ceramic epoxy lining of the DIP and cut edges shall be repaired with ceramic epoxy touchup kits or joint compound according to the coating manufacturers recommendations.
 - c When approved by the Engineering Department, resilient sleeve connectors as required for RCP main may be installed in DIP.
 - i Ceramic epoxy liner repair of DIP and cut edge shall be required
 - D (REPLACE) Connection to Existing Service:
 - 1 Connections to existing service lines shall utilize flexible transition couplings conforming to ASTM C1173
 - 2 Connection couplings shall have a 300 series stainless steel shear ring (or approved alternate shear resistance) and stainless-steel clamps.
 - 3 Couplings shall be specifically sized for the type and diameter of the pipes being connected (e.g. clay, cast iron soil pipe, PVC). PVC diameters may include SDR 26 per ASTM D3034, schedule 40/80 per ASTM D2665, or DR 18 CIOD per AWWA C900.
 - 4 The connection couplings shall be Fernco 1000RC Series, Fernco 5000RC Series, Fernco 6000RC Series (for AIS projects,) Fernco Hulk couplings; or approved equal.
- 2.06 (REPLACE) SANITARY SEWER CLEANOUT
- A Sanitary sewer cleanouts are not allowed on City gravity sewer mains. Manholes are required at the end of sewer mains. Figure 4010-2.03 shall be applicable for sanitary sewer service lines only.
 - B Cleanouts shall be installed in sanitary sewer service lines as required by the City Plumbing Code.
 - C Double cleanouts are suggested for sewer service lines to allow cleaning in both the upstream and down stream portions of the service lines.
 - D Double sweep cleanouts shall be gasketed joint SDR26 4" or 8" two-way cleanout by West Lake, GPK, or equal.
 - E LMK Vac-A-Tee Cleanout: As manufactured by LMK Technologies, Inc. or equal.
 - 1 Shall be a one piece, molded PVC saddle and shall be compatible with the riser pipe and solvent welded to the boss of the saddle. The saddle shall conform to the lateral pipe by a snap fit where the lateral pipe is either four (4") or six (6") in diameter.
 - 2 The riser pipe shall be SDR 26 PVC. The resin shall be a one-part marine grade adhesive/sealant designed for the application of a Vac-A-Tee saddle.
 - 3 The cleanout shall comply with figure 4010.203.
- 2.07 (ADD) SPECIAL GASKETS
- A For soils contaminated with gasoline or other hydrocarbons use nitrile gaskets.
 - B For other soil contaminants, contact the Engineering Department with specific compounds to determine the required gasket.
- Part 3: EXECUTION
- 3.04 GRAVITY MAIN PIPE JOINTING
- B (REPLACE) Polyvinyl Chloride Pipe (PVC):
 - 1 Coat rubber gasket and joint with soap-based lubricant immediately prior to closing the joint.
 - 2 Do not insert spigot of pipe beyond the manufacturer's line.
 - F (REPLACE) Connection between Dissimilar Pipes:

- 1 The nominal inside diameter and actual inverts of the existing mainline sewer and/or service pipe shall match with the new sewer and/or service pipe and shall be extended to the existing pipe as necessary for connection.
 - 2 The pipe transition shall be made with a manufactured flexible elastomeric PVC coupling approved by the jurisdiction such as Fernco or Indiana Seal (GPK) or approved equal.
 - 3 All couplings shall have two (2) stainless steel band clamps for positive attachment to sewer/service pipe and shall have a stainless steel or PVC shear ring to provide pipe inverts to match concentrically and be leak free.
 - 4 A compression seal ring (eccentric of concentric) seal ring shall not be installed unless approved by the Engineering Department.
 - 5 Connections to the existing sewer shall be made at a point where the existing pipe is sound and free of structural defects. If applicable, the sewer main shall be severed to that a smooth pain end spigot exists.
- 3.05 FORCE MAIN INSTALLATION
- C (ADD) HDPE force mains 1-1/4" to 3" may be installed by either trenched or trenchless methods unless otherwise specified on the plans.
- D (ADD) Force Main 4 inch and larger may only be installed by trenched methods. May be installed trenchless with the use of a casing pipe.
- 3.06 SANITARY SEWER SERVICE STUBS
- B Install wye or tee for each service connection.
- 2 Connection to existing sewer main and new RCP.
 - b (REPLACE) Use preformed saddle wye or saddle tee with gasketed saddle for service tap.
- C (REPLACE) Install service stub from sewer main to the property line or as specified in the contract documents. Comply with Figure 4010.201.
- 3 (REPLACE) Terminate end of service stub with a double sweep cleanout, per Figure 4010.203.
 - 5 (REPLACE) For undeveloped properties, place a cleanout at the end of the sanitary sewer service. Mark the end of the service line as required by the Jurisdiction or as specified in the contract documents, typical 4x4 wood post painted green, marked with depth to flow line.
- 3.10 (REPLACE) SANITARY SEWER CLEANOUT
- A Provide cleanouts where specified in the contract documents. Comply with Figure 4010.203.
- B Provide LMK Vac-A-Tee Cleanout where specified in the contract documents.
- 1 In grass areas, the sod shall be neatly cut and removed. In pavement areas, the pavement shall be straight-line marked, cut and removed.
 - 2 The vacuum excavated borehole shall be approximately twenty-inches (20") in diameter and all spoils shall be deposited in a vacuum truck.
 - 3 The adhesive/sealant shall be applied to the underside of the saddle at no less than a 1/4" thick layer.
 - 4 The saddle and riser pipe shall be carefully inserted into the bore hole, setting the saddle onto the pipe, applying a downward force causing the saddle to expand and snap onto the lateral pipe.
 - 5 Immediately after the saddle has been affixed to the lateral pipe, the riser pipe should be secured by backfilling the bore hole with sand or pea-gravel to within 6-inches of the original grade.
 - 6 An exfiltration test shall be performed by filling the riser pipe with a 6-foot column of water. The test shall be performed no less than 12-hours from the time of affixing the saddle to the pipe. The column of water shall be held for five minutes. The water level shall be measured from the top of the riser pipe. Zero leakage is allowed.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

- 7 A diamond core saw shall be introduced into the riser pipe, the crown of the pipe is cut and the coupon is removed.
 - 8 An approved cap or cover is installed at ground level or below ground level.
 - 9 Should soil conditions reveal running sand or similar conditions that would prohibit the installation, the installation shall be terminated and the borehole filled with flowable grout. The surface area shall be restored to its original condition.
 - 10 The site shall be left clean and the property restored to conditions equal to site conditions prior to the VAC-A-TEE® installation.
- 3.14 (ADD) SANITARY SEWER MAIN AND LATERAL INSTALLATION WITH SPECIAL GASKETS
- A Sanitary sewer main and laterals must be installed with special gaskets where site conditions are under the influence or may become under the influence of benzene/petrol. Comply with the requirements in Section 4010.2.07.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

The details from Section 4010 shown in the table below have been modified as part of this supplemental specification. A more detailed summary of the modifications is included below the table.

City of Dubuque Modifications to Standard SUDAS Section 4010 Details			
Details		Description	Dubuque Supplemental Specification
4010.203	SW-203	Sanitary Sewer Cleanout	Specification Modification

Figure 4010.203 (SW-203)

(ADD) Notes and requirements.

- A Figure 4010-2.03 shall be applicable for sanitary sewer service lines only.

END OF SECTION

DIVISION 04 - SEWERS AND DRAINS
SECTION 4010 - SANITARY SEWERS

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Section 4020 - Storm Sewers

Part 1: GENERAL

1.03 (REPLACE) SUBMITTALS.

All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction.

1.08 MEASUREMENT AND PAYMENT

A Storm Sewer:

1 Trenched:

a (REPLACE) Measurement: Each type and size of pipe installed in a trench will be measured in linear feet along the centerline of the pipe from inside face of intake or manhole to inside face of intake or manhole. Where the end of the pipe discharges to a ditch or waterway, measurement will be to the end of the pipe, exclusive of apron. Lengths of elbows and tees, where permitted, will be included in the length of the pipe measured.

c (REPLACE) Includes: Unit price includes, but is not limited to, trench excavation, dewatering, placing and compacting bedding and backfill material, joint wrapping, wyes and other fittings, pipe joints, pipe connections, testing, and inspection.

2 (REMOVE) Trenchless:

B Storm Sewer with Casing Pipe:

1 Trenched:

c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, trench excavation, dewatering, placing and compacting bedding and backfill material, if specified in the contract documents furnishing and filling annular space fill material, pipe joints, testing, and inspection.

2 Trenchless:

c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing both carrier pipe and casing pipe, trenchless installation, materials and equipment, pit excavation, dewatering, placing and compacting backfill material, testing, and inspection.

D Removal of Storm Sewer:

1 (REPLACE) Measurement: Each type and size of pipe removed will be measured in linear feet from end to end. Pipe removal will not be measured for payment for reconstruction on the same alignment or on repair projects.

E (REPLACE) Storm Sewer Connections:

1 Connection to Existing Manhole or Intake: Comply with Section 6010, 1.08, G

2 Concrete Collar Pipe Connection:

a Measurement: Each concrete collar connection will be counted.

b Payment: Payment will be made at the unit price for each type of concrete collar pipe connection installed.

c Includes: Unit price includes, but is not limited to, furnishing and installing all material shown on figure 4020.211 (SW-211).

G Storm Sewer Abandonment, Fill and Plug:

1 (REPLACE) Measurement: Each pipe filled and plugged will be measured in cubic yards of fill material used, obtained from load tickets.

2 (REPLACE) Payment: Payment will be at the bid unit price per cubic yard of fill material used.

Part 2: PRODUCTS

2.01 STORM SEWERS

A Reinforced Concrete Pipe (RCP):

DIVISION 04 - SEWERS AND DRAINS
SECTION 4020 - STORM SEWERS

- 3 (REPLACE) Use tongue and groove joints with rubber O-ring or profile gasket complying with ASTM C443. If specified, cold applied bituminous jointing material may be used with wrapped exterior joints.
- 4 (ADD) If specified, wrap exterior joints complying with ASTM C877.
- B Reinforced Concrete Arch Pipe (RCAP):
 - 3 (REPLACE) Use tongue and groove joints with rubber O-ring or profile gasket complying with ASTM C443. If specified, cold applied bituminous jointing material may be used with wrapped exterior joints.
 - 4 (ADD) If specified, wrap exterior joints complying with ASTM C877.
- C Reinforced Concrete Elliptical Pipe (RCEP):
 - 3 (REPLACE) Use tongue and groove joints with rubber O-ring or profile gasket complying with ASTM C443. If specified, cold applied bituminous jointing material may be used with wrapped exterior joints.
 - 4 (ADD) If specified, wrap exterior joints complying with ASTM C877.
- G (REMOVE) Corrugated Metal Pipe (CMP):
- H (REMOVE) Spiral Rib Pipe:
- I (REMOVE) Coated Corrugated Metal Pipe:
- J (REMOVE) Corrugated Metal Arch Pipe (CMAP):
- K (REMOVE) Spiral Rib Arch Pipe:
- M (REPLACE) Bituminous Jointing Material: If specified, use a cold applied mastic sewer joint sealing compound recommended by the manufacturer for the intended use and approved by the Jurisdiction complying with AASHTO M198; must be used with external joint wrap meeting ASTM C877.
- N Engineering Fabric:
 - 1 (ADD) Use of this material requires specific approval of the engineer.
- P (ADD) Ductile Iron Pipe (DIP) When Required
 - 1 Comply with AWWA C151
 - 2 Minimum thickness class 51
 - 3 Push-on joints per AWWA C111
 - 4 Joint gaskets to be nitrile
 - 5 Cement mortar lining
 - 6 External bituminous seal coating per AWWA C151

END OF SECTION

Section 4030 - Pipe Culverts

Part 1: GENERAL

1.03 (REPLACE) SUBMITTALS

All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction.

1.08 MEASUREMENT AND PAYMENT

A Pipe Culverts:

1 Trenched:

- c (REPLACE) Includes: Unit price includes, but is not limited to, trench excavation, dewatering, placing and compacting bedding and backfill material, connectors, testing and inspection.

2 (REMOVE) Trenchless:

B Pipe Aprons:

- 3 (REPLACE) Includes: Unit price includes, but is not limited to, trench excavation, placing and compacting bedding and backfill material, connectors, and other appurtenances.

Part 2: PRODUCTS

2.01 2.01 PIPE CULVERTS

B Entrance Pipe Culverts:

- 4 (REMOVE) Reinforced Concrete Low Head Pressure Pipe (RCPP).

- 5 (REMOVE) Corrugated Metal Pipe (CMP).

- 6 (REMOVE) Spiral Rib Pipe.

- 7 (REMOVE) Coated Corrugated Metal Pipe

- 8 (REMOVE) Corrugated Metal Arch Pipe

C (REMOVE) Structural Plate Culverts:

D (REMOVE) Aluminum Structural Plate Culverts:

END OF SECTION

DIVISION 04 - SEWERS AND DRAINS
SECTION 4030 - PIPE CULVERTS

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Section 4040 - Subdrains and Footing Drain Collectors

Part 1: GENERAL

1.03 (REPLACE) SUBMITTALS

All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction.

1.08 MEASUREMENT AND PAYMENT

A Subdrains:

- 3 (REPLACE) Includes: Unit price includes, but it not limited to, trench excavation, engineering fabric, placing bedding and backfill material, connectors, and fittings.

B Footing Drain Collectors:

- 3 (REPLACE) Includes: Unit price includes, but it not limited to, trench excavation, pipe, wyes, tap, placing bedding and backfill material, fittings, and adjustment to finished grade.

D Subdrains or Footing Drain Outlets and Connections:

1 Subdrain Outlets and Connections:

- c (REPLACE) Includes: Unit price includes, but it not limited to, core drilling of structures and pipe, flexible connectors (structures) and saddles (pipe), flexible sealant, coupling bands, and rodent guards for pipes 6 inches and smaller.

2 Footing Drain Outlets and Connections:

- c (REPLACE) Includes: Unit price includes, but it not limited to, core drilling of structures and pipe, flexible connectors (structures) and saddles (pipe), flexible sealant, coupling bands, and rodent guards for pipes 6 inches and smaller.

F (ADD) Manufactured Trench Drain:

- 1 Measurement: Each type and size of trench drain will be measured in linear feet, along the centerline of the casting or grate.
- 2 Payment: Payment will be at the bid unit price per linear foot of each type and size of trench drain installed.
- 3 Includes: Unit Price Includes, but is not limited to, equipment, labor and materials required for complete installation of manufactured trench drain.

G (ADD) Groundwater Sampling Port:

- 1 Measurement: Each type and size of groundwater sampling port will be measured by Each.
- 2 Payment: Payment will be at the bid unit price per each groundwater sampling port installed.
- 3 Includes: Unit Price includes, but is not limited to, equipment, labor and materials required for complete installation of the groundwater sampling port. This includes the PVC Tee that ties into the subdrain. Includes Fernco couplers to connect to subdrain.

Part 2: PRODUCTS

2.09 (ADD) GROUNDWATER SAMPLING PORT

A Polyvinyl Chloride Pipe and Fittings (Solid Wall PVC):

- 1 Comply with ASTM D 3034, minimum thickness SDR 35, 46 psi minimum pipe stiffness.
- 2 Use PVC plastic conforming to ASTM D 1784, Cell Classification 12454.
- 3 Casting to use for top of sampling port to be Neenah R-1973-1 or Approved Equal

B Corrugated Polyvinyl Chloride Pipe and Fittings (Corrugated PVC):

- 1 Use corrugated exterior, smooth interior, PVC.
- 2 Comply with ASTM F 949, minimum pipe stiffness, 46 psi.
- 3 Use PVC plastic complying with ASTM D 1784, Cell Classification 12454.
- 4 Casting to use for top of sampling port to be Neenah R-1973-1 or Approved Equal

DIVISION 04 - SEWERS AND DRAINS
SECTION 4040 - SUBDRAINS AND FOOTING DRAIN COLLECTORS

END OF SECTION

Section 4050 - Pipe Rehabilitation

Part 1: PART 1 - GENERAL

1.03 SUBMITTALS

(ADD) All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction.

1.07 SPECIAL REQUIREMENTS

- A (REPLACE) Prior to start of work, notify all affected parties a minimum of 48 hours in advance as to the scheduled start time and anticipated length of time their service will be blocked.
- B (REPLACE) If utilizing jurisdiction water, coordinate with the City of Dubuque Water Department a minimum 48 hours prior to start of work to coordinate water source location and set up water usage meter and account. Utilize an approved double check backflow assembly or open gap.

1.08 MEASUREMENT AND PAYMENT

A Pipe Cleaning and Inspection for Rehabilitation:

- 1 Pre-Rehabilitation Cleaning and Inspection:
 - a (REPLACE) Measurement: Measurement will be made in linear feet along the centerline of the pipe, from inside face of manhole to inside face of manhole, for each diameter range of sewer main cleaned and inspected prior to rehabilitation. Diameter ranges: 4 to 12 inch, 15 to 24 inch, and 27 to 30 inch.
 - c (REPLACE) Includes: Unit price includes, but is not limited to, pre-cleaning CCTV inspection, light sewer cleaning, debris removal and transport, post cleaning CCTV inspection for Engineer review, identification and logging of active service taps, and disposal and associated costs for all debris removed from sewer.

C CIPP Lining:

- 1 CIPP Main Lining:
 - a (REPLACE) Measurement: Each type and size of pipe lining will be measured in linear feet along the centerline of the pipe, from inside face of manhole to inside face of manhole.

L (ADD) Sanitary Sewer Service, Cleaning and Inspection for Rehabilitation:

- 1 Measurement: Inspection will be measured in linear feet along the center line of the pipe from inside face of the main to the end of the inspected distance.
- 2 Payment: Payment will be made at the unit price per linear foot.
- 3 Includes: Unit price includes pipe inspection, and all costs associated with, public information and notification program. The contractor shall be responsible for notifying the residents 48 hours in advance of performing the work.

M (ADD) Sanitary Sewer Service, CIPP Lining:

- 1 Measurement: Each service to be lined will be measured in linear feet from inside face of the main to the termination point of the liner material.
- 2 Payment: Payment will be made at the unit price per linear foot for each diameter of lateral lined.
- 3 Includes: Unit price includes but not limited to, all equipment and materials required to perform the work, any sewer pumping that may be needed, grouting, removal of internal obstructions, heavy pipe and lateral cleaning, inspection via post CCTV lateral launch camera or lateral plumbing camera in color, and all costs associated with public information and notification program. The contractor shall be responsible for notifying the residents 48 hours in advance of performing the work.

N (ADD) Sanitary Sewer Service, Interface Seal

- 1 Measurement: Each Sanitary Sewer Service, Interface Seal installed will be counted.
- 2 Payment: Payment will be made at the unit price for each Sanitary Sewer Service, Interface Seal.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4050 - PIPE REHABILITATION

- 3 Includes: Unit price includes but not limited to, all equipment and materials required to perform the work, connection to 4" or 6" diameter lateral, any sewer pumping that may be needed, removal of internal obstructions, heavy pipe and lateral cleaning, inspection via post CCTV lateral launch camera or lateral plumbing camera in color, and all costs associated with public information and notification program. The contractor shall be responsible for notifying the residents 48 hours in advance of performing the work.

Part 2: PRODUCTS

2.06 PIPE REPAIR COUPLINGS FOR SPOT REPAIRS BY PIPE REPLACEMENT

- E (ADD) Transitions between dissimilar pipe materials shall be accomplished with non-shear, flexible elastomeric plastic or rubber couplings as manufactured by Fernco, Mission or an approved equal. All couplings shall have (4) stainless steel clamps for positive attachment and shall provide a positive seal against infiltration and exfiltration.

2.08 (ADD) SANITARY SEWER SERVICE, LINING

A Lining Material:

- 1 CIPP:
CIPP shall be designed per ASTM F1216, Appendix X1. Materials and Installation practices shall adhere to the minimum requirements of ASTM F2561-11.
- 2 Product:
Liner shall be, T-Liner as manufactured by LMK Technologies, Inc. or equal.
- 3 Liner Assembly:
The liner assembly shall be continuous in length and consist of one or more layers of absorbent textile material i.e. needle punched felt, circular knit or circular braided tubes that meet the requirements of ASTM F1216 and ASTM D5813 Sections 6 and 8. No intermediate or encapsulated elastomeric layers shall be in the textile that may cause de-lamination in the cured in-place pipe. The textile tube and sheet shall be constructed to withstand installation pressures, have sufficient strength to bridge missing pipe segments, and flexibility to fit irregular pipe sections. The wet-out textile tube and sheet shall meet ASTM F 1216, 7.2 as applicable, and shall have a uniform thickness and 5% to 10% excess resin distribution that when compressed at installation pressures will meet or exceed the design thickness after cure.
- 4 Mainline Liner Tube:
The main sheet will be flat with one end overlapping the second end and sized accordingly to create a circular lining equal to the inner diameter of the main pipe. The interior of the textile sheet shall be laminated with an impermeable, translucent flexible membrane. The textile sheet before insertion shall be permanently marked on the membrane as a "Lateral Identification" correlating to the address of the building the lateral pipe provides service.
- 5 Lateral Liner Tube:
The exterior of the lateral liner tube shall be laminated with an impermeable, translucent flexible membrane. Longitudinal seams in the tube shall be stitched and thermally sealed. The lateral tube will be continuous in length and the wall thickness shall be uniform. The lateral tube will be capable of conforming to offset joints, bells, disfigured pipe sections and pipe diameter transitions.
- 6 Mainline Connection:
The main tube and lateral tube shall be formed as a one-piece assembly by stitching the lateral tube to the main sheet aperture. The connecting end of the lateral tube shall be shaped to match the aperture and curvature of the main tube. The lateral tube and main tube are connected by stitching and sealing the stitching using a flexible UV cured adhesive/sealant. The main and lateral tubes are assembled in the shape of a "T" or WYE with corresponding dimensions.

- 7 Gasket Seals:
The mainline connection shall include a seamless molded flange shaped end seal gasket attached to the main liner tube by use of stainless steel snaps. The lateral tube shall include an O-ring gasket attached six-inches from the upstream terminating end of the lateral tube.
- B Resin Material:
 - 1 The resin/liner system shall conform to ASTM D5813 Section 8.2.2.
 - 2 The resin shall be a corrosion resistant polyester, vinyl ester, epoxy or silicate resin and catalyst system that when properly cured within the composite liner assembly, meets the requirements of ASTM F1216, the physical properties herein, and those which are to be utilized in the design of the CIPP, for this project.
 - 3 The resin shall produce CIPP, which will comply with the structural and chemical resistance requirements of ASTM F1216.
- 2.09 (ADD) SANITARY SEWER SERVICE, INTERFACE SEAL
 - A Refer to Section 4050 2.08 for Product Information.
- 2.10 (ADD) SANITARY SEWER SERVICE, CLEANING and INSPECTION
 - A Camera:
 - 1 Produce a high resolution, quality color video image.
 - 2 Integral lighting to provide proper illumination and a clear video image of the entire periphery of the pipe.
 - 3 Capable of operating in 100% humidity conditions.
 - B Provide closed-circuit video inspection equipment capable of displaying on screen footage of camera distance measured to within 1% of actual distance.
 - C Record the inspection in color.
- Part 3: EXECUTION
- 3.01 SEWER CLEANING AND INSPECTION FOR REHABILITATION
 - B Pre-Cleaning Inspection:
 - 4 (ADD) Pre and post videos shall be submitted on a weekly basis for review.
 - D Additional Sewer Cleaning:
 - 4 (REPLACE) If deposits and obstructions cannot be removed by tools normally used in the sewer cleaning industry and a point repair is determined by the contractor to be required, notify Engineer immediately and the owner will either:
 - a Perform the necessary repair, the owner will coordinate the repair within four (4) weeks of receiving the notification.
 - b At its discretion, have this work performed by a third party.
 - c At its discretion, have the contractor perform the necessary repair.
 - d Should a contractor's equipment become lost during operation, the contractor shall be responsible for the recovery of said equipment along with any point repair as necessary.
- 3.03 CIPP MAIN LINING
 - F Service Reinstatement:
 - 2 (NO CHANGE)
 - a (ADD) The contractor shall reopen active services only and services to vacant lots only as directed by the Engineer. The responsibility for determining which services are inactive and which do not serve vacant lots shall be the contractor's.
 - b (ADD) Dye testing of service connections shall be performed during pre-lining televising at no additional cost to the owner; this is to be performed to establish whether services are active.
 - c (ADD) Do not open abandoned service connections except at Engineer's direction. If abandoned service connections are opened without Engineer's approval, perform an internal spot repair to close the connection, at no additional cost to the owner.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4050 - PIPE REHABILITATION

- 3 (REPLACE) Machine the opening to full size of the service connection opening area. Holes cut through the liner shall be neat, smooth, and to the full diameter of the existing connection in order to prevent blockage at the connection. Ensure the bottom of the liner opening and service line are flush.
 - 4 (REPLACE) All service edges shall be smoothed with a wire brush attachment after internal reinstatement. Ensure the opening does not have pipe fragments or CIPP fragments that may obstruct flow or snag debris.
- G Inspection:
- 4 (ADD) The Contractor shall outline specific repair or replacement procedures for potential defects in the installed CIPP. Repair/replacement procedures shall be as recommended by the CIPP system manufacturer and shall be submitted to the Owner at the Pre-Construction Meeting.
 - a Repairable defects in the installed CIPP shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of SUDAS.
 - b Un-repairable defects to the CIPP shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement of the CIPP.
 - 5 (ADD) Defects in the installed CIPP that will not affect the operation and long term life of the product shall be identified and defined. The Owner reserves the right to request an independent evaluation of a defective CIPP identified and defined by the Contractor to not affect the operation and long term life of the product.
 - 6 (ADD) Test coupons shall be removed at the downstream manhole.
 - 7 (ADD) Active leaks shall be sealed or stopped with grout prior to lining in accordance with 4050.3.06.
- 3.09 (ADD) SANITARY SEWER SERVICE, LINING
- A Prior to entering access areas such as manholes, an excavation pit, performing inspection or cleaning operations, an evaluation of the atmosphere to determine the presence of toxic or flammable vapors or lack of oxygen shall be undertaken in accordance with local, state, or federal safety regulations.
 - B Cleaning and Inspection – As per NASSCO Standards.
 - C If a cleanout is required, the cleanout shall be located no less than within two (2) feet of the finished liner.
 - D The upstream side of the cleanout (if installed) shall be plugged during insertion and curing of the liner assembly ensuring no flows enter the pipe and no air, steam or odors will enter the building. When required, the main pipe flows will be by-passed. The pumping system shall be sized for normal to peak flow conditions. The upstream manhole shall be monitored at all times and an emergency deflating system will be incorporated so that the plugs may be removed at any time without requiring confined space entry.
 - E The interior of the pipeline shall be carefully inspected to determine the location of any condition that shall prevent proper installation, such as roots, and collapsed or crushed pipe sections. These conditions shall be noted. Experienced personnel trained in locating breaks, obstacles, and service connections by closed circuit television shall perform inspection of pipelines.
 - F The existing service lateral shall be clear of obstructions that prevent the proper insertion and expansion of the lining system. Changes in pipe size shall be accommodated if the lateral tube is sized according to the pipe diameter and condition. Obstructions may include dropped or offset joints of no more than 20% of inside pipe diameter.
 - G The liner assembly is encapsulated within the translucent bladder (liner/bladder assembly) shall be saturated with the resin system (wet-out) under controlled vacuum conditions. The volume of resin used shall be sufficient to fill all voids in the textile lining material at nominal

- thickness and diameter. The volume shall be adjusted by adding 5% to 10% excess resin for the change in resin volume due to polymerization and to allow for any migration of resin into the cracks and joints in the original pipe. No dry or unsaturated area in the mainline sheet or lateral tube shall be acceptable upon visual inspection.
- H The lateral tube and inversion bladder will be inserted into the carrying device. The main bladder and main flat sheet shall be wrapped around a "T" launching device, formed into a tube and secured by use of rubber bands. A seamless molded flange shaped end seal gasket shall be attached to the main liner tube by use of stainless steel snaps. The end seal shall be installed at the main/lateral pipe interface by inserting the gasket tube into the lateral pipe until the brim of the gasket is firmly seated against the mainline pipe. An end seal O-ring for lateral CIPP shall be installed 6-inches from the upstream terminating end of the lateral tube. The launching device is inserted into the pipe and pulled to the point of repair. The pull is complete when the lateral tube is aligned with the lateral pipe. The lateral tube is completely protected during the pull. The mainline liner is supported on a rigid "T" launcher that is elevated above the pipe invert through the use of a rotating skid system. The liner assembly shall not be contaminated or diluted by exposure to dirt or debris during the pull.
 - I The main bladder shall be inflated causing the main sheet to unwrap and expand; pressing the main tube firmly into contact with the main pipe and embedding the flange shaped gasket between the main tube and the main pipe at the lateral opening. The lateral tube is inverted through the main tube aperture by the action of the lateral bladder extending into the lateral pipe to a termination point that shall be no less than 2-feet from the exterior cleanout. The bladder assembly shall extend beyond each end of the liner, so the liner remains open-ended and no cutting shall be required.
 - J After the liner has been fully deployed into the lateral pipe, pressure is maintained pressing the liner firmly against the inner pipe wall until the liner is cured at ambient temperatures or by a suitable heat source. The heating equipment shall be capable of delivering a mixture of steam and air throughout the liner bladder assembly to a uniform raise the temperature above the temperature required to cure the resin. The curing of the CIPP must take into account the existing pipe material, the resin system, and ground conditions (temperature, moisture level, and thermal conductivity of the soil). The heat source temperatures shall be monitored and logged during the cure and cool down cycles. The manufacturer's recommended cure schedule shall be submitted.
 - K Curing shall be done without pressure interruption with air or a mixture of air and steam for the proper duration of time per the resin manufacturer's recommendations. The curing process is complete when the temperature of the CIPP reaches 100 degrees Fahrenheit or less, the processing shall be finished.
 - L The finished CIPP shall be a homogenous liner assembly located within a lateral service pipe for a specific length, and extending into the main pipe to renew 18-inches of the main pipe including the service connection). The CIPP shall be smooth with minimal wrinkling. The CIPP shall be free of dry spots, lifts, and delaminated portions. The CIPP shall include an engineered taper at each end providing a smooth transition to the host pipe for accommodating video equipment and maintaining proper flow in the mainline. After the work is completed, the installer will provide the owner with video footage documenting the repair and the visual markings identifying the sewer lateral address as completed work. The finished product must provide an airtight / watertight verifiable non-leaking connection between the main sewer and sewer service lateral.
- 3.10 (ADD) SANITARY SEWER SERVICE, CLEANING and INSPECTION
- A Equipment shall be able to be launched through a manhole and travel along the sewer main to the sanitary laterals.
 - B Inspect all sanitary sewer services from the main / lateral connection to the R.O.W. (Right of Way) or 25 linear feet up the lateral or as far as the equipment can safely maneuver.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4050 - PIPE REHABILITATION

- C Contractor shall verify each lateral connection from the main to the corresponding property, either using dye testing, sonde locating device or similar equipment.
- D The contractor shall be responsible for notifying the residents 48 hours in advance of performing the work.
- E Provide a binder with copies of the video inspections and the PDF print outs for each lateral inspected.
- F Videos shall include on-screen continuous footage counter, pipe diameter, direction of camera movement, manhole and street location references in the recording.

END OF SECTION

(NO CHANGE) Section 4060 - Cleaning, Inspection, and Testing of Sewers

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 04 - SEWERS AND DRAINS
SECTION 4060 - CLEANING, INSPECTION, AND TESTING OF SEWERS

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DIVISION 05 - WATER MAIN AND APPURTENANCES

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Section 5010 - Pipe and Fittings

Part 1: GENERAL

1.02 DESCRIPTION OF WORK

(ADD) Refer to SUDAS Facility Design and supplemental requirements for design of this work.

1.03 SUBMITTALS

(REMOVE) Submit product information for joint restraint system to be used.

(ADD) All materials to be incorporated into the work must have submittals furnished which show that the materials comply with the Specifications prior to any construction.

1.05 DELIVERY, STORAGE, AND HANDLING

(REMOVE) Remove pipe and fittings contaminated with mud and surface water from the site; do not use in construction unless thoroughly cleaned, inspected, and approved by the Engineer.

(ADD) Remove pipe and fittings contaminated with mud and surface water from the site; do not use in construction unless thoroughly cleaned, inspected, and approved by the Water Department.

(ADD) Store material in accordance with the manufacturers' recommendations and in locations that will minimize the interference with operations, minimize environmental damage and protect adjacent areas from flooding, runoff and sediment deposition. PVC pipe and PVC pipe gaskets must be protected from direct exposure to sunlight.

1.07 (ADD) SPECIAL REQUIREMENTS

A A City of Dubuque right-of-way permit is required for water main or service line installation or repair work within City street right-of-way. Contact City Engineering Department at City Hall, 50 West 13th Street, 563-589-4270 for permits

B Private Mains and Fire Lines: The Water Department will not furnish any materials for private water mains, fire protection lines, or service lines. All materials installed prior to a meter and backflow preventer, in private systems shall meet the same specifications as for public systems, including polyethylene wrap and tracer wire.

C Coordination for Water Service Stubs:

- 1 Water main Public and Private 4 inches in diameter and above shall be successfully tested and all tests passed prior to activating new water mains and making Service Connections.
- 2 Notify Dubuque Water Department (563-589-4291) at least 48 hours in advance for all taps.

D Equipment and Labor furnished by the City of Dubuque:

- 1 The Water Department will furnish labor and tapping equipment necessary to make taps from 3/4 inch to 12 inches in diameter on all public and private water mains connected to the City's public water system. The associated tapping fee shall be paid by the contractor or developer before the tap is installed.
- 2 The Water Department will furnish all labor and equipment to operate water system valves and fire hydrants in conjunction with the work.

E Water Service Lines:

- 1 Water service lines must meet the following requirements when a new structure is proposed to replace a prior structure on a site.
 - a Water service lines 2 inches or smaller must meet local ordinances and plumbing codes and shall be Type K Copper.
 - i Water service lines and taps must be 3/4 inch minimum and utilize a tapping saddle when required.
 - ii Water service line taps 3/4 inch and 1 inch, shall be a direct tap in ductile iron pipe.
 - iii Water service line taps larger than 1 inch shall utilize a tapping saddle in ductile iron pipe.
 - iv All Water service line taps in poly vinyl chloride (PVC) pipe shall utilize a tapping saddle.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- b Water service lines 4 inches in diameter and above must meet local specifications and plumbing codes and shall be ductile iron pipe (DIP).

1.08 MEASUREMENT AND PAYMENT

A Water Main:

1 Trenched:

- a (REPLACE) Measurement: Each type and size of pipe installed in an open trench will be measured in linear feet along the centerline of the pipe including the length through fittings, valves and structures.
- c (REPLACE) Includes: Unit price includes, but is not limited to, trench excavation, dewatering, placing bedding and backfill material, tracer system, testing, disinfection, and polyethylene wrap for ductile iron pipe and for fittings and as specified.

B Water Main with Casing Pipe:

1 Trenched:

- c (REPLACE) Includes: Unit price includes, but is not limited to, furnishing and installing carrier and casing pipe, trench excavation, dewatering, placing bedding and backfill material, casing spacers, if specified placing and installing annular space fill material, joint restraint, tracer system, testing, and disinfection. Excludes imported granular materials.

C Fittings:

1 Fittings by Count:

- c (REPLACE) Includes: Unit price includes, but is not limited to complete installation of the fitting with polyethylene wrap and tracer wire. Joint restraint will be paid for separately.

2 Fittings by Weight:

- a (REPLACE) Measurement: Each type and size of fitting installed as specified in the contract documents or as required for proper installation of the water main will be counted. Determine the total body weight of fittings counted, in pounds, based on the standard fitting weights published by Tyler Union for domestic fittings.
- c (REPLACE) Includes: Unit price includes, but is not limited to complete installation of the fitting with polyethylene wrap and tracer wire. Joint restraint will be paid for separately.

3 (ADD) Trenched Pipe and Fittings Joint Restraint

- a Measurement: Each type and size of joint restraint installed as specified in the contract documents or as required for proper installation of the water main pipe and fittings will be counted.
- b Payment: Payment will be made at the unit price for each type and size of Joint Restraint.
- c Includes: Unit price includes, but is not limited to, complete installation of the Joint Restraint.

D (REPLACE) Water Service Stubs by Each (2 inch and smaller):

1 (NO CHANGE)

2 (NO CHANGE)

3 (REPLACE) Includes: Unit price includes but is not limited to, saddle (when required), water service corporation, curb stop, stop box, trench excavation, dewatering, furnishing and installing pipe, placing and compacting bedding and backfill material, and installation of tracer wire for service pipe (If specified). Shall include permits and City of Dubuque Water Department tap fees, tapping of the main shall be completed by the City of Dubuque Water Department.

E (REPLACE) Water Service Stubs by Length (2 inch and smaller):

1 Water Service Pipe:

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- c (REPLACE) Includes: Unit price includes, but is not limited to, trench excavation; dewatering; service pipe; furnishing and installing pipe; placing and compacting bedding and backfill material; and installation of tracer wire system (if specified). Excludes imported granular material.
- 2 Water Service Connection:
 - c (REPLACE) Includes: Unit price includes but is not limited to, tapping saddle (when required), water service corporation, trench excavation, dewatering, furnishing and installing pipe, placing and compacting bedding and backfill material. Shall include permits and City of Dubuque Water Department tap fees, tapping of the main shall be completed by the City of Dubuque Water Department.
- 3 Water Service Curb Stop and Box:
 - c Includes: Unit price includes, but is not limited to, excavation, hand excavation, equipment, materials, couplings, installing new valve, installing new stop box, connecting to the new / existing service pipe, placing and compacting bedding and backfill.
- F Water Main Abandonment, Cap:
 - 3 (REPLACE) Includes: Unit price includes, but is not limited to, excavation; removing valves (If required); removing valve boxes; cutting pipe; installing MJ caps; and placing and compacting backfill material. Excludes water main connection removal, granular backfill, and retainer glands.
- G Water Main Abandonment, Fill and Plug:
 - 3 (REPLACE) Includes: Unit price includes, but is not limited to, excavation; removing valves (If required); removing valve boxes; cutting and removing the specified section of pipe; furnishing and pumping flowable material to fill the pipe to be abandoned; installing MJ caps; and placing and compacting backfill material. Excludes water main connection removal, furnishing granular backfill material and retainer glands.
- H Water Main Removal:
 - 3 (REPLACE) Includes: Unit price includes, but is not limited to, excavation; cutting pipe; removal and disposal of all valves and piping specified for removal; placing and compacting backfill material. Excludes water main connection removal, furnishing granular backfill material and retainer glands.
- I (ADD) Water Service Curb Stop Valve Replacement:
 - 1 Measurement: Each Water Service Curb Stop Valve installed will be counted.
 - 2 Payment: Payment will be made at the unit price for each Curb Stop Valve installed.
 - 3 Includes: Unit price includes, but is not limited to, excavation, hand excavation, equipment, materials, couplings, new valve, connecting to the new / existing service pipe, placing and compacting bedding and backfill, installing new Curb Stop Valve. Excludes furnishing granular material.
- J (ADD) Water Service Curb Stop Box and Riser Replacement:
 - 1 Measurement: Each Water Service Curb Stop Box and Riser installed will be counted.
 - 2 Payment: Payment will be made at the unit price for each Curb Stop Box and Riser installed.
 - 3 Includes: Unit price includes, but is not limited to, excavation, hand excavation, equipment, materials, placing and compacting backfill, installing new Curb Stop Box and Riser. Excludes furnishing granular backfill material.
- K (ADD) Water Service Curb Stop Box Extension:
 - 1 Measurement: Each Water Service Curb Stop Box Extension installed will be counted.
 - 2 Payment: Payment will be made at the unit price for each Curb Stop box extension installed.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- 3 Includes: Unit price includes, but is not limited to, excavation, hand excavation, equipment, materials, placing and compacting backfill, installing new curb stop box extension. Excludes furnishing granular backfill material.
- L (ADD) Removal and Salvage – Water Main Fittings and Appurtenances:
 - 1 Measurement: No measurement will be made of individual salvaged materials
 - 2 Payment: Payment will be a lump sum price
 - 3 Includes: Lump sum price includes, but is not limited to, excavation, hand excavation, equipment, materials, placing and compacting backfill, removal of identified appurtenances, and delivering to the Water Department as requested. Excludes furnishing granular backfill material.
- M (ADD) Water Main Connection Removal:
 - 1 Measurement: Each size and location of water main connection (tee, cross, etc.) to be removed shall be counted.
 - 2 Payment: Payment will be made at the unit price for each size and location of water main connection removed.
 - 3 Includes: Unit price includes, but not limited to excavation, cutting main that will remain active, removing fitting (tee, cross, etc.), pipe and designated valves (line and branch); replacing with equivalent water main pipe utilizing appropriate couplings (unrestrained or restrained).

Part 2: PRODUCTS

2.01 WATER MAIN

- A (REPLACE) Polyvinyl Chloride (PVC) Pipe: Comply with AWWA C900 with ductile iron pipe equivalent outside diameters and shall be made in the USA. Requests may be made to the Water Department for polyvinyl chloride (PVC) pipe use. The request shall include results of an IDNR required review of records for any leaking underground storage tank (LUST) site within 500 feet of the proposed water main construction. In areas where PVC pipe is requested and there is no IDNR information available, the requestor could be required, based on the condition and previous use of the site(s), to provide the Water Department with a Phase One Environmental Study. Upon receipt of the required information, the Water Department will determine if PVC may be substituted for DIP. PVC pipe may be substituted for DIP under certain soil and ground-water conditions, where there is no environmental contamination by petroleum products or any other type of contaminants that might permeate PVC pipe or cause damage to PVC pipe. PVC pipe may not be installed within 1000 feet of property zoned commercial or industrial without prior authorization from the City Manager's designee. PVC pipe may be substituted for ductile iron pipe in residential areas for sizes 8 inch, 12 inch and 16 inch.
 - 1 Minimum Wall Thickness:
 - a (REPLACE) 8 inch, 12 inch and 16 inch: Pressure Class 305, DR 14
 - b (REPLACE) Sizes over 16 inch: Not allowed.
 - c (ADD) Sizes 10 inch and 14 inch: Not allowed
 - 2 (REPLACE) Joint Type: Use push-on joint type, except as otherwise specified in the contract documents or as authorized by the Water Department.
 - a (REPLACE) Push-on According to AWWA C900 and ASTM D 3139 with gasket per ASTM F477 and NSF61 compliant lubricant.
 - b (REPLACE) Integral Restrained Joint: AWWA C900 pipe with restraining system manufactured integrally into pipe end. (Bulldog System, Eagle Loc 900, Certa-Lok RJIB or RJ, or equivalent).
 - c (REPLACE) Mechanical Restrained Joint: Restraining glands for mechanical joints connected to PVC pipe shall comply with the requirements of ASTM F1674 and have polyester or epoxy coating.
 - a) EBAA Iron Series 2000PV
 - b) Tyler/Union All domestic Series 2000 MJ Tufgrip

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- c) Romac Romagrip for PVC made in USA or GripRing Pipe Restrainer
 - d (ADD) Joint Harness: PVC pipe push-on joint harnesses when specified or approved with stainless steel bolts/nuts and stainless steel rods/nuts.
 - a) EBAA Series 1500TD or 1600TD
 - b) Romac Style 611 (USA made only)
 - e (ADD) PVC Joint Insertion Stop: Joint insertion stops shall be installed on all PVC pipe joints to be installed in casing. Insertion stops shall be EBAA Iron Mega-Stop Series 5000 with epoxy coating and stainless steel assembly bolts, or USA made equal.
 - f (ADD) Joint Restraint Gaskets: Not allowed
 - B Ductile Iron Pipe (DIP):
 - 1 Minimum Thickness Class
 - a (REPLACE) 4 inch through 12 inch sizes: Special thickness Class 52 according to AWWA C151
 - b (REPLACE) Sizes 16 inch, 20 inch and 24 inch only: Special thickness Class 51 according to AWWA C151
 - c (REPLACE) Flanged Pipe: Special Thickness Class 53 for flanged DIP in structures
 - d (REPLACE) Shall be made in USA
 - 2 (REPLACE) Cement-mortar Lined: Standard thickness according to AWWA C104 with seal coat.
 - 3 (REPLACE) External Coating: Seal coat according to AWWA C151. If specified in the Special Provisions, flanged pipe exterior to have 2-coat epoxy coating within structures.
 - 4 (REPLACE) Joint Type: Use push-on type, unless otherwise specified in the Special Provisions, shown on the drawings or as authorized by the Water Department.
 - c (REPLACE) Restrained, Buried: Pipe manufacturer's standard field removable system, TR Flex, MJ with retainer glands (see 2.03.A.1.b), or joint harness (see 2.01.A.2.d)
 - d (REPLACE) Restrained, in Structures: Flanged.
 - e (REPLACE) Flanged: According to AWWA C111 and C115.
 - f (REMOVE) Grooved/Shouldered: According to AWWA C606.
 - g (REPLACE) Gaskets: According to AWWA C111 and NSF61 compliant lubricant and Supplemental Specification for SUDAS 5010.2.06
 - h (ADD) Restrained, in Casing: Pipe manufacturer's standard field removable system, TR Flex, or MJ retainer glands.
 - i (ADD) Joint Restraint Gaskets: Per approval by the Water Department.
 - 5 Markings on Pipe:
 - d (ADD) Manufacturer's mark, country where cast, the year in which the pipe was produced and the letters DI or "Ductile" shall be stamped on pipe.
 - 6 (ADD) Standard Laying Lengths: Shall be 18 or 20 feet. Random lengths are not acceptable.
- 2.02 BOLTS FOR WATER MAIN AND FITTINGS
 - A Tee-bolts and Hexagonal Nuts for Mechanical Joints:
 - 1 (REPLACE) Stainless steel tee-bolts type 304 per ASTM F593
 - 2 (REPLACE) Stainless steel heavy hex nuts type 304 per ASTM F594
 - 3 (ADD) Fluoropolymer coating on nuts to prevent galling.
 - B (REPLACE) Other Bolts, Rods and Nuts
 - 1 Stainless steel
 - a (ADD) For flanges, flange adapters, joint harnesses, thrust restraint, couplings etc.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- b (ADD) Stainless steel bolts and rods type 304 per ASTM F 593 and stainless steel nuts type 304 per ASTM F 594 with anti-galling coating.
 - 2 (REMOVE) Ductile iron.
 - 3 (REMOVE) Zinc, zinc chromate, or cadmium plated.
- 2.03 FITTINGS
 - A (REPLACE) For DIP and PVC: Comply with AWWA C110 for MJ and Flanged (ductile iron or gray iron) or AWWA C153 for MJ (ductile iron). Fitting shall be USA made Tyler Union unless otherwise approved by the Water Department.
 - 1 Joint Type:
 - a (REPLACE) Mechanical joints complying with AWWA C111 for buried water main. Do not use MJ by plain end fittings.
 - b (REPLACE) Mechanical Joint Retainer Glands
 - 1) EBAA Series 1100 Megalug for DIP or Series 2000PV for PVC pipe
 - 2) Tyler/Union All Domestic Series 1000 MJ Tufgrip for DIP or Series 2000 MJ Tufgrip for PVC pipe
 - 3) Romac USA made and polyester coated, RomaGrip for DIP or RomaGrip for PVC pipe or GripRing Pipe Restraint.
 - c (REPLACE) Flanged Joints: In Structures, joints per AWWA C111
 - 2 (REPLACE) Lined: Cement mortar lined (standard) according to AWWA C104 with seal coat. If specified in Special Provisions, exterior of flanged fittings to have fusion bonded coating per AWWA C116 or 2-coat epoxy coating with surface preparation per NAPF 500-03 within structures (6.0 to 10.0 mils DFT).
 - 3 (REPLACE) Wall Thickness: Comply with AWWA C153 or AWWA C110.
 - 4 (REPLACE) Gaskets: Comply with AWWA C111 with MJ lubricant in compliance with NSF 61.
 - 5 (ADD) Joint Restraint Design:
 - a The Design Engineer for the water main project shall design the joint restraint system to withstand test pressure thrust. Engineer shall submit calculations to the Water Department.
 - B (REPLACE) Flange Adapter (ANSI Class 125):
 - 1 (REPLACE) Body: Ductile iron complying with ASTM A 536, with polyester or epoxy coating.
 - a One Piece Adapter:
 - 1) EBAA E-Z Flange Series 1000
 - 2) Tyler Union, USA made Adapter Flange 27U
 - 3) Romac Field flange
 - b Two Piece Adapter:
 - 1) EBAA Megaflange Series 2100
 - 2) Romac RFCA or Alpha FC
 - 2 (REPLACE) End Rings (Follower Rings): Ductile iron complying with ASTM A 536 with epoxy or polyester coating.
 - 3 (REPLACE) Gaskets: NSF 61 certified SBR or EPDM unless NSF61 Nitrile is required per 5010.2.06 or in Special Provisions.
 - 4 (REPLACE) Bolts and Nuts:
 - a Tee Bolts and Hex Nuts: Type 304 Stainless Steel per ASTM F593/F594. Nuts to have anti-galling coating.
 - b Flange Bolts and Nuts: Type 304 Stainless Steel per ASTM F593/F594. Nuts to have anti-galling coating.
 - c Restraining Bolts/Wedges: Restraining bolts and wedges shall be ductile iron with polyester or epoxy coating.
 - d Set Screws: Heat treated hardened steel or hardened stainless steel if specified in the Special Provisions or on the plans.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- C (REPLACE) Pipe Coupling (Cast):
- 1 (REPLACE) Castings: All cast components (Center ring, bolt guides, etc.) shall be ductile iron per ASTM A536 with center ring NSF 61 Fusion bonded epoxy coated and other castings epoxy or polyester coated.
 - 2 (REPLACE) Restraint Coupling Grippers: Ductile iron per ASTM A536 sharpened and heat treated and coated for corrosion resistance.
 - 3 (REPLACE) Gaskets: NSF 61 certified SBR or EPDM unless NSF61 Nitrile is required per 5010.2.06 or in Special Provisions.
 - 4 (REPLACE) Bolts and Nuts: Type 304 stainless steel per ASTM F593/F594. Nuts to have anti-galling coating.
 - 5 (ADD) Approved Couplings: USA made
 - a Romac 501 (5" center ring)
 - b Romac Macro HP
 - c Romac Alpha (restrained)
 - d Other products must be approved by Water Department
- 2.04 (REPLACE) THRUST RESTRAINT REQUIREMENTS:
- A Water main thrust restraint shall be by use of restrained joint of fittings and pipe for all sizes of water mains and service lines 4-inch and larger. Joint restraint calculations shall be submitted to the Water Department.
- B If the use of restrained joints is not possible, the Design Engineer or the Contractor must submit a written request with justification and calculations based on:
- 1 Use of Iowa DOT Class C concrete
 - 2 Verification of test pressure and soil strength when using figure SUDAS WM-101 (5010.101).
 - 3 Any bolts, nuts, rods, accessories, etc. shall be type 304 stainless steel of a size required for thrust loads.
 - 4 The use of wood blocking is prohibited.
 - 5 Concrete thrust blocks may be installed only when a written approval is issued by the Water Department.
- C Thrust restraint shall be designed and installed for the water main test pressure, 150 psi minimum or one and a half times the operating pressure.
- 2.05 PIPELINE ACCESSORIES
- A Polyethylene Wrap:
- 2 (REPLACE) Provide tubes or sheets with 8 mil minimum thickness and blue in color and have a minimum tensile strength of 1200 psi.
- B Tracer System:
- 1 Tracer Wire:
 - a (REPLACE) Open Cut and within Casing
 - 1) (REPLACE) Stranded Single Copper Conductor:
 - a) Size: #12 AWG
 - b) Insulation Material: High molecular weight polyethylene (HMWPE) insulation suitable for direct burial, with red color.
 - c) Insulation Thickness: 0.030 inches, minimum.
 - d) Tensile Strength: 198 pounds, minimum
 - e) Operating Voltage: Rated for 30 volts.
 - f) Kris-Tech Wire or USA made equal
 - b Directional Drilling/Boring without Casing:
 - 1) Stranded Stainless Steel Conductor
 - a) Size: #8 AWG
 - b) Rating: Direct Burial
 - c) Operating Voltage: Rated for 30 volts
 - d) Conductivity: 21%

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- e) Insulation Material: HMWPE insulation suitable for direct burial, with red color
 - f) Insulation Thickness: 0.045 inches, minimum
 - g) Tensile Strength: 1,700 pounds, minimum
 - h) Kris-Tech Wire or USA made equal
 - 2 (REPLACE) Ground Rod: 5/8 inch diameter, 24 inch long copper clad steel rod uniformly coated with metallically bonded electrolytic copper Ground Rod Clamp: Not required.
 - 4 (REPLACE) Splice Kit: For submersible direct bury applications for single conductors, for copper and stainless steel tracer wires, Advance E&I Systems, 3M, or equal.
 - 5 (REPLACE) Tracer Wire Station: Copperhead brand snakepit two-terminal switchable lid. Part #SP-SWLID-2(B).
- 2.06 SPECIAL GASKETS
- A (REPLACE) For soils contaminated with gasoline, use nitrile gaskets.
 - B (REPLACE) For soils contaminated with volatile organic compounds, use nitrile gaskets.
 - C (REPLACE) For other soil contaminants, contact Water Department for the required gasket.
- 2.07 WATER SERVICE PIPE AND APPURTANENCES
- B Materials
 - 1 (REPLACE) Copper Pipe (2 inch and smaller)
 - a Comply with ASTM B88
 - b Wall Thickness: Type K
 - c Annealed
 - d Refer to City Ordinance number 13-1A-6 INSTALLATION STANDARDS AND MATERIALS
 - 2 (REPLACE) DIP: Four inch (4") and larger. As specified in Section 5010, 2.01 through 2.06, Polyethylene wrap and tracer wire are required.
 - 3 (REPLACE) PVC: Eight inch (8") through sixteen inch (16"). As specified in Section 5010 2.01 through 2.06, Polyethylene wrap is required around all fittings and tracer wire is required.
 - C (REPLACE) Corporation Stops, Curb Stops and Curb Stop Boxes: Contact Water Dept. for requirements.
 - 1 Corporations: Corporations (Corp. stops) and saddle, as required will be furnished and installed by the Water Dept. as part of installing the tap.
 - 2 Contact Water Dept. for fees.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

Part 3: EXECUTION

3.01 PIPE INSTALLATION

A General

- 5 (REPLACE) Push pipe joint to the indication line on the spigot end of the pipe. Assemble DIP joint before making any joint deflections. Do not over insert PVC pipe spigot. Do not deflect PVC pipe joints or PVC pipe vertically or horizontally.
- 6 (REPLACE) Limit joint deflections to one degree less than pipe manufacturer's recommended maximum limit. These requirements shall apply to DIP only. See the following tables (based on DIPRA):

ADJUSTED JOINT DEFLECTION FOR DIP PUSH-ON JOINTS					
		Offset / Segment		Approximate Radius of Curve	
Size	Adjusted Angle (Degrees)	L = 18-ft	L = 20-ft	L = 18-ft	L = 20-ft
4"	4	15"	17"	258'	286'
6"	4	15"	17"	258'	286'
8"	4	15"	17"	258'	286'
10"	4	15"	17"	258'	286'
12"	4	15"	17"	258'	286'
16"	2	8"	8"	515'	573'
20"	2	8"	8"	515'	573'
24"	2	8"	8"	515'	573'

ADJUSTED JOINT DEFLECTION FOR DIP MECHANICAL JOINTS					
		Offset / Segment		Approximate Radius of Curve	
Size	Adjusted Angle (Degrees)	L = 18-ft	L = 20-ft	L = 18-ft	L = 20-ft
4"	7	26"	29"	147'	163'
6"	6	23"	25"	172'	191'
8"	4	15"	17"	258'	286'
10"	4	15"	17"	258'	286'
12"	4	15"	17"	258'	286'
16"	2.5	9"	10"	412'	458'
20"	2	8"	8"	515'	573'
24"	1	4"	4"	1031'	1146'

- 8 (REPLACE) For all DIP and PVC pipe water main and fittings, install restrained joints. Do not install concrete thrust blocks without written approval of the Water Department.
- 9 (REPLACE) Keep exposed pipe ends closed with watertight plugs at all times when pipe installation is not occurring.
- 10 (REPLACE) Close the ends of the installed pipe with watertight plugs during nights and non-working days.
- 12 (ADD) Stake watermain location and right-of-way in new subdivisions prior to water main construction.
- 13 (ADD) Install only approved materials.
- 14 (ADD) Keep trench free of water. Clean pipe interior prior to placement in the trench.
- 15 (ADD) As much as is practical, do not locate water service lines under proposed driveways or sidewalks.

3.02 ADDITIONAL REQUIREMENTS FOR DIP INSTALLATION

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- B (REPLACE) Cut the pipe perpendicular to the pipe barrel. Do not damage the cement lining. Bevel cut, file, or grind the ends for push-on joints according to the manufacturer's recommendations. Deburr cut ends for mechanical joints.
 - C (REPLACE) Encase all pipe, valves, and fittings with polyethylene wrap according to Section 5010, 3.04.
- 3.04 POLYETHYLENE ENCASEMENT INSTALLATION
- A (REPLACE) Apply polyethylene encasement to buried ductile iron pipe and to buried fittings, fire hydrants except base/shoe, and appurtenances. The polyethylene encasement is used to prevent contact between the pipe and the embedment materials, but need not be airtight or watertight.
 - B (REPLACE) Install polyethylene encasement according to AWWA C105, methods A, B or C, using tubes or flat sheets, pipe manufacturer's recommendations, and polyethylene encasement according to City of Dubuque Water Polywrap Detail.
 - F (REPLACE) Secure and repair encasement material using polyethylene or PVC tape or replace as necessary.
- 3.05 TRACER SYSTEM INSTALLATION
- A (REPLACE) Install with all buried water main piping. Comply with SUDAS Figure 5010.102 (WM-201) for tracer wire installation.
 - C (REPLACE) Install wire continuously along the upper quadrants of the pipe. Do not install wire along the bottom of the pipe. Attach wire to the pipe at the midpoint of each pipe length; use 2-inch wide, polyethylene or PVC pressure sensitive tape.
 - D (REPLACE) Install splices only as authorized by the Water Department or Inspecting Engineer. Allow the Water Department or Inspecting Engineer to inspect all below-grade splices of tracer wire prior to placing the backfill material.
 - F (REPLACE) Bring two wires to the surface at each fire hydrant location and terminate with a tracer wire station. Comply with SUDAS Figure 5010.102 (WM-201).
 - H (ADD) Tracer wire access boxes shall be installed at 500 foot intervals if not a hydrants or as approved by the Water Department.
- 3.08 STRUCTURE PENETRATIONS
- B Wall Sleeves:
 - 3 (ADD) Sleeves with exterior waterstop may be polyethylene cast into the concrete wall for Link Seal or approved alternate sealing system.
 - 4 (ADD) Wall penetrations may be PSX Direct Drive Boot installed in a cast-in hole or core drilled hole.
- 3.09 WATER SERVICE STUB
- A (REPLACE) Install water service pipe, curb stops and stop boxes according to Water Department requirements. Copper water services shall have natural sand bedding and backfill material (IDOT PCC fine aggregate) from 4-inches below the pipe to 4-inches above the pipe. Water main taps including saddle (if required) and corporation are to be made by the Water Department. Contact Water Department for requirements and fees.
 - B (REPLACE) All taps (Direct DIP or with saddle on DIP and PVC pipe) shall be located a minimum distance of 2-feet from the pipe bell and at least 18-inches from other taps or fittings in DIP and at least 3-feet from other taps or fittings in PVC pipe (and staggered around pipe).
- 3.10 WATER MAIN ABANDONMENT
- (REPLACE) Verify with the Water Department that all services are no longer using the main to be abandoned and have been disconnected from the main to be abandoned.
- A (REPLACE) For Each Pipe to be Abandoned by Capping:
 - 1 Remove the Water Main Connection(s)
 - a Cut the main that will remain in service and the line to be abandoned 3 to 5 feet from active main.
 - b Remove fitting(s), pipe, and designated valves (line and branch).
 - c Disinfect water main piping to be installed.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

- d Install equivalent water main piping utilizing appropriate couplings (unrestrained or restrained).
 - 2 Install MJ cap(s) on the end(s) of the water main or service line to be abandoned.
 - B (REPLACE) For Each Pipe to be Abandoned by Filling:
 - 1 Remove the Water Main Connection(s) according to 3.10-A.1.
 - 2 Fill the pipe to be abandoned by pumping flowable mortar or bentonite slurry complying with Section 3010.
 - 3 Install MJ cap(s) on the ends of the water main or service line to be abandoned.
- 3.11 WATER MAIN REMOVAL
- (REPLACE) Verify with the Water Department that all services are no longer using the main and have been disconnected from the main to be removed.
- A (REPLACE) For each pipe to be removed:
 - 1 Remove the Water Main Connection(s) according to 3.10-A.1.
 - B (REPLACE) Remove and dispose of water main pipe. Place and compact backfill material.
 - C (REMOVE) Cut pipe to be removed a minimum of 5 feet from the closed valve on each end of the active pipes leaving a minimum of 12 inches of pipe exposed beyond the thrust block.
 - D (REMOVE) Install a MJ cap using a retaining gland according to Figure 5010.101 at the end of each active pipe.
 - E (REMOVE) Remove and dispose of water main pipe. Furnish, place, and compact backfill material.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

The details from Section 5010 shown in the table below have been modified as part of this supplemental specification. A more detailed summary of the modifications is included below the table.

City of Dubuque Modifications to Standard SUDAS Section 5010 Details			
Details		Description	Dubuque Supplemental Specification
5010.101	WM-101	Thrust Blocks	Specification Modification
5010.102	WM-102	Tracer System	Detail Modification

Figure 5010.101

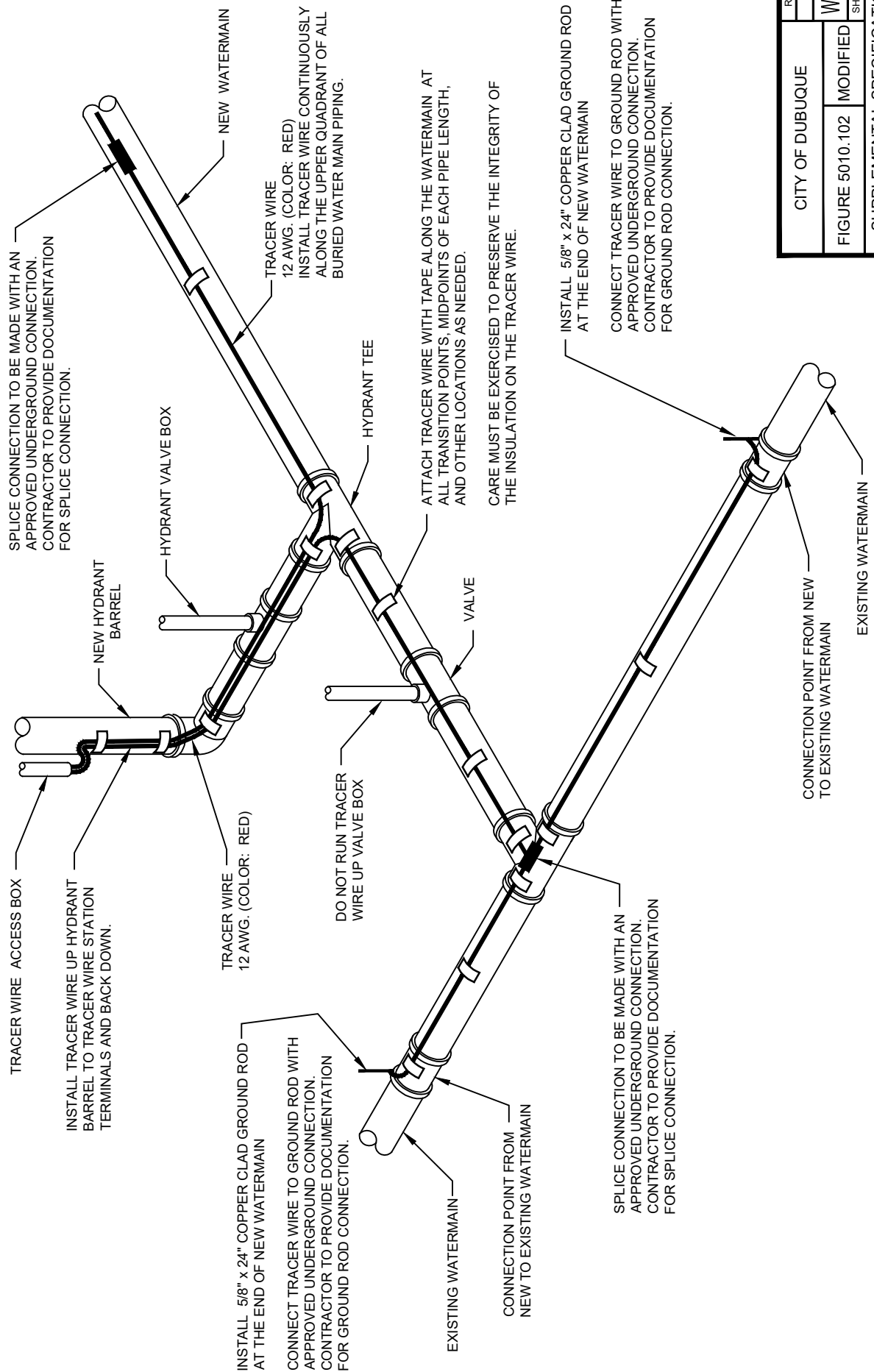
(ADD) Notes and requirements.

- A Thrust restraint shall be provided to restrained joints of fittings and pipe.
 - 1 Thrust restraint calculations shall be submitted to the Water Department for review.
- B Concrete thrust blocks will only be allowed if it is not possible to use restrained joints and if approved by the Water Department in writing.
- C Thrust block design must be based on water main test pressure and site specific soil conditions.

Figure 5010.102

(REPLACE) Figure 5010.102 (WM-102) Tracer System

- A Install wire on top quadrant of water main.



CITY OF DUBUQUE	REVISION	2023
	WM-102	SHEET 1 of 1
FIGURE 5010.102	MODIFIED	
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		
TRACER SYSTEM		

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

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DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

END OF SECTION

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5010 - PIPE AND FITTINGS

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Section 5011 - Fusible PVC and HDPE Pipe

Part 1: (REMOVE) GENERAL

Part 2: (REMOVE) PRODUCTS

Part 3: EXECUTION

(REPLACE) Comply with Section 4010, Part 2 for material requirements of fusible HDPE sanitary force main as well as the following.

END OF SECTION

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5011 - FUSIBLE PVC AND HDPE PIPE

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Section 5020 - Valves, Fire Hydrants, and Appurtenances

Part 1: General

1.01 SECTION INCLUDES

E (REMOVE) Flushing Devices (Blowoffs)

1.03 SUBMITTALS

(ADD) All materials to be incorporated into the work must have submittals furnished which show that the materials comply with the Specifications prior to any construction.

1.08 MEASUREMENT AND PAYMENT

A Valve (Butterfly or Gate):

- 3 (REPLACE) Includes: Unit price includes, but is not limited to, all components attached to the valve or required for its complete installation, including underground operator, square valve operating nut, valve box and cover with Valve Box Adaptor II (or BFV), final trench backfill if not imported granular and box adjustment to final ground surface.

B Tapping Valve Assembly:

- 1 (REPLACE) Measurement: Each size of tapping valve and sleeve will be counted. Water Department will perform pipe tapping. Contact Water Department for tapping fee and materials furnished.
- 2 (REPLACE) Payment: Payment will be at the unit price for each tap and tapping assembly (sleeve and valve) installed.
- 3 (REPLACE) Includes: Unit price includes, but is not limited to, safe excavation, water main preparation, Water Department tapping fee, installation of valve box and cover and Valve Box Adaptor II, final trench backfill if not granular and box adjustment to final ground surface by Contractor. Water Department tapping fee includes installation of tapping sleeve and valve and furnishing valve box by Water Department.

C (REPLACE) Fire Hydrant

- 1 Measurement: Each fire hydrant will be measured as a single unit.
- 2 Payment: Payment will be at the unit price for each fire hydrant.
- 3 Includes: Unit price includes, but is not limited to, the fire hydrant (Set to required elevations for supply lead and height of fire hydrant above finished grade), barrel extensions (If hydrant elevations are incorrect), support block, porous backfill for hydrant drainage, tracer wire access station, polyethylene wrap above hydrant shoe and on top of drainage stone, pumper nozzle orientation and final trench backfill. Excludes 6-inch DIP lead or anchoring pipe, pipe fittings, tap, isolation gate valve with box, joint restraint and imported bedding and granular backfill.

D (REMOVE) Alternate Fire Hydrant Assembly:

E (REMOVE) Flushing Device (Blowoff):

H Valve Box Replacement:

- 3 (REPLACE) Includes: The unit price for each valve box replacement includes, but is not limited to, excavation; removal of existing valve box; furnishing and installing new valve box with Valve Box Adaptor II (or BFV), backfill; compaction, and all other necessary appurtenances. Excludes imported granular bedding and backfill.

I Fire Hydrant Adjustment:

- 3 (REPLACE) Includes: The unit price for adjustment of an existing fire hydrant includes, but is not limited to, excavation of the existing hydrant barrel; furnishing and installing the extension barrel segment and stem; replacement and compaction of backfill; and all other necessary appurtenances.

J Fire Hydrant Assembly Removal:

- 3 (REPLACE) Includes: The unit price includes, but is not limited to, excavation, removal of the fire hydrant, hydrant lead, hydrant isolation valve, any thrust blocks, delivery of the fire hydrant assembly to the Water Department (if specified), cutting

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

out hydrant lead fitting at water main and replacing with water main spigot and couplings, backfill (If not granular), compaction, and reseeding grass areas to match the surrounding areas.

Part 2: PRODUCTS

2.01 VALVES

A General:

- 2 (REPLACE) Direction of Opening: The valve opening direction is to be clockwise as viewed from the top (Open right).
- 3 Joints
 - a (REPLACE) For buried installations, use mechanical joints per AWWA C111. Comply with Section 5010-2.02.A of this Supplemental Specification for joint nuts and bolts.
 - b (REPLACE) For installation within structures, flanged with dimensions and drillings according to AWWA C110 or ANSI B16.1 class 125. Install with stainless steel bolts and nuts per Section 5010-2.02.B of this Supplemental Specification.
- 4 (ADD) The metal interior surfaces and the exterior of all valves shall be epoxy coated per AWWA C550 and NSF 61.
- 5 (ADD) Valve shall be USA made.

B Gate Valves:

- 1 (REPLACE) Standards: Comply with AWWA C509 (gray iron or ductile iron) or AWWA C515 (ductile iron) for resilient seated gate valves and NSF 61, for sizes 4 inch through 24 inch. Valves shall be for 250 psi working pressure, tested to 500 psi.
- 3 (REPLACE) External Bolts and Hex Nuts: Stainless steel according to F593/F594, Type 304, or approved alternate stainless steel bolts/nuts.
- 4 (ADD) All gate valves shall be standard design with non-rising stems and "o" ring stuffing box. Valve stems shall be of bronze. Valve operating nut shall be two inch (2") square (at base).
- 5 (ADD) Manufacturers: Gate valves shall be Kennedy, Clow, Mueller, AFC, or approved USA made alternate.

C Butterfly Valves:

- 1 (REPLACE) Standards: Comply with AWWA C504 class 150B for up to 150 psi working pressure, class 250B for working pressures above 150 psi to 250 psi (gray iron or ductile iron), and NSF 61 for sizes 16 inch through 24 inch.
- 2 (REPLACE) Stem/Shaft(s): Stainless steel, Type 304 or Type 316 per ASTM A276 or Type 630 per ASTM A564. Shaft bearings shall be non-metallic and permanently lubricated. Stem seals shall be same as valve seat.
- 3 For Seat on Body Valves:
 - a (REPLACE) Disc: Ductile iron with Type 316 stainless steel seating edge
 - b (REPLACE) Body Seat: EPDM or Nitrile/NBR retained to body.
 - c (ADD) Body: Ductile iron per ASTM A536 or cast iron per ASTM A126
- 4 For Seat on Disc Valves:
 - a (REPLACE) Disc: Ductile iron per ASTM A536 with EPDM or Nitrile/NBR rubber seat mechanically retained to the disc with Type 304 stainless steel ring and attached with stainless steel fasteners.
 - b (REPLACE) Body Seat: Continuous Type 316 stainless steel seat.
 - c (ADD) Body: Ductile iron per ASTM A536
- 5 (REPLACE) External Bolts and Hex Nuts: Type 304 Stainless steel according to ASTM F593/F594 with anti-galling coating.
- 6 (ADD) Actuator:
 - a Housing: Cast iron or ductile iron with stainless steel fasteners and all stainless steel external position stops. For buried service.
 - b Sizing: Size per AWWA C504

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

- c Operator: 2-inch square operating nut for mechanical joint valves and for flange joint valves.
 - d Mechanism: Traveling nut/lever or worm gear.
- 7 (ADD) Manufacturers: Butterfly valves shall be Kennedy, Clow, DeZurik (BAW), American-BFV (Val-matic) or approved USA made alternate.
- D Tapping Valve Assemblies:
 - 1 (REPLACE) Water Main Tapping: The tapping of water mains for 4 inch and larger connections shall be performed by the Water Department. Contact the Water Department for the required fee for main tapping.
 - 2 (REPLACE) Tapping Valve and Sleeve: The Water Department will furnish the tapping valve with valve box and sleeve as part of the tapping process. The outlet of the tapping valve will be a mechanical joint. Stainless steel bolts and nuts are required for the mechanical joint connection.
 - 3 (REMOVE) Minimum Sleeve Length: Comply with the following table.
 - 4 (REMOVE) Gasket:
 - 5 (REMOVE) Outlet Flange:
 - 6 (REMOVE) Hex Nuts and Bolts:
 - 7 (REMOVE) Tapping Valve Assemblies:
- E (ADD) Air Release Valve Assemblies:
 - 1 From Ten States Standards: At high points in water mains where air can accumulate, provisions shall be made to remove air by means of air relief valves.
 - 2 Air Release Alternatives:
 - a Yard hydrant for 6-inch, 8-inch, 10-inch, and 12-inch water main and 16-inch PVC pipe.
 - b Fire hydrant with modified 6-inch DIP lead for 6-inch, 8-inch, 10-inch and 12-inch water main.
 - c Manually operated ball valve(s) in a manhole for 12-inch and 16-inch DIP and PVC Water Mains; 20-inch and 24-inch DIP water mains.
 - d Automatic air release valve in a manhole for 12-inch and 16-inch DIP and PVC Water Main; 20 inch and 24-inch DIP water mains.
 - 3 Yard Hydrant for Air Release: Comply with 5020.203 (WM-203)
 - a Woodford Y95 flush-with-ground installation and 5-foot bury for up to 125 psi. Consult Water Department for higher pressure.
 - 1) Double check backflow preventer with 3/4-inch hose outlet.
 - 2) Stainless steel or no-lead brass operating pipe and casing.
 - 3) Service Fitting, McDonald 74779 MQ 3/4 M-NPT by Q CTS compression 1/4 bend.
 - 4) Type K copper (3/4-inch) to curb stop.
 - b Ball Style Curb Stop, McDonald 76104 Q (3/4-inch)
 - 1) Installed adjacent to yard hydrant
 - 2) Q CTS compression by Q CTS compression connections
 - 3) Minneapolis pattern thread for curb box connection.
 - 4) Minneapolis pattern curb box McDonald 5614 A, (5-foot length for 4-1/2 to 5-1/2 foot bury) USA made.
 - 5) Type K copper (3/4-inch) to main connection at high point.
 - c Main Connection on Top of Main.
 - 1) Connections to new DIP or PVC pipe. Water mains shall be at an 8"x6", 10"x6", 12"x6" or 16"x6" MJ tee with branch vertical and a 6" MJ plug with 2-inch NPT tap; installed at the water main high point. Install stainless steel 2-inch by 3/4" bushing into plug.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

- 2) Connections to existing DIP/CIP water mains shall use a tapping saddle, Romac 202NS or TPS Series T3 with 3/4-inch F-NPT outlet; installed at the high point.
 - 3) Connections to existing PVC pipe water mains shall be at an MJ tee cut into the existing main with coupling(s) and installed as required for new mains at high point.
 - 4) Install Rhino fiberglass post (blue for water) adjacent to MJ-tee or tapping saddle (fully buried).
- d Ball Style Corporation Stop, McDonald 73149 B (3/4-inch)
 - 1) Installed into MJ tee with tapped 6-inch MJ plug with 2" X 3/4" stainless steel bushing or tapping saddle, on top of existing water main.
 - 2) M-NPT inlet by F-NPT outlet
 - 3) Service Fitting, McDonald 74779 MQ 3/4-inch M-NPT by Q CTS compression 1/4 bend.
 - 4) Type K copper (3/4-inch) to curb stop.
- 4 Fire Hydrant with Modified 6-inch DIP Lead: Comply with Figure 5020.204 (WM-204)
 - a Depth of water main (6-inch, 8-inch, 10-inch or 12-inch) will be increased to accommodate connection tee with 6-inch outlet rotated up at 45 degrees.
 - b Hydrant connection tee shall be a swivel tee (anchoring tee) rotated up 45 degrees.
 - c Connect 6-inch mechanical joint 45-degree vertical bend to branch of swivel tee to provide 5-1/2 feet of cover over top of 6-inch DIP hydrant lead.
 - d Complete installation of lead, isolation valve, and fire hydrant per the fire hydrant specifications and details.
- 5 Manually Operated Ball Valve in Manhole: Comply with Figure 5020.205 (WM-205)
 - a For 12-inch, 16-inch, 20-inch and 24-inch DIP water mains.
 - b Piping
 - 1) Pipe through manhole shall be DIP, class 53, flanged by plain-end and plain-end by plain-end. Connect PE X PE DIP with two-piece flange adapter, EBAA Series 2100 Mega-Flange. Connect DIP to water main with couplings adjacent to manhole. Support DIP with two Standon SST pipe/flange supports.
 - 2) Install 12" X 6", 16" X 6", 20" X 6" and 24" X 6" flanged tee with branch vertical in center of manhole.
 - 3) Install blind flange with 2-inch F-NPT tap. Install 2" X 1" SST bushing.
 - c Metal Pipe/Nipples: Lead free brass (ASTM B43) or stainless steel
 - 1) Brass pipe and nipples shall be schedule 40 and conform to ASTM B687
 - 2) Stainless steel pipe and nipples shall be schedule 40 and conform to ASTM 312 Type 304
 - 3) Joints shall be NPT per ANSI B.1.20.1
 - d Metal Fittings: Lead free brass (ASTM B584) or stainless steel
 - 1) Brass fittings shall be class 150 and conform to ASME B16.15
 - 2) Stainless steel fittings shall be class 150 and comply with ASTM A351, type 304
 - 3) Joints shall be NPT per ANSI B1.20.1.
 - e Air release connections to existing 12-inch, 16-inch, 20-inch and 24-inch water mains require the installation of:
 - 1) A 6" outlet tapping sleeve with a ductile iron MJ outlet with branch vertical.
 - 2) 6-inch gate valve with MJ outlet.
 - 3) Live tap by Water Department. Call for fees.
 - 4) 6-inch MJ plug with two-inch F-NPT tap and 2" by 1" SST bushing

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

- 5) One-inch lead free brass or stainless steel pipe and fittings, stop and drain curb stop, PVC vent piping, vent, etc. as required for flanged tee connection.
- f Lead Free Stop and Drain Ball Curb Stop
 - 1) One-inch F-NPT by F-NPT
 - 2) McDonald 76001 for up to 150 psi.
 - 3) Consult with Water Department for pressure above 150 psi.
- g PVC Pipe and Fittings for Venting
 - 1) PVC pipe shall be schedule 80 per ASTM D1785 made from materials conforming to ASTM D1784.
 - 2) PVC fittings shall be schedule 80 per ASTM D2467.
 - 3) Joints in PVC piping shall be solvent cemented socket and plain end with cement per ASTM D2564.
 - 4) Joints shall be cleaned, primed, and cemented according to ASTM D2855. Primer shall conform to ASTM F656. Do not thread PVC pipe, use socket by NPT fittings.
 - 5) PVC Pipe Support: Fabricate from PVC lumber (Royal or equal with stainless steel fasteners) to support vent pipe from fitting or DIP. Connect top of vent pipe to top of manhole with SST Uni-Strut and SST conduit hanger (Thomas & Betts 6 H2BSS, or equal), with SST fasteners.
- h Outlet Vent: Morrison Model 155, 1-inch, NPT connection at 6-inches from top of manhole.
- 6 Automatic Air Release Valve (ARV) in Manhole: Comply with 5020.206 (WM-206)
 - a An automatic air release valve shall be installed when specifically required by Water Department.
 - b Automatic ARV: Vent Tech WTR Series C (2") or WTW Series C (3")
 - 1) 2-inch for 12-inch and 16-inch water main and 3-inch for 20-inch and 24-inch water main.
 - 2) Inlet: 2-inch M-NPT, 3-inch Class 150 flange with SST Studs
 - 3) Outlet: 2-inch or 3-inch F-NPT, horizontal
 - 4) Standard AISI 304L stainless steel construction with UHMW polyethylene floats and EPDM nozzle buttons and seals.
 - 5) Minimum pressure rating of 232 psi or 16 bar and sealing at 3 psi.
 - 6) NSF 61 and NSF 372 compliance
 - 7) Lower SST bleed port with SST plug.
 - c Piping:
 - 1) Pipe through manhole shall be DIP, class 53, flanged by plain-end and plain-end by plain-end. Connect PE by PE DIP with two-piece flange adapter, EBAA Series 2100 Mega-Flange. Connect DIP to water main with couplings adjacent to manhole exterior. Support DIP with two Standon SST pipe/flange supports.
 - 2) Install 12" X 6", 16" X 8", 20" X 10" and 24" X 12" flanged tee with branch vertical I center of manhole.
 - 3) Install 6-inch and 8-inch blind flange with 2-inch F-NPT tap in 12" X 6" and 16" X 8" flanged tee outlets. Install a 10" by 3" and 12" by 3" Red Head Space Saver Flange in 20" X 10" and 24" X 12" flanged tee outlets. Spacer Saver Flanges shall have stainless steel studs.
 - d Pipe and Fittings: As required for Manually Operated Ball Valves in manhole (lead free brass, SST)
 - e Isolation Valve
 - 1) Two-inch (2") Apollo ball valve 77CLF-108-04-10-A
 - 2) Three-inch (3") AWWA C509 or C515 resilient seat gate valve with flanged connections, hand wheel operator, open right.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

- f ARV Discharge Piping (ARV to Vent)
 - 1) 2-inch or 3-inch SST F-NPT connection installed level/horizontal or vertical to vent.
 - 2) Fernco coupling on each side of ARV manhole wall for horizontal vent piping, in vertical riser to vent remote from manhole, and in vertical riser if above manhole (in non-traffic locations)
- g Outlet Vent: Morrison Model 155, 2-inch or 3-inch, F-NPT connection
 - 1) Locate vent 18" above top of manhole in non-traffic locations. Locate vent behind curb, near ROW line, or at a location to minimize damage potential if ARV manhole is in a traffic area.
 - 2) Install vent approximately 1.5 feet above ground surface on type 304 stainless steel schedule 40 vertical pipe (4 to 5 feet in length).
 - 3) Install Rhino fiberglass post (blue for water) adjacent to vent location; Water Department will install decal.
- h ARV Live Tap
 - 1) The use of live tap connections on existing lines will require a tapping sleeve and valve by Water Department. The branch shall be 6-inch MJ for the tapping sleeve and valve.
 - 2) Install 6-inch MJ plug with 2-inch F-NPT tap into tapping valve.
 - 3) Install 2-inch piping extension for 2-inch automatic ARV (with 2-inch M-NPT inlet)
 - 4) Install SST piping including: 2-inch nipple, 2-inch by 3-inch reducing coupling, 3-in nipple and 3-inch flange for 3-inch automatic ARV (with 3-inch flange with SST studs inlet)
 - 5) Install automatic ARV vent piping and support as required for flanged tee connection.
- 2.02 FIRE HYDRANT ASSEMBLY: Comply with 5020.201 (WM-201) and 5020.202 (WM-202)
 - B (REPLACE) Manufacturers; Clow Medallion, Kennedy K-81D Guardian, Mueller Super Centurion 250 or approved equal USA made fire hydrant; 250 psi working pressure rating.
 - C Features:
 - 5 (REPLACE) Direction of Opening: Clockwise, opens right
 - 6 (REPLACE) Additional Requirements
 - a Operating and Nozzle Cap Nuts: Square, seven-eighths- inch (7/8") top and one-inch (1") at base.
 - b Pumper Nozzle: One with 4-inch diameter.
 - c Nozzle Threads: National standard hose coupling threads for 2-1/2 inch hose nozzles and 4-inch pumper nozzle.
 - d Main Valve Size: Five and one-quarter inch (5-1/4")
 - e Depth of Bury: Six feet (6-ft) from bottom of 6-inch DIP lead pipe to ground surface (5.5 feet cover).
 - f Nozzle Chains: Individual nozzle chains attached to hydrant barrel
 - D Painting:
 - 2 (REPLACE) Hydrant Colors
 - a Hydrant Upper Barrel: Red
 - 1) Tnemec 06SF Safety Red (RGB color code 186,42,26)
 - b Nozzle Caps and Hydrant Cap/Bonnet: Light Gray
 - 1) Tnemec 43 GR Constellation (RGB color code 208, 209, 210)
 - c Color Matching
 - 1) Hydrant manufacturer shall match specified colors as close as possible, or as approved by Water Department.
 - E (REPLACE) External Bolts and Hex Nuts: Type 304 stainless steel per ASTM F593 and F594 (below and above ground surface).

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

- F (REPLACE) Gate Valve: Comply with Section 5020, 2.01 and supplemental specification.
- G (REPLACE) Pipe and Fittings: Comply with Section 5010. Hydrant lead supply pipe shall be 6-inch Class 52 DIP only.
- H (ADD) Hydrant Drainage Stone: Iowa DOT Specification 4125 (3/8" maximum) cover aggregate, Specification 4115.06 PCC CA, or Specification 4131 porous backfill (less than 5% passing 200).

2.03 APPURTANENCES

- A (REMOVE) Flushing Device (Blowoff): As specified in the contract documents.
- B Valve Box:
 - 2 (REPLACE) Manufacturer: Valve boxes shall be Tyler Union domestic heavy duty or USA made approved alternate.
 - 3 (REPLACE) Type: All valve boxes shall be slide type, Tyler Union 6855 Series (664A, 666A, 668A, etc.).
 - 8 (REPLACE) Length:
 - a Provide for adjustment length of plus or minus 4-inches.
 - 10 (REPLACE) Valve Box Centering Ring:
 - a Install Valve Box Adapter II on all gate valves.
 - b Install Butterfly Valve Adaptor on all butterfly valves.
- C (REMOVE) Valve Stem Extension:

2.04 (ADD) VALVE MANHOLE

- A Purpose
 - 1 Stream crossing monitoring manhole
 - 2 Air release valve (manual or automatic)
- B Manhole Requirements
 - 1 Precast Concrete: Refer to SUDAS Section 6010, figure 6010.301 as modified by City Supplemental Specifications and this segment.
 - 2 Inside Diameter: 48 inches larger than nominal diameter of water main.
 - a 60-inch ID for 8", 10" and 12" water mains
 - b 66-inch ID for 16" water main
 - c 72-inch ID for 20" and 24" water mains
 - 3 Base:
 - a Precast base integrally with bottom sidewall section for new water main construction.
 - b Precast base slab or field cast base (8" minimum thickness) to support sidewall for live tap air release on existing water mains.
 - 4 Sidewall: "B" wall per ASTM C478
 - a Polypropylene encased steel, steps at 12-inch spacing
 - b Flexible pipe connectors, A-Lok or PSX Direct Drive for precast or cored holes for new water main.
 - c "Dog House" cut-outs in manhole sidewall for live tap of existing water mains. Install split water stop around pipe. Fill cut-outs with non-shrink grout, flush with interior.
 - d Gasket joints and external wrap
 - e Side Wall Height: Minimum of 6.5-feet from bottom of flat top to floor and minimum of 12-inches clear from bottom of water main to floor.
 - 5 Flat Top: Slip-over precast concrete
 - a Gasketed sidewall joint and exterior wrap
 - b 30-inch diameter opening when manhole is installed in traffic areas or as required by Water Department.
 - c Aluminum hatch cast into flat top when located in a non-traffic area.
 - 6 Casting: For traffic area or as required by Water Department
 - a Neenah R-1557-A4 (30-inch clear opening and 4-inch height)

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

- b Polyethylene adjusting rings with sealant
- c Chimney seal not required
- 7 Hatch: For non-traffic area
 - a US Foundry & Mfg. APS 300
 - b 30" by 30" for 60-inch and 66-inch diameter manholes
 - c 36" by 36" for 72-inch diameter manholes
 - d Install hinges toward side of steps
- 8 Manhole Drainage:
 - a Based on anticipated ground water levels or availability of outlet location for surface discharge, per water main Design Engineer.
 - b Drain to Soil
 - 1) 12-inch hole in manhole base
 - 2) Install manhole on 12" of clean stone (3/8" to 3/4" maximum) with woven drainage fabric below and on sides of drainage stone.
 - c Drain to Surface
 - 1) Hole in manhole side wall for drainage pipe (grouted and water stop)
 - 2) Four-inch SDR 26 PVC with gasket joints and any fittings.
 - 3) Galvanized external guard at outlet, Agri-Drain EG04 or equal.
 - d Drainage Sump:
 - 1) Add 5-inches of concrete to floor to create a 15-inch by 15-inch or 15-inch diameter by 5-inch deep sump on top of precast floor (maintain 12" clearance from floor to bottom of water main)
 - 2) Locate sump to the side opposite to the manhole steps to allow pump-out.
- 9 Valve Manhole Piping:
 - a Air Release See 2.01.E.5 and 2.01.E.6
 - b For stream crossing monitoring
 - 1) Flanged gate valve, open right/clockwise, square operating nut for 8", 10" and 12" watermain.
 - 2) Flanged butterfly valve, open right/clockwise, square operating nut for 16", 20" and 24" watermain.
 - 3) Flanged adapter on PE by PE DIP, EBAA 2100 Mega-flange (with SST bolts or threaded rods)
 - 4) Flange by PE DIP for other pipe segment
 - 5) Cast couplings or MJ sleeves on outside of manhole for flanged pipe connection to watermain beyond (restrained as necessary for horizontal or vertical fittings)
 - 6) Install 3/4-inch tapping saddles on both sides of valve, Romac 202NS (8" thru 24"), AY McDonald 4856-AU (8", 10" and 12") or approved equal.
 - 7) Install 3/4-inch no-lead ball style corporation stop with M-NPT inlet and F-NPT outlet and tee head in each tapping saddle, A.Y. McDonald 74104BF
 - 8) Install 3/4-inch no lead brass or stainless steel plug in outlet of corporation stop.
 - 9) Install 304L stainless steel pipe support on both sides of valve.
 - 10) City will provide connections and flow meter for required monitoring.

Part 3: EXECUTION

3.01 General

- A (NO CHANGE) Install according to the contract documents.
 - 1 (ADD) Place clean crushed stone (1/3 cubic yard minimum) around hydrant shoe for drainage.
- B (NO CHANGE) Apply polyethylene wrap to all iron pipe, valves, fire hydrants, and fittings.
 - 1 (ADD) Do not install polyethylene hydrant wrap to cover drainage opening in shoe. Place polyethylene on top of drainage stone.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

3.02 (REMOVE) FLUSHING DEVICE (BLOWOFF)

3.03 FIRE HYDRANT

A (REPLACE) Install according to City details to comply with Figure 5020.201 (WM-201) and Figure 5020.202 (WM-202) except for the following:

- 1 (ADD) Install vertical 45-degree bend at anchoring (swivel) tee if being used for releasing air. Comply with 5020.204 (WM-204)
- 2 (ADD) Set top of tracer wire access box at finished surface elevation.
- 3 (ADD) Depth of cover from ground surface to top of fire hydrant supply pipe (lead) shall be 5.5 feet.
- 4 (ADD) Hydrant drainage stone shall be place at hydrant base/shoe (minimum 1/3 cubic yard) and covered with polyethylene.
- 5 (ADD) Delete hydrant thrust blocks (not required or approved)
- 6 (ADD) Concrete hydrant support block shall be a minimum of 12-inches square and 4-inches thick.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

The details from Section 5020 shown in the table below have been modified as part of this supplemental specification. A more detailed summary of the modifications is included below the table.

City of Dubuque Modifications to Standard SUDAS Section 5020 Details			
Details		Description	Dubuque Supplemental Specification
5020.201	WM-201	Fire Hydrant Assembly with Swivel Tee	Detail Modification
5020.202	WM-202	Fire Hydrant Assembly with Std Tee	Detail Modification
5020.203	WM-203	Yard Hydrant for Air Release	Detail Modification
5020.204	WM-204	Fire Hydrant for Air Release	Detail Modification
5020.205	WM-205	Manual Air Release in Manhole	Detail Modification
5020.206	WM-206	Automatic Air Release in Manhole	Detail Modification

Figure 5020.201

A (REPLACE) Figure 5020.201, (WM-201) Fire Hydrant Assembly with Swivel Tee

Figure 5020.202

A (ADD) Figure 5020.202, (WM-202) Fire Hydrant Assembly with Standard Tee

Figure 5020.,203

A (ADD) Figure 5020.203, (WM-203) Yard Hydrant Connection for Air Release

Figure 5020.204

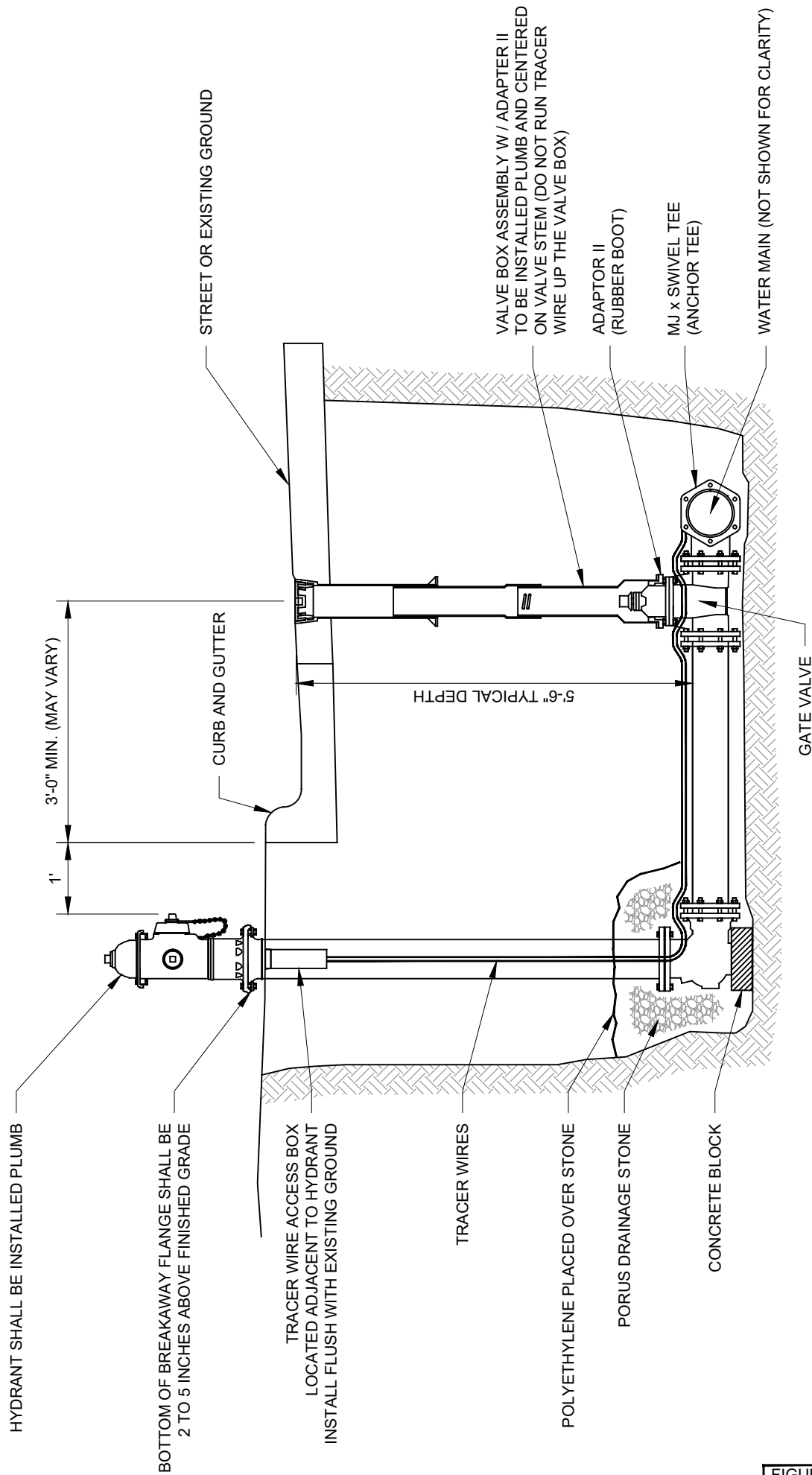
A (ADD) Figure 5020.204, (WM-201) Fire Hydrant for Air Release

Figure 5020.205

A (ADD) Figure 5020.205, (WM-205) Manual Air Release in Manhole

Figure 5020.206

A (ADD) Figure 5020.206, (WM-206) Automatic Air Release in Manhole

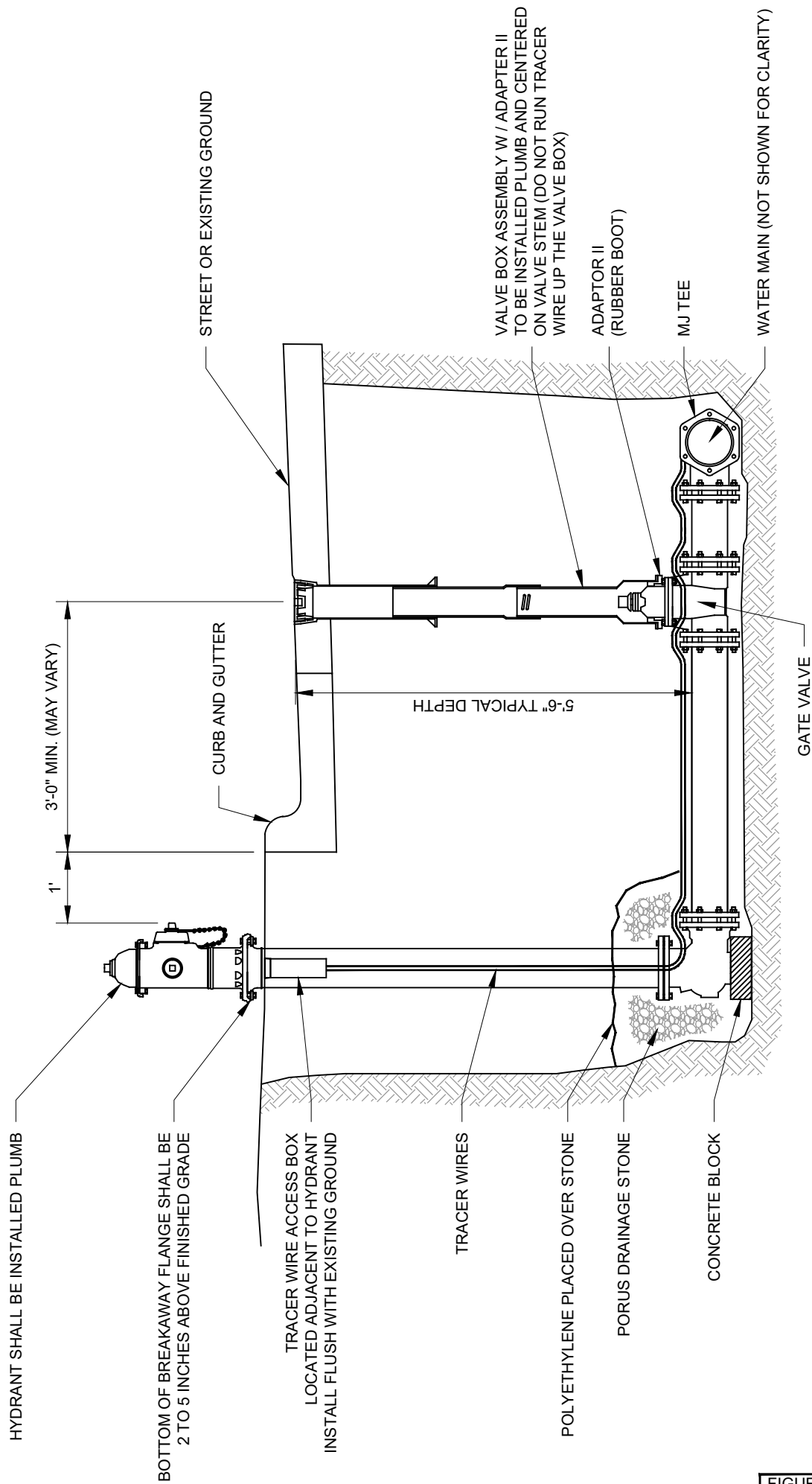


CITY OF DUBUQUE	REVISION	
	2023	
FIGURE 5020-201	WM-201	
	MODIFIED	SHEET 1 of 1
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		
FIRE HYDRANT ASSEMBLY WITH SWIVEL TEE		

FIGURE 5020-201 SHEET 1 of 1

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

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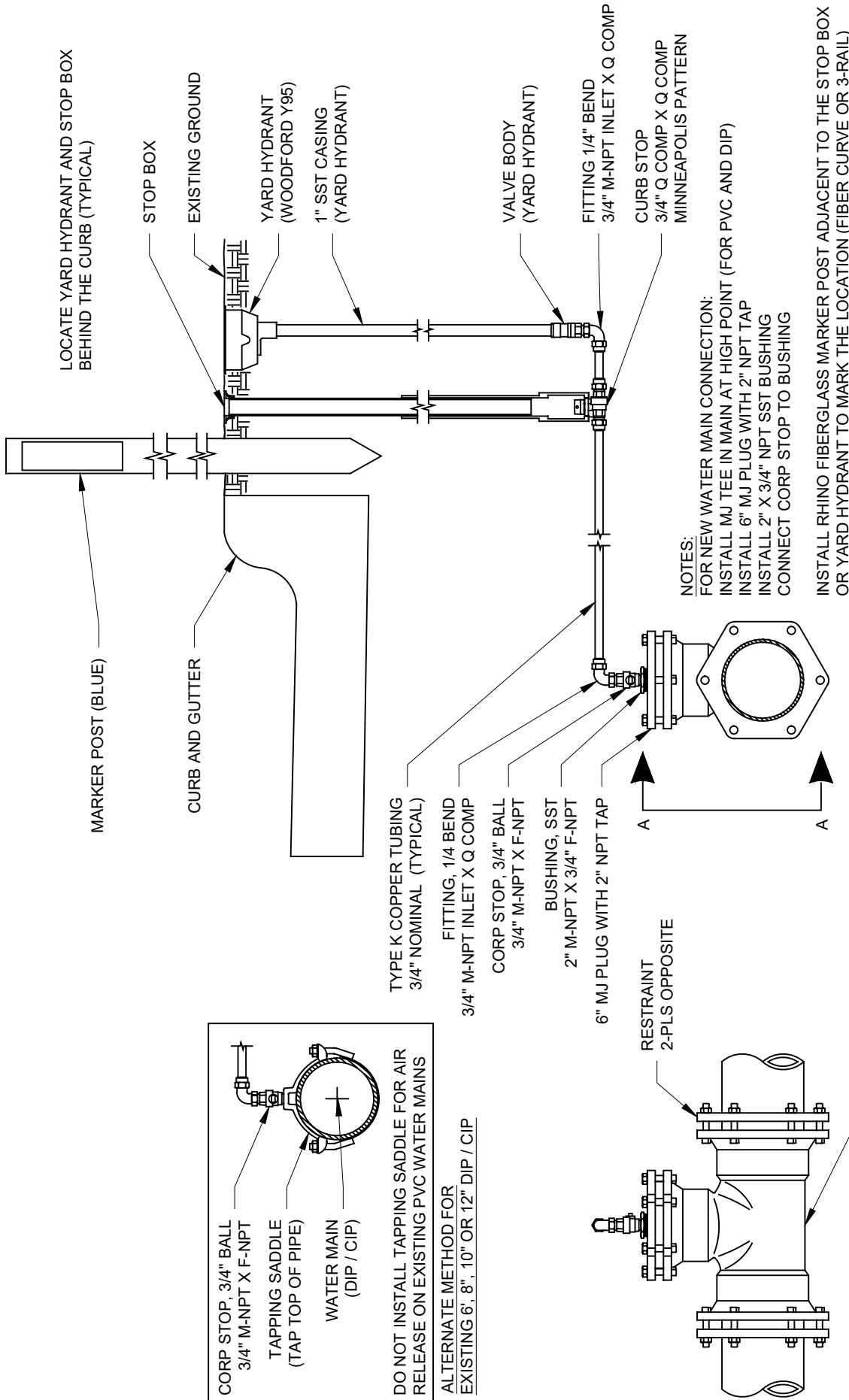


CITY OF DUBUQUE	REVISION	
	2023	
FIGURE 5020-202	MODIFIED	
	WM-202	
SHEET 1 of 1		
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		
FIRE HYDRANT ASSEMBLY WITH STANDARD TEE		

FIGURE 5020-202 SHEET 1 of 1

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

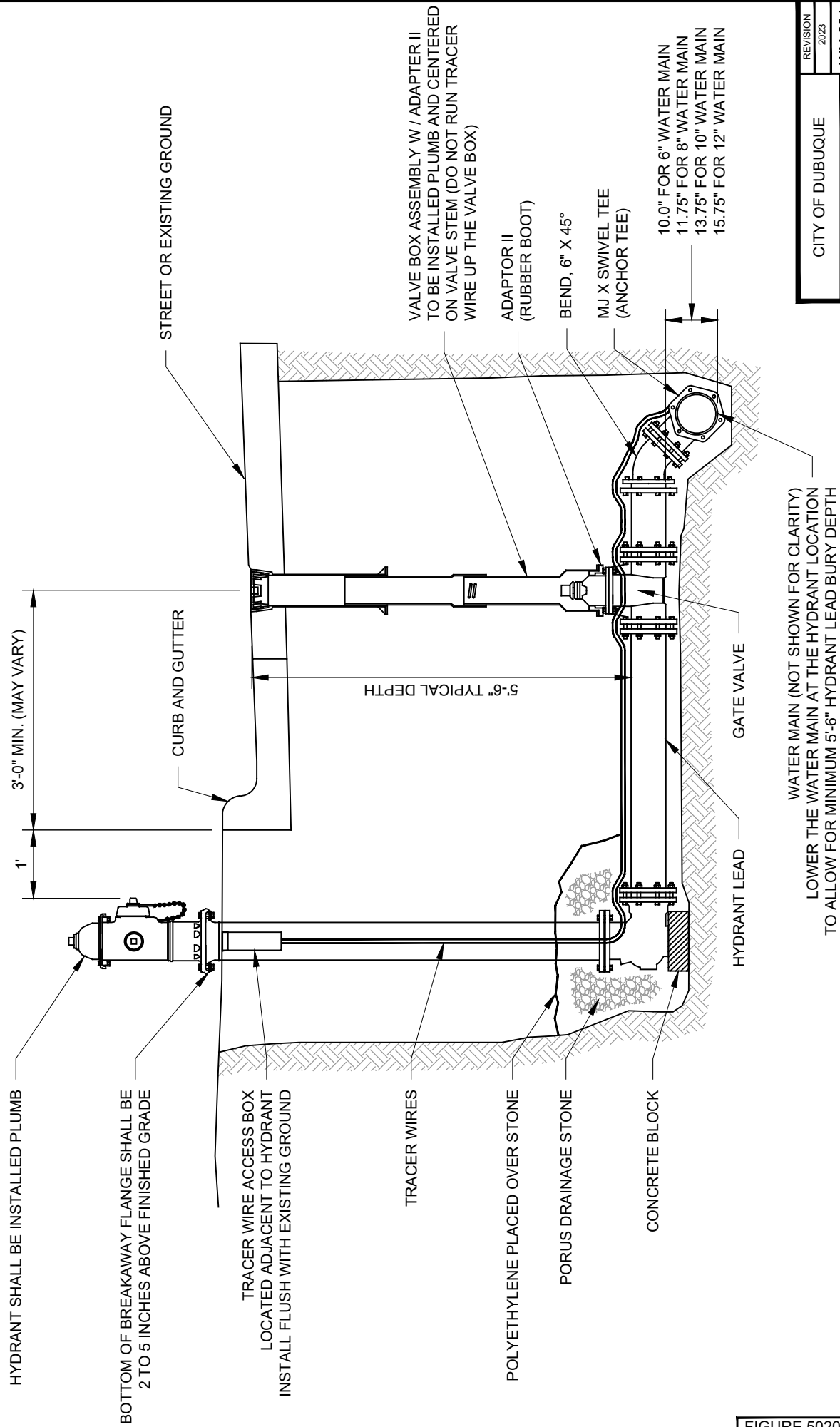
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CITY OF DUBUQUE	REVISION	WM-203
	2023	SHEET 1 of 1
FIGURE 5020.203	MODIFIED	
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		
YARD HYDRANT CONNECTION FOR AIR RELEASE		

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

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CITY OF DUBUQUE	REVISION	WM-204	SHEET 1 of 1
	2023		
FIGURE 5020-204	MODIFIED		
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)			
FIRE HYDRANT FOR AIR RELEASE			

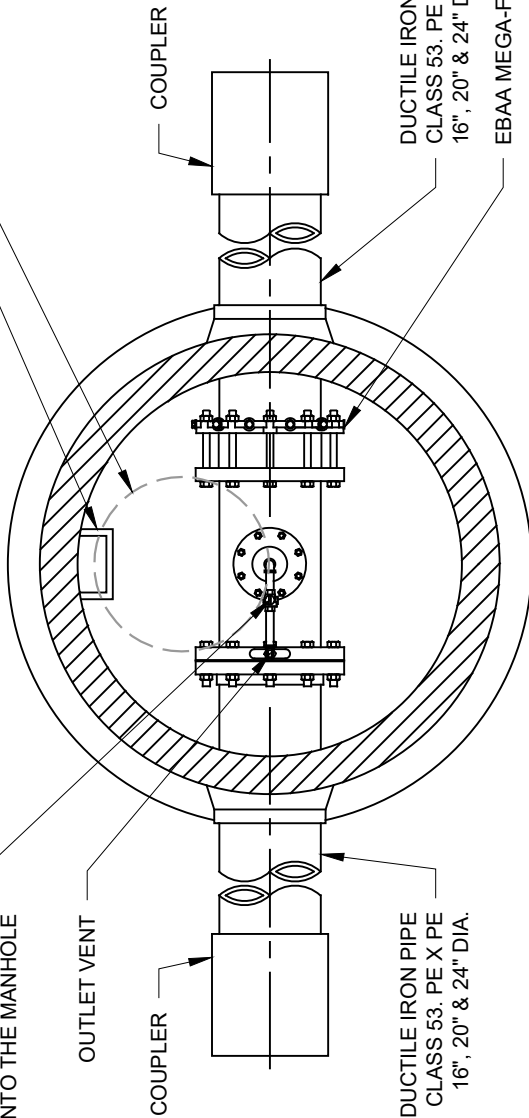
DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

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CURB STOP & DRAIN VALVE
MUST BE WITHIN REACH OF THE MANHOLE
OPENING WITHOUT GOING INTO THE MANHOLE

STEPS ARE SPACED 12" O.C.

MANHOLE OPENING (FOR REFERENCE)



VENT PIPE SUPPORT
CONSTRUCT FROM PVC LUMBER
USE 5/4 THICK MATERIAL
ADJUST HEIGHT AS REQUIRED
ASSEMBLE WITH SST BOLTS

SECURE VENT PIPE WITH STRAP
INSTALL WITH SST SCREWS

CUT PVC LUMBER TO MATCH
THE DIAMETER OF THE PIPE

VENT PIPE SUPPORT DETAIL

DUCTILE IRON PIPE
CLASS 53, PE X PE
16", 20" & 24" DIA.

EBAA MEGA-FLANGE

FRAME AND COVER

SECTION A-A

MANHOLE ADJUSTMENT RINGS

UNISTRUT BRACKETS & CLAMP
(ATTACH TO MANHOLE FLAT TOP LID)

CURB STOP, 1", (STOP & DRAIN), F-NPT X F-NPT
LOCATE VALVE UNDER MANHOLE OPENING
FOR ACCESS

PIPE, 1", 3 PLACES, 1" SST OR N.L. BRASS

90-DEGREE ELBOW, 1" SST OR N.L. BRASS

BUSHING, SST, 2" M-NPT X 1" F-NPT

BLIND FLANGE, WITH 2" TAP

1" MINIMUM

EBAA MEGA-FLANGE

RUBBER SEAL (TYP)

ADJUSTABLE PIPE SUPPORT

FLANGED TEE, WITH 6" BRANCH

CITY OF DUBUQUE	REVISION		WM-205	SHEET 1 of 1
	2023			
FIGURE 5020-205	MODIFIED		SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)	
MANUAL AIR RELEASE IN MANHOLE				

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

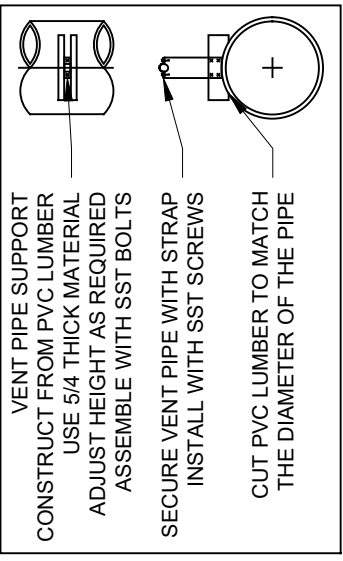
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VENT PIPE, FIELD VERIFY VENT LOCATION
 MANHOLE OPENING (FOR REFERENCE)
 STEPS ARE SPACED 12" O.C.

BALL VALVE, 2" F-NPT X F-NPT
 MUST BE WITHIN REACH OF THE MANHOLE
 OPENING WITHOUT GOING INTO THE MANHOLE

COUPLER
 COUPLER

DUCTILE IRON PIPE
 CLASS 53, PE X PE
 16", 20" & 24" DIA.
 EBAA MEGA-FLANGE



SECTION A-A

FRAME AND COVER
 MANHOLE ADJUSTMENT RINGS

VENT TECH ARV. WTR. SERIES C
 WITH HORIZONTAL DISCHARGE
 BALL VALVE 2" F-NPT X F-NPT
 90-DEGREE ELBOW, 2" SST OR N.L. BRASS
 PIP, 2", 3 PLACES, 1" SST OR N.L. BRASS
 BLIND FLANGE WITH 2" TAP

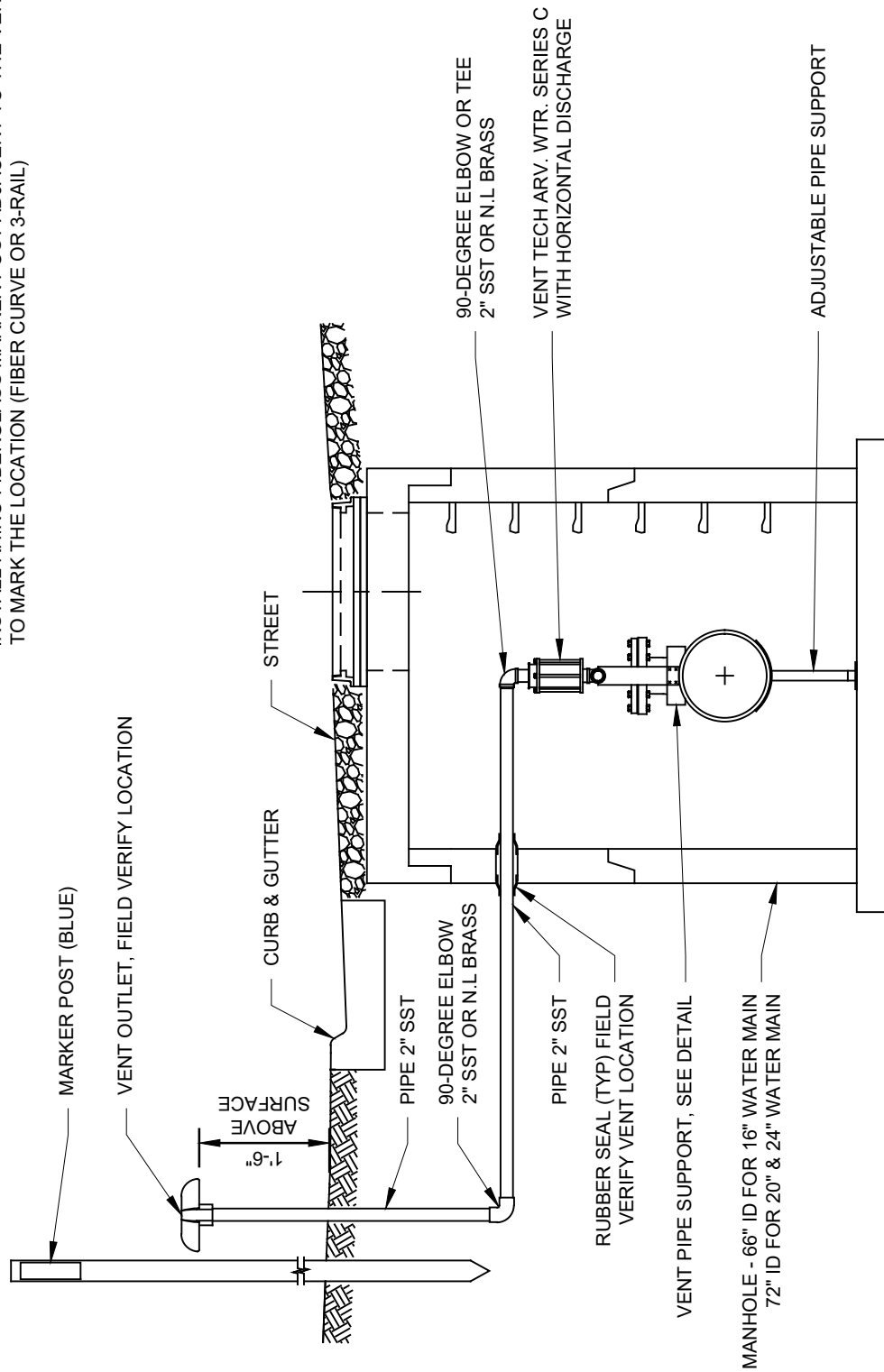
VENT PIPE SUPPORT, SEE DETAIL
 RUBBER SEAL (TYP)
 EBAA MEGA-FLANGE
 ADJUSTABLE PIPE SUPPORT
 FLANGED TEE WITH 8" BRANCH
 1" MINIMUM

CITY OF DUBUQUE	REVISION	2023
	WM-206	SHEET 1 of 2
FIGURE 5020-206	MODIFIED	
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		
AUTOMATIC AIR RELEASE IN MANHOLE		

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

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NOTES:
 INSTALL RHINO FIBERGLASS MARKER POST ADJACENT TO THE VENT OUTLET
 TO MARK THE LOCATION (FIBER CURVE OR 3-RAIL)



SECTION B-B

CITY OF DUBUQUE	REVISION	
	2023	
FIGURE 5020-206	WM-206	
	SHEET 2 of 2	
MODIFIED		
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		
AUTOMATIC AIR RELEASE IN MANHOLE		

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

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DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

END OF SECTION

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5020 - VALVES, FIRE HYDRANTS, AND APPURTANENCES

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Section 5030 - Testing and Disinfection

Part 1: General

1.06 SCHEDULING AND CONFLICTS

- A (REPLACE) Notify Water Department, Engineer, and Inspector at least two working days in advance of testing or disinfection operations to coordinate the operations.
- B (REPLACE) Representatives of the Water Department, the Inspector and possibly the Engineer must be in attendance during testing and disinfection. The Water Department staff will perform all flushing, limited capacity dechlorination, pipe tapping for extra sampling (Contractor to pay tap fee), chlorine testing, and bacteria sampling and testing.

Part 2: Products

2.01 DISINFECTION AGENT – CHLORINE

- A (REPLACE) Liquid Chlorine complying with AWWA B301.
 - 1 The use of liquid (gas) chlorine is not allowed without a specific written procedure by the Contractor as may be approved by the Water Department.
 - 2 The gas feed process and equipment to produce a chlorine solution must be designed by a licensed professional Engineer hired by the Contractor. The gas feed design Engineer shall have experience in the design of such systems.
 - 3 The gas feed chlorine solution process shall be operated by a licensed Water Treatment Operator with experience in gas chlorination processes, acceptable to the Water Department.
 - 4 The gas chlorine feed and injection system shall be designed and operated in a safe manner to protect the Contractor's workers, Water Department staff, the Inspector, Engineer's representatives, the public, etc. The Contractor shall notify the Fire Department when operating the gas feed chlorination system.

Part 3: Execution

3.01 GENERAL

- A (ADD) Keep the water mains clean and dry. Install and maintain a water tight plug in the water main at all times when not actively installing pipe, fittings, valves, and/or hydrants.
- B (ADD) The Contractor should obtain a copy of AWWA C651 "Disinfecting Water Mains" and review the information in the AWWA Standard with the installing/disinfecting workers.
- C (ADD) The approved disinfection methods are:
 - 1 Continuous-Feed Method
 - 2 Granular Method
- D (ADD) The tablet method is not approved due to concern about using adhesive.
- E (ADD) The slug method and the spray method are designated for larger mains and in general are not acceptable for use for water mains covered by the City Specifications. If the Contractor desires to use the slug method or the spray method the following are required for Water Department review and potential approval:
 - 1 Contractor's written procedure and experience with these methods.
 - 2 Calculations and procedure design by licensed professional Engineer with experience in the use of the slug and/or spray methods.
- F (ADD) Operation of all valves and fire hydrants on water main extensions and service line valves shall be by the Water Department staff. Contractor shall coordinate operation, flushing and filling operations with Water Department staff.

3.02 SEQUENCE OF TESTING AND DISINFECTION

- A (REPLACE) Continuous-Feed Method
 - 1 Perform initial flush (by Water Department).
 - 2 Perform pressure and leak testing prior to disinfection as required by AWWA C651.
 - 3 Perform disinfection, see item 3.05 of this supplemental specification.
 - 4 Flush after disinfection (by Water Department).
 - 5 Sample and test water (by Water Department).
- B (REPLACE) Granular Method (Concurrent with Water Main Installation):

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5030 - TESTING AND DISINFECTION

- 1 Place granular chlorine in water main and appurtenances during installation.
- 2 Perform disinfection, see item 3.05 of this supplemental specification.
- 3 Flush after disinfection contact period (by Water Department).
- 4 Sample and test water (by Water Department).
- 5 Perform pressure and leak testing during disinfection (with proper precautions) or after flushing.

3.03 INITIAL FLUSHING

A (REPLACE) Flushing:

- 1 Initial flushing for the granular method shall be performed after disinfection. Initial flushing for the continuous-feed method shall be performed prior to disinfection.
- 2 Potable water shall be used for flushing water mains and appurtenances by Water Department staff.
- 3 The flushing velocity and/or flow rate shall be measured at the discharge point and recorded.
- 4 Flushing of heavily chlorinated water need not be at 3-feet per second to allow for dechlorination. Subsequent to dechlorination, flushing shall obtain a minimum velocity of 3-feet per second in the water main being disinfected.

B (REPLACE) Minimum Flushing Rate:

Table 5030.01: Minimum Flushing Rate

Minimum Pipe Diameter (inches)	Flow Rate for Flushing (gpm)	Number of 2 1/2" Fire Hydrant Outlets ¹
4	120	1
6	260	1
8	470	1
10	730	1
12	1,060	2
16	1,880	2

¹With a 40 psi pressure in the main with the fire hydrant flowing to atmosphere, a 2 1/2 inch fire hydrant outlet will discharge approximately 1,000 gpm; and a 4 1/2 inch fire hydrant outlet will discharge approximately 2,500 gpm.

- 1 Flushing a 20-inch water main
 - a The flushing rate for 20-inch water main shall be a minimum of 2940 Gallons Per Minute.
 - b Flushing a 20-inch water main may require two 4-inch hydrant pumper nozzle discharges or possibly up to a 10-inch connection.
- 2 Flushing a 24-inch water main
 - a The flushing rate for 24-inch water main shall be a minimum of 4230 Gallons Per Minute.
 - b Flushing a 24-inch water main may require two 4-inch hydrant pumper nozzle discharges or possibly up to a 12-inch connection.
- 3 Flushing Design
 - a The water main Design Engineer shall include a method or means for proper flushing water mains.
 - b In general flushing shall be by use of fire hydrants (permanent or temporary) or temporary connections that would be removed/plugged (at active water main) after successful flushing.
 - c Multiple taps of the main shall not be used without specific written approval of the Water Department.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5030 - TESTING AND DISINFECTION

- d The Water Department has the capability to dechlorinate approximately 1000 GPM (2-1/2-inch hydrant nozzle). The water main Design Engineer shall include a procedure for dechlorination flows in excess of Water Department capacity as part of the flushing procedure design.

3.04 PRESSURE AND LEAK TESTING

- C (REPLACE) Unless otherwise approved by the Water Department, water mains shall be tested in lengths of less than 1,200 feet. Isolate new piping from the existing water system. Test against a new valve installed by water main contractor. If testing is to be done against an existing resilient seat valve, the Contractor shall verify that the existing valve does not leak.
- D (REPLACE) Pressure and leak testing may be done during disinfection by the granular method with proper precautions regarding high chlorine concentrations, or after disinfection and flushing with potable water. Ensure all trapped air is removed.

3.05 DISINFECTION

A (REPLACE) General:

- 1 Disinfect according to AWWA C651. Approved methods are the Granular Method and the Continuous Feed Method. The Slug Method and Spray Method are not acceptable methods without Water Department approval of a written justification and procedure from an experienced Contactor.
- 2 Keep piping to be chlorinated isolated from lines in-service and from points of use.
- 3 Coordinate disinfection and testing with the Water Department, Inspector, and the Engineer.

B (REPLACE) Continuous Feed Method Procedure:

- 1 Fill the main with potable water and remove air pockets.
- 2 Flush the completed main to remove particulates at a velocity of not less than 3.0 feet per second.
- 3 Refill the main with potable water chlorinated to 25 mg/L using a tap less than 10 feet from the connection to the existing main.
 - a The chlorinated water may be produced by injecting sodium hypochlorite into the potable water flow from an existing hydrant using a Water Department back flow prevention device and flow meter and disinfected piping/hose.
 - b The chlorinated water may be produced in a disinfected tank and then pumped into the main with a disinfected pump and pipe/hose.
- 4 The chlorine concentration shall be tested at the discharge by the Water Department to verify the required initial concentration of 25 mg/L.
- 5 The chlorine solution shall remain in the main at least 24-hours but, no more than 48 hours during which valves and hydrants in the treated section shall be operated by Water Department staff.
- 6 After 24-hours the treated water shall have a residual of not less than 10 mg/L of free chlorine.
- 7 Flush chlorinated water from the main at a rate that can be properly dechlorinated by City flushing and City dechlorination equipment capacity.
- 8 Consult AWWA C651 and/or an experienced Engineer regarding the procedure for preparing water solutions with 25 mg/L of chlorine.
- 9 When flushing results in chlorine concentrations equivalent to levels in existing mains, bacterial sampling and testing shall be performed by Water Department staff.

C (REPLACE) Granular Method Procedure

- 1 Calcium hypochlorite granules shall be placed at the upstream end of the first section of pipe, at the upstream end of each branch main, at 500 foot intervals, and in hydrant assemblies. The quantity of granules at each location shall be as shown in the following table:

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5030 - TESTING AND DISINFECTION

Pipe Diameter (inches)	Calcium Hypochlorite Granules Per 500-ft. (ounces by weight / grams)
4	1.7 / 48
6	3.8 / 108
8	6.7 / 190
10	10.5 / 298
12	15.1 / 428
16	26.9 / 761
20	42.0 / 1189
24	60.4 / 1712

- 2 Calcium hypochlorite tablets (typically 5-grams per tablet) conforming to AWWA B300 may be used in place of granules.
- 3 When installation has been completed, the main shall be slowly filled with potable water such that the full pipe velocity is no greater than 0.25 feet per second. Approximate flow rates for 0.25 velocity are indicated in the following table:

Pipe Diameter (inches)	Flow Rate for 0.25 fps (GPM)
4	10
6	22
8	40
10	62
12	89
16	157
20	245
24	353

- 4 The Contractor shall continuously monitor filling to insure a uniform chlorine concentration of 25 milligrams per liter in the water main at hydrants and services.
 - 5 Air pockets shall be eliminated.
 - 6 The chlorinated water shall remain in the main for at least 24-hours if the water temperature is 41 degrees F or higher, 48-hours if the water temperature is below 41 degrees F. Avoid excessive contact time.
 - 7 The minimum chlorine concentration after the 24-hour contact period shall be 0.2 milligrams per liter, prior to flushing.
 - 8 After the required contact time the high chlorine concentration water shall be flushed from the main at a rate that can be dechlorinated.
 - 9 The main must be flushed at a velocity of 3.0 feet per second to remove particulates if dechlorination restricts the flow to less than 3.0 fps.
 - 10 When flushing results in chlorine concentrations equivalent to levels in existing mains, bacterial sampling and testing shall be performed by Water Department staff.
- D Additional Disinfection Procedures for New Mains
- 1 Inspecting materials to be used to ensure their integrity.
 - 2 Preventing contamination from entering the water main during storage, construction, or repair and noting potential contamination at the construction site.
 - 3 Removing by flushing or other means, those materials that may have entered the water main or appurtenances.
 - 4 Preventing contamination of existing mains from cross-connection during flushing, pressure testing and disinfection.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5030 - TESTING AND DISINFECTION

- 5 Pressure testing the water main to ensure the main meets allowable leakage rate. Hydrostatic pressure testing shall be conducted with potable water.
 - 6 Chlorinating and adequately documenting the process for disinfection.
 - a Contact times
 - b Flushing time
 - c Flushing flow rate/velocity
 - d Chlorine concentration background, during disinfection, after contact time and after flushing.
 - e Submitting records to Water Department.
- 3.06 FINAL FLUSHING
- A (REPLACE) Flushing and limited capacity dechlorination shall be performed by Water Department staff.
- 1 The pipe shall be flushed using potable water until the chlorine residual equals that of the potable water from the existing system.
 - 2 The rate of flushing highly chlorinated water from the pipe shall not exceed the capacity of the dechlorination system.
 - 3 Subsequent to dechlorination water mains disinfected by the granular method shall be flushed at a velocity of 3.0 feet per second. See 3.03.B for minimum flow rates.
- B (REPLACE) Dispose of chlorinated water to prevent damage to the environment. Dechlorinate highly chlorinated water from disinfection before releasing onto the ground or sewers. Contractor shall assist with dechlorination when the flushing rate exceeds capacity of the Water Department equipment.
- 1 (NO CHANGE)
 - 2 (NO CHANGE)
- (NO CHANGE) Table 5030.02
- C (REPLACE) Protect public and private property from damage during flushing operations.
- 3.07 BACTERIA SAMPLING
- A (REPLACE) The Water Department staff will collect samples at intervals not to exceed 1200 feet of new water main plus one set from the end of the line and at least one from each branch greater than one pipe length.
- 1 Hydrant assemblies (fittings, feed pipe, isolation valve and fire hydrant) shall be included in all disinfection procedures, with special care taken if hydrants are to be used as sampling locations.
 - 2 If trench water entered the new main during construction, or if excessive quantities of dirt or debris entered the main, reduce the sampling interval to every 200 feet of main. The Water Department will make taps as may be necessary for additional sampling. Contractor shall pay for extra pipe taps.
- B (REPLACE) The Water Department staff will collect samples for bacteriological testing according to Option A of Section 5.1 of AWWA Standard C651.
- 1 The initial set of samples will be collected after flushing.
 - 2 A second set of samples shall be taken after a minimum of 16 hours without any water use.
 - 3 Both sets of samples must pass for the main to be approved for release.
 - 4 Option B of Section 5.1 of AWWA Standard C651 is not acceptable to the Water Department.
- 3.08 RE-DISINFECTION
- (REPLACE) If the initial disinfection fails to produce satisfactory bacteriological samples, the Water Department will flush the main again and reinitiate the sampling process. If check samples show the presence of coliform organisms, the Contractor shall re-chlorinate the main prior to Water Department flushing and sampling until satisfactory results are obtained.
- 3.09 PUTTING WATER MAIN IN SERVICE

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5030 - TESTING AND DISINFECTION

- (REPLACE) The completed water main(s) shall be placed in service by the Water Department only after both sets of bacterial samples and pressure/leakage testing have passed
- 3.10 (ADD) DISINFECTION OF EXISTING MAIN CONNECTIONS AND REPAIRS
- A Basic Procedure
- 1 Prevent contamination from entering existing pipe
 - a By maintaining positive pressure in the leaking pipe until repair site or connection site is fully exposed.
 - b By maintaining a dewatered trench.
 - c By keeping all pipe materials being used for repair or connection in a clean and sanitary condition.
 - 2 Inspecting and cleaning of existing and new piping.
 - a Followed by disinfection by spraying or swabbing with a minimum 1 percent chlorine solution.
 - b Include exposed portions of existing pipe interior surfaces, pipe materials used for connections or repair, and other materials and tools to make connections or repair.
 - 3 As appropriate, advise affected customers to adequately flush their service lines upon return of service.
- B DISINFECTION OF CONNECTIONS
- 1 Connections up to 20 feet in length
 - a Pipe fittings, and valves required for connection shall be spray disinfected or swabbed with a chlorine solution.
 - b The chlorine solution shall be 1% chlorine (10,000 milligrams per liter).
 - c Spraying or swabbing shall be performed just before being installed.
 - d Contractor shall utilize proper precautions when preparing solutions; spraying or swabbing; and handling disinfected pipe, fittings, and valves.
 - 2 Connections greater than 20 feet in length
 - a The pipe, fittings, and valves required for connection shall be disinfected above ground and bacteriological tested as described in this section for water main installation.
 - b After satisfactory bacteriological sample results have been received for the pre-disinfected piping, the piping can be used in connecting the new main to the active distribution system.
 - c Between the time the satisfactory bacteriological sample results are taken and the time that the connection piping is installed, the ends of the piping must be sealed with plastic wraps, water tight plugs or caps.
- C DISINFECTION OF REPAIRS
- 1 Possible repair situations are:
 - a Repair without depressurization
 - b Maintaining pressure until break site is fully exposed then main pressure is reduced.
 - c Maintaining pressure until break site is fully exposed then main is shut down and depressurized.
 - d Uncontrolled pipe break with likelihood of water contamination.
 - 2 Repair procedures
 - a Water main repairs shall be made in accordance with written procedures of the Water Department.
 - b Repairs shall be made by Water Department staff if possible.
 - c Potential repair contractors shall become familiar with Water Department procedures and perform work under the guidance of Water Department staff.

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5030 - TESTING AND DISINFECTION

END OF SECTION

DIVISION 05 - WATER MAINS AND APPURTENANCES
SECTION 5030 - TESTING AND DISINFECTION

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DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS

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Section 6010 - Structures for Sanitary and Storm Sewers

Part 1: GENERAL

1.01 SUBMITTALS

(REPLACE) All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction.

A through G (NO CHANGE)

1.08 MEASUREMENT AND PAYMENT

A (REPLACE) Manhole:

- 1 Measurement: Each size and type of manhole will be measured in vertical feet from the flow line to top of casting.
- 2 Payment: Payment will at the Unit price per vertical foot for each size and type of manhole.
- 3 Includes: Unit price includes, but is not limited to, excavation, placing bedding and backfill material, compaction, base, structural concrete reinforcement steel, pre-cast units (if used), inverts, pipe connections at the manhole and to any existing sewers, infiltration barriers (sanitary sewer manholes only), castings, and adjustment rings. Granular bedding and backfill materials paid separately.

B (REPLACE) Intake:

- 1 Measurement: Each size and type of intake will be measured in vertical feet from the flow line to the flow line of gutter.
- 2 Payment: Payment will at the Unit price per vertical foot for each size and type of intake.
- 3 Includes: Unit price includes, but is not limited to, excavation, placing bedding and backfill material, compaction, base, structural concrete reinforcement steel, pre-cast units (if used), inverts, pipe connections at the intake and to any existing sewers, castings, and adjustment rings. Granular bedding and backfill materials paid separately.

D (REPLACE) Casting Extension Rings:

- 1 Measurement: Adjusting rings are incidental as part of the Manhole.
- 2 Payment: Adjusting rings are incidental as part of the Manhole.

F Manhole or Intake Adjustment, Major:

- 1 Manhole Adjustment, Major:
 - a (REPLACE) Measurement: Each existing manhole adjusted to grade by addition or removal of riser, cone or flat top sections, or the exchange of existing riser sections with sections having different vertical dimensions or modification of cast in place structures will be counted.
 - c (REPLACE) Includes: Unit price includes, but is not limited to, removal of existing casting, adjustment rings, top sections, risers, sawing and removal of cast-in-place concrete; excavation, concrete reinforcing steel, precast sections, installing new casting; installing new infiltration barrier (sanitary sewer manhole only), new cast in place concrete, placing backfill material, and compaction.
- 2 Intake Adjustment, Major:
 - a (REPLACE) Measurement: Each existing intake adjusted to grade by addition or removal of riser, cone or flat top sections, or the exchange of existing riser sections with sections having different vertical dimensions or modification of cast in place structures will be counted.
 - c (REPLACE) Includes: Unit price includes, but is not limited to, removal of existing casting, adjustment rings, top sections, risers, sawing and removal of cast-in-place concrete; excavation, concrete reinforcing steel, precast sections, installing new casting; new cast in place concrete, placing backfill material, and compaction.

G Connection to Existing Manhole or Intake:

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

- 1 Connection to Existing Manhole:
 - c (REPLACE) Includes: Unit price includes, but is not limited to, coring or cutting into the existing manhole, flexible pipe connectors, flexible sealant, grout, and water stop (when required). All connections to sanitary sewer manholes must be core drilled to accommodate proper size flexible pipe connector.
- 2 Connection to Existing Intake:
 - c (REPLACE) Includes: Unit price includes, but is not limited to, coring or cutting into the existing intake, flexible pipe connectors, flexible sealant, grout, and water stop (when required).
- 3 (ADD) Concrete Collar Structure Connection:
 - a Measurement: Each size and type of concrete collar structure connection being installed will be counted.
 - b Payment: Payment will be at the unit price for each size and type of concrete collar structure connection.
 - c Includes: Unit price includes, but is not limited to, furnishing and installing all material shown on figure 4020.211 (SW-211).
- I (ADD) Manhole Remove and Replace:
 - 1 Remove and Replace Manhole:
 - a Measurement: Each size and type of manhole being installed will be measured in vertical feet from the flow line to top of casting.
 - b Payment: Payment will at the Unit price per vertical foot for each size and type of manhole being installed.
 - c Includes: Unit price includes, but is not limited to, complete removal of existing structure and replacement with new structure of type and size specified, excavation, placing bedding and backfill material, compaction, base, structural concrete reinforcement steel, pre-cast units (if used), inverts, pipe connections at the manhole and to any existing sewers, infiltration barriers (sanitary sewer manholes only), castings, and adjustment rings.
 - 2 Remove and Replace Intake:
 - a Measurement: Each size and type of intake being installed will be measured in vertical feet from the flow line to gutter line.
 - b Payment: Payment will at the Unit price per vertical foot for each size and type of intake being installed.
 - c Includes: Unit price includes, but is not limited to, complete removal of existing structure and replacement with new structure of type and size specified, excavation, placing bedding and backfill material, compaction, base, structural concrete reinforcement steel, pre-cast units (if used), inverts, pipe connections at the manhole and to any existing sewers, castings, and adjustment rings.

Part 2: PRODUCTS

2.01 MANHOLE AND INTAKE TYPES

Table 6010.01: Manhole and Intake Types

(ADD) See end of this section for City of Dubuque modifications to standard SUDAS figures.

2.05 PRECAST RISER JOINTS

B Joint Sealant:

2 (REMOVE) Storm Sewers:

2.07 BASE

A Sanitary Sewer Manhole

2 (REMOVE) All Other Manholes: Use precast or cast-in-place concrete base.

C Intake:

1 (ADD) Precast intakes allowed for new construction only, subject to Jurisdictional approval.

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

2.08 PIPE CONNECTIONS

- A (REPLACE) Flexible, Watertight Gasket: Comply with ASTM C923. Approved manufacturer A-Lok Industries and Press-Seal PSX Direct Drive Manhole connector or equal.

2.09 MANHOLE OR INTAKE ADJUSTMENT RINGS (GRADE RINGS)

- A Use one of the following materials for grade adjustments of manhole or intake frame and cover assemblies:
(ADD) Use High Density Polyethylene Adjustment Rings wherever possible, If sizes are not available use Reinforced Concrete Adjustment Rings or shim and PCC grout. Reinforced Concrete Adjustment Rings: Comply with ASTM C 478. Provide rings free from cracks, voids, and other defects.

- 2 (REPLACE) High Density Polyethylene Adjustment Rings: comply with ASTM D4976.

2.10 CASTINGS (Ring, Cover, Grate, Extensions)

- D (REPLACE) Load Capacity: Heavy Duty unless otherwise shown on the casting figures.

- 1 (REPLACE) Heavy Duty: Casting certified for 40,000 pound proof load according to AASHTO M306.

E Casting Types:

- 1 Manholes:

Table 6010.03: Manhole Casting Types

Allowable

- a Sanitary Sewer manhole

1) Neenah R-1642-A (Paved Areas)

2) Neenah R-1916-F - Bolted frame and cover (Non-Paved Areas)

- b Storm Sewer manhole

1) Neenah R-1642-A (Paved Areas)

2) Neenah R-1916-F - Bolted frame and cover (Non-Paved Areas)

- 2 Intakes:

- b (REPLACE) Castings must include environmental symbols and message
"DUMP NO WASTE, DRAINS TO FRESH WATER"

c (ADD) Storm Intakes Neenah R-3246-AL (Curb inlet)

d (ADD) Storm Intakes Neenah R-1878 (Area drain)

2.11 ADDITIONAL MATERIALS FOR SANITARY SEWER MANHOLES

B Riser Section Coating:

- 1 (REPLACE) Exterior: When exterior waterproof coating is specified, provide bituminous or water based acrylic coating.

2.16 DROP CONNECTION

A Internal:

- 1 Receiving Bowl:

a (ADD) Inside drop by Reliner Duran, or approved equal.

- 5 (ADD) Structure must have a minimum 60" diameter for use of internal drop connection.

Part 3: PART 3 – EXECUTION

3.05 CONNECTION TO EXISTING MANHOLE OR INTAKE

A General:

- 4 (ADD) All connections to sanitary sewer manholes shall be completed using a flexible connector. No concrete collars shall be used.

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

The details from Section 6010 shown in the table below have been modified as part of this supplemental specification. A more detailed summary of the modifications is included below the table.

City of Dubuque Modifications to Standard SUDAS Section 6010 Details			
Details		Description	Dubuque Supplemental Specification
6010.301	SW-301	Circular Sanitary Sewer Manhole	Detail Modification
6010.303	SW-303	Sanitary Sewer Manhole Over Existing Sewer	Specification Modification
6010.305	SW-305	Tee-section Sanitary Sewer Manhole	Specification Modification
6010.308	SW-308	Internal Drop Connection for Sanitary Sewer Manhole	Detail Modification
6010.401	SW-401	Circular Storm Sewer Manhole	Specification Modification
6010.501	SW-501	Single Grate Intake	Specification Modification
6010.503	SW-503	Single Grate Intake with Manhole	Specification Modification
6010.505	SW-505	Double Grate Intake	Specification Modification
6010.511	SW-511	Rectangular Area Intake	Specification Modification
6010.512	SW-512	Circular Area Intake	Specification Modification
6010.513	SW-513	Open-sided Area Intake	Specification Modification

Figure 6010.301, SW-301

(REPLACE) Figure 6010.301 (SW-301) Circular Sanitary Sewer Manhole

- A Included minimum drop through manhole table.
- B 60" diameter preferred to have cone sections in lieu of flat top.
- C Flat tap sections must have casting integral with top section.

Figure 6010.303, SW-303

(ADD) Notes and requirements.

- A Not allowed without design engineer justification and written approval from the jurisdiction.

Figure 6010.305, SW-305

(ADD) Notes and requirements.

- A Not allowed without design engineer justification and written approval from the jurisdiction.

Figure 6010.308, SW-308

(REPLACE) Figure 6010.308 (SW-308) Internal Drop Connection for Sanitary Sewer Manhole

Figure 6010.401, SW-401

(ADD) Notes and requirements.

- A (ADD) 48" diameter manholes shall use a cone section.

Figure 6010.501, SW-501

(ADD) Notes and requirements.

- A Cast-In-Place Only
- B Short wall dimension - 2'-6"
- C Wall Thickness - 0'-8"
- D Casting - Neenah R-3246-AL, with enviro notice cast into curb
'DUMP NO WASTE DRAINS TO FRESH WATER'

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

Figure 6010.504, SW-503

(ADD) Notes and requirements.

- A Cast-In-Place Only
- B Grate opening dimension - 2'-6"x3'-0"
- C Long Wall Dimension - Varies, See Plan
- D Wall Thickness - 0'-8"
- E Intake Casting - Neenah R-3246-AL, with enviro notice cast into curb
'DUMP NO WASTE DRAINS TO FRESH WATER'
- F Manhole Opening – Eliminate
- G Figure 6010.505, SW-505
- H Cast-In-Place Only
- I No center beam
- J Short wall dimension - 2'-6"
- K Double intake long wall dimension - 6'-1"
- L Triple intake long wall dimension - 9'-2"
- M Wall Thickness - 0'-8"
- N Casting - Neenah R-3246-AL, with enviro notice cast into curb
'DUMP NO WASTE DRAINS TO FRESH WATER'
- 1 Frame left flange removed: R-3246-0043
- 2 Frame right flange removed: R-3246-0044
- 3 Frame left and right flange removed: R-3246-0045

Figure 6010.505, SW-505 – SPECIAL

(ADD) Notes and requirements.

- A Cast-In-Place Only
- B No center beam
- C Box behind intake to be the full length of the intake
- D Short wall dimension -Varies, See Plan
- E Double intake long wall dimension - 6'-1"
- F Triple intake long wall dimension - 9'-2"
- G Wall Thickness - 0'-8"
- H Casting - Neenah R-3246-AL, with enviro notice cast into curb
'DUMP NO WASTE DRAINS TO FRESH WATER'
- 1 Frame left flange removed: R-3246-0043
- 2 Frame right flange removed: R-3246-0044
- 3 Frame left and right flange removed: R-3246-0045

Figure 6010.511, SW-511

(ADD) Notes and requirements.

- A Cast-In-Place Only
- B Inside wall dimension - 3'-0"x3'-0"
- C Wall Thickness - 0'-8"
- D Casting - Neenah R-1878-A10G, with surface mount enviro notice
'DUMP NO WASTE DRAINS TO FRESH WATER' set in surrounding concrete.

Figure 6010.512, SW-512

(ADD) Notes and requirements.

- A Only allowable for pipes < 30" diameter

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

Figure 6010.513, SW-513

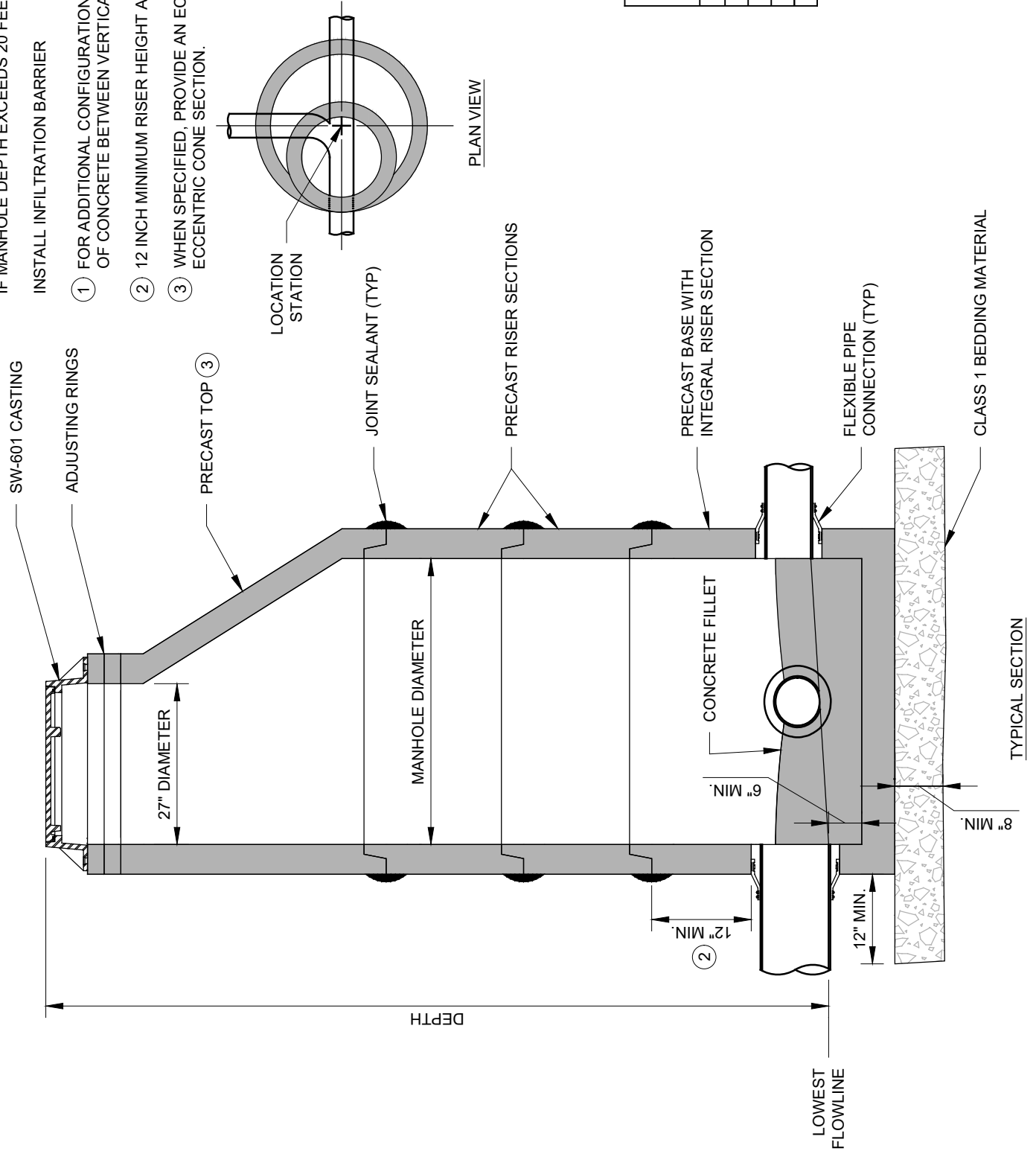
(ADD) Notes and requirements.

- A Only allowable for pipe < 30" diameter
 - 1 Cast-In-Place Only
 - 2 Wall Thickness - 0'-8"
 - 3 Casting - Neenah R-1642 A

IF MANHOLE DEPTH EXCEEDS 20 FEET, INSTALL STEPS.

INSTALL INFILTRATION BARRIER

- ① FOR ADDITIONAL CONFIGURATIONS, MAINTAIN A MINIMUM OF 12 INCHES OF CONCRETE BETWEEN VERTICAL EDGES OF PIPE OPENINGS.
- ② 12 INCH MINIMUM RISER HEIGHT ABOVE ALL PIPE OPENINGS.
- ③ WHEN SPECIFIED, PROVIDE AN ECCENTRIC FLAT TOP IN LIEU OF ECCENTRIC CONE SECTION.



Average Grade	Minimum Drop Thru Manhole
0.15%	0.10'
2.51%	0.20'
5.01%	0.30'
7.51% - 10.00%	0.40'
10.01% - 12.50%	0.50'
12.51% - 15.00%	0.60'
15.01% - 17.50%	0.70'
17.51% - 20.00%	0.80'

Manhole Diameter (inches)	Maximum Pipe Diameter (inches) for 2 Pipes	
	At 180° Separation	At 90° Separation
48	24	18
60	36	24
72	42	30
84	48	36
96	60	42

CITY OF DUBUQUE		REVISION
		2023
FIGURE 6010-301		SW-301
		SHEET 1 of 1
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		
CIRCULAR SANITARY SEWER MANHOLE		

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

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- ① CORE DRILL OPENINGS AT LEAST 12 INCHES FROM EXISTING MANHOLE JOINTS
- ② INSTALL FLEXIBLE PIPE COUPLER OR PIPE JOINT ON NEW SANITARY SEWER 18 TO 24 INCHES FROM OUTSIDE OF MANHOLE WALL.
- ③ CHAMFER END OF PIPE:
PROVIDE SQUARE END CUT WITH A MINIMUM DISTANCE OF 1/4 OF THE PIPE. VERTICAL DISTANCE OF CHAMFER CUT IS EQUAL TO THE PIPE DIAMETER.
- ④ SHAPE OR RESHAPE THE FILLET TO PROVIDE A LEVEL BENCH TO SUPPORT THE DROP PIPE AND A SMOOTH TRANSITION TO DIRECT THE FLOW TO THE OUTLET.
- ⑤ SELECT APPROPRIATE MANHOLE DIAMETER TO PROVIDE A MINIMUM OF 48 INCH CLEAR SPACE BETWEEN THE DROP PIPE AND THE SIDEWALL OF THE MANHOLE.
- ⑥ INSIDE DROP SYSTEM AS MANUFACTURED BY RELINER / DURAN INC. OR APPROVED EQUAL.

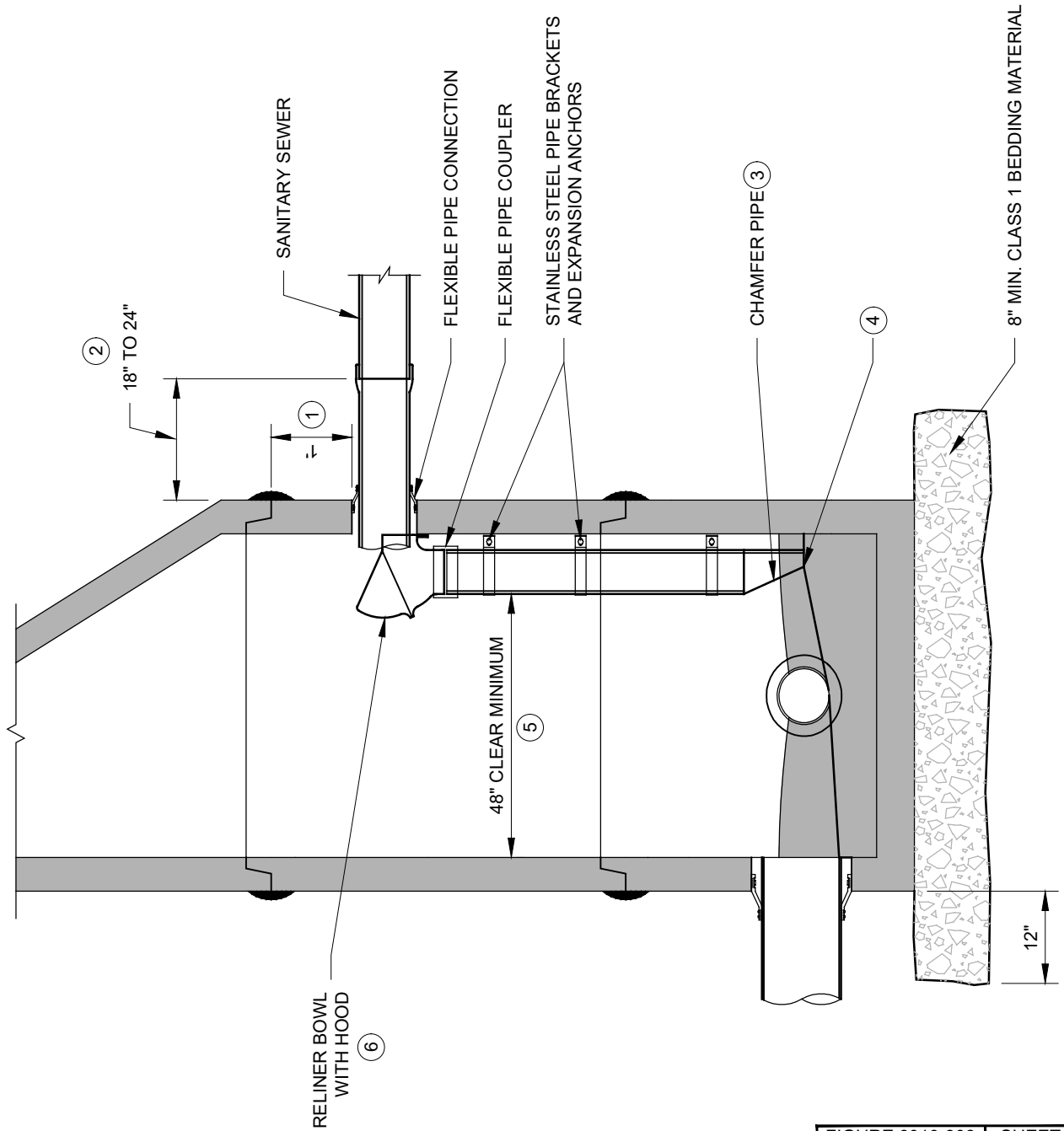


FIGURE 6010-308 SHEET 1 of 1

CITY OF DUBUQUE	REVISION	2023
	FIGURE 6010-308	MODIFIED
SUPPLEMENTAL SPECIFICATIONS TO STATEWIDE URBAN DESIGN AND SPECIFICATIONS (SUDAS)		SHEET 1 of 1
INTERNAL DROP CONNECTION FOR SANITARY SEWER MANHOLE		

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

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DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

END OF SECTION

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6010 - STRUCTURES FOR SANITARY AND STORM SEWERS

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Section 6020 - Rehabilitation of Existing Manholes

Part 1: GENERAL

1.03 SUBMITTALS

(REPLACE) All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction

A Thru B (NO CHANGE)

1.04 (REMOVE) SUBSTITUTIONS

1.08 MEASUREMENT AND PAYMENT

A Infiltration Barriers:

2 (REMOVE) Molded Shield

3 (REMOVE) Urethane Chimney Seal

C (REMOVE) In-Situ Manhole Replacement, Cast-in-place Concrete with Plastic Liner:

D Manhole Lining with Centrifugally Cast Cementitious Mortar Liner with Epoxy Seal:

3 (REPLACE) Includes: Unit prices includes, but is not limited to, the handling of sewer flows during lining operations as required to properly complete the installation, existing casting shall be left in place.

E (ADD) Manhole Lining with Centrifugally Cast Cementitious Mortar Liner:

3 Measurement: The vertical dimension of manhole lining will be measured for depth in feet from the bottom of the lining to the top of the lining for each liner thickness specified.

4 Payment: Payment will be at the unit price per vertical foot for each liner thickness.

5 Includes: The unit price includes, but is not limited to, the handling of sewer flows during lining operations as required to properly complete the installation, casting shall be left in place.

F (ADD) Chemical Grouting of Manholes:

3 Chemical Grouting of Sanitary Sewer Manholes

a Measurement: Per gallon injected as approved for the discontinuation of leaks.

b Payment: Will be made per the unit price Per Gallon Injected.

c Include: Unit price includes but is not limited to furnishing all materials, labor, and equipment to complete all work specified. The contractor shall be responsible for sealing all visible leaks and areas with evidence of leaks (deposits or staining) in the listed manholes for this project. The contractor shall verify the condition of the manholes before bidding.

Part 2: PRODUCTS

2.01 INFILTRATION BARRIER

B (REMOVE) Molded Shield

C (REMOVE) Heat Shrink Sleeve

2.02 IN-SITU MANHOLE REPLACEMENT, CAST-IN-PLACE CONCRETE

C (REMOVE) Plastic Liner:

2.03 CENTRIFUGALLY CAST CEMENTITIOUS MORTAR LINER WITH EPOXY SEAL

A Cementitious Lining

4 (ADD) Cementitious mortar liner shall be installed to meet a 0.5 inch minimum thickness.

B Corrosion-Resistant Epoxy Lining:

3 (ADD) Two-Part 100% solids epoxy shall be installed to meet a 25 square foot per gallon coverage at 0.065 inch thickness.

C (REPLACE) Casting shall be left in place.

2.04 (ADD) MANHOLE LINING WITH CENTRIFUGALLY CAST CEMENTITIOUS MORTAR LINER

A Refer to Section 6020 2.03 - A for materials. (Section 6020 2.03: B not required)

Part 3: EXECUTION

3.01 INFILTRATION BARRIER

B (REMOVE) Molded Shield:

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6020 - REHABILITATION OF EXISTING MANHOLES

- C (REMOVE) Urethane Chimney Seal:
- 3.03 CENTRIFUGALLY CAST CEMENTITIOUS MORTAR LINER WITH EPOXY SEAL
 - B Mortar Application:
 - 2 (REPLACE) Retrieve the applicator head at the manufacturer's recommended speed to achieve the desired thickness. Thickness shall be a minimum of 1/2".
 - E (ADD) Repair/Replacement of Defects.
 - 1 The Contractor shall outline specific repair or replacement procedures for potential defects in the installed cementitious mortar liner with epoxy seal. Repair/replacement procedures shall be as recommended by the liner/sealer system manufacturer and shall be submitted to the Owner at the Pre-Construction Meeting.
 - a Repairable defects in the installed cementitious mortar liner with epoxy seal shall be specifically defined by the Contractor based on manufacturer's recommendations, including a detailed step-by-step repair procedure, resulting in a finished product meeting the requirements of SUDAS.
 - b Un-repairable defects to the cementitious mortar liner with epoxy seal shall be clearly defined by the Contractor based on the manufacturer's recommendations, including a recommended procedure for the removal and replacement.
 - 2 Defects in the installed cementitious mortar liner with epoxy seal that will not affect the operation and long term life of the product shall be identified and defined.
 - a The Owner reserves the right to request an independent evaluation of a defective cementitious mortar liner with epoxy seal identified and defined by the Contractor to not affect the operation and long term life of the product. In the event, the Owner/Owner's representative determines the defect does not result in a finished product meeting the requirements of SUDAS, the Contractor shall follow SUDAS Division 6, Section 6020 – Rehabilitation of Existing Manholes, Part 3 – Execution, 3.03 Centrifugally Cast Cementitious Mortar Liner with Epoxy Seal E (1).
- 3.05 (ADD) Chemical GROUTING OF MANHOLES
 - A Contractor shall install Chemical Grout per the manufacturer's instructions. If grout sealing is determined by the Contractor to be necessary, the Contractor shall notify the Owner for approval, prior to installation.

END OF SECTION

(NO CHANGE) Section 6030 - Cleaning, Inspection, and Testing of Structures

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 06 - STRUCTURES FOR SANITARY AND STORM SEWERS
SECTION 6030 - CLEANING, INSPECTION, AND TESTING OF STRUCTURES

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DIVISION 07 - STREETS AND RELATED WORK

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Section 7010 - Portland Cement Concrete Pavement

The details from Section 7010 shown in the table below have been modified as part of this supplemental specification. A more detailed summary of the modifications is included below the table.

City of Dubuque Modifications to Standard SUDAS Section 7010 Details			
Details		Description	Dubuque Supplemental Specification
7010.102	PV-102	PCC Curb Details	Specification Modification
7010.901		PCC Pavement Jointing	Specification Modification

Figure 7010.102, PV-102

(ADD) Notes and requirements.

- A 4" and 6" Sloped Curb Details only allowed with City of Dubuque approval.
- B Primarily used on roundabouts.

Figure 7010.901

(ADD) Notes and requirements.

- A Only Quarter Point Jointing is allowed on pavements with a thickness less than 9 inches.
- B Gutterline Jointing can only be used in pavements 9" thick or greater with City of Dubuque approval.

END OF SECTION

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7010 - PORTLAND CEMENT CONCRETE PAVEMENT

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(NO CHANGE) Section 7011 - Portland Cement Concrete Overlays

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7011 - PORTLAND CEMENT CONCRETE OVERLAYS

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Section 7020 - Hot Mix Asphalt Pavement

Part 1: GENERAL

1.09 (ADD) SCALES

Scales shall conform to the Iowa DOT Standard Specifications for Highway and Bridge Construction latest series, Section 2001 Weighing Equipment and Procedures.

Part 3: EXECUTION

3.01 ASPHALT PAVEMENT

F Fixtures in the Pavement Surface

- 2 (REPLACE) All fixture locations are to be cored with a core bit assembly after final pavement placement. Manhole castings shall be encased in a ring of M-4 concrete, matching pavement thickness and 10 inches wide. See PV-201 for Circular Boxout. Water valve boxes shall be encased in a ring of M-4 concrete, 8 inches wide and matching pavement thickness. The ring and cover shall be $\frac{1}{4}$ inch below the adjacent HMA surface. Before paving, a metal plate will be placed over the fixture location to be adjusted. Contractor to ensure plate will not shift or move during paving. After final surface is placed and fully compacted, fixture can be adjusted after 24 hours has passed to allow for cooling of the pavement surface. Any HMA mix that falls into the structure and pipe will be completely removed by the contractor.
- 3 (REMOVE) Construct boxouts where allowed for later adjustment of fixtures. See Figure 7020.201 for the size and shape of the boxout.

END OF SECTION

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(NO CHANGE) Section 7021 - Hot Mix Asphalt Overlays

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7021 - HOT MIX ASPHALT OVERLAYS

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Section 7030 - Sidewalks, Shared Use Paths, and Driveways

Part 1: GENERAL

1.08 MEASUREMENT AND PAYMENT

F (REPLACE) Brick/Paver Sidewalk with Pavement Base:

City Policy pertaining to the installation and location of Brick Sidewalk was adopted on October 15, 2007 by City Council. The policy prohibits the installation of brick sidewalks in the traveled portion of the right-of way, which shall be a minimum of four feet in width.

- 1 **Measurement:** Measurement will be in square yards for the area of brick/paver sidewalk placed on a pavement base. The area of pavement base will not be measured separately.
- 2 **Payment:** Payment will be at the unit price per square yard for the area of brick/paver sidewalk.
- 3 **Includes:** Unit price includes, but is not limited to, subgrade preparation, pavement base, setting bed, neoprene asphalt adhesive for asphalt setting bed, setting the bricks/pavers, installing weep holes and associated materials, and sand/cement joint filler.

H Driveways

- 2 **(REMOVE) Granular Surfacing for Driveways by Square Yards:**

Part 2: PRODUCTS

2.01 PORTLAND CEMENT CONCRETE

- ##### **A (REPLACE) Use Class C concrete with materials complying with Section 7010. Use coarse aggregate of Class 2 durability or better.**

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7030 - SIDEWALKS, SHARED USE PATHS, AND DRIVEWAYS

The details from Section 7030 shown in the table below have been modified as part of this supplemental specification. A more detailed summary of the modifications is included below the table.

City of Dubuque Modifications to Standard SUDAS Section 7030 Details			
Details		Description	Dubuque Supplemental Specification
7030.101		Concrete Driveway, Type A	Specification Modification
7030.102		Concrete Driveway, Type B	Specification Modification
7030.202		Curb Details for Class A Sidewalk	Specification Modification

Figure 7030.101

(ADD) Notes and requirements.

- A Replace the following notes on figure 7030.101.
 - 3 (REPLACE) Pavement thickness. Residential: 6 inches minimum. Commercial and Industrial: 8 inches minimum

Figure 7030.102

(ADD) Notes and requirements.

- A Replace the following notes on figure 7030.101.
 - 3 (REPLACE) Pavement thickness. Residential: 6 inches minimum. Commercial and Industrial: 8 inches minimum
 - 5 (REPLACE) Box out shall extend to the first longitudinal panel joint. Full depth saw cut is still required.

Figure 7030.202

(ADD) Notes and requirements.

- A Delete Detail 1 and Detail 2 in their entirety.
- B Detail 3 Jurisdictional Approval only.

END OF SECTION

Section 7040 - Pavement Rehabilitation

Part 1: GENERAL

1.08 MEASUREMENT AND PAYMENT

G. Milling:

3. (REPLACE) Includes: Unit price includes, but is not limited to, milling pavement; furnishing water; cutting or clipping of reinforcement; and salvaging, stockpiling, and removing cuttings and debris.

M. (ADD) M. Historic Brick Paver Removal and Salvage:

1. Measurement: Will be in square yards of pavers removed
2. Payment: Payment will be at the bid unit price for each square yard of pavers removed.
3. Includes:
 - a. Removal of brick pavers
 - b. Cleaning each paver of loose soils and debris
 - c. Palletizing pavers on contractor supplied pallets and wrapping the palletized pavers with shrink wrap.
 - d. Loading, trucking, unloading palletized pavers to the storage area at the Dubuque Metro Landfill or other designated area as directed by City Engineer.

N. (ADD) Curb and Gutter, Remove and Replace

1. Measurement: Measurement will be in linear feet measured along the face of the curb for each different width and thickness of curb and gutter.
2. Payment: Payment will be at the unit per linear foot of curb and gutter removed and replaced.
3. Includes: Unit price includes, but not limited to, sawing, breaking, removing, and disposing of existing curb and gutter; and final subgrade/sub-base preparation, furnishing and installing base material, bars and reinforcement, joints and sealing, surface curing and pavement protection, and box outs for fixtures.

O. (ADD) Removal – Railroad Track

1. Measurement: Measurement will be in Track Lineal Feet (TLF) which includes the length for both rails. The length will be measured down the centerline of the railroad. If the contractor removes only one rail of the railroad tracks, the Contractor will be paid for 0.5 feet for each 1.0 feet of Track Lineal Feet removed.
2. Payment: Payment will be at the unit price per Track Lineal Feet removed.
3. Includes: Unit price includes, but not limited to, all labor required to saw, cut, and removal of both rails, ties, and other items associated with railroad track removal.

END OF SECTION

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7040 - PAVEMENT REHABILITATION

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(NO CHANGE) Section 7050 - Asphalt Stabilization

NO CHANGES PROPOSED FOR THIS SECTION.

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(NO CHANGE) Section 7060 - Bituminous Seal Coat

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7060 - BITUMINOUS SEAL COAT

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(NO CHANGE) Section 7070 - Emulsified Asphalt Slurry Seal

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7070 - EMULSIFIED ASPHALT SLURRY SEAL

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Section 7080 - Permeable Interlocking Pavers

Part 1: GENERAL

1.08 MEASUREMENT AND PAYMENT

H. (ADD) Foundation Waterproofing, Surface Leveling:

1. Measurement: Measurement will be in square feet of leveling product applied to the surface.
2. Payment: Payment will be at the bid unit price for each square foot of leveling product applied to the surface.
3. Includes: Unit price includes, but is not limited to, cleaning and preparing the surface in accordance with manufacturer's instructions, installation of the leveling product

I. (ADD) Foundation Waterproofing, Sealer:

1. Measurement: Measurement will be in square feet of sealing product applied to the surface.
2. Payment: Payment will be at the bid unit price for each square foot of sealing product applied to the surface.
3. Includes: Unit price includes, but is not limited to, cleaning and preparing the surface in accordance with manufacturer's instructions, installation of the leveling product.

Part 2: PRODUCTS

2.01 PERMEABLE INTERLOCKING CONCRETE PAVERS

A. Manufacturer: County Materials, Unilock and Interlock Concrete Products.

1. Local Distributor: Top Block & Brick, East Dubuque, IL, County Materials

B. B. Permeable Interlocking Concrete Paver Units:

1. Paver Type: H2O Pro Paver, Unilock Eco-Optiloc Paver and Holland Eco Paver.
 - a. Material Standard: Comply with ASTM C 936.
 - b. Color: To be approved by City of Dubuque.
 - c. Color Pigment Material Standard: Comply with ASTM C 979

END OF SECTION

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7080 - PERMEABLE INTERLOCKING PAVERS

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(NO CHANGE) Section 7090 - Cold-In-Place Pavement Recycling

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7090 - COLD-IN-PLACE PAVEMENT RECYCLING

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(NO CHANGE) Section 7091 - Full Depth Reclamation

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7091 - FULL DEPTH RECLAMATION

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(NO CHANGE) Section 7092 - Crack and Seat Existing PCC Pavement

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 07 - STREETS AND RELATED WORK
SECTION 7092 - CRACK AND SEAT EXISTING PCC PAVEMENT

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DIVISION 08 - TRAFFIC

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

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(REPLACE) Section 8010 - Equipment, Lighting, and Signals

Part 1: GENERAL

1.01 SECTION INCLUDES

- A Underground
- B Cabinets, Pedestals, and Poles
- C Detection
- D Emergency Preemption
- E Data Aggregator
- F Pan / Tilt-Zoom Cameras
- G Stop Bar Cameras
- H ITS Components

1.02 DESCRIPTION OF WORK

This part of the specifications includes the furnishing of all material and equipment necessary to complete, in place and operational, traffic control signal(s) as described in the project plans.

1.03 SUBMITTALS

Comply with Division 1 - General Provisions and Covenants, as well as the additional requirements listed below. All of the following must be submitted within 30 days after awarding of the contract for the project. Verify the method of submittal with the Jurisdiction.

- A Schedule of Unit Prices: Submit a completed schedule of unit prices. Estimates of the work performed on the project will be made by the Jurisdiction and the unit costs will be used to prepare progress payments to the Contractor.
- B Material and Equipment List: Submit a completed list of materials and equipment to the Jurisdiction for written approval before any equipment or materials are ordered.
- C Contractor Certification: Submit the name(s) and contact information of the International Municipal Signal Association (IMSA) Level II Certified Traffic Signal Technician(s) working on the project and a copy of their IMSA certificate.
- D Shop Drawings: Submit shop drawings for traffic signal poles and structures to be furnished on the project. Submit catalog cuts and manufacturer's specifications for all items in the equipment list.

1.04 SUBSTITUTIONS

Comply with Division 1 - General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 - General Provisions and Covenants.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 - General Provisions and Covenants.

1.07 SPECIAL REQUIREMENTS

Comply with the current edition of the MUTCD as adopted by the Iowa DOT.

- A Any existing traffic signal equipment designated to be removed on the project shall remain the property of the City of Dubuque, unless Dave Ness or Duane Richter, City of Dubuque, 563-589-4270, indicates the Contractor shall retain ownership. The Contractor shall deliver any removed equipment to the City of Dubuque Public Works Department at the address given by the City Project Engineer. The Contractor shall take all reasonable precautions in protecting existing equipment. If any equipment is damaged, the Contractor shall be liable for replacement. The existing signal shall remain in operation until the new system is ready for service. The Contractor shall notify the City Project Engineer and Police Dispatcher prior to any operational shutdown of the traffic signals, either existing or new.
- B Fabrication or assembly process materials shall comply with the applicable parts of Section 2523 "Highway Lighting" of the "1992 Standard Specifications" with the additions as stated herein
- C Equipment and materials shall be of new stock unless the plans provide for the relocation of or the use of fixtures furnished by others. New equipment and materials shall be the product of reputable manufacturers of electrical equipment, and shall meet Engineer approval

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- D One (1) copy of catalog cuts and manufacturer's specifications shall be furnished for all standard "off-the-shelf" items shall be emailed to the City of Dubuque. Engineer review of shop drawings and catalog cuts shall not relieve the Contractor of any responsibility under the Contract documents.
- E All electrical equipment shall conform to the standards of the National Electrical Manufacturers Association (NEMA), and all material and work shall conform to the requirements of the National Electrical Code (NEC), the Standards of the American Society for Testing Materials (ASTM), the American Standards Association (ASA), and local ordinances. Miscellaneous electrical equipment and materials shall be UL approved.
- F Wherever reference is made in these specifications or in the standard provisions to the code, the safety orders, the general order, or the standards mentioned above, the reference shall be construed to mean the code, order, or standard that is in effect at the date of advertising of these Specifications.
- G Certification from the manufacturers of all electrical equipment, signal supports, conduit and cable shall be supplied by the Contractor stating said material complies with these Specifications.

1.08 MEASUREMENT AND PAYMENT

- A Traffic Signal:
 - 1 Measurement: Lump sum item; no measurement will be made.
 - 2 Payment: Payment will be at the lump sum price for traffic signal installation.
- B Temporary Traffic Signal:
 - 1 Measurement: Lump sum item; no measurement will be made.
 - 2 Payment: Payment will be at the lump sum price for temporary traffic signal. 50% of the lump sum bid amount will be paid upon completion of the installation and successful initial operation of the signal; the final 50% will be paid upon removal of the temporary traffic signal and cleanup of the site.
 - 3 Includes: Lump sum price includes but is not limited to furnishing, installing, maintaining, and removing poles; wiring; traffic signal control equipment including pedestrian equipment if specified; all modifications of signal timing due to changes in construction staging; relocation of trailer mounted temporary traffic signal systems; placement in another physical location to address changes in construction staging; and all appurtenances.
- C Handholes:
 - 1 Measurement: Each type of handhole installed will be counted.
 - 2 Payment: Payment will be at the unit price for each type of handhole installed.
 - 3 Includes: Unit price includes but is not limited to furnishing each type of handhole, excavation, installation, placing bedding and backfill, backfill compaction, casting, core drilled and sealed conduit connections and grounding and bonding. Bedding and backfill material, in accordance with section 3010, paid for under separate bid items.
- D Fiber Vault, PC:
 - 1 Measurement: Each type of fiber vault installed will be counted.
 - 2 Payment: Payment will be at the unit price for each type of fiber vault installed.
 - 3 Includes: Unit price includes but is not limited to furnishing each type of fiber vault, excavation, installation, placing bedding and backfill, backfill compaction, casting, core drilled and sealed conduit connections and grounding and bonding. Bedding and backfill material, in accordance with section 3010, paid for under separate bid items.
- E Fiber Vault, Composite:
 - 1 Measurement: Each type of fiber vault installed will be counted.
 - 2 Payment: Payment will be at the unit price for each type of fiber vault installed.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 3 Includes: Unit price includes but is not limited to furnishing each type of fiber vault, excavation, installation, placing bedding and backfill, backfill compaction, core drilled and sealed conduit connections and grounding and bonding. Bedding and backfill material, in accordance with section 3010, paid for under separate bid items.
- F Traffic Signal Tub:
 - 1 Measurement: Each type of Traffic Signal Tub installed will be counted.
 - 2 Payment: Payment will be at the unit price for each type of Traffic Signal Tub installed.
 - 3 Includes: Unit price includes but is not limited to furnishing each type of Traffic Signal Tub, excavation, installation, placing bedding and backfill, backfill compaction, casting, core drilled and sealed conduit connections and grounding and bonding. Bedding and backfill material, in accordance with section 3010, paid for under separate bid items.
- G Connections, Existing Handholes and Vaults:
 - 1 Measurement: Each additional connection, as directed by the Jurisdiction, to a vault or handhole will be counted.
 - 2 Payment: Payment will be at the unit price for each connection installed.
 - 3 Includes: Unit price includes but is not limited to core drilling the structure to accommodate the new conduit connection, sealing the annular space around the conduit with a flexible sealant.
- H Conduits:
 - 1 Measurement: Each size and type of conduit will be measured along its centerline, from inside face of structure to inside face of structure. If there are not any structures, the conduit will be measured from the ends of the conduit installed.
 - 2 Payment: Payment will be at the unit price per lineal foot for each size and type of conduit installed.
 - 3 Includes: Unit Price Includes, but is not limited to conduit, innerduct (if required), microduct, tracer wire, couplings, bends, sweeps, fittings, pull tape, plugs, and installation. Trenching, boring, Placing bedding and backfill material in accordance with section 3010.
- I Conduit, Re-route:
 - 1 Measurement: Each size and type of conduit will be measured along its centerline, from coupling to the centerline of terminal structure. If there are is not a terminal structure, the conduit will be measured from the ends of the conduit installed.
 - 2 Payment: Payment will be at the unit price per lineal foot for each size and type of conduit installed.
 - 3 Includes: Unit Price Includes, but is not limited to; removal, modifying and reinstalling the existing wiring / cable / fiber; modifying the existing innerduct / microduct as needed; modifying the existing conduit as needed; installation of new conduit, tracer wire, couplings, bends, sweeps, fittings, pull tape, plugs and installation.
- J Wiring and Cable:
 - 1 Measurement: Each type and size of wire or cable will be measured in linear feet, from face of structure to face of structure. Wiring or cabling within cabinets, and poles will not be measured.
 - 2 Payment: Payment will be at the bid unit price per linear foot of each type and size of wire or cable installed. Payment for wire and cable within cabinets and poles shall be considered incidental to the cabinet or pole and merged into the unit price of that item.
 - 3 Includes: Unit Price Includes, but is not limited to, wire / cable / fiber optic cable, accessories, and installation.
- K Footings and Foundations:
 - 1 Measurement: Each type of precast footing will be counted.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 2 Payment: Payment will be at the bid unit price for each precast footing installed. Bedding and backfill will be paid separately, at the bid unit price.
 - 3 Includes: Unit Price Includes, but is not limited to, excavation, placing bedding and backfill material in accordance with section 3010, precast foundation unit, installation, conduit connections and grounding and bonding.
- L Bonding and Grounding:
- 1 Measurement: Each structure being grounded will be counted.
 - 2 Payment: Payment will be at the bid unit price for each structure being grounded, at the bid unit price.
 - 3 Includes: Unit Price Includes, but is not limited to, furnishing and installation of ground rods, copper wire fittings, and approved mechanical connectors.
- M Cabinets and Pedestals:
- 1 Measurement: Each cabinet or pedestal will be counted.
 - 2 Payment: Payment will be at the bid unit price for each cabinet or pedestal installed.
 - 3 Includes: Unit Price Includes, but is not limited to, furnishing and installation of the cabinet or pedestal on the PC foundation, identified components, wiring, cabling, fiber optic cable, connections and terminations to internal components. City will pay all fees to supply the electrical service.
- N Street Lights:
- 1 Measurement: Each type of light will be counted.
 - 2 Payment: Payment will be at the bid unit price for each light installed.
 - 3 Includes: Unit Price Includes, but is not limited to, furnishing and the complete installation of the pole, arm, and fixture on the PC foundation, wiring from the handhole, and connections.
- O Removals:
- 1 Measurement: Each item removed will be counted.
 - 2 Payment: Payment will be at the bid unit price for each item removed.
 - 3 Includes: Unit Price Includes, but is not limited to, the complete removal of street lights, intersections signal systems, wiring, conduit, cabinets, vaults, handholes, and PC bases. This unit price also includes, if required, salvaging and delivery of identified items to the City storage yard on Terminal Street. Backfilling, in accordance with section 3010, of excavations due to the removal of underground structures is also included. Surface restoration and backfill material is paid for separately.
- P Relocate:
- 1 Measurement: Each item relocated will be counted.
 - 2 Payment: Payment will be at the bid unit price for each item relocated.
 - 3 Includes: Unit Price Includes, but is not limited to, the complete relocation of identified items. This unit price also includes all necessary modifications and connections for conduit, wiring, cabling, and backfilling, in accordance with section 3010, of excavations. Surface restoration and backfill material is paid for separately.
- Q Abandonment, CIP or PC Concrete Base:
- 1 Measurement: Each item abandoned in place will be counted.
 - 2 Payment: Payment will be at the bid unit price for each item abandoned in place.
 - 3 Includes: Unit Price Includes, but is not limited to, removal of the top portion of the concrete footing or foundation to four feet below grade, and backfilling, in accordance with section 3010, of excavations. Surface restoration and backfill material is paid for separately.
- R Cameras, Traffic & Surveillance, Fixed:
- 1 Measurement: Each item installed will be counted.
 - 2 Payment: Payment will be at the bid unit price for each camera installed.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 3 Includes: Unit Price Includes but is not limited to complete installation of the camera, mounting brackets and hardware, wiring, licensing and testing.
- S Cameras, Traffic & Surveillance, 180 Deg:
 - 1 Measurement: Each item installed will be counted.
 - 2 Payment: Payment will be at the bid unit price for each camera installed.
 - 3 Includes: Unit Price Includes but is not limited to complete installation of the camera, mounting brackets and hardware, wiring, licensing and testing.
- T Cameras, Traffic & Surveillance, PTZ:
 - 1 Measurement: Each item installed will be counted.
 - 2 Payment: Payment will be at the bid unit price for each camera installed.
 - 3 Includes: Unit Price Includes but is not limited to complete installation of the camera, mounting brackets and hardware, wiring, licensing and testing.

Part 2: PRODUCTS

2.01 UNDERGROUND

- A Traffic Signal:
 - 1 See Below for specifications related to the individual components
- B Traffic Signal – Temporary:
 - 1 See Below for specifications related to the individual components
- C Handholes:
 - 1 General:
 - a Granular Base: Comply with section 3010; however, the Engineer may authorize a change in gradation, subject to materials available locally at the time of construction.
 - b Cover: Include "TRAFFIC SIGNAL" as a message on the cover. Alternate messages may be required as specified in the contract documents.
 - 2 Precast Concrete Handhole:
 - a Pipe: Comply with ASTM C 76. Minimum Class III, Wall B (Iowa DOT Class 2000D).
 - b Casting: Gray cast iron and certified according to requirements of AASHTO M 306 for a 16,000 pound proof-load (HS-20).
 - 3 Composite Handhole and Cover:
 - a Composed of mortar consisting of sand, gravel, and polyester resin reinforced by a woven glass fiber mat or of resin mortar and fiberglass.
 - b handhole and cover rated for a load of 20,000 pounds.
 - c Provides a skid resistant surface on the cover and includes "TRAFFIC SIGNAL" or "ELECTRIC" as a message on the cover. Alternate messages may be required as specified in the contract documents.
 - d Provide two 3/8-16 UNC stainless steel hex head bolts with washers
- D Fiber Vault, Precast Concrete:
 - 1 General:
 - a Precast Concrete Base: Integral base and sidewall comply with ASTM C 478
 - b Precast Concrete Top: Top comply with ASTM C 478. Provide 27" dia. opening centered in the top.
 - c Joint Sealant: Use Profile gasket comply with ASTM C 443.
 - d Adjustment Rings (Grade Rings): High Density Polyethylene Adjustment Rings. Comply with ASTM D 1248
 - e Conduit Openings: Manufactured Knock-outs or Core drilled from the inside.
 - f Cable Hooks: Provide four cable hooks with a minimum diameter of 3 inch saddle hook. Material shall be plastic, aluminum, or stainless steel.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- g Sump and Drainage: Each vault shall include a drainage system (where applicable) as shown on in the plans. The vault will have a 6" dia. x 3" deep sump with 4 – ¾" drain holes in the sump pit for water to drain.
 - h Granular Base: Maintain 18" of 1" clean stone beneath and around the structure. Comply with section 3010; however, the Engineer may authorize a change in gradation, subject to materials available locally at the time of construction.
 - i Casting: Casting shall be Neenah 1642-4 or equal. Include "Fiber Optics" as a message on the cover. Alternate messages may be required as specified in the contract documents.
 - j Sizes:
 - 1) Square: 48" x 48" outside dimension, 36" x 36" inside dimension fiber vault manhole. 48" deep (inside dimension).
 - 2) Round: 48" inside diameter x 48" deep (inside dimension)
- E Fiber Vault, Composite:
 - 1 General:
 - a Composite vault: Comply with Tier 22
 - b Conduit Openings: Core drilled from the inside.
 - c Cable Hooks: Provide three 3/8" diameter female threaded inserts. Hooks shall be 3/8" diameter and a minimum length of 5 inches. Hook material shall be plastic, aluminum, or stainless steel.
 - d Sump and Drainage: Each vault shall include a drainage system (where applicable) as shown on in the plans.
 - e Granular Base: Maintain 18" of 1" clean stone beneath and around the structure. Comply with section 3010; however, the Engineer may authorize a change in gradation, subject to materials available locally at the time of construction.
 - f Cover: Include "Fiber Optics" as a message on the cover. Alternate messages may be required as specified in the contract documents.
 - g Cone Dimensions: Top opening – 26 3/8" inside diameter, Bottom opening - 48" inside diameter, 36" outside vertical dimension.
- F Traffic Signal Tub, Precast Concrete:
 - 1 General:
 - a Precast Concrete: Comply with ASTM C 478
 - b Adjustment Rings (Grade Rings): High Density Polyethylene Adjustment Rings. Comply with ASTM D 1248
 - c Conduit Openings: Manufactured Knock-outs or Core drilled from the inside.
 - d Cable Hooks: Provide four cable hooks with a minimum diameter of 3/8 inch and a minimum length of 5 inches. Material shall be plastic, aluminum, or stainless steel.
 - e Sump and Drainage: Each vault shall include a drainage system (where applicable) as shown on in the plans. Open bottom.
 - f Granular Base: Maintain 18" of 1" clean stone beneath and around the structure. Comply with section 3010; however, the Engineer may authorize a change in gradation, subject to materials available locally at the time of construction.
 - g Casting: Casting shall be Neenah R-6685-5 or equal. Include "Traffic Signal" as a message on the cover. Alternate messages may be required as specified in the contract documents.
 - h Size: 24" x 36" inside dimension, 32" deep (inside dimension), 4" wall thickness.
- G Connections, Existing Handholes and Vaults:
 - 1 General:
 - a Core drill openings to receive new conduit installation
 - b Seal annular space with NP-1 flexible sealant
- H Conduit:

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 1 General:
 - a Conduit shall meet the requirements of Sections 2523.10 and 4185.10 of the Iowa DOT Standard Specifications
 - b Furnish weatherproof fittings of identical or compatible material to the conduit. Use standard factory elbows, couplings, and other fittings.
 - c All conduit openings in the controller cabinet, handholes, and bases shall be sealed with an approved polyurethane expansion joint sealing compound such as BASF Sonolastic NP1, Bostik Chem-Calk 915, Tremco Vulkem 116 or approved equal. This compound shall be readily workable soft plastic. It shall be workable at temperatures as low as 30° F, and shall not melt or run at temperatures as high as 300° F.
 - d All empty conduits to have flat polyester pull-tape (1,250 lbs. tensile) with footing markings.
- 2 Plastic Conduit and Fittings:
 - a PVC:
 - 1) 2" diameter.
 - 2) PVC Schedule 40 plastic conduit and fittings complying with NEMA TC-2 (pipe), NEMA TC-3 (fittings), and UL 651 for Schedule 40 heavy wall type.
 - 3) Solvent welded, socket type fittings, except where otherwise specified in the contract documents.
 - 4) Threaded adaptors for jointing plastic conduit to rigid metal ducts.
 - 5) Provide bell end fittings or bushings.
 - b HDPE:
 - 1) 2" diameter
 - 2) ASTM F 2160 (conduit) and ASTM D 3350 (HDPE material), SDR 13.5.
 - 3) Use orange colored conduit.
 - 4) Continuous reel or straight pieces to minimize splicing.
 - c Inner Duct:
 - 1) 1" & 1 1/2" diameter
 - 2) ASTM D 3350 (HDPE material), SDR 13.5.
 - 3) Inner duct colors: Red, Blue, Green, Yellow
 - 4) Continuous reel or straight pieces to minimize splicing.
 - d Microduct:
 - 1) Future Path or approved equal.
 - 2) 7 way, 16/12 MM.
 - 3) Over sheath color: orange
 - 4) Duct colors: Red, Gray, Orange, White, Brown, Green, Blue
 - 5) Internal ribs
 - 6) Rip cord for sheath opening
 - 7) Continuous reel or straight pieces to minimize splicing.
 - e Conduit Connections & dissimilar conduit material
 - 1) PE to PE a fusion splice or ETCO Double E-LOC Coupling is required. Fusion splicing shall not cause significant interior deformation or ridges. If deformation or ridges are present the conduit needs to be cut and refused.
 - 2) PE to PVC the approved coupling is a Shurlock II system as manufactured by AD Technologies or approved equal for the appropriate size conduit.
 - 3) PVC to PVC, an approved PVC primer must be applied along with an approved PVC glue to seal the connection.
 - 4) Future path to future path, a 3" schedule 40 conduit by 3' long shall be used to in case splice. The inner connectors shall be staggered in and 18" opening of the polyethylene covering. Both ends shall have a 1" neoprene stripping and then filled with expansion foam.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 5) Existing splices that need to be repaired, or a coupling is needed for conduits with existing infrastructure, the approved coupling is the MOR Clamp or approved equal. The MOR Clamp is manufactured by AD Technologies. The MOR Clamp shall only be used with the approval of the engineer.
- I Re-route: See "H" above
- J Wiring and Cable: Provide wire that is plainly marked on the outside of the sheath with the manufacturer's name and identification of the type of the cable. Wire and cable construction types, conductor sizes, and working voltage ratings will be specified in the contract documents.
 - 1 Power Cable:
 - a Comply with Iowa DOT Article 4185.12.
 - b 600-volt, single conductor, stranded copper, Type XHHW, UL approval
 - c Conform to the National Electric Code currently in effect
 - d Unless otherwise specified, use a 3 conductor #8 gauge (Black, White, Ground) to feed between the traffic control pedestal and the meter pedestal
 - 2 Signal Cable:
 - a Comply with IMSA Specifications 19-1 (PVC jacket) or 20-1 (polyethylene jacket) for polyethylene insulated, 600 volt, solid, multi-conductor copper wire, #14 American Wire Gauge (AWG).
 - 3 Loop detector Wire (With Plastic Tubing)
 - a The loop wire shall meet the requirements of the International Municipal Signal Association (IMSA) Specification 51-5, latest revision thereof for polyvinyl chloride insulated, nylon jacketed, loosely encased in a polyvinyl chloride or a polyethylene tube loop detector wire. The conductor shall be #14 AWG unless otherwise specified on plans.
 - 4 Detector Lead-In Cable
 - a Detector lead-in cable shall meet the requirements of the International Municipal Signal Association (IMSA) Specification 50-2, latest revision thereof for polyethylene insulated, polyethylene jacketed loop detector lead-in cable. All conductors shall be #14 AWG unless otherwise specified on the plans
 - 5 Tracer Wire:
 - a Tracer wire shall be a 10 AWG solid, PRO-TRACE® HF-CCS PE30 with orange insulation color. Conductor shall be soft-drawn, 21% IACS, copper clad steel, utilizing a AISI 1006 low carbon steel core (required to meet break load and flexibility), with break load of 448 lbs. (55,000 psi). Conductor shall be extruded with a 30 mil, high density polyethylene, and meet the APWA color code of the buried utility line. Tracer wire shall be rated for direct burial use at 30 volts and RoHS compliant. Tracer wire shall be PRO-TRACE ® HF-CCS PE30 as manufactured by Pro-Line Safety Products
 - 6 Street Light Cable:
 - a shall be single conductor, Class B stranded, annealed copper, six-hundred (600) volt, ninety (90) degrees centigrade Type XHHW. Street light cable shall be of the size shown on the plans. All underground cable shall be in conduit of the type and size shown on the plans and shall conform to the National Electric Code currently in effect. Unless otherwise specified, use a 3 conductor #8 gauge XHHW (Black, White, Green) to feed between the luminaires and the meter pedestal
 - 7 Communications Cable:
 - a Comply with IMSA Specifications 39-2 or 40-2 for #19 AWG, solid copper conductor, twisted pairs. Superior Essex Cat 6 BBDN6. Use polyethylene insulated, aluminum shielded, complying with REA Specification PE-39 for paired communication cable with electrical shielding.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 8 Fiber Optic Cable and Accessories:
- a Furnish fiber optic cable of the mode type, size, and number of fibers specified in the contract documents, and all associated accessories.
 - b Optical fibers shall be placed inside a loose buffer tube, minimum six (6) fibers per tube, normally twelve (12) fibers per tube. Actual number of fibers per tube shall be 12 or 24 fibers per tube unless specified differently on the Plans
 - c Meet the latest applicable standard specifications by ANSI, Electronics Industries Association (EIA), and Telecommunications Industries Association (TIA).
 - d Single-mode only – each buffer tube shall contain 6, 12 or 24 fibers
 - e All fibers shall be glass and be manufactured by Corning or pre-approved equal.
 - f All fiber shall be loose tube construction for both indoor and outdoor installation. Indoor cabling shall use plenum rated conduit to within less than 50 foot of point of termination eliminating the requirement to convert to indoor cable
 - g The cable shall be new, unused, and of current design and manufacture
 - h All fiber cables shall be 10 Gigabyte rated
 - i Fillers shall be included in the cable core to lend symmetry to the cable cross-section where needed
 - j The central anti-buckling member shall consist of a glass reinforced plastic rod. The purpose of the central member is to prevent buckling of the cable
 - k Single-Mode Fiber:
 - 1) All fibers in the cable must be usable fibers and meet required specifications.
 - 2) Fiber shall consist of a dry water block coupled with a dry tube construction
 - 3) Typical Core Diameter: 8.3 μ m
 - 4) Cladding Diameter: 125 +1.0um by fiber end measurement
 - 5) Core-to-cladding offset: <1.0um
 - 6) Attenuation Uniformity: No point discontinuity shall be greater than 0.1 dB, except terminations or patch cords, at either 1310nm or 1550nm
 - 7) Factory cable rating shall be 0.35 dB/KM at 1310 nM and 0.24 dB/KM at 1550 nM
 - 8) Installed tolerance shall be less than 0.44 dB/KM at 1310 nM and less than 0.33 dB/KM at 1550 nM, testing tolerance
 - 9) Dual layer UV cured acrylate coating applied by the fiber manufacturer, mechanically or chemically strip-able without damage to the fiber.
 - 10) Glass reinforced plastic rod central member designed to prevent the buckling of the cable. Cable core interstices filled with water blocking tape to prevent water infiltration. Dielectric fillers may be included in the cable core where needed to lend symmetry to the cable cross-section.
 - l Buffer tubes of dual layer construction with a polycarbonate inner layer and polyester outer layer. Each buffer tube filled with a water-swellable yarn or tape. Buffer tubes stranded around the central member using reverse oscillation or "SZ" stranding process. Gel-free cable and buffer tubes.
 - m Six (6) Buffer tubes and fibers meeting TIA/EIA-598A, "Color coding of fiber optic cables," with 12 fibers per buffer tube
 - 1)

Buffer Tube/Fiber	Tube/Fiber Color
#1, 1st tube or fiber	blue
#2, 2nd tube or fiber	orange"
#3, 3rd tube or fiber	green
#4, 4th tube or fiber	brown
#5, 5th tube or fiber	slate
#6, 6th tube or fiber	white
#7, 7th tube or fiber	red
#8, 8th tube or fiber	black

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- | | |
|-------------------------|--------|
| #9, 9th tube or fiber | yellow |
| #10, 10th tube or fiber | violet |
| #11, 11th tube or fiber | rose |
| #12, 12th tube or fiber | aqua |
- n Cable tensile strength provided by a high tensile strength aramid yarn and/or fiber glass.
 - o All dielectric cables (with no armoring) except microfiber shall be sheathed with medium density polyethylene. The minimum nominal jacket thickness shall be 1.4 mm. Jacketing material shall be applied directly over the tensile strength members and flooding compound. Cable jacketing shall utilize the newer designs to provide maximum flexibility without loss or appreciable dB attenuation. Cable diameter shall not exceed 0.50 inch. Additionally, provide a durable weather proof label on the cable jacket showing the actual attenuation of each fiber expressed in dB/km.
 - p The jacket or sheath shall be marked with the manufacturer's name, the words "optical cable", the year of manufacture, number of fibers, type of fiber (SM or MM) and sequential feet or meter marks. The markings shall be repeated every one-meter or three feet. The actual length of the cable shall be within $-0/+1\%$ of the length marking. The marking shall be in a contrasting color to the cable jacket. The height of the marking shall be approximately 2.5 mm. A copy of the manufacturer fiber definition and shipping sheet identifying all tests, results and fiber indexes shall be provided to the Engineer on delivery of cable to the City or shall be included with a contractor's listing of place(s) of installation when installed by a Contractor (See 22.3.2).
 - q All optical fibers shall be 100% attenuation tested at the manufacturer. The attenuation of each fiber shall be provided with each cable reel. The measured attenuation shall be for both 1310 or 1550 frequency for single mode. This documentation shall be provided with each spool.
 - r Cable fabricated to withstand a maximum pulling tension of 600 pounds during installation (short term) and 135 pounds upon installation (long term).
 - s Shipping, storing, and operating temperature range of the cable: -40 deg C to $+70$ deg C. Installation temperature range of cable: -10 deg C to $+60$ deg C.
 - t Each fiber of all fiber optic cable tested by manufacturer at the 100% level for the following tests:
 - 1) Proof tested at a minimum load of 100 kpsi
 - 2) Attenuation
 - u Meet the appropriate standard Fiber Optic Test Procedure for the following measurements: • Fluid Penetration
 - 1) Compound Drip
 - 2) Compressive Loading Resistance
 - 3) Cyclic Flexing
 - 4) Cyclic Impact
 - 5) Tensile Loading and Bending
 - v Make cable ends available for testing. Seal cable ends to prevent moisture impregnation.
 - w Fiber Optic Connectors:
Connectors shall be mechanical LC or ST/SC (ceramic ferrule-outdoor connections) compatible, field installable, and self-aligning and centering or factory fabricated pigtails. Connectors to the special devices used for Ethernet network connections shall utilize a factory converter cable of LC or SC to ST or manufacturer specified converter patch cord. Fiber optic equipment, used for terminating fibers, shall be rated for the type of connectors used. Connectors

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- shall be Siecor CamLite, UniCam, or NEMA temperature rated epoxy type, or Engineer approved equal. All single mode fiber shall use LC or ST type connectors. All multimode fiber shall use SC type connectors
- x Fiber Optic Jumpers/Patch Cords: For connections in the cabinet, provide factory assembled duplex pigtail jumpers with dielectric strength member, durable outer jacket and ST or SC compatible connectors. Provide adequate length for connections and 2 feet minimum slack.
 - y Fiber Optic Breakout Kits: The breakout kits or termination boxes used to terminate each fiber cable in the cabinet shall provide for the separation and protection of the individual fibers with the buffer tubing and jacketing materials. The termination housing shall be installed within a wall or shelf mountable interconnect housing which shall provide for storing fibers, ample room for feed through cable, strain relief for multiple cables within unit, and accommodate LC or ST/SC compatible connectors. All fiber pigtails shall be terminated through LC or ST/SC connectors on the wall or shelf mounted interconnect panel. All terminations shall be LC or ST/SC type, ceramic core (outdoor connections), and plug into the provided controller unit internal fiber optic modem. Acceptable enclosures for combination termination/splice points shall be CCH-CS24 enclosures or pre-approved equal. All new cabinets shall use high density CCH-CS24 enclosures. Splices to pigtail fiber, where used, shall utilize fan out kit protection to the fiber, heat shrink tubing with metal bar reinforcement and 900 micron rated pigtail insulation. Splices to factory pigtails shall use pigtails that are rated for a minimum temperature range of zero degrees to +150 degrees Fahrenheit. In the absence of pigtails meeting this temperature rating, fibers shall utilize loose tube fiber in fanout kit tubes and mechanical LC or ST/SC connectors. These splices, fiber cable to pigtails, may be external to splice trays mounted internally to the enclosure, when shown on the wiring diagrams. The glass/fiber in the pigtails shall be from the same manufacture of glass/fiber installed in the field. All other splices, not specified to be installed external to the fiber splice tray, shall be installed in splice trays and be supported with heat shrink tubing.
 - z Splices/ Splice Enclosures: The fiber cable shall be installed in continuous runs between cabinets. No splices shall be allowed, unless shown on the plans or for testing. Splices, where specified, shall be by fusion splice and shall be installed using an automatic fusion splicer. Splices between two fibers leaving the cabinet shall be supported in splice trays installed in splice enclosures. All splices shall be re-enterable splice capsules, gas or gel filled only and shall be protected by heat shrink tubing designed for fiber optic splicing applications. Fibers being terminated in two separate termination or splice enclosures shall be supported between enclosures by the use of buffer tubing or approved equal support material or shall be pigtail patch cords. Termination / splice enclosures shall be separated by less than 12 inches unless a conduit is installed between enclosures. All splices shall be performed by an automated splicer device that verifies the final splice termination quality. All splices shall be nominally .05 dB loss but shall be less than a 0.08 dB loss.
 - aa Cable Termination: Terminations shall be made using the method recommended by the connector manufacturer. All fibers shall utilize a fan-out kit of the size and type recommended by the manufacturer and of the number of fibers provided in each fiber tube. All fibers terminated shall utilize a ceramic ferrule (outdoor connections), LC or ST/SC, mechanical termination equal to Siecor UniCam connectors, or be a wide temperature (-40 to +170 degrees Fahrenheit) epoxy. Heat cured or epoxy type connections meeting the full temperature ratings are

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

acceptable for this Project, including factory manufactured pigtails. The Contractor shall be required to provide proof of purchase of sufficient quantities of ceramic terminations for outdoor terminations to verify ceramic connector usage or temperature ratings on epoxy or heat cured processes prior to terminating any fibers. The Contractor may terminate fibers by splicing factory pigtails to the fiber ends and then connecting the pigtail to the fiber coupler in the fiber tray. When splicing pigtails to terminate, all splices shall be provided with the metal reinforced shrink tube protector. The contractor may terminate fibers by the use of UniCam mechanical termination connectors. All termination ST/SC couplers shall be rated for dual fiber application, MM and SM

K Footings and Foundations:

- 1 Concrete bases/foundation for traffic control cabinets, fiber hub cabinets, light poles, pedestal poles, electrical services and battery backups should be precast from a pre-approved vendor
- 2 Use Class C structural concrete complying with Iowa DOT Section 2403.
- 3 Furnish precast concrete handhole or fiber vault, or fiberglass handhole, each with cast iron ring and cover or heavy duty fiberglass cover as specified in plans.
- 4 24" Round Handhole HH 24-24:
 - a The 24" round handhole shall be a 3" thick concrete 24" diameter by 24" in depth with a 22.25"
 - b cast iron manhole cover with the legend "Traffic Signal" set flush to the ground.
 - c Cast iron ring and shall be rated heavy duty for traffic areas (320 pounds minimum) where shown on the plans. Deviations in weights shall not exceed plus or minus five percent
 - d Each HH 24-24 handhole shall have a 5/8" by 10' ground rod driven into the center of the handhole (for later use if not needed immediately).
 - e Each HH 24-24 shall include a drainage system as shown in the plans.
 - f The body of the pre-cast handhole shall meet the requirements for Class 1500D concrete pipe insofar as applicable..
- 5 Fiber Vault, Square FVS48-48:
 - a Fiber Optics Junction Vault shall be a Square 48" x 48" outside dimension,
 - b 36" x 36" inside dimension
 - c Vault shall be 48" deep (inside dimension).
 - d Each vault shall include a drainage system (where applicable) as shown on in the plans.
 - e The vault will have 4 – 3/4" drain holes in the sump pit for water to drain.
 - f A minimum of 4 cable hooks will be installed in each vault to support fiber optic cables.
 - g All conduits shall enter the vault at a depth of 18" to 30" from the bottom of the vault.
 - h All holes cut into vaults for conduit entry/exit shall be core drilled from the inside out or shall use manufactured knock-outs of appropriate size.
 - i Cast iron rings and covers
- 6 Fiber Vault, Round FVR 48-48:
 - a FVR48-48 which is an internal 48" diameter x 48" deep fiber vault manhole.
 - b 4" or larger opening in the bottom sump area with 4 – 3/4" drain holes in the sump pit for water to drain. Each vault shall include a drainage system as shown on in the plans (Where applicable).
 - c 8 knockout locations, each measuring 2'-2" x 6" x 2 1/4 every 45 degrees in angle;
 - d 48" lid with a 24" cast iron cover marked "Fiber Optics" as shown on the details in the plans.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- e A minimum of 4 cable hooks will be installed in each vault to support fiber optic cables
 - f All components are to be plastic, aluminum, or stainless steel to avoid rusting.
 - g Each vault shall have a 5/8" by 10' ground rod driven into the ground near the sump pit opening. This ground and the tracer wires shall be wired together and (if applicable) into the locator station.
- 7 Fiber Vault, PCL CONE FVR 36-48:
- a PCL CONE FVR36-48 shall be a cone shape 33.5 inches at the top and 48 inch inside dimension and 54" inch outside dimension at the bottom. Vault shall be 36 inches deep (inside dimension).
 - b 24" cast iron cover marked "Fiber Optics" as shown on the details in the plans.
 - c All components are to be plastic, aluminum, or stainless steel to avoid rusting.
 - d Each vault shall have a 5/8" by 10' ground rod driven into the ground near the sump pit opening. This ground and the tracer wires shall be wired together and (if applicable) into the locator station.
- 8 Traffic Signal Tub, (Indicated as "TCHH" and located adjacent to the Control Cabinet:
- a Tubs shall be a 36"x44"x32" precast concrete
 - b Casting shall be Neenah R-6685-5 (or equal) with the legend "Traffic Signal" on the lid.
 - c Covers shall support an 8,000 pound load over a 10" square with a minimum test load of 12,000 pounds. Covers subject to heavy loads shall support a 15,000-pound load over a 10" square with a minimum test load of 22,568 pounds.
 - d Traffic tub shall be constructed with an open bottom. A coarse aggregate drain shall be provided.
 - e The ground rod assembly at this location shall conform to the Grounding and Bonding at a cabinet location standard
- 9 Bonding and Grounding:
- a Ground Rods: Ground rods must be UL listed, made of copper-clad steel with a nominal diameter of 5/8 inches. Ground rod sections must be a minimum of 8 feet in length and manufactured for the sole purpose of providing electrical grounding
 - b Ground rod assemblies: consisting of one or more ground rods coupled together, such that the total length of the assembly is a minimum of 10 feet, driven into the earth at a single point, without disrupting the electrical continuity of the assembly. Ground rod assemblies shall be full length as shown on the plans and each rod length shall be the tapered end style, not threaded.
 - c Ground Rod Array: is the inter-connection of the ground rods at each pole or structure at the site, consisting of two or more ground rod assemblies, bonded together in accordance with NEC Article 250 bonding
 - d Ground wires shall be connected to the ground rods with one (1) piece non-ferrous clamps which employ set screws as tightening devices ILSCO clear tap cat no. PCT(4/10), often referred to as Acorn Nuts. Connections to ground rods need not be taped. Ground rods and assemblies shall be of the length specified on the plans
 - e Cabinet location shall use a 20-foot ground rod assembly as specified in 11.2 with a #4 AWG, bare, tinned, solid annealed copper ground wire bonded back to the cabinet earth and electrical neutral bus at the cabinet and main service disconnect.
 - f Ground rod assembly electrodes shall be provided in and accessible at the adjacent hand holes at each structure including but not limited to signal poles, pedestal poles and controllers as detailed on the plans. The entire intersection

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

grounding array shall be a single ground array and bonded back to the cabinet ground along with the cabinet and main disconnect

- g Metal structures and their associated grounds shall be bonded together to the cabinet main disconnect, (NEC Article 250 Bonding). Ground rods should extend to just below the top of the manhole or vault and be located between 3" and 6" of the side to allow measuring of ground array using a clamp- on tester and inspection of the connections as part of a preventative maintenance program
- h Ground wires between metal structure and nearest ground rod shall be #4 AWG, bare, solid, annealed copper wire unless otherwise specified on the plans. Each steel pole or pedestal shall be firmly connected to the ground rod provided, by means of an internal grounding terminal or earth lug. Placing the ground wire under an anchor bolt nut, anchor bolt cover, or similar device will not be permitted.
- i Conduit, steel poles, pedestals, and hand holes in the immediate intersection shall be bonded between structures and cabinet to form a continuous effective ground array. Bonding ground wires shall be No. 6 AWG, XHHW insulated green, multi-strand copper wire or equal connected by appropriate sized split bolt or crimp connectors to the #4 ground wires specified in section 11.5
- j The No. 6 AWG, XHHW insulated green multi-strand copper wire shall be installed in all PVC conduit that carries electrical conductors (including low voltage)

2.02 CABINETS, PEDESTALS and POLES

A Fiber Hub Cabinet

- 1 Meets all Caltrans and FHWA requirements
- 2 Combined 24V DC power supply and power distribution assembly
- 3 Aluminum (0.125" thick), Natural Finish. Dimensions 66" H x 24" W x 30" D, Mounting Base Mounted, Bolt Pattern 25" x 15" with (4) 3/4" x 16" Anchor Bolts, Full size doors, front and back
- 4 100 CFM Fan with Thermostatic Control. Filtered air intake in front door. Door Stops 90° & 180° stop, each door, top & bottom ($\pm 10^\circ$).
- 5 Three Point Lock System
- 6 Rack Assembly Removable, Standard, 19" EIA Rack

B Lighting Controller Cabinet

- 1 Approved UL-508 pad mounted metered service pedestal/dedicated lighting controller.
- 2 contain a photo-eye that will be wired to the lighting controller.
- 3 Nema 3R approved
- 4 Contain a factory installed breaker panel with separate circuits for each electrical branch or direction.
- 5 Lighting controller must be set on a precast concrete foundation
- 6 Comply with all local electrical codes.

C Traffic Controller Cabinet:

- 1 The cabinet and auxiliary equipment shall conform to the requirements of the National Electrical Manufacturer's Association (NEMA) Standard TS-1 and TS-2, most current revision, and to these specifications.
- 2 The cabinet shall be a DBQTS2-NU-P or DBQTS2-NU-R

D Electric Service Pedestal:

- 1 Tesco, model 27-22, or equal, combination battery backup with Dubuque Specifications, electrical service with meter and lighting controller as shown in the plan details.

(a) When specified the Contractor shall supply and install a side mount Tesco, model 2200 battery backup system as specified below.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 2 The service pedestal shall be part of the continuously grounded system discussed in section 2.02 L of this specification.
- 3 Enclosure shall be Anodized aluminum weatherproof enclosure shall house BBS and batteries.
- 4 Enclosure shall be TIG welded construction with welding materials specifically designed for the material to be welded.
- 5 Enclosure shall have fully framed side hinged outer doors with swaged close tolerance sides for flush fit with drip lip and closed cell neoprene flange compressed gaskets.
- 6 Front door shall incorporate a full-length piano hinge, pad-lockable draw latch (center area on door-latch side), and a pad lockable welded-in place vandal-proof tabs rated at 2000 lbs.
- 7 There shall be no exposed nut, bolts, screws, rivets or other fasteners on the exterior of the enclosure.
- 8 Maximum cabinet dimensions 46" H x 20" W x 10.25" D. Weight 250 lbs. with batteries.
- 9 BBS shall be mounted in an interior tilt out housing with 800 lb. rated stops.
- 10 Battery connectors shall be Anderson Connectors with silver plated contacts.
- 11 Batteries shall be installed in fixed position framed trays for seismic safety and be readily accessible for maintenance.
- 12 Batteries shall be mounted allowing airflow front and back.
- 13 Enclosure shall include two transfer bypass switches, one for BSS bypass the second for auxiliary generator (optional).
- 14 All switched must be panel mounted on interior dead front panel board.
- 15 UV resistant plastic laminated nameplates shall identify all controls and major components.
- 16 A plastic covered wiring diagram will be attached to the inside of the front door.
- 17 All components shall be factory wired and conform to required NEMA, NEC, and UL standards.
- 18 A chassis ground point shall be provided.
- 19 Panel shall be UL 508 Industrial Control Panel rated Main breakers shall be 1, 2 or 3 pole
- 20 Operating temperature shall be a minimum -37°C to + 74° C
- 21 BBS Panel Minimum features:
 - a System shall provide 700 watts of full control run time for two (2) hours. In addition the system shall provide six (6) to eight (8) hours of flash.
 - b BBS bypass and BBS isolation switch
 - c Dead front safety panel board with all switches, indicating fuses, plugs, and isolation fuses for each battery pre-wired with phenolic nameplates
 - d All nameplates shall be screwed on phenolic engraved type
 - e All wire terminating lugs shall be full wrap around type
 - f All batteries shall be captive spaced from external captive sides in earthquake proof buckets
 - g Cabinet ventilation shall be by (qty. 2) 4" x 1/4" louvers top and bottom with encapsulated bug screens, cleanable filters and 100cfm fan to completely exchange air 25 time minimum per minute
 - h All DC terminals and connections shall incorporate safety covers such that the safety covers are in place for every normal maintenance mode
 - i Event Counters & Total Run Time Counter
- 22 BBS Unit Minimum Specifications:
 - a BBS unit shall provide a true sine-wave output with minimum 1400VA 950 Watts continuous capacity, with quick make/break connectors and plugs.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- b BBS will provide on-line operation for a minimum input on 92 to 145 VAC, provide full load output of 120VAC - 10% / +4% at 60 Hz +/- 0.05% over a temperature range of -37° C (optional adder) to +74° C and be a UL Approved Design
 - c Surge energy withstand 480 Joules, 6.5kA
 - d Transient lighting protection - 160 Joules
 - e BBS must provide for utility service isolation when in operation.
 - f Common mode clamping 0 ns < 5ns typical UL 1449
 - g Conditioned power - Computer quality
 - h Transfer to battery time - 2ms
 - i Retransfer to utility - 2ms
 - j Each battery shall be 24 volts @ 18 AH with heavy duty Anderson plugs and isolated fused (dead front panel mounted 30 amp) connections to the BBS for greater system reliability and ease of maintenance. Series wiring in unacceptable
 - k The BBS shall be capable of running an intersection with LED lights (for Run Time consult manufacturer).
 - l The unit shall operate off-line, with battery condition indicator, with automatic test provisions, and with hot-swappable batteries (all batteries in system).
 - m BBS will automatically recharge batteries from full discharge to 95% capacity within 6 hours.
 - n Low voltage safety design at 24v DC. (Higher voltage DC systems are unacceptable).
 - o Fan cooling shall be fused for locked rotor current
 - p Cooling air shall be ducted to cool the front and back of each battery with air space on all four sides and top of battery
 - q BBS covers shall be 60% open on both sides to diminish the environmental effects of extreme temperatures
 - r Includes USB & RS232, DB9 Computer Interface Ports
 - s For Safety and maintenance the BBS shall not exceed 28 pounds.
 - t The BBS unit will be delivered with maintenance manuals and schematic diagrams.
 - u Separate pull section
 - v Full length dead front with stainless steel hinge and ¼ turn latch & knurled knobs
 - w Dead front hinged on same side as the front door and opens up to 120 degrees
 - x Completely prewired in the factory
 - y Wiring will be to NEMA IIB standards showing external connections & external equipment
- 23 BBS Unit Minimum Features
- a 1400VA 950 Watts, with quick make/break connectors and plugs. (Systems requiring hard wiring termination to/from the inverter are unacceptable)
 - b Surge energy withstand 480 Joules, 6.5kA
 - c Common mode clamping 0 ns < 5ns typical UL 1449
 - d Conditioned power - Computer quality
 - e Transient lighting protection - 160 Joules
 - f Transfer to battery time - 2ms
 - g Retransfer to utility - 2ms
 - h Each battery shall be 24 volts @ 18 AH with heavy duty Anderson plugs and isolated fused (dead front panel mounted 30 amp) connections to the BBS for greater system reliability and ease of maintenance. Series wiring in unacceptable
 - i Fan cooling shall be fused for locked rotor current

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- j Cooling air shall be ducted to cool the front and back of each battery with air space on all four sides and top of battery
 - k BBS covers shall be 60% open on both sides to diminish the environmental effects of extreme temperatures.
 - l Includes USB & RS232, DB9 Computer Interface Ports
 - m Low voltage safety design at 24v DC. (Higher voltage DC systems are unacceptable)
- 24 BBS Communication Module
- a All inverter connections shall be made without the use of tools. This includes: A/C-Input, A/C-Output, Normally-Open, and Normally-Closed programmable contacts
 - b Smart Slot Relay I/O Module:
 - 1) Input #1 Turn the BBS on.
 - 2) Input #2 Turn the BBS off.
 - 3) Input #3 Start the BBS self-test.
 - 4) Input #4 Shut down the BBS (when on battery).
 - 5) Output #1 The BBS is on-battery (during a power failure, self-test or run time calibration).
 - 6) Output #2 BBS has a low battery - Programmable.
 - 7) Output #3 The protected load is not receiving power from the BBS.
 - 8) Output #4 Replace the BBS batteries.
 - 9) Output #5 The BBS is overloaded.
 - 10) Output #6 Any BBS fault or self-test failure.
- 25 Batteries
- a Batteries shall be maintenance-free, type AGM/VRLA (Absorbed Glass Mat / Valve Regulated Lead Acid), such as APC Smart-UPS RMXL or approved equal. Batteries shall be independently pre-wired and individually fused. Batteries shall be furnished with heavy-duty 50 amp rated silver-plated Anderson Connectors. 100 Amp internal fuse by Battery supplier. Batteries shall be lightweight for personnel safety and protection plus ease of installation and maintenance. Batteries with a weight of over 26 lbs. are not acceptable
- 26 Enclosure Temperature Compensation
- a Operating temperature shall be a minimum -37°C to + 74° C
- 27 Power System Analyzer and Conflict Resolution Module
- a The 1400XL incorporates an integrated Power System Analyzer and Conflict Resolution Module. The Analyzer will evaluate and make limited adjustments to the incoming utility power and will automatically transfer load to the battery back-up power if utility power is lost. When utility power becomes available, the BBS will analyze the power to verify stability and return to normal operation. The system provides automatic BBS failure detection and automatically isolates the failed BBS and locks the unit on to utility power. Once the failure has been corrected, the system will return to the normal operation.
- 28 Triple Bypass System for Offline BBS
- a SPACT – Smart Power Analyzer with Conflict Monitor Isolation and Transfer Module.
 - b PCM – Power Conflict Monitor.
 - c The PCM is a totally redundant failsafe system. The PCM monitors load bus power available continuously. If load bus power fails for 5ms the PCM will transfer and isolate the BBS and guarantee that commercial power will be locked on.
 - d Watchdog Timer – Redundant 5 ms delay and hard transfer to utility power.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- e The outboard Smart Transfer Switch shall not interrupt the normal controller function. Transfer time shall be 2ms.
 - f Onboard Smart I/O module will execute lockout of battery back up system upon Smart detection of any inverter BBS fault. If BBS resets itself, it will automatically be available for backup.
 - g ON Inverter to timed relay for Full Time control of Output, 0 to 10 hours.
- 29 Smart Battery Charger
 - a Small charge from shut off discharge to 95% fully charged in less than 6 hours. Batteries shall be ambient enclosure compensated to less than 120°. The battery charger shall utilize Smart Cell Technology to extend battery life
- 30 Intelligent Battery Management
 - a Cell Guard means longer battery life – Improved reliability results from a precision battery charging system, and automatic true-load battery tests. Redundant overcharge protection contributes to longer battery life. Smart Boost and SmartTrim regulate under and over voltages without switching to battery
- 31 Battery Replacement Warning prevents downtime
 - a 1400XL-BBS automatically performs a self-test every two weeks. This ensures that you will be alerted to degrading batteries before they wear out. Through software, or the push of a button, self-tests may be performed at any time. Faster Recharge Time – 1400XL-BBS battery charging systems are microprocessor controlled to precisely charge batteries in less time than legacy BBS systems. This makes the system available more quickly for subsequent power disturbance
- 32 Hot-Swappable Battery Replacement
 - a The 60 second, user friendly, hot-swappable battery replacement system – Saves the time and expense of returning the BBS to the factory for battery service, and allows safe and easy replacement of batteries while your system is up and running. Replacement battery packs ship in a reusable box for convenient return of exhausted batteries to a recycling center.
- 33 General
 - a The service pedestal shall be installed as shown in the plans. Two inch conduit connecting the service pedestal and the control cabinet shall be installed as shown in the plans.
 - b The meter shall be an Alliant Energy approved meter. The contractor shall verify acceptability with Alliant Energy and coordinate power connection to the meter from the power source
- E Communications Cabinet: As specified in the contract documents.
- F Multi-Use Cabinet: As specified in the contract documents.
- G Poles:
 - 1 The fabricator shall certify that the mast arms are capable of withstanding winds up to 80 MPH with a 1.3 gust factor without failure; that only certified welding operators in accordance with AWS D1.1-80 or latest revisions were used; and that only electrodes as modified by AASHTO 1981 Standard Specifications for Welding of Structural Steel for Highway Bridges were used
 - 2 Poles shall be manufactured in accordance with the requirements of the latest Standard Specifications for Structural Supports for Highway Signs, Luminaries, and Traffic Signals as approved by the American Association of State Highway and Transportation Officials.
 - a Poles shall have minimum yield strength of 48,000 PSI. The base and flange plates shall be of structural steel conforming to AASHTO M183 (ASTM A36) and cast steel conforming to ASTM A27, Grade 65-35 or better.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- b The pole shall be designed to support the traffic signals, lighting and/or signs as shown on the plans
 - c The pole shall be galvanized inside and out in accordance with the requirements of ASTM A123, latest revision
 - d Where mast arms are used, the hole located on the upright pole shall be large enough for all the wires used for equipment located on the mast arm
 - e Where a combination street lighting/signal pole is specified on the plans, the pole shall be equipped with a minimum 4"x 6" hand hole and cover located opposite the signal mast arm
 - f Where a combination street lighting/signal pole is specified on the plans, the luminaire arm is to be mounted in the same vertical plane as the signal arm unless otherwise indicated on the plans.
 - g The luminaire arm type shall be a single member type arm unless specified otherwise on the plans
 - h The luminaire arm shall provide the spread and nominal mounting height as shown on the plans
 - i The luminaire arm shall be arched.
 - j The pole shall be equipped with a minimum 8"x 12" hand hole and aluminum cover located in the transformer base of the pole. Securing of the cover to the base shall be done with the use of simple tools. Hardware shall be corrosion resistant.
 - k The mast arms and poles shall be equipped with all necessary hardware, shims and anchor bolts to provide for a complete installation without additional parts
 - l All hardware shall be steel, hot dipped galvanized meeting the requirements of ASTM A123, Class D
 - m Commercial style lighting shall use a galvanized Valmont four anchor bolt style transformer base with 12" bolt circle, 15 foot arm length.
 - n Subdivision Style lighting shall use a Valmont three anchor bolt style base (DS-200 style 20 foot galvanized pole) with a Urban Townguide Classic "T" Clear
 - o The anchor bolts shall meet the requirements of ASTM A36 or better
 - 1) The anchor bolts shall be hot dip galvanized for a minimum of 12 inches on the threaded end.
 - 2) The anchor bolts shall be threaded and exposed a minimum of 6 inches at one end and have a 4-inch long, 90-degree bend at the other end.
- 3 Mast-arm Mounted Street Lighting – 40':
- a LED luminaires shall be a Lumec / Philips brand Roadview RVS-135W80LED4K-R-LE3-UNIV-GY3-RC -Cobra head style multi-tap luminaires set for 240-volt operations
 - 1) Lamps shall be Type III or as specified in the contract documents
 - b Luminaire housing shall consist of single piece aluminum castings with integral slipfitter for two-inch bracket mounting
 - c Slipfitter shall be arranged to accommodate a two-inch standard pipe bracket
 - 1) shall consist of bracket clamps
 - 2) shall provide for vertical adjustment and horizontal leveling of the luminaire
 - 3) A weatherproof, hinged access door shall be provided for quick access to the terminal block and mounting arrangement
 - 4) All exposed metal parts shall be made from non-ferrous metal or stainless steel.
- 4 Vehicle Traffic Signal Heads
- a This section of the specifications describes the minimum acceptable design and operating requirements for vehicular signal heads with twelve (12) inch diameter lens openings, including all fittings and brackets as shown on the plans. All

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

components of the vehicular signal heads furnished under this specification shall comply with the latest version of the Institute of Transportation Engineers Standard(s) for Adjustable Face Vehicle Traffic Control Signal Heads. All vehicle signals will use LED modules.

- b Red Ball, Green Ball, and Green Arrow LED Modules
 - 1) The low power LED red ball, green ball, and green arrow vehicle signals shall be installed in traffic signal housings rated as a 12" signal housing commercially manufactured with a durable polycarbonate material and be compatible with traffic signal mounting brackets utilizing serrated locking between signal sections. The LED signal section shall be a self-enclosed, sealed unit, with electrical connections to be terminated on the standard terminal block, spade termination, mounted in the traffic signal section. The signals shall be 120 VAC rated and shall be compatible with either public utility or backup power sources of a 60-hertz, +/- 5-hertz with a voltage variance between 80 and 135.
 - 2) All electronics in the signal shall meet NEMA temperature rating of -40 to +74 °C. The enclosure shall conform to NEMA Moisture Resistance Standard 250-1991 for Type 4 enclosures <ITE 6.4.6.2 Moisture Resistance>. The signal electronics shall meet FCC Title 47, Subpart B, Section 15 Regulations for Electrical Noise dissemination. The electronics shall be provided with an operating power factor correction of a minimum of 0.9 and shall be provided with fuse and transient suppression incorporated for line and load protection.
 - 3) The traditional "ball" signal display, shall have the following characteristics:
 - (a) Red Signal Display (Dialight 433-1210-003XL15)
 - (b) Luminous Intensity # (cd) 365
 - (c) Dominant Wavelength (nm) 625
 - (d) Lens Tint Red
 - (e) Typical Wattage at 25 °C 7.0 +/- 0.5
 - (f) Meet or exceed ITE VTCSH Part 2 (July 1998)
 - (g) Green Signal Display (Dialight 433-2270-001XL15)
 - (h) Luminous Intensity # (cd) 475
 - (i) Dominant Wavelength (nm) 500
 - (j) Lens Tint Clear
 - (k) Typical Wattage at 25 °C 7.0 +/- 0.5
 - (l) Meet or exceed ITE VTCSH Part 2 (July 1998)
 - 4) The traditional "green arrow" signal display, shall have the following characteristics:
 - (a) Green Arrow Display (Dialight 432-2324-001XOD15)
 - (b) Dominant Wavelength (nm) 500
 - (c) Lens Tint Clear
 - (d) Typical Wattage at 25 °C 7.0 +/- 0.5
 - 5) Arrow signals shall have power factor correction and temperature compensation.
 - 6) The LED modules shall be rated for low power consumption and for use in a backup power installation. LED modules shall be compatible with NEMA TS-2 requirements for traffic controller installations and be fully compliant and compatible with industry standard conflict monitors and malfunction monitor units. LED modules shall be at the rated power consumption, without exception, as backup power sources have been rated based on these design parameters. Charging circuit design shall preclude battery damage caused by continuous battery charge power availability.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 7) LED modules shall be warranted for a minimum field life of 15 years, repair or replacement; and, be designed for a minimum life of fifteen (15) years non-degrading for illumination output caused by lens deterioration or LED degrading
- c Signal Head Assembly
 - 1) The housing for the individual signal sections shall be made of a durable polycarbonate. It shall be clean, smooth and free from flaws, cracks, blowholes, and other imperfections. It shall be designed as a self-contained unit capable of separate mounting or inclusion in a signal face containing two or more signal sections rigidly and securely fastened together. It shall be equipped with openings and positive locking devices in the top and bottom so that it may be rotated between waterproof supporting brackets capable of being directed and secured at any angle in the horizontal plane. Doors and lenses shall be provided with suitable water-tight gaskets and doors shall be suitably hinged and held securely to the body of the housing by simple locking devices of non-corrosive material.
 - 2) The optical system shall be so designed as to prevent any objectionable reflection of sun rays even at times of the day when the sun may shine directly into the lens
 - 3) Lenses shall be twelve (12) inches in diameter as specified on the plans. Lenses shall be polycarbonate. Glass lenses are not acceptable
 - 4) The visors for each signal section shall be durable polycarbonate not less than 0.10" in thickness. It shall be designed to fit tightly against the door, and shall not permit any perceptible filtration of light between it and the housing door. Visors shall be of the tunnel-type at least 8" long for all 12" rectangular pedestrian signals, at least 9 1/2" long for 12" diameter signals, shall angle slightly downward, and shall be of the type specified on the plans
 - 5) The reflector holder shall be designed to separately support the reflector and socket in proper relation to the lens. The reflector holder shall either be hinged to the left-hand side of the signal body when viewed from the front with the right-hand side held in place by a spring catch or other quickly releasable means, or the reflector shall be mounted in a manner that does not require it to be removed from its normal position during bulb replacement. Both the hinge device and the spring catch, or equivalent, shall be of a flexible nature which will permit the reflector holder to be pushed inwardly for at least one-sixteenth of an inch and to align itself correctly with the lens when the door of the optical unit is closed and pressed against the rim of the reflector holder. By such means, the joint between the reflector holder and the lens shall be rendered dust-tight. It shall not be necessary to remove any screws or nuts in order to swing the reflector holder out of the body section to obtain access to the light socket. The reflector shall be Alzak treated aluminum or Lexalite (C) polycarbonate. Glass is not acceptable. The reflector assembly shall be interchangeable and shall be designed so that it can be easily removed without the use of tools. When polycarbonate reflectors are furnished, gaskets shall be fabricated of silicone material
 - 6) The lamp receptacle shall be of the fixed focus type, positioning the lamp filament at the correct focal point in respect to the reflector. The assembly shall be designed so that the lamp socket can be rotated through 360 degrees and eight (8) positions of adjustment for proper positioning of the lamp filament after relamping the signal. The lamp socket shall be equipped with color coded wire, either red, yellow, or green, depending upon the lens color of the section. The socket wires shall be a minimum of 26 inches long,

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- composed of wire with insulation designed to withstand 105 degrees centigrade. The wiring leads shall be terminated with spade lugs for ease of connection to the terminal block. The socket shall be equipped with a gasket to insure a dust-tight fit between the socket and reflector
- 7) One section of each three-section signal shall be equipped with a six position terminal block for termination of field wiring. Each five indication signal shall be equipped with an eight (8) position terminal block
 - 8) The color of all polycarbonate signal heads shall be black in their entirety. The color shall be an integral part of the materials composition
 - 9) Signal mounting hardware for side of pole mounted signals shall consist of aluminum 1-1/2 inch pipe and appropriate fittings or PELCO SE-3036 ASTRO-BRAC ®. Signals shall be secured to pole by using a stainless-steel cable mounting material. Pole mounted signal heads shall be mounted such that the traffic signal is between the pole and roadway
 - 10) All vehicle signal heads shall include back plates. Five inch (5") back plates shall be furnished and attached to the signal faces to provide a dark background for signal indications. Backplates shall be constructed of one-piece durable black plastic capable of withstanding a 100 M.P.H. wind
 - 11) The signal heads shall be constructed of the highest quality materials. High-grade workmanship shall be used throughout. Each head shall have a smooth surface both inside and outside and shall contain no sharp fins or sharp projections of any kind.
- d Pedestrian Traffic Signal Heads
- 1) The pedestrian signal head shall comply with the latest version of the Institute of Transportation Engineers Standards on Pedestrian Traffic Signal Heads.
 - 2) Signal Head Assembly
 - (a) The mounting, housing, and visors for pedestrian signal heads shall conform to the provisions of "Vehicle Traffic Signal Heads" section in these specifications, and as shown on the plans
 - (b) Count down style LED Signal shall be a 16"x18" module, which incorporates a Portland orange hand and a lunar white walking person. Lenses shall be polycarbonate; glass lenses are not acceptable. LED lenses shall be used for the hand symbol and walking person.
 - (c) LED lenses shall meet the following ITE specification: Vehicle Traffic Control Signal Heads – Part 2: Light Emitting Diode (LED) Vehicle Traffic Control Signal Modules, An Interim Purchase Specification of the Institute of Transportation Engineers
 - (d) Lenses shall have an effective area for the "HAND" or "WALKING PERSON" legends. The size shall comply with the Institute of Transportation Engineers Standards on Pedestrian Traffic Signal Heads
 - (e) The "HAND" symbol shall be red LED
 - (f) "WALKING PERSON" symbol lunar white LED.
 - (g) The color of all polycarbonate signal heads shall be black in their entirety. The color shall be an integral part of the materials composition
 - (h) Signal mounting hardware shall consist of aluminum 1-1/2 inch pipe and appropriate fittings or PELCO ASTRO-BRAC ® for pedestrian head side of pole mounting. Signals shall be secured to pole by using a stainless-steel cable mounting material.
- e Pedestrian Push Buttons

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 1) Pedestrian push button detectors shall be Model Bulldog III manufactured by Polara and shall be Yellow in color with a black push button cup and shall be ADA compliant
- 2) The push button shall be weatherproof and of sturdy design. The entire assembly shall be weather tight, secure against electrical shock, and able to withstand continuous hard usage. The contacts shall be normally open with no current flowing except at the moment of actuation
- 3) The housing shall be made of aluminum alloy and furnished with suitable mounting hardware
- 4) Push button signs shall be furnished and shall conform to the requirements of the current Manual on Uniform Traffic Control Devices (MUTCD). Signs shall be R10-3E as specified in the plans
- 5) The Owner shall be furnished with a certification from the equipment manufacturer stating that the equipment furnished under this specification complies with all provisions of this specification. If there are any items, which do not comply with this specification, then a list of those exceptions must be detailed on the certification
- 6) General Specifications
 - (a) Body Material: Die Cast Aluminum, Powder Coated
 - (b) Button Material: 316 Stainless Steel
 - (c) Piezo Driven Solid State Switch
 - (d) Operating Temperature: -30°F to 165°F (-34°C to 74°C)
 - (e) Operating Life: Greater than 100 million operations
 - (f) BDPM3 (Momentary LED Model)
 - i Operating Force: 2 lbs. Maximum
 - ii Operating Voltage: 12-36V DC or 12-25V AC
 - iii On Resistance: 10 Ω Typical
 - iv Operating Standby Current: 10 μ A typical (equivalent to 2M Ω at 20V)
 - v Operating Mode: Approx. 0.025 sec flash each time button is pressed
 - vi Luminous Intensity: 0.3 Lux @ 1 meter minimum (ultra bright red)
 - vii Viewing Angle: 155° 160°
 - viii Black – Low profile base
 - ix Yellow Stainless Body
 - (g) Audible Tone
 - i Sounds simultaneously with button push
 - ii Different tones for press and release: 2.6kHz and 2.3kHz
 - iii Beeper uses power from existing switch wires
- f Traffic Signs and Posts:
 - 1) Comply with Iowa DOT Section 4186.
 - 2) Use a universally adjustable mast arm mounted sign bracket utilizing cable mounting
 - 3) Comply with MUTCD and the contract documents for the street name sign dimensions, letter height and font, and sheeting
 - (a) Street Name Signs
 - i white letters
 - ii Highway Gothic Series B font
 - iii title case lettering (first letter in each word is capitalized)
 - iv green background
 - v HIP rated sheeting 10-inch blade
 - vi thickness of the aluminum sign blank shall be 0.08 inch
 - vii corners of the sign blank shall have a 1-inch radius.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- viii 6 inch upper case and 4.5 inch lower case lettering
- ix white border, .375 inch wide
- 4) Traffic signs shall be mounted on posts as indicated
 - (a) Posts to be metal, 4-inch x 4 inch, or 4 inch x6 inch wood
 - (b) Installed to a depth adequate to prevent sign installation from leaning or tipping
 - (c) Posts shall conform to the requirements of Iowa DOT Section 4186.for Type 2 posts unless otherwise noted
- g Traffic Signs on Mast Arms:
 - 1) Traffic signs shall be mounted on the mast arms utilizing a universally adjustable mast arm mounted sign bracket
 - 2) Street Name Signs
 - (a) white letters
 - (b) Highway Gothic Series D font (Series C being acceptable for long legends)
 - (c) title case lettering (first letter in each word is capitalized)
 - (d) green background
 - (e) HIP rated sheeting 18-inch blade
 - (f) thickness of the aluminum sign blank shall be 0.125 inch
 - (g) corners of the sign blank shall have a 3-inch radius.
 - (h) 12 inch upper case and 9 inch lower case lettering
 - (i) white border, 1 inch wide

2.03 DETECTION

A SMARTSENSOR MATRIX VEHICLE DETECTION

This item shall govern the purchase of above-ground radar presence detector (RPD) equivalent to the Wavetronix SmartSensor Matrix.

- 1 Matrix Stop-bar radar detection.
- 2 Provide the proper number of sensors, harnesses, home run cable, interface-panels with a terminal server, and contact closure cards required for proper operation, based on Engineers quantities or plan documents.
 - a Provide the following part numbers as required for proper operation:

Part Number	Description
WX-SS-225, Matrix	Stop-bar detector with mounting bracket
WX-SS-704-XXX	Sensor Harness
WX-SS-705-XXXX	Home Run cable
WX-SS-B01-0005	4 Sensor interface panel
WX-SS-B01-0003	2 Sensor interface panel
WX-CLK-656	6 Sensor interface Panel with SDLC port
WX-CLK-650	4 Sensor interface panel with SDLC port
WX-CLK-301	Terminal server
WX-CLK-114	4 Channel card rack contact closure card
WX-CLK-104	4 Channel Din rail contact closure card
- 3 Sensor Outputs
 - a The RPD shall present real-time presence data in 10 lanes.
 - b The RPD shall support a maximum of sixteen zones.
 - c The RPD shall support four channels and have user-selectable channel assignments.
 - d The RPD shall use OR logic to combine multiple zones to a channel output, and shall have channel output extend and delay functionality.
 - e The RPD algorithms shall mitigate detections from wrong way or cross traffic.
 - f The RPD system shall have fail-safe mode capabilities for contact closure outputs if communication is lost.

- 4 Detectable Area
 - a Detection Range. The RPD shall be able to detect and report presence in lanes with boundaries as close as 6 ft. from the base of the pole on which the RPD is mounted.
 - b The RPD shall be able to detect and report presence in lanes located within the 140 ft. arc from the base of the pole on which the RPD is mounted.
 - c Field of View. The RPD shall be able to detect and report presence for vehicles within a 90 degree field of view.
 - d Lane Configuration. The RPD shall be able to detect and report presence in up to 10 lanes.
 - e The RPD shall be able to detect and report presence in curved lanes and areas with islands and medians.
- 5 Maintenance
 - a The RPD shall not require cleaning or adjustment to maintain performance.
 - b The RPD shall not rely on battery backup to store configuration information, thus eliminating any need for battery replacement.
 - c Once the RPD is calibrated, it shall not require recalibration to maintain performance unless the roadway configuration changes.
- 6 Physical Properties
 - a The RPD shall not exceed 4.2 lbs. in weight.
 - b The RPD shall not exceed 13.2 in. by 10.6 in. by 3.3 in. in its physical dimensions.
 - c Enclosure. The RPD shall be enclosed in a Lexan EXL polycarbonate.
 - d The enclosure shall be classified "f1" outdoor weatherability in accordance with UL 746C.
 - e The RPD shall be classified as watertight according to the NEMA 250 Standard.
 - f The RPD enclosure shall conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures. Test results shall be provided for each of the following type 4X criteria:
 - 1) External Icing (NEMA 250 clause 5.6)
 - 2) Hose-down (NEMA 250 clause 5.7)
 - 3) 4X Corrosion Protection (NEMA 250 clause 5.10)
 - 4) Gasket (NEMA 250 clause 5.14)
 - g The RPD shall be able to withstand a drop of up to 5 ft. without compromising its functional and structural integrity.
 - h The RPD enclosure shall include a connector that meets MIL-C-26482 specification. The MIL-C-26482 connector shall provide contacts for all data and power connections.
- 7 Power
 - a The RPD shall consume less than 10 W.
 - b The RPD shall operate with a DC input between 9 VDC and 28 VDC
- 8 Communication Ports
 - a The RPD shall have two communication ports, and both ports shall communicate independently and simultaneously.
 - b The RPD shall support the upload of new firmware into the RPD's non-volatile memory over either communication port.
 - c The RPD shall support the user configuration of the following:
 - 1) Response delay
 - 2) Push port
 - d The communication ports shall support a 9600 bps baud rate.
- 9 Radar Design
 - a The RPD shall be designed with a matrix of radars

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- b Frequency Stability. The circuitry shall be void of any manual tuning elements that could lead to human error and degraded performance over time.
 - c All transmit modulated signals shall be generated by means of digital circuitry, such as a direct digital synthesizer, that is reference to a frequency source that is at least 50 parts per million (ppm) stable over the specified temperature range, and ages less than 6 ppm per year. Any up conversion of a digitally generated modulated signal shall preserve the phase stability and frequency stability inherent in the digitally generated signal.
 - d The RPD shall not rely on temperature compensation circuitry to maintain transmit frequency stability.
 - e The bandwidth of the transmit signal of the RPD shall not vary by more than 1% under all specified operating conditions and over the expected life of the RPD.
 - f Antenna Design. The RPD antennas shall be designed on printed circuit boards.
 - g The vertical beam width of the RPD at the 6dB points of the two-way pattern shall be 65 degrees or greater.
 - h The antennas shall cover a 90 degree horizontal field of view.
 - i The sidelobes in the RPD two-way antenna pattern shall be -40dB or less.
 - j Resolution. The RPD shall transmit a signal with a bandwidth of at least 245 MHz.
 - k RF Channels. The RPD shall provide at least 8 RF channels so that multiple units can be mounted in the same vicinity without causing interference between them.
 - l Verification. The RPD shall have a self-test that is used to verify correct hardware functionality.
 - m The RPD shall have a diagnostics mode to verify correct system functionality.
- 10 Configuration
- a Auto-configuration. The RPD shall have a method for automatically defining traffic lanes, stop bars and zones without requiring user intervention. This auto-configuration process shall execute on a processor internal to the RPD and shall not require an external PC or other processor.
 - b The auto-configuration process shall work under normal intersection operation and may require several cycles to complete.
 - c Manual Configuration. The auto-configuration method shall not prohibit the ability of the user to manually adjust the RPD configuration.
 - d The RPD shall support the configuring of lanes, stop bars and detection zones in 1-ft. increments.
 - e Windows Mobile®-based Software. The RPD shall include graphical user interface software that displays all configured lanes and the current traffic pattern using a graphical traffic representation.
 - f The graphical interface shall operate on Windows Mobile, Windows 10 in the .NET framework.
 - g The software shall support the following functionality:
 - h Operate over a TCP/IP connection
 - i Give the operator the ability to save/back up the RPD configuration to a file or load/restore the RPD configuration from a file.
 - j Allow the backed-up sensor configurations to be viewed and edited.
 - k Provide zone and channel actuation display
 - l Provide a virtual connection option so that the software can be used without connecting to an actual sensor.
 - m Local or remote sensor firmware upgradability.
- 11 Operating Conditions
- a RPD operation shall continue in snow or in rain up to 1 in. per hour.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- b The RPD shall be capable of continuous operation over an ambient temperature range of -40°F to 165.2°F.
 - c The RPD shall be capable of continuous operation over a relative humidity range of 5% to 95% (noncondensing)
- 12 Mounting Assembly
 - a The RPD shall be mounted directly onto a mounting assembly fastened to a mast arm, pole or other solid structure.
 - b The RPD mounting assembly shall provide the necessary degrees of rotation to ensure proper installation.
 - c The RPD mounting assembly shall be constructed of weather-resistant materials and shall be able to support a 20-lb (9.1 kg) load
- 13 Mounting Location
 - a The RPD shall be mounted at a height that is within 15-30 feet per manufacturer's recommended mounting heights.
 - b The RPD shall be mounted at an offset from the first lane that is not less than 6 feet per the RPD's minimum offset.
 - c The RPD shall be mounted so that at least 20 feet along the farthest lane to be monitored is within the field view of the RPD.
 - d The RPD shall be mounted with its cable connector down and shall be tilted so that the RPD is aimed at the center of the lanes to be monitored. Typically, the RPD is titled off of vertical by 20-30 degrees.
 - e The RPD shall be mounted on a vertical signal pole or on the horizontal mast arm.
 - f The RPD shall be mounted so that its field of view is not occluded by poles, signs or other structures.
 - g RPDs that are mounted within 20 ft. (6.1 m) of each other or that are monitoring the same intersection shall be configured to operate on different RF channels regardless of the pointing direction of the RPDs.
 - h It is recommended that the manufacturer be consulted to verify final RPD placement if the RPD is to be mounted near large planar surfaces (sound barrier, building, parked vehicles, etc.) that run parallel to the monitored roadway.
- 14 Cabling
 - a Ground wire #4 AWG shall be provided from the equipment location to the foundation ground. The cable shall be SmartSensor 6-conductor wire. The cable end connector shall meet the MIL-C-26482 specification and shall be designed to interface with the appropriate MIL-C-26482 connector. The connector back shell shall be an environmentally sealed shell that offers excellent immersion capability. All conductors that interface with the connector shall be encased in a single jacket, and the outer diameter of this jacket shall be within the back shell's cable O.D. range to ensure proper sealing. The back shell shall have a strain relief with enough strength to support the cable slack under extreme weather conditions. Recommended connectors are Cannon's KPT series, and recommended back shells are Glenair Series 37 cable sealing back shells.
 - b The cable shall be the Orion Wire Combo-2204-2002-PVC-GY or an equivalent cable that conforms to the following specifications:
 - 1) The RS-485 conductors shall be a twisted pair.
 - 2) The RS-485 conductors shall have nominal capacitance conductor to conductor of less than 71pF/Ft at 1 Khz.
 - 3) The RS-485 conductors shall have nominal conductor DC resistance of less than 16.5 ohms/(304.8 m) at 68o F (20°C).
 - 4) The power conductors shall be one twisted pair with nominal conductor DC resistance of less than 11.5 ohms/(304.8 m) at 68° F (20°C).

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 5) Each wire bundle or the entire cable shall be shielded with an aluminum/mylar shield with a drain wire.
 - c The cable shall be terminated only on the two farthest ends of the cable.
 - d The cable length shall not exceed 2000 ft. (609.6 m) for the operational baud rate of RS-485 communications (9.6 Kbps).
 - e If 12 VDC is being supplied for the RPD then the cable length shall not exceed 110 ft. (33.5 m).
 - f If 24 VDC is being supplied for the RPD then the cable length shall not exceed 600 ft. (182.9 m).
 - g Both communication and power conductors can be bundled together in the same cable as long as the above-mentioned conditions are met.
- 15 In Cabinet Interface Equipment
 - a The RPD shall be installed using the SmartSensor Matrix Preassembled Traffic Cabinet Backplate or an equivalent that provides input power surge suppression, sensor cable surge suppression, AC to DC power conversion (if necessary), and terminal blocks. The surge protection devices shall meet or exceed the EN 6100-4-5 Class 4 specifications
- 16 Power Supply
 - a If needed, the RPD shall be installed using the WX-CLK656, WXCLX 650 or an equivalent AC to DC power converter that meets the following specifications:
 - b The power converter shall be power rated at 48 W for temperature less than 140°F (60°C) with a 5% power decrease for each degree increase up to 158°F (70°C).
 - c The power converter shall operate in the temperature range of -29.2°F to +165.2°F (-34°C to 74°C).
 - d The power converter shall operate in the humidity range of 5% to 95% at 77°F (25°C) non-condensing.
 - e The power converter shall accept an input voltage of 85 VAC to 264 VAC or 120 VDC to 370 VDC.
 - f The power converter shall operate at an input frequency of 47 Hz to 63 Hz.
 - g The power converter shall produce an output voltage of 24 VDC $\pm 4\%$.
 - h The power converter shall withstand a voltage across its input and output of 2kV. The power converter shall withstand a voltage across its input and ground of 1.5 kV.
 - i The power converter shall conform to safety standards UL 60950 and EN60950.
 - j The power converter shall conform to EMC standards EN55022 Class B and EN61000-3-2, 3.
 - k In brown-out conditions (i.e. <85VAC input), the output voltage of the power converter shall be less than 1 VDC.
 - l The terminal blocks shall be color-coded insulation displacement terminal blocks.
 - m The terminal blocks shall be prewired to the other in-cabinet equipment so that no wiring other than cable terminations, connecting input power and connecting input file cards shall be required during installation.
- B SMARTSENSOR HD DETECTION
 - 1 General: This item shall govern the purchase of above-ground radar vehicle sensing devices (RVSD) equivalent to the Wavetronix SmartSensor HD.
 - a Wavetronix, HD Count station.
 - b Provide the proper number of sensors, harnesses, home run cable, interface and communication equipment for proper operation, based on Engineers quantities or plan documents.

Part Number	Description
WX-SS-126, HD	ITS Sensor with mounting bracket
WX-SS-706-XXX	Sensor Harness

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

MAS-3000-01	Custom Solar Engine
MAS-3000-02	Custom AC Engine
WX-CLK-400	900 MHz radios
Radios to include surge, antennas and cabling required for full operation	
WX-CLK-301	Terminal server
WX-CLK-200	Surge arrestor
WX-CLK-201	1 amp Power Supply
WX-CLK-205	AC lighting surge protection
WX-CLK-206	Resettable circuit breaker

- 2 Measured Quantities.
 - a The RVSD shall provide volume, average speed, occupancy, classification counts, 85th percentile speed, average headway, average gap, speed bin counts and direction counts for user-configurable time intervals for up to 10 lanes of traffic.
 - b The RVSD shall provide up to eight length-based classification bins.
 - c The RVSD shall provide up to 15 speed bins.
 - d The RVSD shall provide speed, length, class, lane assignment, and range data for each vehicle detection.
 - e The RVSD shall provide presence data for up to 10 lanes of traffic.
- 3 Detectable Area.
 - a Maximum Lanes.
 - 1) The RVSD shall be able to detect and report information from up to 10 lanes.
 - b Detection Range.
 - 1) The RVSD shall be able to detect and report information in lanes with boundaries as close as 6 ft. (1.8 m) from the base of the pole on which the RVSD is mounted.
 - 2) The RVSD shall be able to detect and report information in lanes located with the far boundary at 250 ft. (76.2 m) from the base of the pole on which the RVSD is mounted.
 - 3) The RVSD shall be able to simultaneously detect and report information from a lane located at the minimum offset and from a lane located at the maximum range.
 - c Lane Size and Spacing.
 - 1) The RVSD shall allow any spacing of traffic lanes positioned from the minimum offset to the maximum range. Gore and unequally sized or spaced lanes shall be handled so that detections from the lanes meet all performance specifications.
- 4 Performance.
 - a Volume Accuracy.
 - 1) The volume data shall be within 5% of truth for a direction of travel during nominal conditions. Individual lane volume data shall be within 10% of truth during nominal conditions. The percentage of missed detection and the percentage of false detections for each lane shall not exceed 15% during nominal conditions. Nominal conditions exist when average speeds are greater than 10 mph (16 kph) in every lane; when there is less than 20% truck traffic per lane; and when at least 50 cars per lane are counted in the interval.
 - b Speed Accuracy.
 - 1) Average speed data shall be accurate to within 3 mph (5 kph) for any direction of travel when there are more than five cars per lane in an interval. Average speed data for any individual lane shall be accurate to within 3 mph (5 kph) when there are more than five cars per lane in an interval.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 2) The RVSD shall provide per-vehicle speed measurements on 95% of vehicles that are not occluded by other vehicles or by barriers. The RVSD shall provide per-vehicle speed measurements in which 90% of the measurements are within 5 mph (8 kph).
 - 3) The RVSD shall measure speed using a dual-radar speed trap that calculates the time delay between two different radar beams.
 - c Occupancy Accuracy.
 - 1) Occupancy data shall be within 10% of truth for any direction of travel on a roadway during nominal conditions. For example, if the true occupancy in a lane is 20%, then the measured occupancy shall be between 18% and 22%. Individual lane occupancy shall be within 20% during nominal conditions. Nominal conditions exist when true occupancy is less than 30%, without merging traffic; when average speeds are greater than 10 mph (16 kph) in every lane; and when there is less than 20% truck traffic per lane.
 - d Classification Accuracy.
 - 1) The RVSD shall correctly determine classification for 80% of detected vehicles when the classification bins are at least 10 ft. (3 m) wide and occupancy of all lanes is below 30%.
- 5 Performance Maintenance.
 - a The RVSD shall not require cleaning or adjustment to maintain performance. The RVSD shall not rely on battery backup to store configuration information, thus eliminating any need for battery replacement.
 - b Once the RVSD is calibrated, it shall not require recalibration to maintain performance unless the roadway configuration changes.
 - c The RVSD shall be manufactured using techniques that will yield a mean time between failures of 10 years.
- 6 Physical Properties.
 - a The RVSD shall not exceed 5 lbs. (2.3 kg) in weight.
 - b The RVSD shall not exceed 14 in. by 12 in. by 4 in. (35.6 cm x 30.5 cm x 10.2 cm) in its physical dimensions.
- 7 Enclosure.
 - a The RVSD shall be enclosed in a Lexan polycarbonate.
 - b The enclosure shall be classified "f1" outdoor weatherability in accordance with UL 746C.
 - c The RVSD shall be classified as watertight according to the NEMA 250 Standard.
 - d The RVSD enclosure shall conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures.
 - e Test results shall be provided for each of the following type 4X criteria:
 - 1) External Icing (NEMA 250 clause 5.6)
 - 2) Hose-down (NEMA 250 clause 5.7)
 - 3) 4X Corrosion Protection (NEMA 250 clause 5.10)
 - 4) Gasket (NEMA 250 clause 5.14)
 - f The RVSD shall be able to withstand a drop of up to 5 ft. (1.5 m) without compromising its functional and structural integrity.
 - g The RVSD enclosure shall include a connector that meets the MIL-C-26482 specification. The MIL-C-26482 connector shall provide contacts for all data and power connections.
- 8 Communication Ports.
 - a The RVSD shall have an RS-485 port and an RS-232 port, and both ports shall communicate independently and simultaneously.
 - b The RS-232 port shall be full-duplex and shall support true RTS/CTS hardware handshaking for interfacing with various communication devices.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- c The RVSD shall support the upload of new firmware into the RVSD's non-volatile memory over either communication port.
 - d The RVSD shall support the user configuration of the following:
 - 1) Baud rate
 - 2) Response delay
 - 3) Data push
 - 4) RS-232 flow control (RTS/CTS or none)
 - e The communication ports shall support all of the following baud rates: 9600, 19200, 38400, 57600 and 115200 bps.
- 9 Performance Maintenance.
- a The RVSD shall not require cleaning or adjustment to maintain performance.
 - b The RVSD shall not rely on battery backup to store configuration information, thus eliminating any need for battery replacement.
 - c Once the RVSD is calibrated, it shall not require recalibration to maintain performance unless the roadway configuration changes.
 - d The RVSD shall be manufactured using techniques that will yield a mean time between failures of 10 years.
- 10 Power.
- a The RVSD shall consume less than 9.5 W.
 - b The RVSD shall operate with a DC input between 12 VDC and 28 VDC.
- 11 Data Protocols.
- a The RVSD shall support three different data protocols for all lanes being monitored: interval (bin) data, event (per vehicle) data, and real-time true presence data.
 - b The interval (bin) data packet protocol shall support:
 - 1) Sensor ID
 - 2) A timestamp that records the year, month, day, hour, minute, and second of the end of time interval
 - 3) Total volumes of more than 65536
 - 4) Average speed values in either mph or kph
 - 5) Occupancy in 0.1% increments
 - 6) Volume in up to eight length-based user-defined vehicle classification bins
 - 7) Volume in up to 15 user-defined speed bins (bin by speed)
 - 8) Volume for both directions of traffic (bin by direction)
 - 9) Average headway in seconds
 - 10) Average gap in seconds
 - 11) 85th percentile speed in either mph or kph
 - c The event (per vehicle) data packet protocol shall support:
 - 1) Sensor ID
 - 2) A timestamp that records the year, month, day, hour, minute, second and millisecond of the time the vehicle left the detection zone
 - 3) Lane assignment
 - 4) Speed values in either mph or kph
 - 5) Vehicle length
 - 6) Classification using up to eight user-defined classes
 - 7) Range
 - d The real-time true presence data packet protocol shall support:
 - 1) Sensor ID
 - 2) True presence information for each lane being monitored
- 12 Data Buffering.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- a The RVSD shall store, in non-volatile memory, at least 9,000 interval data packets with the maximum number of lanes and approaches configured and all interval fields enabled.
 - b The RVSD shall timestamp interval data using a real-time clock that maintains accurate time even when power is disconnected from the sensor for extended periods of time.
- 13 Radar Design.
 - a The RVSD shall employ a dual radar design that includes two receive channels.
- 14 Frequency Stability.
 - a The circuitry shall be void of any manual tuning elements that could lead to human error and degraded performance over time.
 - b All transmit modulated signals shall be generated by means of digital circuitry, such as a direct digital synthesizer, that is referenced to a frequency source that is at least 50 parts per million (ppm) stable over the specified temperature range, and ages less than 6 ppm per year. Any up conversion of a digitally generated modulated signal shall preserve the phase stability and frequency stability inherent in the digitally generated signal.
 - c The RVSD shall not rely on temperature compensation circuitry to maintain transmit frequency stability.
 - d The bandwidth of the transmit signal of the RVSD shall not vary by more than 1% under all specified operating conditions and over the expected life of the RVSD.
- 15 Antenna Design.
 - a The RVSD antennae shall be designed on printed circuit boards.
 - b The vertical beam width of the RVSD at the 6dB points of the two-way pattern shall be 65 degrees or greater.
 - c The horizontal beam width of the RVSD at the 6dB points of the two-way pattern shall be 7 degrees or less.
 - d The sidelobes in the RVSD two-way antenna pattern shall be -40dB or less.
- 16 Resolution.
 - a The RVSD shall transmit a signal with a bandwidth of at least 240 MHz.
- 17 RF Channels.
 - a The RVSD shall provide at least 4 RF channels so that multiple units can be mounted in the same vicinity without causing interference between them.
- 18 Auto-configuration.
 - a The RVSD shall have a method for automatically defining traffic lanes or detection zones without requiring user intervention. The auto-configuration process shall execute on a processor internal to the RVSD and shall not require an external PC or other processor.
 - b The auto-configuration process shall automatically define traffic lanes or detection zones by detecting the relative position of vehicles within the RVSD's field of view.
 - c The RVSD shall include a transceiver capable of detecting multiple vehicles present within its field of view. The RVSD shall also include a processor or computer with executable instruction that estimates the position of each of the vehicles, records the position of the vehicles, generates a probability density function estimation from each position of the vehicles, and defines traffic lanes from that probability density function estimation. The probability density function estimation represents the probability that a vehicle will be located at any range.
 - d The RVSD auto-configuration process shall define all lanes within the detectable area of the RVSD, up to the maximum number of lanes, during free-flow conditions; when at least 50% of a sedan is visible above any barriers; when at

least 10 cars pass in each lane during configuration time; and there are less than 10% lane-changing.

19 Manual Configuration.

- a The auto-configuration method shall not prohibit the ability of the user to manually adjust the RVSD configuration.
- b The RVSD shall support the configuring of lanes or detection zones in 1-ft. (0.3-m) increments.

20 Windows Mobile®-based Software.

- a The RVSD shall include graphical user interface software that displays all configured lanes and the current traffic pattern using a graphical traffic history representing at least the last 1.5 seconds of detected traffic. This graphical traffic history shall also allow the option of displaying the measured speed or length of a detected vehicle.
- b The graphical interface shall operate on Windows Mobile, Windows 10 in the .NET framework.
- c The software shall support the following functionality:
 - 1) Automatically find the correct baud rate
 - 2) Automatically find the correct serial communication port
 - 3) Operate over a TCP/IP connection
 - 4) Support dial-up modem connectivity
 - 5) Give the operator the ability to save/back up the RVSD configuration to a file or load/restore the RVSD configuration from a file
 - 6) Provide a virtual connection option so that the software can be used without connecting to an actual sensor

21 Operating Conditions.

- a The RVSD shall maintain accurate performance in all weather conditions, including rain, freezing rain, snow, wind, dust, fog and changes in temperature and light, including direct light on sensor at dawn and dusk.
- b RVSD operation shall continue in snow or in rain up to 4 in. (10.2 cm) per hour.
- c The RVSD shall be capable of continuous operations over an ambient temperature range of -40°F to 165.2°F (-40°C to 74°C). The RVSD shall be capable of continuous operation over a relative humidity range of 5% to 95% (non-condensing).

22 Manufacturing.

- a The RVSD shall be manufactured and assembled in the U.S.A.

23 Mounting Assembly.

- a The RVSD shall be mounted directly onto a mounting assembly fastened to a pole or other solid structure.
- b The RVSD mounting assembly shall provide the necessary degrees of rotation to ensure proper installation.
- c The RVSD mounting assembly shall be constructed of weather-resistant materials and shall be able to support a 20-lb. (9.1 kg) load.

24 mounting Location.

- a The RVSD shall be mounted at a height that is within 0-10 feet per manufacturer's recommended mounting heights.
- b The RVSD shall be mounted at an offset from the first lane that is between 6-50 feet per the RVSD's minimum offset.
- c The RVSD shall be mounted so that the farthest lane to be monitored is not more than 200 feet per maximum range of the RVSD.
- d The RVSD shall be mounted with its cable connector down and shall be tilted so that the RVSD is aimed at the center of the lanes to be monitored. Typically, the RVSD is tilted off of vertical by 10-20 degrees.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- e The RVSD shall be aligned so that the horizontal angle is within approximately +2 degrees of perpendicular to the flow of traffic. The RVSD alignment tool shall be used to verify pointing accuracy.
- f Two RVSD units shall not be mounted so that they are pointed directly at each other.
- g A distance of 40 ft. (12.2 m) or more, along the direction of the roadway, shall separate the RVSDs if they are located on opposing sides of a roadway and the RVSDs shall be configured to operate on different RF channels.
- h RVSDs that are mounted within 20 ft. (6.1 m) of each other shall be configured to operate on different RF channels regardless of the pointing direction of the RVSDs.
- i When possible, the pole selected for the RVSD shall be where there is no guardrail or other type of barrier between the pole and the first lane of traffic.
- j The RVSD shall not be installed in areas with overhead structures. For example, overhead sign bridges, tunnels and overpasses should be avoided. The RVSD shall be mounted at least 30 ft. (9.1 m) to the side of any such overhead structure.
- k It is recommended that the manufacturer be consulted to verify final RVSD placement if the RVSD is to be mounted near large planar surfaces (sound barrier, building, parked vehicles, etc.) that run parallel to the monitored roadway.

25

Cabling.

- a The cable shall be SmartSensor wire. The cable end connector shall meet the MIL-C-26482 specification and shall be designed to interface with the appropriate MIL-C-26482 connector. The connector back shell shall be an environmentally friendly sealed shell that offers excellent immersion capability. All conductors that interface with the connector shall be encased in a single jacket, and the out diameter of this jacket shall be within the back shell's cable O.D. range to ensure proper sealing. The back shell shall have a strain relief with enough strength to support the cable slack under extreme weather conditions. Recommended connectors are Cannon's KPT series, and recommended back shells are Glenair Series 37 cable sealing back shells.
- b The cable shall be the Orion Wire Combo-2207-2002-PVC-GY or an equivalent cable that conforms to the following specifications:
 - 1) The RS-485 conductors shall be a twisted pair.
 - 2) The RS-232 and RS-485 conductors shall have nominal capacitance conductor to conductor of less than 71pF/Ft at 1 Khz.
 - 3) The RS-232 and RS-485 conductors shall have nominal conductor DC resistance of less than 16.5 ohms/(304.8 m) at 68°F (20°C).
 - 4) The power conductors shall be one twisted pair with nominal conductor DC resistance of less than 11.5 ohms/(304.8 m) at 68°F (20°C).
 - 5) Each wire bundle or the entire cable shall be shielded with an aluminum/mylar shielded with a drawn wire
 - 6) The cable shall have a single continuous run with no splices.
 - 7) The cable shall be terminated only on the two farthest ends of the cable.
 - 8) The cable length shall not exceed the following limits for the operational baud rate of RS-485 communications:

Baud Rate	Cable Length
115.2 Kbps	300 ft. (91.4 m)
57.6 Kbps	600 ft. (182.9 m)
38.4 Kbps	800 ft. (243.8 m)
19.2 Kbps	1000 ft. (304.8 m)

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

9.6 Kbps 2000 ft. (609.6 m)

NOTE: These represent maximum data rates. The data used should be the minimum data rate required for operation.

- c If communication is conducted over the RS-232 bus, then the RS-232 driver must be able to source and sink +7 mA or more.
- d The cable length shall not exceed the following limits for the operational baud rate of RS-232 communications:

Baud Rate	Cable Length
115.2 Kbps	40 ft. (12.2m)
57.6 Kbps	60 ft. (18.3 m)
38.4 Kbps	100 ft. (30.5 m)
19.2 Kbps	140 ft. (42.7 m)
9.6 Kbps	200 ft. (61 m)

NOTE: These represent maximum data rates. The data used should be the minimum data rate required for operation.

- e If 12 VDC is being supplied for the RVSD then the cable length shall not exceed 110 ft. (33.5m).
- f If 24 VDC is being supplied for the RVSD then the cable length shall not exceed 600 ft. (182.9 m).
- g If a cable length of 600 ft. (182.9 m) to 2000 ft. (609.6 m) is required, the power cable shall be an ANIXTER 2A-1402 or equivalent cable that meets the following requirements:
 - 1) 10 AWG conductor size/gauge
 - 2) Two conductor count
 - 3) Stranded cable type
 - 4) Bare copper material
 - 5) 600 V range
 - 6) 194°F (90°C) temperature rating/nylon insulation material
 - 7) PVC- polyvinyl chloride jacketing material
 - 8) 25 A per conductor
- h Both communication and power conductors can be bundled together in the same cable as long as the above-mentioned conditions are met.

26 Lighting Surge Protection.

- a The RVSD shall be installed using lighting surge protection on all communication and power lines. The surge protection devices shall meet or exceed the EN 61000-4-5 Class 4 specifications.
- b The lighting surge protection unit shall be the Wavetronix Click! 200TM or equivalent.

27 Power Supply.

- a The RVSD shall be installed using the Click! 201, Click! 202 or an equivalent AC to DC power converter that meets the following specifications:
- b The power converter shall be power rated at 15 W or greater at 77°F (25°C) and 10 W or greater at 165.2 (74°C).
- c The power converter shall operate in the temperature range of to -29.2°F to +165.2°F (-34°C to +74°C).
- d The power converter shall operate in the humidity range of 5% to 95% at 77°F (25°C) non-condensing.
- e The power converter shall accept an input voltage of 85 VAC to 264 VAC or 120 VDC to 370 VDC.
- f The power converter shall operate at an input frequency of 47 Hz to 63 Hz
- g The power converter shall produce an output voltage of 24 VDC +4%.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- h The power converter shall have a hold-up time of greater than 20 ms at 120 VAC.
- i The power converter shall withstand a voltage across its input and output of 2kV.
- j The power converter shall withstand a voltage across its input and ground of 1.5kV.
- k The power converter shall conform to safety standards UL 60950 and EN60950.
- l The power converter shall conform to EMC standards EN55022 Class B and EN61000-3-2, 3.
- m In brown-out conditions (i.e. <85VAC input), the output voltage of the power converter shall be less than 1 VDC.

28 Input File Cards.

- a If input file cards are used in the detection system, then the Click! 172, Click! 174 or an equivalent that meets the following specifications shall be used.
- b The input file cards shall be compatible with 170, 2070, NEMA TS1, and NEMA TS2 style input racks.
- c The input file card shall translate data packets from the RVSD into contact closure outputs.
- d The input file card shall support dual loop (speed trap) emulation, as well as the following modes of operation:
 - 1) Pulse (a single 125 ms output pulse for each vehicle)
 - 2) Presence (an output pulse corresponding to the duration of each vehicle in the detection zone)
 - 3) Actuation (true presence output in real time)
 - 4) Single loop speed (duration of the pulse is inversely proportional to the speed of the vehicle)
- e The input file card shall receive data packets over an RS-485 bus at any of the following baud rates: 9600, 19200, 38400 and 57600 bps
- f The input file card shall autobaud and auto-detect an RVSD over wired and wireless communication channels that have a maximum latency of 500 ms.
- g The input file card shall comply with the NEMA TS2-1998 Traffic Controller Assemblies with NTCIP Requirements (Section 2.8 specification).

C Advance Microwave Vehicle Detection

- 1 This item shall govern the purchase of above ground continuous tracking advance detector (CTAD) equivalent to the Wavetronix SmartSensor Advance®.
- 2 Advance, Advance CTAD radar detection.
- 3 Provide the proper number of sensors, harnesses, home run cable, interface-panel with a terminal server, and contact closure cards required for proper operation, based on Engineers quantities or plan documents.

Part Number	Description
WX-SS-200V,	Advance Advance Sensor with mounting bracket
WX-SS-200E,	Advance Extended Range Advance with mounting bracket
WX-SS-704-XXX	Harness
WX-SS-705-XXXX	Home Run cable
WX-SS-B01-0005	4 Sensor interface panel
WX-SS-B01-0003	2 Sensor interface panel
WX-CLK-656	6 Sensor interface panel with SDLC port
WX-CLK-650	4 sensor interface panel with SDLC port
WX-CLK-301	Terminal server
WX-CLK-112	2 Channel card rack contact closure card
WX-CLK-104	4 Channel Din rail contact closure card

- 4 Measured Quantities and Outputs

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- a The CTAD shall detect range, speed, vehicle estimated time of arrival (ETA) to the stop bar for vehicles or clusters of vehicles moving in the user selected direction of travel. The CTAD shall also detect instantaneous roadway efficiency.
 - b The CTAD shall be able to simultaneously detect and report information from up to 25 vehicles on the roadway when they are serially sequenced between the near and far boundaries.
 - c The CTAD shall turn on a zone output when the range, speed, ETA, and qualified count or instantaneous roadway efficiency requirements for that zone are satisfied.
 - d The CTAD shall turn on a latched channel output when the on alert is turned on and the delay time is satisfied. The CTAD shall turn off a latched channel output when the off alert is turned on or the max timer expires and the extension time is satisfied.
 - e The CTAD shall provide vehicle call and extend data on up to eight channels that can be connected to contact closure modules compliant with NEMA TS1, NEMA TS2, 170, and 2070 controller cabinets.
 - f The CTAD shall be capable of providing data for each tracked detection over the serial ports.
- 5 Detectable Area
- a Mounting Location. The CTAD shall be able to detect and report vehicle information when mounted within 50' (15.2 m) of the center of the lanes of interest.
 - b The CTAD shall be able to detect and report vehicle information when mounted at heights up to 40' (12.2m) above the road surface.
 - c Detection Range. The CTAD shall be able to detect and report information on the roadway located with the near boundary at 50' (15.2m) from the base of the pole on which is CTAD is mounted.
 - d The CTAD shall be able to detect and report information on the roadway located with the far boundary at 500' (152.4m) from the base of the pole on which the CTAD is mounted.
 - e For incoming traffic, 95 percent of large vehicles within the line-of-site of the CTAD shall be detected and reported before they arrive 400' (121.9m) from the sensor. For incoming traffic, 90 percent of all motor vehicles within the line-of-site of the CTAD shall be detected and reported before they arrive 400' (121.9m) from the sensor.
- 6 Performance
- a Detection Accuracy. The CTAD shall detect at least 98 percent of large vehicles like truck-trailer combinations and at least 95 percent of all motor vehicles within the line-of-sight of the CTAD sensor where multiple detections of multi-unit vehicles are not considered false detections and merged detections of adjacent lane vehicles are not considered missed detections.
 - b Range Accuracy. The CTAD shall provide range measurements in which 90 percent of the measurements are accurate within 10' (3m) when the vehicle is tracked independently.
 - c Speed Accuracy. The CTAD shall provide per vehicle speed measurements in which 90 percent of the measurements are accurate within 5 mph when tracked independently.
 - d ETA Accuracy. The CTAD shall provide estimated time-of-arrival (ETA) measurements in which 85 percent of the measurements are accurate within one second, when the detected vehicles are tracked independently at a constant speed above 40 mph (64 kph) and are within 2.5 and 5.5 seconds of the stop bar.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 7 Performance Maintenance
 - a The CTAD shall not require cleaning or adjustment to maintain performance.
 - b The CTAD shall not rely on battery backup to store configuration information, thus eliminating any need for battery replacement.
 - c Once the CTAD is calibrated, it shall not require recalibration to maintain performance unless the roadway configuration changes.
- 8 Physical Properties
 - a The CTAD shall not exceed 5 lbs. (2.3 kg) in weight.
 - b The CTAD shall not exceed 14 in. by 12 in. by 4 in. (35.5 cm x 30.5 cm x 10 cm) in its physical dimensions.
 - c Enclosure. The CTAD shall be enclosed in a Lexan polycarbonate.
 - d The enclosure shall be classified "f1" outdoor weatherability in accordance with UL 746C.
 - e The CTAD shall be classified as watertight according to the NEMA 250 Standard.
 - f The CTAD enclosure shall conform to test criteria set forth in the NEMA 250 standard for type 4X enclosures. Test results shall be provided for each of the following type 4X criteria:
 - 1) External Icing (NEMA 250 clause 5.6)
 - 2) Hose-down (NEMA 250 clause 5.7)
 - 3) 4X Corrosion Protection (NEMA 250 clause 5.10)
 - 4) Gasket (NEMA 250 clause 5.14)
 - g The CTAD shall be able to withstand a drop of up to 5' (1.5 m) without compromising its functional and structural integrity.
 - h The CTAD enclosure shall include a connector that meets the MIL-C-26482 specification. The MIL-C-26482 connector shall provide contacts for all data and power connections.
- 9 Power
 - a The CTAD shall consume less than 8 W.
 - b The CTAD shall operate with a DC input between 12 VDC and 28 VDC
- 10 Communication Ports
 - a The CTAD shall have two serial communication ports, and both ports shall communicate independently and simultaneously.
 - b The CTAD shall support the upload of new firmware into the CTAD's non-volatile memory over either communication port.
 - c The CTAD shall support the user configuration of the following:
 - 1) Baud rate
 - 2) Communication port response delay
 - 3) Contact closure output frequency
 - d Both communication ports shall support all of the following baud rates: 9600, 19200, 38400, 57600 and 115200 bps.
 - e The contact closure output frequency shall be user configurable as short as 10 ms, with a default near 130 ms for compatibility.
 - f Contact closure data shall be reliably communicated over homerun cable connections as long as 600' (182.9 m) with latency from the time of channel requirement satisfaction to the eventual reporting of on the back edge of the contact closure card in 15 ms or less.
- 11 Radar Design
 - a Frequency Stability. The circuitry shall be void of any manual tuning elements that could lead to human error and degraded performance over time
 - b All transmit modulated signals shall be generated by means of digital circuitry, such as a direct digital synthesizer, that is referenced to a frequency source that is at least 50 parts per million (ppm) stable over the specified temperature range,

and ages less than 6 ppm per year. Any upconversion of a digitally generated modulated signal shall preserve the phase stability and frequency stability inherent in the digitally generated signal.

- c The CTAD shall not rely on temperature compensation circuitry to maintain transmit
 - 1) frequency stability.
 - d The bandwidth of the transmit signal of the CTAD shall not vary by more than 1 percent under all specified operating conditions and over the expected life of the CTAD.
 - e Antenna Design. The CTAD antennae shall be designed on printed circuit boards.
 - f The vertical beam width of the CTAD at the 6dB points of the two-way pattern shall be 65 degrees or greater.
 - g The horizontal beam width of the CTAD at the 6dB points of the two-way pattern shall be 11 degrees or less.
 - h The sidelobes in the CTAD two-way antenna pattern shall be -40dB or less.
 - i RF Channels. The CTAD shall provide at least four RF channels so that multiple units can be mounted in the same vicinity without causing interference between them.
- 12 Configuration
- a Auto-configuration. The CTAD shall have a method for automatically configuring the sensitivity of detection in at least 5' (1.5-m) increments.
 - b The auto-configuration method shall not prohibit the ability of the user to manually adjust the CTAD configuration.
 - c The CTAD shall support the configuration of up to eight channel outputs with up to four alerts per channel and up to four zones per alert, resulting in 32 configurable alerts and 128 configurable zones.
 - d Zone Configuration. The CTAD shall support the configuring of zones in 5' (1.5 m) increments
 - e The CTAD shall support detection zones as long as 450' (137.2 m).
 - f The CTAD shall support user configurable high-speed and low-speed detection filters for each zone.
 - g The CTAD shall support the configuring of speed filters in 1-mph (1.6-kph) increments.
 - h 8 The CTAD shall support user configurable upper and lower estimated time-of-arrival (ETA) filters for each zone.
 - i The CTAD shall support the configuring of ETA filters in increments of 0.1 seconds.
 - j The CTAD shall provide configurable upper and lower count filters that help determine if a required number of qualified detections are present.
 - k The CTAD shall support the configuring of qualified count filters in increments of one.
 - l Windows Mobile®-based Software. The CTAD shall include graphical user interface software that displays the current traffic pattern using a graphical traffic representation.
 - m The graphical user interface shall provide a means of logging the vehicular track files with an update rate of greater than five times per second.
 - n The graphical interface shall operate on Windows Mobile, Windows 2000, Windows XP and Windows Vista in the .NET framework.
 - o The software shall support the following functionality:
 - 1) Automatically find the correct baud rate
 - 2) Automatically find the correct serial communication port

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 3) Operate over a TCP/IP connection
 - 4) Provide a virtual sensor connection for software usability without a sensor
 - 5) Give the operator the ability to save/back up the CTAD configuration to a file or load/restore the CTAD configuration from a file.
- 13 Operating Conditions
 - a The CTAD shall maintain accurate performance in all weather conditions, including rain, freezing rain, snow, wind, dust, fog and changes in temperature and light, including direct light on sensor at dawn and dusk
 - b CTAD operation shall continue in snow or rain up to 4 in. (10 cm) per hour
 - c The CTAD shall be capable of continuous operation over an ambient temperature range of -40°F to 165°F (140°C to 74°C).
 - d The CTAD shall be capable of continuous operation over a relative humidity range of 5% to 95% (non-condensing)
- 14 Manufacturing
 - a The CTAD shall be manufactured and assembled in the U.S.A
- 15 Mounting and Installation
 - a Mounting Assembly. The CTAD shall be mounted directly onto a mounting assembly fastened to a pole, overhead mast arm, or other solid structure.
 - b The CTAD mounting assembly shall provide the necessary degrees of rotation to ensure proper installation.
 - c The CTAD mounting assembly shall be constructed of weather-resistant materials and shall be able to support a 20-lb. (9.1 kg) load.
 - d Mounting Location. The CTAD shall be mounted at a height that is within 17-40 feet per manufacturer's recommended mounting heights.
 - e The CTAD shall be mounted in a forward-fire position, looking towards either approaching or departing traffic.
 - f The CTAD shall be mounted so that it is pointed within 10 ft. (3 m) of the target point as defined by the manufacture's table of target points for mounting offsets and mounting heights.
 - g The CTAD shall be mounted so that its vertical center line is within 5 degrees of the lanes of interest as described in the manufacture's documentation.
 - h Aligning the CTAD's center line with the roadway ensures that the antenna beam of the CTAD is positioned along the roadway.
 - i Two CTAD units shall not be mounted so that they are pointed directly at each other.
 - j CTADs that are mounted within 20 ft. (6.1 m) of each other shall be configured to operate on different RF channels regard-less of the pointing direction of the CTAD.
 - k The CTAD shall not be installed in areas with overhead structures. For example, overhead sign bridges, tunnels and overpasses should be avoided. The CTAD shall be mounted at least 30 ft. (9.1 m) to the side of any such overhead structures.
- 16 Cabling
 - a Ground wire #4 AWG shall be provided from the equipment location to the foundation ground. The cable shall be SmartSensor wire. The cable end connector shall meet the MIL-C-26482 specification and shall be designed to interface with the appropriate MIL-C 26482 connector. The connector backshell shall be an environmentally sealed shell that offers excellent immersion capability. All conductors that interface with the connector shall be encased in a single jacket, and the outer diameter of this jacket shall be within the backshell's cable O.D. range to ensure proper sealing. The backshell shall have a strain relief with enough strength to support the cable slack under extreme weather

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

conditions. Recommended connectors are Cannon's KPT series, and recommended backshells are Glenair Series 37 cable sealing backshells.

- b The cable shall be the Orion Wire Combo-2207-2002-PVCGY or an equivalent cable that conforms to the following specifications:

- 1) The RS-485 conductors shall be a twisted pair.
- 2) The RS-232 and RS-485 conductors shall have nominal capacitance conductor to conductor of less than 71pF/Ft at 1 KHz.
- 3) The RS-232 and RS-485 conductors shall have nominal conductor DC resistance of less than 16.5 ohms/(304.8 m) at 68°F (20°C).
- 4) The power conductors shall be one twisted pair with nominal conductor DC resistance of less than 11.5 ohms/(304.8 m) at 68°F (20°C).
- 5) Each wire bundle or the entire cable shall be shielded with an aluminum/mylar shield with a drain wire.

- c The cable shall have a single continuous run with no splices.

- d The cable shall be terminated only on the two farthest ends of the cable.

- e The cable length shall not exceed the following limits for the operational baud rate of RS-485 communications:

Baud Rate	Cable Length
115.2 Kbps	300 ft.
57.6 Kbps	600 ft.
68.4 Kbps	800 ft.
19.2 Kbps	1000 ft.
9.6 Kbps	2000 ft.

- f If communication is conducted over the RS-232 bus, then the RS-232 driver must be able to source and sink ± 7 mA or more.

- g The cable length shall not exceed the following limits for the operational baud rate of R-S232 communications.

Baud Rate	Cable Length
115.2 Kbps	40 ft.
57.6 Kbps	60 ft.
38.4 Kbps	100 ft.
19.2 Kbps	140 ft.
9.6 Kbps	200 ft.

- h If 12 VDC is being supplied for the CTAD then the cable length shall not exceed 110 ft.

- i If 24 VDC is being supplied for the CTAD then the cable length shall not exceed 600 ft.

- j If a cable length of 600 ft. to 2000 ft. is required, the power cable shall be an ANIXTER 2A-1402 or equivalent cable that meets the following requirements:

- 1) 10 AWG conductor size/gauge
- 2) ii. 2 conductor count
- 3) iii. Stranded cable type
- 4) iv. Bare copper material
- 5) v. 600 V range
- 6) vi. 194°F temperature rating
- 7) vii. PVC/nylon insulation material
- 8) viii. PVC- poly vinyl chloride jacketing material
- 9) 25 A per conductor

- k Both communication and power conductors can be bundled together in the same cable as long as the above-mentioned conditions are met.

17 Lightning Surge Protection

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- a The CTAD shall be installed using lightning surge protection devices that meet or exceed the EN 61000-4-5 Class 4 specifications. The lightning surge protection unit shall be the Wavetronix Click! 201, Click! 202 or an equivalent AC to DC power converter that meets the following specifications
- 18 Power Supply
 - a The CTAD shall be installed using the Click! 201, Click! 202 or an equivalent AC to DC power converter that meets the following specifications.
 - b The power converter shall be power rated at 15 W or greater at 77°F and 10 W or greater at 165°F.
 - c The power converter shall operate in the temperature range of to -29°F to 165°F.
 - d The power converter shall operate in the humidity range of 5% to 95% at 77°F non-condensing.
 - e The power converter shall accept an input voltage of 85 VAC to 264 VAC or 120 VDC to 370 VDC.
 - f The power converter shall operate at an input frequency of 47 Hz to 63 Hz.
 - g The power converter shall produce an output voltage of 24 VDC \pm 4%.
 - h The power converter shall have a hold-up time of greater than 20 ms at 120 VAC.
 - i The power converter shall withstand a voltage across its input and output of 2 kV. The power converter shall withstand a voltage across its input and ground of 1.5 kV.
 - j The power converter shall conform to safety standards UL 60950 and EN60950.
 - k The power converter shall conform to EMC standards EN55022 Class B and EN61000-3-2, 3.
 - l In brown-out conditions (i.e. <85 VAC input), the output voltage of the power converter shall be less than 1 VDC.
- 19 Input File Cards
 - a If input file cards are used in the detection system, then the Click! 172, Click! 174 or an equivalent that meets the following specifications shall be used.
 - b The input file cards shall be compatible with 170, 2070, NEMA TS1, and NEMA TS2 style input racks.
 - c The input file card shall translate data packets from the CTAD into contact closure outputs.
 - d The input file card shall support actuation mode (passage detection output in real time) of operation.
 - e The input file card shall receive data packets over an RS-485 bus at any of the following baud rates: 9600, 19200, 38400 and 57600 bps.
 - f The input file card shall autobaud and auto-detect an CTAD over wired and wireless communication channels that have a maximum latency of 500 ms.
 - g The input file card shall comply with the NEMA TS2-1998 Traffic Controller Assemblies with NTCIP Requirements (Section 2.8 specification).

2.04 EMERGENCY PREEMPTION

A System Description

- 1 The required priority control system will consist of a Global Traffic Control (GTT) formerly Opticom equipment including a model 764 Card with a 768 interface panel along with model 721 receivers using model 138 detector cable all using data-encoded infrared communication to identify the presence of designated priority or probe vehicles. A record of system users, in the form of vehicle classification and identification number, will be created. In priority vehicle mode, the data-encoded communication will request the traffic signal controller to advance to and/or hold a desired traffic signal display selected from phases normally available. In probe

vehicle mode, no traffic signal priority is requested--only a record of the probe vehicle's presence is generated.

- 2 The priority control system will consist of a matched system of data-encoded emitters, infrared detectors, detector cable, phase selectors and system software.
 - 3 The emitter will generate an infrared, data-encoded signal. The data-encoded signal will be detected and recognized by the infrared detectors at or near the intersection over a line-of-sight path of up to 2,500 feet (762m) under clear atmospheric conditions. The phase selector will process the electrical signal from the detector to ensure that the communication (1) is a valid base frequency, (2) is correctly data encoded, and (3) is within the user-settable priority request activation range, and (4) performs priority arbitration between simultaneous users of the system. If these conditions are met, the phase selector will generate a priority control request to the traffic controller (i.e., a green light) for the approaching priority vehicles, or record the presence of approaching probe vehicles by classification and identification number.
 - 4 The system will require no action from the vehicle operator other than to turn the emitter on. The system will operate on a first-come, first-served basis. High priority requests will override Low priority requests. The system will interface with most traffic signal controllers and will not compromise normal operation or existing safety provisions
- B Matched System Components**
- 1 The required priority control, data-encoded, infrared communications system will be comprised of five basic matched components: data-encoded emitter, infrared detector, detector cable, phase selector and system software. In addition, a card rack and an electromechanical interface card will be available if required. To ensure system integrity, operation and compatibility, all components will be from the same manufacturer. The system will offer compatibility with most signal controllers, e.g., electromechanical, NEMA (National Electrical Manufacturers Association), 170. The system can be interfaced with most globally available controllers using the RS232 interface or with the card rack using designated external inputs. Interfacing to an electromechanical controller may require the use of an interface card.
 - 2 Data-Encoded Emitter. The data-encoded emitter will trigger the system. It will send the encoded infrared signal to the detector. It will be located on the priority or probe vehicle
 - 3 Infrared Detector. The detector will change the infrared signal to an electrical signal. It will be located at or near the intersection. It will send the electrical signal, via the detector cable, to the phase selector.
 - 4 Detector Cable. The detector cable will carry the electrical signal from the detector to the phase selector
 - 5 Phase Selector. The phase selector will accommodate data-encoded communication and will perform priority level arbitration, validate, identify, classify and record the signal from the detector. It will be located within the controller cabinet at the intersection. It will request the controller to provide priority to the requesting vehicle and/or record presence of a probe vehicle
 - 6 System Software. The system software will be a Windows™ 10 (or greater) compliant program. It supports system configuration and gathering of operational information.
 - 7 Card Rack. The card rack will provide simplified installation of a phase selector into controller cabinets that do not already have a suitable card rack
 - 8 Electromechanical Card. The electromechanical card will provide electrical interface between the phase selector and electromechanical-type traffic controllers
- C System Component Specifications**
- 1 Data-Encoded Infrared Emitter and Programming Software

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- a The required data-encoded emitter will generate the infrared signal, which serves as the trigger to the rest of the priority control system. The infrared signal generated by the data encoded emitter will be a series of intense flashes from a single light source with integral power supply. The flash signal will consist of a fixed frequency base signal and a coded overlay signal that can be used to transmit information
- b The data-encoded emitter will be powered by the DC voltage supplied from the battery of the vehicle, 10 to 16 volts DC. The unit will be equipped with a weatherproof in-line fuse holder and a weatherproof quick-disconnect plug
- c The unit, including all electronics, will be miniaturized to a size no greater than 5.900 inches (15 cm) wide by 3.800 inches (9.7 cm) high by 3.500 inches (8.9 cm) deep to accommodate standalone and internal lightbar installation.
- d The data-encoded emitter will be supplied complete with a 25-foot (7.5 m) installation cable
- e The flash sequence generated by the data-encoded emitter will carry three types of information:
 - 1) The first type will be one of three distinctly different base frequencies of either approximately 10Hz for a Low priority emitter, or approximately 14Hz for a High priority emitter, or 12Hz for Probe frequency.
 - 2) The second type of information generated by the data-encoded emitter will be a vehicle classification and identification code that is interleaved into the base frequency flashes. Setting the vehicle classification and identification code will be accomplished through emitter programming software. Each data-encoded emitter will be capable of setting 10 different classifications with 1,000 different identification numbers per class for a total of 10,000 codes per base frequency.
 - 3) The third type of information generated by the data-encoded emitter will be reserved for setting the intersection detection range. A specially equipped emitter control module with a range setting command switch will enable the traffic engineer to activate the range code from his/her vehicle. The system will accommodate setting a separate range from 200 feet (61m) to 2,500 feet (762m) with 1200 range set points, for both High and Low priority signals.
- f The emitter will include a multi-purpose communication port compliant with the SAE J1708 communication standard. This port enables unit configuration to be set into the emitter and read from the emitter. It also allows real-time communication between the vehicle and the emitter
- g While operating, the data-encoded emitter will conduct self-diagnostics designed to monitor data transmission integrity by checking for missing pulses. Any failures of the self-diagnostic tests will be displayed by flashing of the ON/OFF switch indicator light
- h An ON/OFF switch (available for each data-encoded emitter) will be equipped with an indicator light providing internal diagnostics to assist in troubleshooting. The indicator light will operate as follows
 - 1) Steady on when the emitter is operating
 - 2) Flash at a 0.5Hz rate when the emitter is intentionally disabled
 - 3) Flash at a 2Hz rate when the emitter is inoperative
- i The data-encoded emitter will be equipped with a disable input that, when activated, will stop the emitter from flashing, thereby eliminating the possibility of inadvertent signal transmission after the priority vehicle has arrived at its destination. The disable input will be programmable to operate in either a latching or non-latching mode. Operation of the disable input will be programmable using software

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- j The data-encoded emitter will be available with an optional visible light-blocking filter
 - k The data-encoded emitter will be configured with a grating to provide precise directionality control
 - l The data-encoded emitter will have a consistent flash intensity. The energy output per flash will be 0.84 Joules
 - m The data-encoded emitter will operate over a temperature range of -30°F (-34°C) to +165°F (+74°C).
 - n The data-encoded emitter will operate over a relative humidity range of 5% to 95%.
 - o Windows™ based software will be available for programming the emitter through its J1708 compatible multi-purpose port. The communication protocol will be made available upon request for creating software to implement real-time communication
 - p The emitter will provide operating modes that allow it to be powered on with the strobe active or inactive
- D Infrared Detector
- 1 The required detector will be a lightweight, weatherproof device capable of sensing and transforming pulsed infrared energy into electrical signals for use by the phase selection equipment
 - 2 The infrared detector will be designed for mounting at or near an intersection on mast arms, pedestals, pipes or span wires.
 - 3 Each infrared detector will be supplied with mounting hardware to accommodate installation on mast arms. Hardware will be available for span wire installations. Additional hardware may be needed
 - 4 The infrared detector design will include adjustable tubes that lock into position, to enable their reorientation for span wire mounting without disassembly of the unit.
 - 5 The detector will accept infrared signals from one or two directions and will provide single or dual electrical output signal(s).
 - 6 The infrared detector will be available in three configurations:
 - a Uni-directional with one output channel
 - b Bi-directional with one output channel
 - c Bi-directional with two output channels
 - 7 The detector will allow aiming of the two infrared sensing inputs for skewed approaches, wide roads or slight curves
 - 8 The infrared detector will have a built-in, labeled terminal block to simplify wiring connections
 - 9 The infrared detector will receive power from the phase selector and will have internal voltage regulation to operate from 18 to 37 volts DC
 - 10 The infrared detector will respond to a clear lens data-encoded emitter with 0.84 (10%) Joules of energy output per flash at a distance of 2,500 feet (762m) under clear atmospheric conditions. If the emitter is configured with a visible light filter, the detector will respond at a distance of 1800 feet (549m) under clear atmospheric conditions. The noted distances will be comparable day and night
 - 11 The infrared detector will deliver the necessary electrical signal to the phase selector via a detector cable up to 1,000 feet (305m) in length
- E Detector Cable
- 1 The detector cable will deliver sufficient power from the phase selector to the infrared detector and will deliver the necessary quality signal from the detector to the phase selector over a non-spliced distance of 1,000 feet (305m).
 - 2 The cable will be of durable construction to satisfy the following installation methods:
 - a Direct burial.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- b Conduit and mast arm pull
 - c Exposed overhead (supported by messenger wire).
 - 3 The outside diameter of the detector cable will not exceed 0.3 inches (7.62mm).
 - 4 The insulation rating of the detector cable will be 600 volts minimum
 - 5 The temperature rating of the detector cable will be +158°F (+70°C) minimum.
 - 6 The conductors will be shielded with aluminized polyester and have an AWG #20 (7 x 28) stranded and individually tinned drain wire to provide signal integrity and transient protection
 - 7 The shield wrapping will have a 20% overlap to ensure shield integrity following conduit and mast arm pulls
 - 8 The detector cable will be comprised of three signal wires and a drain wire. Each wire will be 20 AWG (7 x 28). The capacitance will not exceed 48 pF per foot at 1 KHz. The detector cable wires will be stranded, individually tinned copper, color-coded insulation as follows:
 - a Orange for delivery of detector power (+).
 - b Drain wire for detector power return (-).
 - c Yellow for detector signal #1
 - d Blue for detector signal #2 or ground, depending on model of detector being used.
- F Phase Selector
- 1 The phase selector, designed to be installed in the traffic controller cabinet, will accommodate data-encoded signals and is intended for use directly with numerous controllers. These include California/New York Type 170 controllers with compatible software, NEMA controllers, or other controllers along with the system card rack and suitable system interface equipment and controller software
 - 2 The phase selector will be a plug-in, four channel, multiple-priority device intended to be installed directly into a card rack located within the controller cabinet
 - 3 The phase selector will be powered from 115 volt (95 volts AC to 135 volts AC), 60Hz mains and will contain an internal, regulated power supply that supports up to twelve infrared detectors
 - 4 Programming the phase selector and retrieving the data stored in it will be accomplished using an IBM PC-compatible computer and the system interface software. The connection can be made either directly, via the computer's communication (COM) port, or remotely via a modem. The communication port on the phase selector will be 10/100Mb Ethernet communication, USB 2.0 and RS232 interface located on the front and back of the unit. The communication protocol will be made available upon request for creating software to implement other communication applications.
 - 5 The phase selector will include the ability to directly sense the green traffic controller signal indications through the use of dedicated sensing circuits and wires connected directly to the field wire termination points in the traffic controller cabinet
 - 6 The phase selector will have the capability of storing up to 10,000 of the most recent infrared and GPS priority control calls, probe frequency passages, or unauthorized vehicle occurrences. When the log is full, the phase selector will drop the oldest entry to accommodate the new entry. The phase selector will store the record in non-volatile memory and will retain the record if power terminates. Each record entry will include ten points of information about the priority call, as follows:
 - a Classification: Indicates the type of vehicle
 - b Identification number: Indicates the unique ID number of the vehicle
 - c Priority level: Indicates whether High or Low priority, or Probe frequency is requested by the vehicle
 - d Direction: Channel A, B, C, or D; indicates the vehicle's direction of travel

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- e Call duration: Indicates the total time in seconds the priority status is active
 - f Final greens at end of call: Indicates which phases are green at the end of the call
 - g Duration of the final greens: Indicates the total time final greens were active at the end of call
 - h Time and date call started and ended: Indicates the time a priority call started and ended; provided in seconds, minutes, hours, day, month, year
 - i Maximum signal intensity: Indicates the strongest signal intensity measured by the phase selector during call
 - j Priority output active: Indicates if the phase selector requested priority from the controller for the call
- 7 The phase selector will include several control timers that will limit or modify the duration of a priority control condition, by channel, and can be programmed from an IBM PC-compatible computer. The control timers will be as follows:
- a MAX CALL TIME: Will set the maximum time a channel is allowed to be active. It will be settable from 60 to 65,535 seconds in one-second increments
 - b CALL HOLD TIME: Will set the time a call is held on a channel after the priority signal is no longer being received. It will be settable from one to 255 seconds in one-second increments. Its factory default must be six seconds
 - c CALL DELAY TIME: Will set the time a call must be recognized before the phase selector activates the corresponding output. It will be settable from zero to 255 seconds in one-second increments. Its factory default must be zero seconds
- 8 The phase selector's default values will be re-settable by the operator using an IBM PC-compatible computer, or manually using switches located on its front
- 9 The phase selector will be capable of three levels of discrimination of data-encoded infrared signals, as follows:
- a Verification of the presence of the base infrared signal of either High priority, Low priority or Probe frequency
 - b Validation of the infrared signal data-encoded pulses
 - c Determination of when the vehicle is within the prescribed range
- 10 The phase selector's card edge connector will include primary infrared detector inputs and power outputs. Two additional detector inputs per channel will be provided on a front panel connector
- 11 The phase selector will include one opto-isolated NPN output per channel that provides the following electrical signal to the appropriate pin on the card edge connector:
- a $6.25\text{Hz} \pm 0.1\text{Hz}$ 50% on/duty square wave in response to a Low priority call
 - b A steady ON in response to a High priority call
- 12 The phase selector will accommodate three methods for setting intensity thresholds (emitter range) for high and low priority signals:
- a Using a data-encoded emitter with range-setting capability
 - b Using any encoded emitter by manipulating the front panel switches
 - c Inputting the range requirements via the communication port
- 13 The intensity threshold will have 1200 set points. There will be separate intensity thresholds for the primary detector and the auxiliary detectors
- 14 The phase selector will have a POWER ON LED indicator that flashes to indicate unit diagnostic mode and illuminates steadily to indicate proper operation
- 15 The phase selector will have internal diagnostics to test for proper operation. If a fault is detected, the phase selector will use the front panel LED indicators to display fault information
- 16 The phase selector will have a High (High) and Low (Low) LED indicator for each channel to display active calls

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 17 The phase selector will have a test switch for each channel to test proper operation of High or Low priority
 - 18 The phase selector will properly identify a High priority call with the presence of 10 Low priority data-encoded emitter signals being received simultaneously on the same channel
 - 19 The phase selector will have write-on pads to allow identification of the phase and channel
 - 20 The phase selector will have the capability to enter unique names for each channel via the interface software
 - 21 The phase selector will provide one isolated confirmation light control output per channel. These outputs are user configurable through software for a variety of confirmation light sequences
 - 22 The NEMA model of the phase selector will have outputs for the control of NEMA controllers that lack internal preemption capability. This function will be accomplished through the use of Manual Control Enable, Interval Advance, and Phase Omit options
 - 23 The NEMA model will also have the option of providing separate outputs for High and Low priority calls for controllers that do not recognize a 6.25Hz pulsed Low priority request
 - 24 The NEMA model of the phase selector will have the capability to set Interval Advance rates as low as once every 200 mSec for Low priority calls. It will also be able to operate in the Manual Control Enable Mode for Low priority calls and activate a standard preemption output for high priority calls
 - 25 The phase selector will have the capability of recording the presence of a vehicle transmitting at the specified Probe frequency. The phase selector will at no time attempt to modify the intersection operation in response to the Probe frequency
 - 26 The phase selector will have the capability of providing Low priority in a mode where the output to the controller is gated or controlled by timing relationships within the controller cycle
 - 27 The phase selector will have the capability to assign a relative priority to a call request within High or Low priority. This assignment will be based on the received vehicle class
 - 28 The phase selector will have the capability to discriminate between individual ID codes and allow or deny a call output to the controller based on this information
 - 29 The phase selector will have the capability to log call requests by unauthorized vehicles
 - 30 The phase selector will have the ability to command an emitter to relay a received code to the next intersection
 - 31 The phase selector will have the capability of functionally testing connected detector circuits and indicating via front panel LEDs non-functional detector circuits
 - 32 The phase selector will incorporate a precision real time clock synchronized to an AC power line frequency
 - 33 The clock will have the capability to automatically adjust itself for changes in daylight saving time. Interface software will be used to set the clock and to input the appropriate dates and times for daylight saving changes.
 - 34 The phase selector shall have the capability to set the minimum time between Low priority calls
 - 35 An auxiliary interface panel will be available to facilitate interconnections between the phase selector and traffic cabinet wiring
- G Card Rack
- 1 The required card rack will provide simplified installation of a phase selector into controller cabinets that do not already have a suitable card rack

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 2 The card rack will be factory wired to one connector, located behind the card slot, and a terminal block, located next to the phase selector slot, on the front of the card rack
 - 3 The card rack connector on the front will provide for all connections to the traffic controller
 - 4 The card rack will provide labeled terminal blocks for connecting the primary infrared detectors to a phase selector
- H Interface Card for Electromechanical Controllers
- 1 The required interface card for electromechanical controllers will provide electrical and logic interface between the phase selector and an electromechanical-type controller and shall be a Model 764 card
 - 2 The inputs to the interface card for electromechanical controllers will be connected to the outputs of the phase selector
 - 3 The outputs of the interface card for electromechanical controllers will be connected to the Hand Control Switch or Police Panel where the dial motor and its self-generated solenoid advance pulses are disconnected from the cam/solenoid assembly and replaced by pulses generated by the action of the Hand Control Switch in the electromechanical-type controller
 - 4 The interface card for electromechanical controllers will decode the outputs of the phase selector(s) and advance the controller to the phase that is set for that channel by sensing the traffic controller signal indications
 - 5 The interface card for electromechanical controllers will have one input to disable the interface card
 - 6 The interface card for electromechanical controllers will include the following switches:
 - a Channel 1 Green Time: 16-position rotary switch; Controls timing between advance pulses, in seconds, when in Phase 1 green
 - b Channel 2 Green Time: 16-position rotary switch; Controls timing between advance pulses, in seconds, when in Phase 2 green
 - c Channel 3 Green Time: 16-position rotary switch; Controls timing between advance pulses, in seconds, when in Phase 3 green
 - d Channel 4 Green Time: 16-position rotary switch; Controls timing between advance pulses, in seconds, when in Phase 4 green
 - e NON Green Time: 16-position rotary switch; Controls timing between advance pulses, in seconds, when no indications are green
 - f Power Switch
- I Interface Software
- 1 The priority control interface software will be provided on a single CD-ROM to interface with the phase selector. It must run on most IBM-compatible computers equipped with at least 64M RAM, Windows™ 10 and color VGA display capability
 - 2 The priority control interface software must accommodate:
 - a Setting up and presenting user-determined system parameters
 - b Viewing and changing settings
 - c Viewing activity screens
 - d Displaying and/or downloading records of previous activity showing class, code, priority, direction, call duration, final greens at end of call, duration of final greens, time call ended in real time plus maximum signal intensity (vehicle location information). This information may be used to reconstruct the route taken by a priority (or probe) vehicle to track the vehicle
 - 3 The priority control interface software must accommodate operation via a mouse or via the keyboard, or in combination
 - 4 The priority control interface software must provide menu displays to enable:

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- a Setting of valid vehicle ID and class codes.
- b Establishing signal intensity thresholds (detection ranges), modem initialization, Intersection name and timing parameters.
- c Setting of desired green signal indications during priority control operation and upload and download capability to view.
- d Resetting and/or retrieving logged data and priority vehicle activity.
- e Addressing for each card in a multi-drop connected system.
- f Confirmation light configuration.
- g NEMA Control Parameters.
- 5 The interface software will provide readout of noise levels detected by the detectors. This noise level will serve as a troubleshooting tool
- 6 The interface software will provide a real-time activity screen which will provide the following information
 - a Call intensity value even if below threshold
 - b Vehicle class and ID.
 - c Emitter priority level.
 - d Indication of detection on primary or auxiliary detector
 - e Indication if call is being serviced or is pending.
 - f Indication if vehicle is in range.
 - g Readout for four separate vehicles per channel.
 - h Detector noise level readout.
 - i Green phase monitoring with information on the current greens
- J Reliability
 - 1 All equipment supplied as part of the infrared priority control system intended for use in the controller cabinet will meet the following electrical and environmental specifications spelled out in the NEMA Standards Publication TS2 1992, Part 2
 - a Line voltage variations per NEMA TS2 1992, Paragraph 2.1.2.
 - b Power source frequency per NEMA TS2 1992, Paragraph 2.1.3.
 - c Power source noise transients per NEMA TS2 1992, Paragraph 2.1.6.1.
 - d Temperature range per NEMA TS2 1992, Paragraph 2.1.5.1.
 - e Humidity per NEMA TS2 1992, Paragraph 2.1.5.2.
 - f Shock test per NEMA TS2 1992, Paragraph 3.13.9.
 - g Vibration per NEMA TS2 1992, Paragraph 3.13.8
 - 2 Each piece of equipment supplied as part of the priority control system intended for use in or on priority vehicles will operate properly across the entire spectrum of combinations of environmental conditions (temperature range, relative humidity, vehicle battery voltage) per the individual component specifications.
- K Qualifications
 - 1 The manufacturer of the required infrared priority control system will verify the proven, safe operation of the system's infrared communication technology. Upon request, the manufacturer will produce a list of user agencies having experience interfacing priority control equipment with electromechanical, solid state and programmable controller types.
 - 2 The manufacturer will demonstrate the ability to finance ongoing technical support, written product warranties, and responsibility for product failure.
 - 3 Upon request, the manufacturer will produce a copy of its last full year and four previous year's corporate financial statements.
 - 4 The manufacturer will have an independent quality department that has complete authority to control product integrity and is answerable only to the senior officer of the organization.

2.05 DATA AGGREGATOR

A Data Aggregator

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 1 The Data Aggregator 300 / 400 shall provide real time intersection data and cabinet health to existing ATMS data set.
- B General Requirements
 - 1 This product shall safely retrieve critical data from MMU/CMU.
 - 2 Provide cabinet health and GPS- based time sync
 - 3 Provide travel time ready via Wi-Fi or Bluetooth sensors
 - 4 5-Band anteenens covering GSM/GPRS/LTE, GPS, Wi-Fi, Bluetooth, DSRC Bands
 - 5 Detector information from NEMA TS-1, TS-2, or Type 170/2070 cabinets using RS-232Serial Communications for up to 32 channel.
 - 6 Detector and signal information from NEMA TS-2 cabinets using SDLC communications to provide additional data
- 2.06 PAN/TILT-ZOOM CAMERAS
 - A Traffic Monitoring System: Provide as specified in the contract documents including, video camera in dome, dome mounting bracket and hardware, camera controller, cabling from camera to controller cabinet, and all accessories and hardware necessary for a complete and operational system. PTZ camera shall be Axis 6155-E
 - 1 This product shall be manufactured by a firm whose quality system is in compliance with the IS/ISO 9001/EN 29001, QUALITY SYSTEM. Safety: CE, UL
 - 2 The manufacturer shall provide a three year (3) warranty.
 - 3 The product specified shall be a rugged, outdoor surveillance domed camera system. The camera system consists of an integrated high resolution, CCD camera using a 1/4-inch imager and a 30X (4.3 – 129mm F1.6 to F4.7 auto-iris, auto-focus optical zoom lens; 12x digital zoom; a variable/high speed, 360° pan/tilt unit; and an intelligent, integral receiver/driver. This camera is designed to perform over a wide range of environmental and lighting conditions and automatically adjusts from daytime to nighttime operation.
 - 4 The camera shall automatically switch from daylight color operation to a higher sensitivity nighttime monochrome mode when light levels fall below an adjustable threshold level. Day/night operation may also be manually switched on or off from the system switcher/controller keyboard.
 - 5 The camera shall provide a selectable slow shutter (frame integration) function that increases the camera's sensitivity up to 50 times by reducing the shutter speed. Selectable slow shutter speeds shall be from 1/60000 sec to 2 sec, and fully automatic.
 - 6 The camera shall be equipped with a 30X optical zoom lens with laser focus auto iris. A full 12x digital zoom shall then be functional once the maximum 30X optical zoom limit has been reached.
 - 7 The 12x digital zoom lens shall be on/off selectable from the system controller keyboard.
 - 8 The camera's 360° pan rotation shall is divided into 16 independent sectors with 16-character titles per sector. Any or all of the 16 sectors may be blanked from the operator.
 - 9 In addition to the blanking function, a privacy masking feature shall be provided that allows creation of up to thirty two (32) 3D privacy masks that prohibit areas of the field of view from being seen even if the camera is panned, tilted, or zoomed.
 - 10 Digital image stabilization shall be provided using electronic compensation that filters out vibrations caused by wind and other environmental conditions. This image stabilization function shall be on/off selectable from the controller's system keyboard.
 - 11 A Fast Addressing method for setting the camera address number for control shall be remotely programmable from the system controller keyboard. The camera address may also be directly settable via thumbwheel switches located within the camera.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 12 The camera shall allow the storage of up to 256 preset scenes with each preset programmable for 16 character titles. A tour function shall be available to consecutively display each of the preset scenes for a programmed dwell time. Any or all of the presets may be included or excluded from the tour.
 - 13 The camera shall be capable of recording two (2) separate tours (macros) of an operator's keyboard movements consisting of, tilt, and zoom activities for a total combined duration time of 15 minutes. Recorded tours can be continuously played back.
 - 14 When an operator stops manually controlling the camera, and a programmed period of time is allowed to expire, the camera will execute one of the following programmable options: 1) return to preset #1; 2) return to the automated tour previously executed; 3) do nothing.
 - 15 The camera shall ensure that any advanced commands required to program the camera are accessed via three levels of password protection ranging from low to high security.
 - 16 The camera system shall provide a feature that automatically rotates, or pivots, the camera to simplify tracking of a person walking directly under the camera.
 - 17 The camera shall provide four (4) normally open or normally closed alarm input contacts and one (1) relay output. Any or all of the input contacts may be programmed upon activation to automatically move the camera to any preposition location, close the output relay for a programmed period of time, and display an alarm indication on the on-screen display of the display monitor.
 - 18 The camera shall be available in wall mount, mast mount (pole), and corner mount versions that include an integral outdoor power supply box. Roof mount (parapet) and pipe mount versions are provided with a separate outdoor power supply box.
 - 19 The camera system shall be provided in a NEMA 4X or IP66 certified, rugged, weather-resistant package.
 - 20 Any additional Milestone licenses need to be included in the cost. The yearly support agreement should be prorated to match the City of Dubuque's existing maintenance contract with Milestone.
- B Camera Specification:
- 1 Imager: 1/2.8" Progressice scan CMOS
 - 2 Horizontal Resolution: 1920X1080p to 320X180
 - 3 Lens: 30X zoom(4.3 to 129mm) F1.6 to F4.7
 - 4 Digital Zoom: 12X
 - 5 Field of view: 2.36° to 66.7°
 - 6 Focus and iris: Automatic with manual override
 - 7 Aperture correction: Horizontal and vertical
- C Electrical Specifications:
- 1 Main supply input voltage/current, as required by the application:
 - a NTSC: 115VAC, 60Hz
 - b NTSC: 24VAC, 60Hz
 - 2 Power (camera): 21-28 VAC, 50/60 Hz, 11W maximum
 - a Power (heater): 21-28 VAC, 50/60 Hz, 30 W maximum.
 - 3 Video output: 1.0Vp-p ± 0.1Vp-p, 75 ohms
 - 4 Synchronization: Line-lock (-120° to +120° vertical phase adjust) or internal crystal
 - 5 Sensitivity: (usable video):
 - a Color: 0.15 lux at 30 IRE, F1.6
 - b B/W 0.01 lux at 30 IRE, F1.6
 - c Color: 0.2 lux at 50 IRE, F1.6
 - d B/W: 0.02 lux at 50 IRE, F1.6
 - 6 Signal to Noise Ratio: Greater than 50 dB

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- D Mechanical Specifications
 - 1 Weight: 6.4 lb. (2.9 kg)
 - 2 Pan/tilt: 360° continuous pan; +20° to -90° tilt from horizontal plane
 - 3 Pre-position speed: 360°/sec. +/- .50° accuracy
 - 4 Variable speed: 120°/sec
- E Environmental Specifications
 - 1 Humidity: 0% to 100% relative, condensing
 - 2 Operating temperature: -40°C to +70°C (-40°F to +158°F)
 - 3 Housing Rating: NEMA 4X and IP66 Certified
- 2.07 STOP BAR MONITORING CAMERAS
 - A The Stop Bar Monitoring Camera System utilized on the project shall be a Axis Model No. Axis-1615-E MK II network camera manufactured by AXIS
 - B Follow manufacturer's recommendations for power feed between power cabinet to the camera/outdoor enclosure and traffic cabinet
 - C Power and Network cabling to consist of outdoor rated UV resistance CAT6 network cabling between AXIS 1615-E camera and network switch mounted inside of the traffic cabinet. The CAT6 cable shall be OSP Broadband BBDN6 shielded with aluminum or approved equal
 - D Outdoor Enclosure to be mounted near the end of mast-arm using a Skybracket cable mount camera support with 2 foot extension or skybracket pole mount
 - E Cameras shall be installed and tied into the City of Dubuque's existing Milestone video management system by a qualified Network/Video company. Any additional Milestone licenses need to be included in cost. The yearly support agreement should be prorated to match the City of Dubuque's existing maintenance contract with Milestone.
 - F The Network and Video electronic equipment shall be provided and installed by a single company regularly engaging in these technologies and services.
- 2.08 ITS COMPONENTS
 - A Network Products
 - 1 All items defined in these sections are considered mandatory and must be adhered to for this project.
 - 2 Network switches: There will be three different hardware configurations required of the network switches
 - a Head-end Layer 3 switch with the following capabilities:
 - 1) Ability to route traffic between vlans.
 - 2) Access control lists.
 - 3) 24 10/100/1000BaseT ports
 - 4) 4 SFP ports with 2 1000Base-LX fiber optic SFPs installed
 - 5) Stacking capability to add SFP ports in future
 - 6) Port mirroring ability for network analysis
 - 7) Supports 802.1w Rapid Spanning Tree
 - 8) Supports 802.1q Vlan trunks
 - 9) Supports SNMPv3 manageability
 - 10) Supports secure web management through https
 - 11) Supports QoS with ToS/DiffServ
 - 12) Supports RMON
 - 13) Supports IGMP and multicast pruning
 - b Hardened backbone Layer 2 switch with following capabilities:
 - 1) NEMA TS-2 Certified
 - 2) Capacity of 16 10/100Base-T ports
 - 3) Port mirroring ability for network analysis
 - 4) Two Field-upgradeable module slots with 4 port 100Base-FX fiber module and 2 port 1000Base-LX fiber module installed
 - 5) Supports 802.1w Rapid Spanning Tree

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 6) Supports 802.1q Vlan trunks
- 7) Supports SNMPv3 manageability
- 8) Supports secure web management through https
- 9) Supports QoS with ToS/DiffServ
- 10) Supports RMON
- 11) Supports IGMP Snooping and multicast pruning
- c Hardened edge Layer 2 switch with following capabilities:
 - 1) TS-2 Traffic
 - 2) Capacity of 16 10/100Base-T ports
 - 3) Port mirroring ability for network analysis
 - 4) Two Field-upgradeable module slots with 4 port 100Base-FX fiber module installed
 - 5) Supports 802.1w Rapid Spanning Tree
 - 6) Supports 802.1q Vlan trunks
 - 7) Supports SNMPv3 manageability
 - 8) Supports secure web management through https
 - 9) Supports QoS with ToS/DiffServ
 - 10) Supports RMON
- B IP Based Integrated Digital Video management System (IPDVMS)
 - 1 The existing system that shall be tied into is Milestone Video Management system
 - 2 The system shall support an integrated IP Based Digital Video Management recording solution that provides the following features and capabilities
 - a The IPDVMS shall be computer hardware independent and must meet or exceed the manufacturer's minimum specification for the computer and related devices.
 - b The IPDVMS shall incorporate a modular architecture and be able to support an unlimited number of cameras
 - c The IPDVMS shall be able to simultaneously record and display live video and display recorded video.
 - d The IPDVMS shall support both event based and continuous recording.
 - e The IPDVMS shall mark all events and they shall be available for playback and or archiving at any time
 - f Video events shall be linked to system events in the system database and only one database shall be acceptable for this interface.
 - g Up to 32 simultaneous users shall be able to access any video feed from any recorder on the network.
 - h User defined profiles shall be available for tailoring granular access to configuration and operation
 - i Shall have the ability to enhance a frame of video with embedded features or off the shelf software while providing security for the original video image to preserve integrity.
 - j Shall be capable of independent camera setup for, compression rate, brightness, contrast and other factor setups.
 - k The IPDVMS shall support Ethernet 10BT, Ethernet 100BT and 1000BT. Network protocols shall be supported including TCP/IP, IPX, and UDP.
 - l The network interface shall allow remote access of the IPDVMS from anywhere on the end-users LAN/WAN.
 - m the end-users LAN/WAN.
 - n Shall support limiting of frame rate transmission to individual clients.
 - o The IPDVMS shall support either Multicast or Unicast streaming technology.
 - p The IPDVMS shall be have the ability to playback stored video over the LAN / WAN for remote access of video clips.
 - q The IPDVMS shall support World Time Zone.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- r Any alarm / event in the system shall have the ability to be associated with a digital video clip in real time. The IPDVMS shall support user defined pre and post roll.
 - s Each camera shall be configurable for a 32 alphanumeric character name and shall allow for the setup and adjustment of brightness, contrast, archiving, motion detection, Pan / Tilt / Zoom, on a per camera basis.
 - t The IPDVMS shall support CCTV PTZ control via the system video interface.
 - u The IPDVMS shall support Analog CCTV PTZ control via approved Video Encoding Devices.
 - v The IPDVMS shall support H264, MJPEG and MPEG4 formats for multiple IP Video Cameras and IP Video Encoders from approved sources.
 - w The IPDVMS shall support integral time stamping upon receipt of video from the camera.
- C The IPDVMS shall support the following configuration and customization parameters:
- 1 Compression percentage
 - 2 Pre and Post Roll in seconds
 - 3 Motion Detection Alarms
 - 4 Set Time Lapse Recording
 - 5 Continuous Recording Mode
 - 6 The ability to enforce user authentication to specify individuals or groups that have the ability to view live or recorded video or make modifications to the system.
 - 7 The ability to change any or all of the associated IP camera passwords manually or on schedule.
 - 8 User determination of Event Locking method.
 - 9 Dual Path Fail Over support
 - 10 Blind Camera (Obstructed View) Alarm reporting.
 - 11 Presets on Alarm
 - 12 Event Locking to protect specific video events from being overwritten
 - 13 UNC path support for Network Attached Storage Devices
 - 14 Configuration of Off-line cameras
 - 15 Support for Intelligent Motion Video Searching
- D Each alarm / event condition shall have the ability to mark the start of a video event or the end of a video event in real time
- E The IPDVMS shall support uni-directional audio recording utilizing built in audio recording devices on select IP cameras
- F The IPDVMS shall support automatic firmware downloads to select IP cameras.
- G The IPDVMS shall support both internal camera video storage and external camera video storage. Internal storage shall allow the camera to store video events and then download these events to the IPDVMS on a predetermined schedule or on demand
- H Pan / Tilt / Zoom Control from Monitoring Locations
- 1 The IPDVMS shall support PTZ control from the Alarm Monitoring workstation. The PTZ control shall support approved IP PTZ cameras connected to approved IP Servers
 - 2 The IPDVMS shall support the following PTZ features:
 - a Priority Levels
 - b Device Group Control
 - c PTZ Override (Lockout)
 - d Proportional PTZ Control
 - e Preset Lock via video screen
 - f Preset Tour
- I Video Archiving

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 1 The Archive Server software shall be hardware independent, providing the ability to utilize commercial off-the-shelf mass storage devices, including SAN (Storage Area Network) solutions, Tape Libraries, and direct connect external storage drive arrays
 - 2 The Archive Server software shall provide the ability to manage and store video information from multiple video recorders to a central location, without operational degradation
 - 3 Each IPDVMS shall have the ability to set its own unique archiving properties. Video shall automatically be archived based on user defined "percentage full" settings. When the IPDVMS reaches the designated capacity threshold, video shall be automatically copied to the archive storage media and space on the recorder is released for over-write by new video information.
 - 4 Regardless of the storage location (local on the recorder or in archive) the system will automatically retrieve video associated with an event on demand. The actual storage location shall be transparent to the user.
- J Real Video Time Monitoring
- 1 The IPDVMS shall allow monitoring of real time video from any Alarm Monitoring client workstation. DVS and Camera status shall be displayed on a System Hardware Tree.
- K Video Player
- 1) The IPDVMS shall support an advanced matrix view of multiple On-line camera views. The Video Player shall allow operator sizing of the video windows in the matrix view.
- L Video Camera Groups / Video Camera Tours
- 1 An unlimited number of camera groups shall be supported, and each camera group shall support an unlimited number of cameras. Cameras within a camera group shall span multiple digital video servers. Cameras shall have the ability to be placed into multiple camera groups.
 - 2 The system shall provide for video camera tours that rotate live video between each of the cameras defined in the video camera group at a user defined increment. The time increment shall be user definable in whole seconds.
- M Still Image Capture / Save
- 1 During playback or monitoring of video, the system shall have the ability to create and save a still picture. This operation shall not affect any other operation and shall not alter the recorded video. The file format shall be an industry standard format allowing for file transfer via e-mail, printing or file transfer to other media.
- N Export Video Clip to File
- 1 The system shall have to ability to save and export recorded video to a file for the purpose of sharing and reviewing video clips. The start and end times for each video segment shall be user defined. The exported video clip shall be viewable via a standard Windows media player.
- O Video Image Processing
- 1 The IPDVMS shall support video image processing of a single frame captured image through use of an integral image processing module which shall offer the following features:
 - a Intensity, Contrast and Saturation
 - b Gamma Correct
 - c Histo-Contrast and Histo-Equalize
 - d Flip, Reverse, Invert and Rotate
 - e Shear
 - f Add Noise, Average, Sharpen, Mosaic, Posterize and Median
 - g Halftone
 - h Emboss

- i Gray Scale
- 2 The IPDVMS shall allow the ability to save any combination of effects as a defined profile. Profiles shall have the ability to be added or deleted from the system at any time.
- P Video Loss Detection
 - 1 The system shall detect video loss from any or all cameras and activate an alarm
- Q Automated Motion Video Searching
 - 1 The IPDVMS shall support advanced automated motion video searching against pre-recorded video. The automated motion video search shall analyze frames in a video segment to detect motion activity from image to image. It shall display thumbnail images of the frames with activity, complete with a histogram depicting the relative amount of activity within each frame.
 - 2 The search shall be defined by selecting a specific camera and a specific time period in which the suspected activity took place and all motion events associated with that camera and time period shall be displayed in either a trace or thumbnail format for review.
- R Remote Monitoring Application
 - 1 The IPDVMS shall support a Remote Monitoring Application that allows the operator to monitor video from any computer connected to the network
- S Intelligent Video Analysis System (IVAS)
 - 1 The system shall provide the ability for an Intelligent Video Analysis solution that shall seamlessly integrate with the IPDVMS. The set of Intelligent Video Analysis algorithms shall provide the following functionality:
 - a Alert types
 - 1) Smart Video Motion Detection (the IVAS shall ignore minor vibration and provide motion masking)
 - 2) Camera Tampering (shall occur when the IVAS detects a camera is moved from its original position, when the camera view is obstructed or when the focus is changed)
 - 3) Sudden Change in Light Intensity (shall occur when the IVAS detects an extreme change in ambient light – light to dark or dark to light)
 - 4) New Object in Scene (shall occur when the IVAS detects an object not present when the IVAS originally learned the scene view is left in that view)
 - 5) Object Removed from Scene (shall occur when the IVAS detects an object that was present when the IVAS originally learned the scene view)
 - 6) Object Detected in Scene (shall occur when the IVAS detects an object defined by specific properties including people, automobiles or an object of a specific color)
 - 7) Congestion in Defined Area (shall occur when the IVAS detects congestion in a specific region)
 - 8) Directional Motion (shall occur when the IVAS detects an object moving in a direction specified in the setup of this feature)
 - 9) Object Crosses a Defined Region (shall occur when the IVAS detects an object moving across a virtual boundary or area from a specified direction)
 - 10) Moving Object Stops (shall occur when the IVAS detects a moving object in the scene ceases to move)
 - 11) Static Object Starts to Move (shall occur when the IVAS detects a static object in the scene starts to move)
 - 12) Object moves too fast (shall occur when a pre-defined speed has been exceeded)
 - 13) Loitering (shall occur when the IVAS detects a person in the scene slows down or ceases to move for a specified period of time)

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 14) Detection of a Human Face (shall occur when the IVAS detects a frontal view of a human face is detected in the scene)
- 15) People Counting (shall occur when the IVAS is set for a top down view of a portal. This feature shall provide an alarm with a positive count for entry and a negative count for exit)
- 16) The IVAS shall support the ability to store the graphical output for a specific event for use with IVAS alarms. This feature shall allow the graphical output of a specific event to be stored as a file and later used as an overlay to be used and associated with an alarm for historical searching.
- b The IVAS shall support H265, H264, CIF, 4CIF and D1 video resolutions during video processing.
- c The IVAS shall support video infra-red imaging.

Part 3: EXECUTION

3.01 UNDERGROUND

A Handhole:

- 1 Locations:
 - a Do not construct in ditch bottoms, low areas where ponding of water may occur, or where they will be subject to normal vehicular traffic.
 - b Handholes/Vaults in the immediate intersection shall conform to the Grounding and Bonding section of the specifications.
- 2 Excavation: Excavate as necessary to accommodate the handhole and granular base.
- 3 Granular Base: A coarse aggregate drain conforming to the dimensions shown on the plan details shall be provided.
- 4 Placement:
 - a In paved areas, install the handhole at an elevation so the casting is level and flush with the pavement. In unpaved areas, install the handhole approximately 1 inch above the final grade.
 - b Verify ring placement. Invert rings when installed in paved areas.
- 5 Conduit:
 - a Remove knockouts as necessary to facilitate conduit entrance.
 - b Extend conduit into the handhole, through a knockout, approximately 4 inches beyond the inside wall to a maximum of 4". Conduit to slope down and away from the handhole.
 - c Place flexible sealant in the opening of the knockout area after placement of conduit.
 - d All conduits shall enter the handhole at a depth of 12 inches from the bottom of the handhole unless otherwise specified. Any deviations from this requirement shall be approved by the Engineer
- 6 Backfill: Place suitable backfill material according to Section 3010.
- 7 Casting: Place the casting on the handhole. Ensure the final elevation meets the handhole placement requirements.

B Conduit:

- 1 General:
 - a Place electrical and communications conduit with a depth of cover of 24 inches and fiber conduit with a depth of cover of 42 inches below finished surface.
 - b Place tracer wire with all conduit.
 - c Change direction at handholes or by bending, such that the conduit will not be damaged or its internal diameter changed. Ensure bends are uniform in curvature and the inside radius of curvature of any bend is no less than six times the internal diameter of the conduit.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- d On the exposed ends of conduit, place bell-end fittings on PVC or HDPE conduit prior to installing cable.
- e Extend all conduits 2 inches inside of a handhole and a maximum of 12 inches above the finished surface of any foundation, footing, or structural base. Conduits entering vaults shall enter with no more than 8" or less than 6" of exposed conduit inside of the vault.
- f Future path entering vaults shall extend to the far side of the vault. All innerducts that are empty shall be capped with micro fit end stop connector
- g Conduits entering fiber vaults shall not enter in the center of the vault but to off to one side so that fiber can be coiled and stored on each of the four walls
- h Conduit attached to structures shall be nonmetallic, similar in color to the structure, and rigid enough not to sag under its own weight plus the weight of its contents between brackets
- i When it is necessary to cut and thread steel conduit, do not allow exposed threads. Ensure conduits and fittings are free from burrs and rough places. Clean, swab, and ream conduit runs before cables are installed. Use nipples to eliminate cutting and threading where short lengths of conduit are required. Coat damaged galvanized finish on conduit with zinc rich paint. Use only galvanized steel fittings with steel conduit.
- j Pack conduit ends with a conduit sealing compound.
- k When extending conduit to the limits of the construction project for future installation of 7-way future path a 3" SDR 13.5 conduit shall be installed from the fiber vault.
- l conduits will be installed between vaults. One exception to this rule is when there is not a receiving vault at the end of this conduit, in which case the conduit shall be capped with a tracer wire installed
- m fiber conduit from the fiber vault to the traffic control cabinet shall make a direct path between the two structures and should be kept separate from any intersection wiring conductors and handholes. This fiber conduit shall terminate in the back left side of the traffic control cabinet.
- n In areas where fiber inner duct it is open trenched, it shall also contain 3" non-detectable underground tape: "CAUTION BURIED FIBER OPTIC LINE BELOW" (Orange) at approximately 18" to 24" in depth
- o Existing conduit may consist of a 4" fiber conduit between vaults which will contain 4 – 1" HDPE inner-ducts as detailed below. One exception to this rule is when there is not a receiving vault at the end of this conduit, in which case the conduit shall be capped with a tracer wire installed. Installation of 1" conduits shall be with a pulley system at the same horizontal level as the conduit. This is to prevent tearing, or crushing of the 4" conduit.
- p All larger conduits that contain smaller 1" conduits shall have a Quadplex type seal installed between the larger conduit and the 4 smaller conduits. These 4 smaller conduits shall be the following colors: RED, GREEN, BLUE, and YELLOW. These 4 smaller conduits shall not extend more than 3 inches nor less than 1 inch past the end of the larger conduit. Follow manufacturer's specifications for PE and allow for the proper amount of shrinkage after the inner-duct is pulled. The tracer wire shall not be installed inside any of the 1" inner ducts.
- q All empty conduits to have flat polyester pull-tape (1,250 lbs. tensile) with footing markings, including each of the 4 - 1½" and 4 – 1" inner ducts when connecting to existing conduit. This pull-tape is to be attached to the expandable plug and sealed within conduit with a minimum of 48" of slack in the pull-tape on each end (96" total).

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- r Generally, a 4" PVC or HDPE (if bored) will be used between the traffic controller and signal base. A 2" PVC or HDPE will be used to connect to the upright pedestal signals. Conduit placed under the street will be assumed to be bored unless otherwise noted.
 - s Street lighting conduit will be installed from the service pedestal into the hand-hole located next to the traffic controller. The metered service feed for the traffic controller will be fed directly into the front right side of the controller base. The metered service for the Fiber Hub cabinet will be fed directly from the meter pedestal to the right side of the fiber hub base.
 - t All empty and used conduits at foundation locations shall be plugged. Empty conduits shall be plugged with appropriate sized duct plugs. Conduits with conductors shall be plugged with duct seal.
- 2 Trenched Installation:
 - a Place backfill in layers not to exceed 12 inches in depth with each layer thoroughly compacted before the next layer is placed. Ensure backfill material is free of cinders, broken concrete, or other hard or abrasive materials.
 - b Remove all surplus material from the public right-of-way as soon as possible.
- 3 Trenchless Installation:
 - a When placing conduit under pavements, use the trenchless installation methods described in Section 3020.
 - b If trenchless methods that compact soils in the bore path are used, provide sufficient cover to prevent heaving of overlying paved surfaces.
 - c Do not allow pits for boring to be closer than 2 feet to the back of curb, unless otherwise specified in the contract documents.
- C Wiring and Cable:
 - 1 Where practical, follow color codes so that the red insulated conductor connects to the red indication terminal, yellow to yellow, and green to green. Ensure cables are properly labeled at the controller by durable labels, or other appropriate methods, attached to the cables. Label home runs for cables as follows: northwest corner is red, southeast corner is blue, northeast corner is green, and southwest corner is orange.
 - 2 Install continuous runs of vehicle and pedestrian signal cables from the vehicle or pedestrian signal head to the handhole compartment of the signal pole base. Install continuous runs of vehicle and pedestrian signal cables from the handhole compartment of the signal pole base to the terminal compartment in the controller cabinet. Do not splice signal cables in underground handholes.
 - 3 Install continuous runs for video detection and emergency vehicle preemption cables from the unit to the controller cabinet.
 - 4 Install continuous runs of power lead-in cables from the service point to the meter socket and from the meter socket to the controller cabinet.
 - 5 Install continuous detector cable from each detector loop to the first handhole adjacent to the loop. Ensure cables are properly labeled at the controller by durable labels, or other appropriate methods, attached to the cables. Install continuous homerun cable from the splice made in the first handhole to the terminal compartment in the controller cabinet. Attach the drain wire of the shielded cable to the ground in the controller cabinet.
 - 6 Provide a minimum of 2 feet of additional cable at the last handhole and loosely coil the extra cable on the handhole cable hooks.
 - 7 Cables shall be pulled through conduit by means of a cable grip designed to provide a firm hold upon the exterior covering of the cable or cables, with a minimum of dragging on the ground or pavement. This shall be accomplished by means of reels mounted on (jacks, frame mounted pulleys, or other suitable devices).

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 8 Conductor dimensions on construction plans are plan length between bases, contractor must adjust for any vertical runs. The tracer wire shall be spliced in the handholes and controller to form a continuous network.
- 9 Install a tracer wire in all conduits with the exception of conduits between detector loops and handholes. Use a silicon-filled wire nut to splice the tracer wire in each handhole and at the controller to form a continuous run.
- 10 Signal Cable should homerun from each corner quadrant to control cabinet as single 12 or 20 conductor A 7 conductor #14 gauge IMSA 19-1 wire to feed from each signal head to the transformer base at the bottom of each signal
- 11 7 conductors will also feed from the transformer base to each "Walk/Don't Walk, Countdown" combination pedestrian head
- 12 Conductor color coding shall be provided by the use of base colored insulation in accordance with the above referenced specifications. Color coding by the use of words or numerals printed on the insulation will not be accepted.
 - a 5 Conductor (Standard Colors) reserved for pedestrian pushbuttons
 - 1) Black
 - 2) White
 - 3) Red
 - 4) Green
 - 5) Orange
 - b 7 Conductor (Standard Colors)
 - 1) Black
 - 2) White
 - 3) Red
 - 4) Green
 - 5) Orange
 - 6) Blue
 - 7) White with Black Stripe
 - c 12 Conductor (Standard Colors)
 - 1) Black
 - 2) White
 - 3) Red
 - 4) Green
 - 5) Orange
 - 6) Blue
 - 7) White with Black Stripe
 - 8) Red with Black Stripe
 - 9) Green with Black Stripe
 - 10) Orange with Black Stripe
 - 11) Blue with Black Stripe
 - 12) Black with White Stripe
 - d 20 Conductor (Standard Colors)
 - 1) Black
 - 2) White
 - 3) Red
 - 4) Green
 - 5) Orange
 - 6) Blue
 - 7) White with Black Stripe
 - 8) Red with Black Stripe
 - 9) Green with Black Stripe
 - 10) Orange with Black Stripe

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 11) Blue with Black Stripe
 - 12) Black with White Stripe
 - 13) Red with white stripe
 - 14) Green with white stripe
 - 15) Blue with white stripe
 - 16) Black with red stripe
 - 17) White with red stripe
 - 18) Orange with red stripe
 - 19) Blue with red stripe
 - 20) Red with green stripe
 - e Signal Head Color Code Legend
 - 1) Red - Red Ball
 - 2) Orange - Yellow/Amber Ball
 - 3) Green - Green Ball
 - 4) Black - Yellow/Amber Arrow
 - 5) Blue - Green Arrow
 - 6) Blue with Black Stripe Walk
 - 7) Black with White Stripe Don't Walk
 - 8) Example of Conductor Usage Double Head, Double Ped using a 12 conductor
 - (a) One phase solids
 - (b) One phase with black stripes
 - (c) Solid Blue Ped 1
 - (d) Solid Black Ped 1
 - (e) Blue with Black Stripe Ped 2
 - (f) Black with White Stripe Ped 2
 - f Mast arm
 - 1) 7 conductor to/from each head to transformer base
 - 2) Transformer base to controller - Whatever is needed to complete phases, typically a 12 or 20 conductor as specified on the plans.
 - 3) Mast arm/Head Naming Convention
 - (a) Mast arm closest to controller cabinet = Pole #1
 - (b) Then Clockwise Pole #2, Pole #3, Pole #4 Etc.
 - (c) Signal heads numbered from farthest end of mast arm (#1) to transformer base
 - (d) Signal Head #1, #2, #3 etc.
 - (e) Ped heads numbered from top to bottom starting with direction of mast arm, then in a clockwise direction. If no mast arm exists, then North is #1
 - (f) All cables labeled Pole #1 Head #1, Pole #1 Head #2, Pole #1 Ped #1
- Example
Pole #1 Head #1, Pole #1 Head #2, Pole #1 Head #3, Pole #1, Ped #1,
Pole #1, Ped #2 Pole #2 Head #1, Pole #2 Head #2 Pole #2 Ped #1
- 13 All classes of cable shall be shipped on substantially constructed reels plainly marked as to size, type, and insulation identification. Only one (1) length of cable will be shipped on each reel. All cable must be new. Damaged cable, or repairs to damaged cable, will not be permitted
 - 14 Prior to the installation of underground cable, the Contractor shall make sure that the conduit is open, continuous, free of water, and clear of debris. The cable shall be installed in such a manner and by such methods as to ensure against harmful stretching of the conductor, injury to the insulation, or damage to the outer protective covering of the cable. No splices or joints will be permitted to be drawn inside the

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- conduit. Where more than one (1) cable is to be installed in the conduit, all shall be pulled at the same time. No splices or joints shall be made in any cable outside of pole bases or traffic signal heads. All splices or joints of cable in pole bases shall be made waterproof using high grade rubber splicing tape; and the finished splice or joints shall be waterproofed and covered with vinyl plastic tape to provide mechanical protection in accordance with these special provisions. An approved cable lubricant may be used to aid in pulling cables through conduit when necessary to avoid stretching the conductor or damaging the insulation.
- 15 The Contractor shall provide drip loops at all signal hangers, wire inlet and service entrance heads. All wire inlets on the poles and signal heads shall be sealed with duct seal
- 16 All splices and connectors shall be covered with rubber type electrical insulation tape, applied one and one-half (1-½) times the thickness of the cable insulation. All bolt type connectors shall be wrapped with one (1) layer of paper tissue prior to the application of the electrical insulation tape. The insulation tape shall be covered with a one-half (1/2) lapped layer of thermoplastic electrical insulating tape extended past the rubber insulation tape at each end of the splice. Splices shall be finished with an application of asphaltic impregnated open mesh fabric tape or coated with a waterproof compound. A layer of conductive shielding tape shall be applied to any splice of two (2) shielded cables to continue the shield through the splice. All splices shall be made in accordance with the cable manufacturer's recommendations.
- 17 Connectors shall be either a bronze, bolted type, soldered, or a compression sleeve type. Connectors of the proper size to fit the largest conductor in the connection shall be used to join wires in pillboxes and pole bases. All connectors shall be Underwriters Laboratory (UL) approved.
- 18 Wire ends must be thoroughly cleaned after the insulation is stripped off to insure complete contact with another wire, or the connector. If strands are damaged when the insulation is removed, the section of cable must be discarded. Nicked or damaged conductor strands will not be permitted inside of connectors. Loose wire ends shall not be used as "shims" to make a connection.
- 19 Covered connections must be arranged so that they will not be in contact with pillbox lids or metal pole bases.
- 20 All splices and connections shall be capable of satisfactory operation under continuous immersion of water.
- 21 Cable connections in signal heads and controller cabinets shall be made at the terminal boards provided for this purpose. All stranded wires inserted under a binder head screw shall be equipped with a solderless pressure type space connector with a pre-insulated shank. All solid wire shall have an eye bend and shall not have a terminal connector.
- 22 Trained and experienced personnel shall supervise the fiber optic cable installation. Qualified technicians shall make the cable terminations and splices. The Contractor upon request of the Engineer shall provide documentation of qualifications and experience for fiber optic equipment installations. The Engineer shall determine if the Contractor is qualified to perform this work. The Contractor shall have attended a certified fiber optic training class mandated by these specifications prior to starting work.
- 23 The fiber optic cable installation shall be in accordance with or exceed all minimal requirements of State codes, National codes, and manufacturer codes as applicable.
- 24 The Contractor shall furnish and install all necessary miscellaneous connectors and equipment to make a complete and operating installation in accordance with the plans, standard sheets, standard specifications, special provisions, and accepted good practice of the industry.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 25 The Contractor shall designate on the Plans the location where each spool has been installed and provide this data to the Engineer.
- 26 A suitable cable feeder guide shall be used between the cable reel and the face of the duct and conduit to protect the cable and guide it into the duct off the reel. It shall be carefully inspected for jacket defects. If defects are noticed, the pulling operation shall be stopped immediately and the Engineer notified. Precautions shall be taken during installation to prevent the cable from being "kinked" or "crushed"
- 27 A pulling eye shall be attached to the cable and used to pull the cable through the duct and conduit system. A pulling swivel shall be used to eliminate twisting of the cable. As the cable is played off the reel into the cable feeder guide, it shall be sufficiently lubricated with a type of water-based lubricant recommended by the cable manufacturer. Dynamometers or breakaway pulling swing shall be used to ensure that the pulling line tension does not exceed the installation tension value specified by the cable manufacturer. The mechanical stress placed on a cable during installation shall not be such that the cable is twisted or stretched. The pulling of cable shall be hand assisted at each controller cabinet.
- 28 Along with the fiber optic cable, one (1) #10 AWG tracer wire (see conduit system specifications for tracer wire), shall be pulled with ten feet (10') slack in each pull box.
- 29 Sufficient slack shall be left at each end of the cable to allow proper cable termination, minimum 100', this slack shall be in addition to installation slack as hereinafter specified. Additional slack cable, as defined in the drawings, shall be left in each hub cabinet, handhole, and at the top of each conduit riser. Excess slack at hub cabinets shall be re-pulled into the nearest handhole to provide a neat and orderly installation
- 30 Storage of minimum slack cable in controller cabinets and additional slack at pull boxes shall be coiled and labeled with City supplied precool fiber markers. If multiple fiber cables are pulled through the same duct, this fiber should be coiled separately from one another. The slack coils shall be bound at a minimum of 3 points around the coil parameter and supported in their static storage positions. If stored in a manhole, fiber shall be stored along the outermost wall to allow unabated ingress and egress. The binding material and installation shall not bind or kink the cable. Storage of additional slack cable adjacent to conduit risers and support poles shall be as visibly marked/tagged as "CAUTION – FIBER OPTIC CABLE".
- 31 All fiber cables shall be marked with a metallic identifier in the handhole adjacent to the traffic controller and on the cable in the traffic controller at the point of termination. The identifier, both in the cabinet and in the handhole, shall indicate the direction the cable is going, cable contents [SM or SM/MM], and the abbreviated location for the other end destination. Fiber cabling between traffic controllers and adjacent hub locations shall be outdoor rated, loose tube fiber, when not linked by a direct, continuous conduit installation.
- 32 For static storage, the cable shall not be bent at any location to less than ten times the outside diameter of the cable or as recommended by the manufacturer. During installation, the cable shall not be bent at any location to less than twenty times the outside diameter of the cable or as recommended by the manufacturer.
- 33 Each section of the cable shall be tested for continuity and attenuation as a minimum. If the attenuation is found not to be within the acceptable nominal values, the Contractor shall use an optical time domain reflectometer (OTDR) to locate points of localized loss caused by bends or kinks. If this is not successful the Contractor shall replace the damaged cable with no additional payment.
- 34 Splices will not be allowed to repair the damaged section. After all fiber cable is installed between traffic controller cabinets and fiber links between fiber distribution points (FDP) complete links, all fibers, whether terminated or non-terminated, shall

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- be tested for continuity (flash light). All terminated fiber shall be tested with an OTDR and Power Meter. The Contractor may jumper termination points at controller cabinets to minimize the number of tests and run a single OTDR test between several controller cabinets, subject to the range of the OTDR. Links between FDP's shall be tested separately.
- 35 Each OTDR trace, for documented test result submittal, shall be displayed individually and not be combined with other fiber traces as overlays. Multimode fiber shall be tested using 1300 nm and single mode fiber shall be tested at 1310 nm. The results of the OTDR test shall be provided on an electronic media (disk) and paper printout. The OTDR wave, pictorial diagram of dB loss over the length of fiber tested, shall be provided along with the measured data values. The printout shall contain the manufacturer's fiber optic Index of Refraction to the third decimal point for the fiber provided. The Contractor shall provide the Engineer with a written report showing all the values measured compared to the calculated values for length and coupler/connector losses at the completion of these tests. Outdoor patch cords between FDP and controller units less than 151 feet do not need be OTDR tested.
- 36 Documentation provided to the Engineer shall include a written indication of every splice, termination, patch cord, etc. for cable being measured. Power meter measurement recordings shall indicate the exact measured distance [OTDR or field measurement with cross reference for oscillation multiplier] on the sheet showing the power meter readings. Any deviations between fiber readings in the same tube shall be notated for OTDR graphs as well as deviations greater than 5% on power meter readings. Rated values for acceptable installation shall be based on the following parameters:
- a Patch cords/Pigtails 60 MM & .15 SM dB each
 - b Unicam / Hotmelt Terminations 1.0 dB set of 2 [In and Out]
 - c Splices 0.08 each
 - d 1 KM = 0.3077 KF where KF is 1000 feet
- 37 Data documentation shall include for each test between cabinets or between FDP sites, the length of fiber as measured by OTDR, frequency used in test on OTDR by each fiber type, distance to each splice, termination or patch cord jumper, dB loss rating by manufacture from spool documentation, index of refraction by type of fiber in section, and the dB loss of each section as measured in the final test for each fiber. A special test shall be made on all continuous spliced fiber from start to end that includes the total dB loss measured and the OTDR plot on electronic disk. Splice points shall be identified on the trace.
- 38 Light Source - An LED light source with a wavelength that is the system wavelength, 850 and 1300 nm for multimode and 1310 and 1550 nm for single mode, shall be used. The LED shall be stable within 0.1 dB in intensity over a time period sufficiently long to perform the measurement. The output of the LED shall overfill the input end of the launch fiber/cable in both numerical apertures (NA) and core diameter. The accuracy of the combined light source and power meter shall be less than .05 dB and be temperature compensated stabilized to 0.01 dB over the operating range of the meter(s).
- 39 Power Meter -The detector in the power meter shall have an effective numerical aperture and active region that is larger than the receive reference cable and/or the fiber under test. The power meter shall have a minimum range from +3 DBMS to -40 DBMS. The power meter shall have an accuracy of +/-0.5 dB through the operating temperature and minimum resolution of 0.1 dB.
- 40 The launch attenuator, one each for single and multimode fiber testing, shall be utilized for all OTDR tests such that one launch cable shall be at the beginning of the fiber being tested. The launch attenuator(s) shall be of the same fiber core size and

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

type as the fiber under test. The attenuator shall emulate the minimum distance specified by the OTDR manufacturer for stabilization of the pulse generation. ST/SC connectors shall be utilized with each attenuator to connect the device to the test device, OTDR. One launch cable shall be installed on the start of the fiber being tested.

- 41 The OTDR shall have the Threshold Loss set at a value to show each splice or termination junction of a single fiber in each tube without showing the extraneous noise caused by handhole coils or turns into the cabinets. This level is normally a value [Threshold Loss] between 0.3 and 0.8 on the OTDR. This trace shall be provided for one fiber in each tube tested and each "event" shall be marked as to splice, jumper or patch cord. The Threshold Loss shall then be set to a value of 0.25 for multimode fiber tests and to a value of 0.10 for single mode fiber tests. The test of each fiber installed shall be conducted and any recorded events above this threshold shall be identified, such as jumper or patch cord. Events that are in excess the provided values shall be corrected prior to documentation submittal, such as terminations in excess of the rated value or bends in the fiber at the point of a splice entering or leaving the splice tray (See Testing). For measured values recorded in excess of the above (0.25 MM and 0.10 SM) listed values, refer to the paragraph 12.2 specification as hereinbefore defined. The Engineer reserves the right to spot test fiber terminations, splices, or re-testing of all fibers in a section to insure proper quality assurance both during and after installation and testing. Deviations from Engineer testing and report documentation shall be reviewed and the Contractor shall be able to retest any or all challenged measurements to verify a valid test. Inconsistent test results, in the sole opinion of the Engineer, shall be cause for the Contractor to retest the entire fiber installation

D Footings and Foundations

- 1 Traffic signal pole footings shall be installed with the conduit shown on the plans plus one additional 2" PVC conduit stubbed out of the footing for future use. Precast signal foundations are allowed, if precast foundations are provided, they shall be from an approved vendor. Traffic signal controller footings shall be installed with the conduit shown on the plans plus one additional 2" and one additional 3" PVC conduit stubbed out of the footing for future use. The ends of the conduit stubs shall be capped
- 2 Prior to setting poles, the anchor bolts shall be covered in such a manner as to protect them against damage and to protect the public from possible injury. The foundations must be given a minimum of seven days to cure before poles are erected.
- 3 Mast arm foundations must have a minimum 6" of threaded anchor bolt exposed above the foundation
- 4 During removal, all existing signal foundations shall be removed and disposed of. If there are circumstances that prevent their removal, the exposed concrete must be removed to a minimum of 4 feet below the ground surface level
- 5 Backfilling shall be completed in accordance with Division 3010

E Bonding and Grounding

- 1 Ground rod assemblies: consisting of one or more ground rods coupled together, such that the total length of the assembly is a minimum of 20 feet, driven into the earth at a single point, without disrupting the electrical continuity of the assembly. Ground rod assemblies shall be full length as shown on the plans and each rod length shall be the tapered end style, not threaded.
- 2 Ground Rod Array: is the inter-connection of the ground rods at each pole or structure at the site, consisting of two or more ground rod assemblies, bonded together in accordance with NEC Article 250 bonding.

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

- 3 Ground wires shall be connected to the ground rods with one (1) piece non-ferrous clamps which employ set screws as tightening devices ILSCO clear tap cat no. PCT(4/10), often referred to as Acorn Nuts. Connections to ground rods need not be taped. Ground rods and assemblies shall be of the length specified on the plans
 - 4 Cabinet location shall use a 20-foot ground rod assembly as specified in 11.2 with a #4 AWG, bare, tinned, solid annealed copper ground wire bonded back to the cabinet earth and electrical neutral bus at the cabinet and main service disconnect
 - 5 Ground rod assembly electrodes shall be provided in and accessible at the adjacent hand holes at each structure including but not limited to signal poles, pedestal poles and controllers as detailed on the plans. The entire intersection grounding array shall be a single ground array and bonded back to the cabinet ground along with the cabinet and main disconnect.
 - 6 All metal structures and their associated grounds shall be bonded together to the cabinet main disconnect, (NEC Article 250 Bonding). Ground rods should extend to just below the top of the manhole or vault and be located between 3" and 6" of the side to allow measuring of ground array using a clamp- on tester and inspection of the connections as part of a preventative maintenance program.
 - 7 All ground wires between metal structure and nearest ground rod shall be #4 AWG, bare, solid, annealed copper wire unless otherwise specified on the plans. Each steel pole or pedestal shall be firmly connected to the ground rod provided, by means of an internal grounding terminal or earth lug. Placing the ground wire under an anchor bolt nut, anchor bolt cover, or similar device will not be permitted.
 - 8 All conduit, steel poles, pedestals, and hand holes in the immediate intersection shall be bonded between structures and cabinet to form a continuous effective ground array. Bonding ground wires shall be No. 6 AWG, XHHW insulated green, multi-strand copper wire or equal connected by an appropriate sized split bolt or crimp connectors to the #4 ground wires specified in section 11.5.
 - 9 The No. 6 AWG, XHHW insulated green multi-strand copper wire shall be installed in all PVC conduit that carries electrical conductors (including low voltage).
- 3.02 CABINETS, PEDESTALS, and POLES
- A Fiber Hub Cabinet
 - B Lighting Controller Cabinet
 - C Traffic Controller Cabinet
- 1 The controller cabinet shall be installed at the location indicated on the plans with the back of the cabinet toward the intersection such that the signal heads can be viewed while facing the controller, unless otherwise directed by the Engineer.
 - 2 The controller cabinet shall be installed on pre-placed caulking material on the concrete base. After the cabinet is installed in place the Contractor shall also place caulking material around the base of the cabinet.
 - 3 For compatibility the actuated controller and cabinet shall be number "DBQTS2-NU-P" or DBQTS2-NU-R" depending on the location. The local intersection controller shall be fully compatible and interchangeable with the existing local controllers in the City of Dubuque System operating as a Closed-Loop System which are TACTICS Traffic Management System located in the Traffic Management Center. The system will be tied into the TACTICS via the fiber optics and network gear using an IP based communication. The controller shall also be capable of stand-alone remote dial-up operation including monitoring and upload/download capabilities without the need of a master or any additional equipment other than a standard dial-up modem.
 - 4 Electrical connections from the controller and auxiliary devices to outgoing and incoming circuits shall be made in such a manner that the controller or auxiliary device can be replaced with a similar unit, without the necessity of disconnecting and

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

reconnecting the individual wires. This may be accomplished by means of a multiple pin jack, a spring connected mounting or approved equivalent arrangement.

- 5 All cabinet wiring shall be neatly trained throughout the cabinet and attached to the interior panels using nonconductive clamps or tie-wraps. Bundles of cables shall be laced or tied or enclosed in a sheathing material. The cabinet wiring shall not interfere with the entrance, training, or connection of the incoming or outgoing field conductors.
- 6 Except where terminated by direct soldering, all wires shall be provided with terminal lugs for attachment to terminal blocks using screws. All wires shall be identified and labeled in accordance with the cabinet wiring prints.
- 7 Complete system documentation shall be provided. Such documentation shall, as a minimum consist of:
 - a Three (3) complete operations manuals for each controller and associated signal equipment including equipment wiring diagrams, schematics, and parts lists sufficient for ordering any parts.
 - b Three (3) sets of cabinet wiring diagrams. The corresponding phase numbers for each movement shall be indicated on the intersection layout diagram on the cabinet wiring diagram
- 8 The controllers shall be provided with the most current software and documentation. Future software and documentation revisions to the local system controller shall be provided without charge
- 9 Cabinet wiring diagrams shall include two sheets. One sheet shall indicate the manufacturer point to point wiring of the terminal facility complete with all harnesses for the controller unit and the conflict monitor. This drawing shall be an unaltered generic drawing. The second drawing shall indicate the electrical connections of all equipment and terminal connections for the traffic control cabinet for each cabinet provided. The drawings shall include pictorial representations of the intersection geometrics and phasing. Detectors shall be positioned for each approach and lane, being tagged with its harness (rack/slot) assignment. The controller cabinet shall be positioned and shown as a rectangle with the two crossing diagonal lanes. In addition to the three sets of wiring diagrams specified above, one digital copy shall be provided to the Engineer at the time of turn on at the intersection.
- 10 The Contractor shall provide a customized intersection graphic depicting the local intersection for each intersection provided. The customized intersection shall include the following: correct number of lanes by function for each approach; graphically correct orientation of the intersection layout; proper phase assignment by lane; proper pedestrian phase assignments; street names on the lanes; key landmark indicators shown in the graphics. The Engineer will provide an 8 ½ x 11 pictorial of the intersection geometrics and the key landmark indicators to be shown in the graphic. System detectors shall be shown on the graphic and labeled in accordance with the card rack/slot plus system detector assignment numbers. Orientation for all intersection displays shall be north as top of screen.
- 11 The addition of any local intersections requires the Master Map to be modified. The Contractor shall provide a corrected map graphic for each intersection added to the group. The map graphic shall include geometrically proportioned locations of the intersections plus locations of all system detectors for each location. A table shall be provided on the graphic, which displays the current assignment of detectors by DR., DR2, CS1, CS2, NA1, and NA2. Modified maps shall be loaded into the computer system and viewed for proper operation. Orientation of the map shall be as selected by the Engineer to best display the System Operation.
- 12 The Owner shall be furnished with a certification from the equipment manufacturer stating that the equipment furnished under this specification complies with all

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

provisions of this specification. If there are any items, which do not comply with this specification, then a list of those exceptions must be detailed on the certification

D Electric Service Pedestal

- 1 Dedicated conduits shall connect the 27-22 with the fiber hub cabinet, traffic cabinet and quazite handhole (for streetlighting).
- 2 Two 5/8 inch by 10 foot ground rod shall be driven in near the base of the 27-22 BBS. One ground shall be installed in the nearest handhole with the second ground rod installed a minimum of 6 feet away from the first. Ground wires shall be connected to the ground rod with one (1) piece non-ferrous clamps which employ set screws as tightening devices

E Light and Mast Arm Poles

- 1 All poles shall be erected so as to be vertical under normal load. The bases shall be securely bolted to the precast concrete foundations. Plumbing of poles shall be accomplished by adjusting the nuts. Shims or other similar devices for plumbing and raking will not be permitted, except for the leveling of the transformer bases. Shims and/or one nut or two nuts on each anchor rod may be used only between the transformer base and the foundation for leveling. One nut shall be turned on each anchor rod and the pole placed in position on these nuts. The top nuts shall then be turned into place loosely and the pole adjusted to the vertical position by adjusting both the upper and lower nuts.
- 2 After leveling the poles, expansive type grout shall be troweled between the pole base and the foundation for gaps of 1" or greater. Exposed edges of grout shall be neatly finished to present a pleasing appearance. A weep hole made from one-half inch (1/2") diameter copper tubing shall be placed in the grout. This grouting should be conducted within the appropriate temperature range of the material used.
- 3 Each pole shall be grounded by installing a No. 4 AWG bare copper ground wire between the pole and the ground rod at the foundation handhole (see section on bonding and grounding).
- 4 If the painted or galvanized surface of any equipment is damaged in shipping or installation, such equipment shall be retouched, repaired or replaced in a manner satisfactory to the Engineer
- 5 Streetlight installation - Follow City of Dubuque street lighting standards but include the following Supplemental Street lighting specifications:
 - a 2 - 2" HPDE or Sch 40 PVC conduit shall be used.
 - b Hand-holes shall be spaced a maximum of 200 feet using a Quazite PG 12"X18" with heavy duty cover or pre-approved equivalent.
 - c Place hand-hole next to each light. All splicing shall be performed in hand-hole, not in light-pole.
 - d Hand-hole shall be centered between back of curb and front of sidewalk on 18 " of clean stone. Fill in space between curb and box, and sidewalk and box.
 - e Place 5/8 " X 8' ground rod in box closest to light pole. Run ground wire from light pole to hand-hole with ground rod. Bond adjacent street lights together with a bonding wire (see section on bonding and grounding).
 - f Use Idea # 30-260 water tight connector used in pole and IlSCO # uspa 350ss-db water tight, underground in line splice used in hand-hole
 - g Each light shall contain in-line fusing and all wiring shall be XHHW.
 - h An approved UL-508 pad mounted metered service pedestal/dedicated lighting controller will be located central to the lights installed and adjacent to the power source. The nearest streetlight to the controller will contain a photo-eye that will be wired to the lighting controller. Size conductors for a maximum 5% voltage drop at furthest point. This lighting controller must be Nema 3R approved and contain a factory installed breaker panel with separate circuits for each electrical

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

branch or direction. Lighting controller must be set on a precast concrete foundation over 18 inches of clean stone and must comply with all local electrical codes.

- i If part of a new subdivision, a separate street lighting plan shall be submitted on its own page detailing lighting, conduit, hand-holes, grounding, bonding, lighting controller and service locations.

F Mast arm and Signals

- 1 All traffic signal displays shall be installed as indicated on the plans. All overhead displays located on each mast arm shall have each green indication set at approximately the same elevation, unless otherwise directed by the Engineer. All signal head locations shall be confirmed in the field by the City Engineer to ensure proper location.
- 2 During the course of construction and until the signals are placed in operation, signal faces shall be covered or turned away from approaching traffic. When ready for operation, they shall be securely fastened in position facing toward approaching traffic and plumb.

G Testing

- 1 General: The Contractor shall provide all personnel, equipment, instrumentation and supplies necessary to perform all testing. All testing shall be performed in an accepted manner and in accordance with the testing equipment manufacturer's recommendations. All data shall be recorded and submitted to the Traffic Engineer as hereinbefore specified. The Contractor shall provide one copy of operating software to read and view all OTDR traces.
- 2 Attenuation: The end-to-end attenuation shall be measured for each fiber for each link after installation and termination. A patch cord jumper cable shall be connected to both the light source and the receive cable to the power meter by the use of a connector (barrel). The two reference cables shall then be connected via a termination coupler and the power meter "zeroed" to eliminate the line loss. This process results in a reading of the actual line loss (dB) of the input connector, fiber cable, exiting connector and any other splices or jumpers installed in the measured test link. The calculated "loss" shall not include the input or departing cables in the loss calculation. The calculated fiber loss measured shall list the number of terminations, including the input and departing connectors, the number of splices and the number of patch cords used to jumper the link(s) into the measured final link. The measured values for each terminated fiber in each tube shall include the Tube number, fiber number, number of feet in the link, the number of splices, the number of patch cords and the number of connectors, if any. The length of optical cable shall be as measured by the OTDR rather than the fiber cable jacket as the fiber is a reverse oscillation process resulting in a greater optical distance than the fiber cable jacket. The value for both the OTDR length and the cable jacket shall be provided in the recorded documentation for each link distance. All distances shall be recorded in feet rather than meters for both recorded lengths.

Fibers that are not continuous from beginning of the link to the end of the link shall be noted in the documentation; otherwise, all fibers in a single tube may be listed with a single data entry for all required data listed above for all fibers in the tube. The fiber documentation for each fiber shall identify the fiber being tested by either fiber number or fiber coating color and be recorded by complete tube, Tube 1 through Tube 6, fiber 1 through fiber 12. The OTDR to be performed in both directions of the test shall be recorded for information purposes only to resolve discrepancies in replicating the test during inspections of the final installation. The power meter reading recordings shall log total dB loss over the length of the fiber measured,

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

equivalent to a dB loss budget.

Each tube of a cable shall be in the same file divider where the tube cover OTDR page shows the overview of all splices, patch cords, terminations from start to end. The second section shall include all Power Meter readings and the mandated documentation to show the calculated line loss (losses). The third section shall contain all OTDR traces, one trace per screen. The fourth section shall include the spool sheet for the fiber installed on the test section. An "explanation" sheet may be included where required to clarify an unusual reading that is valid but difficult to be explained through traditional data presentation, such as a video feed fiber that is attached to a jumper to provide continuous feed from the start to end of the tube length where other fibers in the same tube are simply spliced. The above format shall be repeated for each tube of a cable. Traffic multimode fiber measured in sections marked by traffic controller cabinets between Hub Sites may be sub-sectioned in an easy to understand format or may be jumpered using patch cords as a single OTDR Link with each section separated for power meter readings.

Documentation -The result of all testing shall be recorded along with date of test, name of person performing test, brand name, model number, serial number of equipment used during test, and any other pertinent information and data. The documentation shall be provided to the engineer in electronic format instead of paper copy format. The Contractor shall be responsible to provide input to the Engineer reviewing the recorded data documentation to resolve all questions or data discrepancies.

END OF SECTION

DIVISION 08 - TRAFFIC
SECTION 8010 - EQUIPMENT, LIGHTING, AND SIGNALS

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Section 8020 - Pavement Marking

Part 1: GENERAL

(ADD) Follow Iowa Department of Transportation Specification Section 2527

END OF SECTION

DIVISION 08 - TRAFFIC
SECTION 8020 - PAVEMENT MARKINGS

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Section 8030 - Temporary Traffic Control

Part 1: GENERAL

(ADD) Follow Iowa Department of Transportation Specification Section 2528

END OF SECTION

DIVISION 08 - TRAFFIC
SECTION 8030 - TEMPORARY TRAFFIC CONTROL

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Section 8040 - Traffic Signals and Posts

Part 1: GENERAL

(ADD) Follow Iowa Department of Transportation Specification Section 2524

DIVISION 08 - TRAFFIC
SECTION 8040 - TRAFFIC SIGNALS AND POSTS

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DIVISION 09 - SITE WORK AND LANDSCAPE

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Section 9010 - Seeding

Part 1: GENERAL

1.03 SUBMITTALS

- C (ADD) All materials to be incorporated into the work must have certifications furnished which show that the materials comply with the Specifications prior to any construction.

1.08 MEASUREMENT AND PAYMENT

A Conventional Seeding:

1 Seeding:

- a (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum for each type of seed.
- b (REPLACE) Payment: Payment will be in unit price per square feet, square yards, acres, or lump sum for each type of seed.

2 Fertilizer:

- a (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum of fertilizer.
- b (REPLACE) Payment: Payment will be in unit price per square feet, square yards, acres, or lump sum of fertilizer.

3 Mulching:

- a (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum of mulch.
- b (REPLACE) Payment: Payment will be in unit price per square feet, square yards, acres, or lump sum of mulch.

B Seeding, Fertilizing, and Mulching for Hydraulic Seeding:

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum for each type of seed.
- 2 (REPLACE) Payment: Payment will be in unit price per square feet, square yards, acres, or lump sum for each type of seed.

C Seeding, Fertilizing, and Mulching for Pneumatic Seeding:

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum for each type of seed.
- 2 (REPLACE) Payment: Payment will be in unit price per square feet, square yards, acres, or lump sum for each type of seed.

END OF SECTION

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9010 - SEEDING

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Section 9020 - Sodding

Part 1: GENERAL

1.08 MEASUREMENT AND PAYMENT

A Sod:

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum, or squares with each square containing 100 square feet of sod.
- 2 (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, or lump sum, or square of sod.

END OF SECTION

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9020 - SODDING

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(NO CHANGE) Section 9030 - Plant Material and Planting

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9030 - PLANT MATERIAL AND PLANTING

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Section 9040 - Erosion and Sediment Control

Part 1: GENERAL

1.08 MEASUREMENT AND PAYMENT

B Compost Blankets:

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum for each thickness of compost blanket.
- 2 (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, or lump sum for each thickness of compost blanket.

E Temporary Rolled Erosion Control Products (RECP):

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum, based on the width specified in the contract documents and actual measured length, for each type of temporary RECP.
- 2 (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, or lump sum for each type of temporary RECP.

Q Erosion Control Mulching:

1 Conventional Mulching:

- a (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum of conventional mulch.
- b (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, or lump sum of conventional mulch.

2 Hydromulching:

- a (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum for each type of hydromulch.
- b (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, or lump sum for each type of hydromulch.

R Turf Reinforcement Mats (TRM):

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, lump sum, or squares for each type of turf reinforcement mat with each square containing 100 square feet.
- 2 (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, lump sum, or squares for each type of turf reinforcement mat.

S Surface Roughening:

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum of surface roughening, including directional tracking or grooving/furrowing.
- 2 (REPLACE) Payment: Payment will be at the unit price in square feet, square yards, acres, or lump sum of surface roughening.

U Flow Transition Mat:

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum of flow transition mat.
- 2 (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, or lump sum of flow transition mat.

V End of Season Temporary Erosion Control:

- 1 (REPLACE) Measurement: Measurement will be in square feet, square yards, acres, or lump sum of end of season temporary erosion control applied.
- 2 (REPLACE) Payment: Payment will be at the unit price per square feet, square yards, acres, or lump sum for end of season temporary erosion control.

END OF SECTION

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9040 - EROSION AND SEDIMENT CONTROL

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(NO CHANGE) Section 9050 - Gabions and Revet Mattresses

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9050 - GABIONS AND REVET MATTRESSES

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(NO CHANGE) Section 9060 - Chain Link Fence

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9060 - CHAIN LINK FENCE

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(NO CHANGE) Section 9070 - Landscape Retaining Walls

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9070 - LANDSCAPE RETAINING WALLS

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(NO CHANGE) Section 9071 - Segmental Block Retaining Walls

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9071 - SEGMENTAL BLOCK RETAINING WALLS

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Section 9072 - Combined Concrete Sidewalk and Retaining Wall

Part 1: GENERAL

1.08 MEASUREMENT AND PAYMENT

A (REPLACE) Combined Concrete Sidewalk and Retaining Wall:

- 1 Type A Wall Height 3' Max
 - a Measurement: Measurement will be in cubic yards for the volume of combined sidewalk and retaining wall.
 - b Payment: Payment will be at the unit price per cubic yard of combined sidewalk and retaining wall.
 - c Includes: Unit price includes, but is not limited to, excavation; foundation preparation; furnishing and placing concrete and reinforcing steel; joint material; subdrain; porous backfill material; suitable backfill material; finishing disturbed areas; and shoring as necessary
- 2 Type B Wall Height 3' Min 5' Max
 - a Measurement: Measurement will be in cubic yards for the volume of combined sidewalk and retaining wall.
 - b Payment: Payment will be at the unit price per cubic yard of combined sidewalk and retaining wall.
 - c Includes: Unit price includes, but is not limited to, excavation; foundation preparation; furnishing and placing concrete and reinforcing steel; joint material; subdrain; porous backfill material; suitable backfill material; finishing disturbed areas; and shoring as necessary

END OF SECTION

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9072 - COMBINED CONCRETE SIDEWALK AND RETAINING WALL

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Section 9080 - Concrete Steps, Handrails, and Safety Rail

Part 1: GENERAL

1.08 MEASUREMENT AND PAYMENT

A Concrete Steps:

- 1 Type A Concrete Steps With Handrail
 - a Measurement: Measurement will be in cubic yards for the volume of combined sidewalk and retaining wall.
 - b Payment: Payment will be at the unit price per cubic yard of combined sidewalk and retaining wall.
 - c Includes: Unit price includes, but is not limited to, excavation; foundation preparation; furnishing and placing concrete and reinforcing steel; joint material; subdrain; porous backfill material; suitable backfill material; finishing disturbed areas; and shoring as necessary
- 2 Type B Concrete Steps With Handrail
 - a Measurement: Measurement will be in cubic yards for the volume of combined sidewalk and retaining wall.
 - b Payment: Payment will be at the unit price per cubic yard of combined sidewalk and retaining wall.
 - c Includes: Unit price includes, but is not limited to, excavation; foundation preparation; furnishing and placing concrete and reinforcing steel; joint material; subdrain; porous backfill material; suitable backfill material; finishing disturbed areas; and shoring as necessary

END OF SECTION

DIVISION 09 - SITE WORK AND LANDSCAPE
SECTION 9080 - CONCRETE STEPS, HANDRAILS, AND SAFETY RAIL

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DIVISION 10 - DEMOLITION

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Section 10,010 - Demolition of Building Structures

Part 1: GENERAL

1.02 DESCRIPTION OF WORK

- E (REPLACE) Place clean backfill material in holes and depressions, grade the site003 to drain, and establish ground cover.
- F (ADD) Applicable provisions of SUDAS Standard Specifications and the City of Dubuque Supplemental Specifications shall govern all work under this Section.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 – General Provisions and Covenants, as well as the following:

- D (ADD) Obtain and complete utility sign-off portion of City of Dubuque Demolition Permit prior permit being issued.

1.07 SPECIAL REQUIREMENTS

- E (ADD) Prior to beginning any work at the site, obtain a City of Dubuque Building Demolition Permit.

1.08 MEASUREMENT AND PAYMENT

A Demolition Work:

- 3 (REPLACE) Includes: Lump Sum price includes but is not limited to, removal of:
 - a Buildings, building materials, all contents of buildings, appliances, electronics, furniture, materials to be recycled, trash, rubbish, basement walls, foundations, sidewalks, steps, driveways, yard waste, and all other materials to be removed as directed in the plans and specifications.
 - b The disconnection of all utilities.
 - c Furnishing, placing and compaction of backfill material (See Division 3), finish grading of disturbed areas, the furnishing and placing topsoil and the furnishing, placing, maintenance, and watering of seeding until the grass is fully established.
 - d The furnishing, placing, maintenance and removing safety fencing,
 - e The removal and disposal of trees, brush, vegetation that are to be removed as directed in the plans and specifications.
 - f Payment of any permit or disposal fees.

Part 2: PRODUCTS

2.04 (REPLACE) WELL PLUGGING

- C (ADD) Meet the requirements of the City of Dubuque ordinance Chapter 15 and Dubuque County Well Abandonment ordinance Chapter 32.

2.05 (ADD) PUBLIC UTILITY ABANDONMENT

- A Sanitary Sewer Abandonment: Meet the requirements of Section 4010, 3.08
- B Utility Trench Backfill Materials: Meet the requirements of Section 3010, 2.03.

2.06 (ADD) SAFETY FENCE

Orange, 4-mil plastic construction fence 4 feet high with an economy grade mesh.

Part 3: EXECUTION

3.01 GENERAL

- G (ADD) Prepare and submit to owner written demolition plan describing sequencing of work and the time durations for each activity.
- H (ADD) Set up and establish a written Construction Waste Management Plan per Section 10020 prior to starting any deconstruction work.

3.02 UTILITY DISCONNECTIONS

- A (REPLACE) Disconnect all City utilities prior to initiating deconstruction work.
- B (REPLACE) Water and Sanitary Sewer Service Laterals:
 - 1 If site is to remain vacant, water and sewer services are to be abandoned at the connection to the main before deconstruction permit is issued.
 - a Water Service Lateral: Disconnect all water services by a licensed plumber according to the Jurisdiction's Plumbing Code requirements. Notify Jurisdiction Representative for inspection prior to placing backfill material. After successful

DIVISION 10 - DEMOLITION
SECTION 10,010 - DEMOLITION OF BUILDING STRUCTURES

inspection, City Inspector will sign-off on Deconstruction Permit Application.
Water corp valve to be shut off at main and slug placed in line out.

- b Sanitary Sewer Service Lateral: Disconnect and plug all sanitary sewer service lines at the connection point to the sewer main in accordance with Section 4010, 3.08, A. Existing wye at the sanitary sewer main shall be removed and replaced with solid pipe, unless otherwise agreed upon in writing by the jurisdiction. Notify Jurisdiction Representative for inspection of the disconnection prior to placing backfill material. After successful inspection City Inspector will sign-off on the Demolition Permit Application.

D Private Utility Services:

- 1 (ADD) The Jurisdiction Representative for each private utility shall be responsible for the turning off of utility services before the start of deconstruction work.

3.03 PROTECTION OF THE PUBLIC

- A (REPLACE) Temporary Fencing: Prior to commencing any work, erect temporary orange construction fencing around the entire site including all excavations, buildings, or other dangerous elements to prevent unauthorized access. Provide a fence 4 feet high minimum. Ensure the fence is consistently restrictive and without horizontal openings greater than 2 inches. Fence shall be properly mounted or affixed to posts or other appurtenances to avoid sagging at any point greater than 3 inches. Maintain fencing until all work is complete. Ensure any site access locations are fully secured at the end of the work day.

3.06 WELL PLUGGING AND ABANDONMENT

- D (ADD) Meet the requirements of the City of Dubuque ordinance Chapter 15 and Dubuque County Well Abandonment ordinance Chapter 32.

3.08 DEMOLITION AND REMOVAL

- B (REPLACE) Basements and Foundations: Completely remove and dispose of all basement walls to 4 feet below existing grades unless otherwise specified in the contract documents as having other deconstruction limits. Basement floor slab shall be fractured to allow water drainage, to the satisfaction of the Jurisdictional Representative. Notify Jurisdictional Representative 48 hours prior to basement or foundation work. The Jurisdiction shall inspect work site prior to any backfilling of the excavated work.

E Retaining Walls:

- 1 (ADD) Contractor shall provide additional fill to grade the site if necessary.

- H (ADD) Excavations: All excess soils from the project site must be disposed of in the State of Iowa.

3.14 (ADD) ABANDONING AND REMOVING UNDERGROUND PROCESS PIPING AND SITE UTILITIES

- A Contractor shall be responsible for the disconnection of all site utilities and process piping before starting the deconstruction work.
- B The ends of process piping and conduits to be abandoned that are exposed by excavation shall be plugged with concrete to prevent soil infiltration into the openings.

3.15 (ADD) OBTAIN BUILDING DEMOLITION PERMIT

- A To obtain the permit, Contractor must fill out and complete an application and submit it to the City's Building Services Department. Supply all project information as required to fully complete the permit application.
- B Contractor must obtain signatures from all entities listed on the permit application prior to submitting the form to the Building Services Department.
- C Water and sanitary sewer service laterals must be disconnected and inspected by the City of Dubuque prior to the demolition permit being issued.
- D Water meter (MIU – outside reading device) and UFR (if applicable) must be properly disconnected by City of Dubuque Water Department staff prior to the demolition permit being issued.

DIVISION 10 - DEMOLITION

SECTION 10,010 - DEMOLITION OF BUILDING STRUCTURES

- E For all properties submit copy of Hazardous Material Assessment or Abatement Report along with demolition permit application demonstrating that all asbestos materials have been removed from the structure being deconstructed. Submit an additional copy of the report to the Iowa Department of Natural Resources.
- F Provide proof of insurance as required to obtain the demolition permit.
- G Give such other data and information as may be required by the City Manager for the demolition permit application (Ord. 61-12, 11-19-2012).
- H The permit application must be signed by the Contractor or Contractor's authorized agent who may be required to submit evidence to indicate such authority.
- I Along with the permit application submit a plan for the storage of construction materials equipment for the site.
- J Contact City of Dubuque Police Dispatch, Building Services, and Engineering Departments as required by the demolition permit prior to commencing the work.
- K No building deconstruction work shall start until at least 48 hours after the permit approval has been issued by the City.
- L If the demolition work start date is changed, Contractor shall provide a 48-hour notice of the revised date and Contractor may be subject to additional demolition permit fee charges by the City of Dubuque.

END OF SECTION

DIVISION 10 - DEMOLITION
SECTION 10,010 - DEMOLITION OF BUILDING STRUCTURES

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(ADD) Section 10,020 - Waste Management

Part 1: GENERAL

1.01 SECTION INCLUDES

- A Waste generated by structure deconstruction activities

1.02 DESCRIPTION

Applicable provisions of Division 1 shall govern all work under this Section.

This Section specifies requirements for salvaging, recycling, and disposing of non- hazardous construction waste.

1.03 SUBMITTALS

- A Construction Waste Management Plan: Prior to commencing demolition or construction activities, CONTRACTOR shall develop and submit a Construction Waste Management Plan to OWNER and ENGINEER for approval within 30 working days after Contract award or prior to any waste removal.
- B Summary of Waste Progress Reports: Throughout the duration of the Project, CONTRACTOR shall submit with Applications for Payment a Summary of Waste for the overall project including the following information:
 - 1 Material category.
 - 2 Generation point of waste by building or structure.
 - 3 Total quantity of waste in tons.
 - 4 Quantity of waste salvaged, both estimated and in actual tons.
 - 5 Quantity of waste recycled, both estimated and in actual tons.
 - 6 Total quantity of waste recovered (salvaged plus recycled) in tons.
 - 7 Total quantity of waste recovered (salvaged plus recycled) as percentage of total waste.
- C Summary of Waste Final Documentation: Before request for Substantial Completion of the Project, CONTRACTOR shall submit calculated end-of-project rates for salvage, recycling, and disposal as a percentage of total waste generated by the work for overall project. The documentation shall include reuse and recycling results, including the quantity of each material recycled, reused, or salvaged, the receiving party, and the applicable diversion rates.
- D Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations.
- E Records of Sales: Indicate receipt and acceptance of salvageable waste and equipment sold to individuals and organizations.
- F Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.
- G Landfill and Incinerator Disposal Records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

1.04 SUBSTITUTIONS

Comply with Division 1 – General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 – General Provisions and Covenants

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 – General Provisions and Covenants

1.07 SPECIAL REQUIREMENTS

A PRECONSTRUCTION AND PREBID MEETINGS

- 1 The Preconstruction Conference and Prebid Meetings will include as a minimum, discussion of the following items as they relate to the proposed Construction Waste Management Plan. The purpose of the discussion is to develop a mutual understanding regarding details of construction waste management implementation.
- 2 Review waste management plan.

DIVISION 10 - DEMOLITION
SECTION 10,020 - WASTE MANAGEMENT

- 3 Review requirements for documenting quantities of each type of waste and its disposition.
 - 4 Review and finalize procedures for metered separation and verify availability of containers and bins needed to avoid delays.
 - 5 Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
- B WASTE MANAGEMENT GOALS
- 1 The recycling goal (including reuse) to be achieved at Substantial Completion of the Project shall be by 75% by weight of total waste generated by the Project and includes reuse.
 - 2 Reduce: The Project shall generate the least amount of waste and methods shall be used that minimize waste due to error, poor planning, breakage, mishandling, contamination, or similar factors. The Project shall promote the resourceful use of materials to the greatest extent possible.
 - 3 Reuse: CONTRACTOR shall reuse materials to the greatest extent possible. Salvage reusable materials for resale, for reuse on this Project, or for storage for use on future projects. Return reusable items (e.g., pallets or unused products) to the material suppliers.
 - 4 Recycle: As many of the waste materials not able to be eliminated in the first place or salvaged for reuse shall be recycled. Waste disposal in landfills shall be minimized to the greatest extent possible.
- C CONSTRUCTION WASTE MANAGEMENT PLAN
- 1 The purpose of the Construction Waste Management Plan developed by Contractor is to achieve successful reuse and recycling with the highest possible reuse and recycling rates. The Plan shall include the following as a minimum:
 - a A schedule identifying milestones and key reporting dates of Construction Waste Management.
 - b A list of waste materials expected to be generated from the Project as debris.
 - c A list of each material proposed to be salvaged, reused, recycled, and discarded. Identify applicable markets for reuse and/or recycling. At a minimum, all materials required by State law to be recycled shall be recycled (e.g., cardboard, cans, bottles, office paper, fluorescent bulbs, refrigerants, mercury, etc.), and scrap metal shall be recycled.
 - d Separation and Materials Handling Procedures: Description of how waste materials identified above will be separated, cleaned (if necessary), and protected from contamination.
 - e Educational and Motivational Procedures: Meetings to be held and other proposed methods for educating construction personnel regarding waste reduction and recycling.
 - f Waste Auditing Procedures: Methods of monitoring and enforcing the Plan.
 - g Documentation Procedures: Methods of documenting materials leaving the Project site as waste, for reuse, or recycling to allow Summary of Waste Progress Reports to be submitted with Applications of Payment.
 - 2 Contractor shall distribute copies of the Construction Waste Management Plan to Jurisdiction and Jurisdiction Representative.

Part 2: PRODUCTS

None

Part 3: EXECUTION

3.01 CONSTRUCTION WASTE MANAGEMENT PLAN IMPLEMENTATION

- A Contractor shall be responsible for coordinating the separation, handling, recycling, salvage, reuse, and return methods to be used by all construction personnel. Contractor shall be responsible for reporting the results of the Construction Waste Management Plan. Contractor

- shall designate a "Waste Manager" who is responsible for instructing construction personnel and overseeing and documenting results of the Construction Waste Management Plan.
- B Instruction: Contractor shall provide on-site instruction regarding appropriate separation, handling, recycling, salvage, reuse, and return methods to be used by all construction personnel throughout the duration of the Project.
- C Separation Facilities: Contractor shall lay out and identify a specific area on the Project site for separating materials for recycling, salvage, reuse, and return. Contractor shall provide clean waste bins and shall keep these bins and the recycling area neat, clean, and clearly marked to avoid contamination of materials. The containers and bins shall be inspected for contamination and contaminated materials removed if found.
- D Sorting: The following sorting methods are acceptable:
- 1 Sorting recyclable materials at the Project site and transporting them to recycling markets directly from the Project site.
 - 2 Employing haulers who make use of a materials-recovery facility or a transfer station where recyclable materials are sorted from the waste and recycled before disposing of the remainder. If using a hauler or recycling facility to sort out recyclables, verify that the hauler sorts out all construction waste loads and is not limited to those that are not acceptable at the landfill.
 - 3 As a minimum, the following materials shall be recycled or reprocessed:
 - a Brick.
 - b Cardboard.
 - c Concrete.
 - d Metals.
 - e Crushed stone and bituminous pavement.
 - f Plastic, paper goods and aluminum cans.
 - g Drywall.
 - h Wood and lumber.
 - i EPDM roofing.
 - j Ceiling tile.
 - k Equipment removed.
- E Hazardous Waste: Hazardous waste shall be disposed of according to State law. (Hazardous Waste is a separate category and not part of the basis on which the recycling percentage is calculated.)
- F The following resources are provided for information only, to aid Contractor in managing the Project's construction waste:
- 1 The Iowa DNR Waste Management:
<http://www.iowadnr.gov/waste/recycling/and.html>.

END OF SECTION

DIVISION 10 - DEMOLITION
SECTION 10,020 - WASTE MANAGEMENT

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(ADD) Section 10,030 - Hazardous Material Removal - Structures

Part 1: GENERAL

1.01 SECTION INCLUDES

- A Removal of all hazardous materials from all structures at the site.
- B Disposal of all removed hazardous materials in compliance with all State and Federal regulations.

1.02 DESCRIPTION

- A Conduct a building assessment to identify the presence of household and other hazardous wastes
- B Remove all hazardous materials identified in the environmental reports listed in Section 00775 of this Contract Documents Manual. Arrange for proper disposal of all hazardous materials.

1.03 SUBMITTALS

- A Comply with Division 1 – General Provisions and Covenants
- B Contractor must coordinate for the Jurisdiction, as legal owner or operator of the site, to provide to Iowa Department of Natural Resources an “Asbestos Notification of Demolition and Renovation.” This notice must be postmarked at least ten (10) working days before beginning work at the site.
- C Prior to the start of work submit a copy of each employee’s Iowa asbestos worker license and Contractor’s Iowa contractor asbestos demolition license
- D Prior to the start of work develop a site-specific Health and Safety Plan (HASP) which documents that site activities will be conducted in accordance with applicable provisions of OSHA 29 CFR 1910 and submit it to the Jurisdiction
- E Contractor must submit Conditional Exempt Small Quantity Generator (CESQG) documentation to the Dubuque Metropolitan Area Solid Waste Agency (DMASWA) for disposal of all hazardous waste on the site. Contractor is responsible for complying with all DMASWA, State and Federal solid waste disposal regulations.
- F Contractor must provide the Jurisdiction with all CESQG and disposal documentation (including manifests) at the end of the project.
- G Prior to the start of work provide the Jurisdiction with training certificates of employees operating machinery or handling hazardous waste per section 1.07.C.
- H Prior to the start of work, contractor shall create and provide a copy of the hazardous materials demolition plan to the Jurisdiction.

1.04 SUBSTITUTIONS

Comply with Division 1 – General Provisions and Covenants.

1.05 DELIVERY, STORAGE, AND HANDLING

Comply with Division 1 – General Provisions and Covenants
Ensure access to fire hydrants is maintained at all times.

1.06 SCHEDULING AND CONFLICTS

Comply with Division 1 – General Provisions and Covenants

1.07 SPECIAL REQUIREMENTS

- A Contractor must comply with Local, State, and Federal requirements for all employees and subcontractor employees. When required by law, all workers at the site must be properly trained and licensed to perform work.
- B Work completed on site must be completed and screened per Local, State, and Federal regulations for possible exposure hazards when hazardous materials are suspected or known to be located.
- C Operators of machinery that will be handling any hazardous waste and the site foremen and shift supervisors need to comply with all of the requirements of an OSHA First Responder Awareness Training which should include, at a minimum, a 4-hour training course.
- D Prior to any demolition activities in a defined space or structure, all hazardous materials must be removed

DIVISION 10 - DEMOLITION
SECTION 10,030 - HAZARDOUS MATERIAL REMOVAL - STRUCTURES

1.08 MEASUREMENT AND PAYMENT

A Hazardous Material Removal:

- 1 Measurement: Lump sum item; no measurement will be made.
- 2 Payment: Payment will be the lump sum price.
- 3 Includes: All Labor, Equipment, and Materials to safely and lawfully remove and dispose of all hazardous materials prior to demolition.

Part 2: PRODUCTS

None

Part 3: EXECUTION

3.01 GENERAL

- A Contractor must review all previously completed environmental reports that are listed in Section 00775. Copies of these reports may be obtained from the Jurisdiction upon request. These reports will provide information on quantities and location of hazardous materials that have been identified at the site, such as asbestos containing materials, lead, mercury, and PCB-containing materials, and small household hazardous wastes. These reports will also identify any limiting conditions experienced during the assessment. Care should be taken to observe, characterize, and segregate any suspect materials encountered during demolition. Contractor is responsible for complying with all DMASWA, State, and Federal solid waste disposal regulations for any suspect materials encountered during demolition.
- B Contractor must conduct an investigation of all buildings to determine if other household hazardous wastes that are not described in the reports listed in Section 00775 are present in the structures on site. These materials may include asbestos containing materials, lead (not including lead based paint), mercury and PCB-containing materials.
- C Contractor must pay all hazardous material handling and disposal costs.

3.02 PROTECTION OF THE PUBLIC

- A Mitigate exposure risk: Provide appropriate protection to the general public and to all employees working outside of the contaminated area as required by Local, State, and Federal regulations.
- B All employees entering the contaminated area must be properly trained, certified, and wearing the appropriate personal protective equipment (PPE) as required by Local, State, and Federal regulations.

3.03 ENVIRONMENTAL REQUIREMENTS

- A Asbestos Dust Control: Encapsulation of asbestos-containing material must be completed per State and Federal regulations and trucks, dumpsters, or any other storage or transport container must fully encapsulate the debris to prevent the creation of dust while transporting debris from the site to the appropriate disposal site. All trucks must be covered before leaving site.
- B Lead: When lead-based paint products are suspected, sampling and disposal must be completed according to Local, State, and Federal requirements to determine the appropriate removal procedures and disposal location for the material.

3.04 DISPOSAL

- A Hazardous materials and building material segregation: Prior to any demolition activities, all hazardous materials and hazardous building materials must be properly separated and removed or abated in accordance with applicable Local, State, and Federal requirements. If material is encountered during the demolition that is suspected or known to be hazardous then demolition activities must stop to allow for appropriate sampling, segregation, removal, and disposal of the material by a licensed professional (when required by Local, State, or Federal regulations). If hazardous material, such as asbestos, is included with other demolition debris, then the entire debris quantity must be treated as hazardous material for both handling and disposal.
- B Disposal facility and process: The Dubuque Metropolitan Solid Waste Agency Regional Collection Center for Household Hazardous Materials (HHM) considers Contractors a

DIVISION 10 - DEMOLITION

SECTION 10,030 - HAZARDOUS MATERIAL REMOVAL - STRUCTURES

- Conditionally Exempt Small Quantity Generator (CESQG), as long as they are not already identified as a Large or Small Quantity Generator (LGQ or SQG). CESQG is a business that generates no more than 220 pounds of hazardous waste per month and stores no more than 2,200 pounds on-site at any one time.
- C DMSWA requires that an appointment be made for delivery and disposal of hazardous materials and a certification with shipping manifest must be provided prior to the disposal time. Appointment times are typically available on Monday through Friday between 7:30 A.M. and 3:30 P.M. Full instructions and forms are provided on the DMSWA's website. The website <http://www.dmaswa.org/about.cfm>. also provides a list of common materials accepted and associated disposal prices.

END OF SECTION

DIVISION 10 - DEMOLITION
SECTION 10,030 - HAZARDOUS MATERIAL REMOVAL - STRUCTURES

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DIVISION 11 - MISCELANEOUS

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(NO CHANGE) Section 11,010 - Construction Survey

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 11 - MISCELANEOUS
SECTION 11,010 - CONSTRUCTION SURVEY

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(NO CHANGE) Section 11,020 – Mobilization

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 11 - MISCELANEOUS
SECTION 11,020 – MOBILIZATION

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(NO CHANGE) Section 11,030 - Temporary Services During Construction

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 11 - MISCELANEOUS
SECTION 11,030 - TEMPORARY SERVICES DURING CONSTRUCTION

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(NO CHANGE) Section 11,040 - Temporary Sidewalk Access

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 11 - MISCELANEOUS
SECTION 11,040 - TEMPORARY SIDEWALK ACCESS

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(NO CHANGE) Section 11,050 - Concrete Washout

NO CHANGES PROPOSED FOR THIS SECTION.

DIVISION 11 - MISCELANEOUS
SECTION 11,050 - CONCRETE WASHOUT

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(ADD) DIVISION 12 - LIFT STATIONS

THE FOLLOWING DIVISION 12 CONSISTS OF THE MINIMUM SPECIFICATIONS REQUIRED FOR A WASTEWATER LIFT STATION THAT WILL BE OWNED AND OPERATED BY THE CITY OF DUBUQUE. ADDITIONAL PROJECT SPECIFIC LIFT STATION AND FORCE MAIN REQUIREMENTS AND CALCULATIONS ARE REQUIRED TO BE SUBMITTED FOR REVIEW AND APPROVAL BY THE CITY OF DUBUQUE PRIOR TO SUBMITTING TO IDNR FOR THE IDNR WASTEWATER CONSTRUCTION PERMIT APPLICATION PROCESS. THE PROJECT SPECIFIC WASTEWATER LIFT STATION AND FORCE MAIN REQUIREMENTS MUST CONFORM TO DIVISION 12 FOR CITY APPROVAL.

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Section 12,010 - Minor Wastewater Lift Station

Part 1: PART 1 – GENERAL

1.01 SPECIFICATION INCLUDES

- A Submersible wastewater pumps and motors
- B Wet well and valve vault
- C Piping and valves
- D Flow measurement
- E Electrical and controls

1.02 DESCRIPTION OF WORK

- A Provide all labor, materials, equipment, operations, facilities, and administration necessary to furnish and complete all work covered by this specification and project drawings to produce a fully functioning wastewater pumping lift station.
- B Provide pumping, flow measurement, and pump control system adjustment and startup services per the Submersible Wastewater Pump Association (SWPA), SWPA startup report, and operator training.

1.03 SUBMITTALS

- A All materials to be incorporated into the work must have submittals furnished which show that the materials comply with the Specifications prior to any construction. See SUDAS General Provisions (Section 1050, Article 1.05).
- B Submit drawings and product data for review by the City Engineer. Submittals to include information to determine compliance with specifications, drawings, and installation requirements, and City approved lift station design by others. SUDAS submittal requirements shall apply.
- C Submit operation, maintenance, and service data and manuals/information for City staff use (three copies required).
- D Equipment and materials submittals include but are not limited to:
 - 1 Pre-cast concrete structures, pipe connections to structures, concrete mixes, (structural, paving, corrosion resistant, etc.), admixtures, and manhole access castings.
 - 2 Pumps and motors, wet well top, valve vault hatch, valve vault ladder, pump base elbows, pump guide rails and mounting brackets, trash basket assembly (when required), and certified pump performance testing results (when required).
 - 3 DIP, PVC pipe (gravity and pressure), mechanical joint fittings, flanged fittings, flanged gate valves, check valves, air release valves, cast couplings, flange bolts and gaskets, MJ bolts and gaskets, tapping saddles, ball valves (PVC and bronze), flange adapters, retainer glands, buried gate valves (with boxes and Valve Box Adaptor II), pipe supports, etc.
 - 4 Paint products used for factory finishes and for factory priming. Paint for field touch-up. Paint for field finish coating.
 - 5 Electrical metering equipment, PVC conduit and fittings, aluminum conduit and fittings, wire, main breaker (service entrance), double throw switch, junction box for mounting above wet well, gen-set plug, light fixtures and switch, receptacles, etc.
 - 6 Lift station control panel, magnetic flow meter system, and cellular modem connected to Verizon or alternate City carrier.

1.04 SUBSTITUTIONS

- A Comply with SUDAS-General Provisions and Covenants Section 1060 Article 1.02 as modified by City of Dubuque Supplemental Specifications Section 1060 Article 1.02, regarding substitutions.

1.05 DELIVERY, STORAGE, AND HANDLING

- A Comply with SUDAS-General Provisions and Covenants Section 1060 Article 1.04 as modified by City of Dubuque Supplemental Specifications Section 1060 Article 1.04, regarding storage of materials.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- B Comply with SUDAS-General Provisions and Covenants Section 1060 Article 1.06 as modified by City of Dubuque Supplemental Specifications Section 1060 Article 1.06, regarding storage of materials.
- 1.06 SCHEDULING AND CONFLICTS
 - A Comply with SUDAS-General Provisions and Covenants Section 1080 as modified by City of Dubuque Supplemental Specifications Section 1080, regarding scheduling and progress.
 - B It is intended that this specification with completed Part 3 and any City approved additions be provided to all potential contractors who may be involved in the lift station project.
- 1.07 SPECIAL REQUIREMENTS
 - A Refer to project drawings, Part 3, and Special Provisions (if included) for additional information specific to the project.
- 1.08 MEASUREMENT AND PAYMENT
 - A Minor Wastewater Lift Station
 - 1 Measurement: Lump Sum Item. No Measurement will be made
 - 2 Payment: Payment will be made at the lump sum price. Contractor must provide the engineer with a schedule of values for this item.
 - 3 Includes: Includes all labor, equipment and materials required to completely construct the lift station as shown in the contract documents. See Part 2, 2.01, A
- Part 2: PRODUCTS
- 2.01 LIFT STATION GENERAL
 - A STATION INCLUDES - Submersible wastewater pump lift station shall include:
 - 1 Two identical heavy duty submersible motor driven wastewater pumps with power and sensing cords.
 - 2 Pump mounting bases with disconnecting assemblies and discharge connections.
 - 3 Pump removal guide rails with supports and lifting chains.
 - 4 Wet well and valve vault structures with integral (extended) bases and valve vault top.
 - 5 Wet well cover, trash basket (when required) with guide rails and lifting chain, and valve vault hatch and ladder.
 - 6 Piping from pump bases through valve vault to force main connection including valves and magnetic flow meter.
 - 7 Lift station controls for automatic operation with level sensing, alarms, monitor system, and all electrical work.
 - B MADE IN USA - The following equipment and materials shall be made in the USA unless otherwise approved by the City:
 - 1 Submersible pumps and motors and discharge connection pump bases.
 - 2 Pipe and fittings (DIP, PVC pipe, iron fittings).
 - 3 Gate, ball, air release, and check valves.
 - 4 Saddles, couplings and adapters.
 - C OTHER MATERIEALS AND EQUIPMENT-The country of origin for other equipment and materials shall be for the brand name and model specified unless alternates are approved by the City.
 - D PROJECT SPECIFIC REQUIREMENTS-The project specific requirements shall be as indicated in Part 3 of these specifications and/or on the City approved drawings. These requirements shall include:
 - 1 Pump Requirements:
 - a pump inlet and outlet size
 - b pump design discharge rate (GPM) at duty point
 - c pump total dynamic head (TDH in feet) at duty point
 - d pump nominal rotation speed (RPM)
 - e pump minimum hydraulic efficiency at duty point (%)
 - f maximum power demand at duty point (HP)

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- g maximum power demand for the selected pump performance curve (HP)
- h pump manufacturer(s) and model number(s), impeller diameter(s)
- i solids handling or chopper pump
- j any special/additional requirements
- 2 Motor Requirements:
 - a nameplate horsepower (HP)
 - b full load efficiency (%)
 - c oil filled or air filled
 - d service factor

2.02 PUMP AND MOTOR SPECIFICATIONS

A GENERAL

- 1 Pump delivery in GPM at TDH in feet at rotational speed per Part 3.
- 2 Do not exceed motor nameplate horsepower (HP) at duty point. Do not exceed service factor horsepower at any point on the performance curve, unless approved by the Jurisdiction.
- 3 Handle (pass or chop) raw unscreened wastewater including 3-inch solid spheres, trash, and stringy material.
- 4 Pumps and motors shall handle full reverse rotation without damage.
- 5 Pumps and motors shall be capable of un-submerged operation without damage, for at least 15 minutes.
- 6 The pump/motor assembly shall be removable and replaceable without dewatering or entering wet well.
- 7 Pump efficiency to be as high as possible.

B SOLIDS HANDLING SUBMERSIBLE WASTEWATER PUMPS AND MOTORS

- 1 Each pump shall be the sealed submersible type. Submersible pumps shall be designed for intermittent duty (at least 10 starts per hour) and continuous duty at 40 degrees Celsius ambient or higher.
- 2 Castings including the cord connection cap, motor housing, bearing housing, seal enclosure, and volute/casing shall be ASTM A48 Class 30 cast iron. The pumps shall have a minimum 4" inlet and shall have a centerline 4-inch minimum flanged discharge. All external mating parts shall be machined, and O-ring sealed. All exposed bolts and nuts shall be 300 series stainless steel.
- 3 The impeller shall be designed for wastewater service and shall be capable of being trimmed to meet various specific conditions of head and capacity. The impeller shall be statically and dynamically balanced. Impellers shall be keyed and secured to the pump/motor shaft by a 300 series stainless steel fastener with a suitable locking device and shall be removable without the use of special tools. Impellers shall be constructed of ASTM A48 Class 30 cast iron or ASTM A536 Class 65 ductile iron. A stainless steel or bronze replaceable volute wear ring shall be installed to maintain minimum clearances and minimize recirculation.
- 4 The combination pump and motor shaft shall be 416 stainless steel per ASTM A582 of adequate strength and stiffness for service intended. Motor/pump shaft bearings shall be heavy duty anti-friction ball type adequate to handle all thrust and radial loads.
- 5 Elastomers for O-rings, mechanical seals and cord grip grommets shall be nitrile.
- 6 The motor shall be sealed from the pump by double mechanical seals with an oil chamber between the two independent seals. The upper seal and the lower seal shall be carbon/silicon carbide or better. The seals shall require neither maintenance or adjustment but shall be easily inspected and replaced. The lower seal shall be replaceable without disassembly of the seal chamber. No seal damage shall result from operating the pumping unit continuously out of the liquid environment. The seal system shall not rely upon the pumped media for lubrication. All metal parts of the

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- seal including springs shall be stainless steel. The seal chamber shall be fitted with an electrode probe that shall indicate water in the seal chamber.
- 7 The pumping assembly shall be painted to provide corrosion and chemical exposure protection. The paint shall be a waterborne acrylic unless an epoxy coating is specified in the Special Provisions or Part 3. Surface preparation prior to painting shall comply with the coating manufacturer's recommendations for the intended service, as approved.
- 8 Pump motors including stator windings, rotor, and bearings shall be O-ring sealed in a submersible housing. The electrical supply shall be as indicated on the drawings and/or in the Special Provisions or Part 3.
- 9 The motors shall be premium efficiency in accordance with IEC 60034-30, level IE3, and NEMA MG 1 (NEMA 12.60 enclosed motor). Motor rating tests shall be conducted in accordance with CSA C390-10 requirements. Motors shall be housed in an oil filled casing to provide cooling and bearing lubrication or if approved by the City, motors may be air-filled for up to 15 minutes of unsubmerged operation. Cooling systems utilizing auxiliary water supply or utilizing circulation of pumped media will not be approved.
- 10 The pump motor shall be squirrel cage induction design, 1800 RPM maximum, NEMA type A or B for 3 phases (per NEMA MG1 1.19) and NEMA type L for single phase (NEMA MG1 1.20) if use of single phase power is approved by City.
- 11 The motor shall have copper stator windings, that are insulated with moisture resistant Class H insulation materials, rated for 180 degrees Celsius (356 degrees Fahrenheit) per NEMA MG1 1.66. Air filled motors may utilize Class F insulation or better.
- 12 The motor service factor shall be 1.15 or greater unless the motor is to be rated for "Inverter Duty". Inverter duty (VFD) rated motors shall have a 1.0 service factor as defined by MG1 standard.
- 13 The motors shall have a voltage tolerance of plus or minus 10% from nominal and a phase to phase voltage imbalance tolerance of 1%.
- 14 Motors shall be UL Listed for Class 1, Division 1 Groups C and D explosion proof hazardous locations as defined by the National Electric Code.
- 15 The motors shall be designed for continuous duty with a pumped liquid temperature of 40 degrees Celsius (104 degrees Fahrenheit). Each of the three phases shall have a UL/FM approved thermostat or thermistor. The windings operating temperature at rated horsepower and service factor shall be 130 degrees Celsius, at 40 degrees Celsius ambient.
- 16 The motors shall meet the requirements of NEMA MG1 Part 30 and 31 for operation on PVM type variable frequency drives (VFD).
- 17 The heat sensing units shall be connected to trip or stop the motor if over-temperature is sensed. Single phase motors, if City approved, may have one sensing unit.
- 18 The pump and motor bearings shall be heavy duty ball type (single row upper and double row lower) with a minimum B10 bearing life of 50,000 hours for radial and thrust bearings while operating across the entire hydraulic range of the pump. Single row lower ball bearings or sleeve lower bearings shall not be acceptable. Bearings shall be lubricated for life at the manufacturing facility.
- 19 The power cord shall be SOOW or W, oil and water resistant, 600 volt, 90 degrees Celsius, UL and CSA approved and sized for amperage per NEC ratings at the rated temperature of the cable for intermittent/continuous duty. The motor and sensing cords shall be double protected with a compression fitting in the cord cap and an epoxy potted area that seals each conductor at the power/sensing cord entry to the pumping assembly. Each individual lead shall be stripped down to the bare strands

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

of wire at staggered/offset intervals and each wire individually separated. This area of the cord cap shall then be filled with an epoxy potting compound. The cord leads shall be connected to the motor leads with a terminal block or extra heavy duty connectors. The cord cap shall be bolted to the motor housing and sealed with a nitrile O-ring.

- 20 If the motor is to be installed with VFD speed control, the shaft shall have a grounding ring unless otherwise approved by the City. The shaft current mitigation technology shall protect bearings from stray shaft currents by providing a low impedance path to ground, drawing the currents safely away from the bearings.
- 21 Solids handling pumps/motors shall be Hydromatic or Fairbanks to be similar to other pumps in the City wastewater system for maintenance purposes. Alternate pumps must exist in the City system to be considered.
- C Chopper Submersible Wastewater Pumps and Motors
 - 1 General
 - a Submersible chopper pumps shall be specifically designed to pump waste solids at heavy consistencies without plugging or dewatering the solids.
 - b Materials shall be chopped/macerated and conditioned by the pumps as an integral part of the pumping action.
 - c The pumps must have demonstrated the ability to chop through and pump high concentrations of solids such as plastics, heavy rags, grease and hairballs, wood, paper products and stringy materials without plugging, both in tests and field applications.
 - d The submersible pump/motor assembly shall be removable and replaceable without dewatering or entering the wet well.
 - e Chopper pumps shall be manufactured by Vaughan Co., Inc. Montesano, WA to be similar to other pumps in the City wastewater system for maintenance purposes.
 - f The project specific requirements for the pumps and motors shall be as indicated in Part 3.
 - 2 Details of Pump Construction
 - a Casing and back pull-out plate
 - 1) Pump casing shall be of volute design, spiraling outward to the Class 125 flanged centerline discharge (3-inch minimum).
 - 2) Back pull-out design shall incorporate adjusting sleeves, for accurate adjustment of impeller-to-cutter bar clearance.
 - 3) Casing and backplate shall be ductile cast iron with all water passages to be smooth and free of blowholes and imperfections for good flow characteristics.
 - 4) A pressure tap shall be included on or near the discharge flange.
 - 5) Backplate shall include a replaceable Rockwell C 60 alloy steel cutter adjustable for 0.005 – 0.050 inch clearance to cut against the rotating impeller pump-out vanes for removing fiber and debris.
 - b Impeller
 - 1) Shall be semi-open type with pump-out vanes to reduce seal area pressure.
 - 2) Chopping/maceration of materials shall be accomplished by the action of the cupped and sharpened leading edges of the impeller blades moving across the cutter bar at the intake openings, with a set clearance between the impeller and cutter bar of 0.015 – 0.025 inch cold.
 - 3) Impeller shall be cast alloy steel heat treated to minimum Rockwell C 60 and dynamically balanced.
 - 4) The impeller shall be keyed to the shaft and shall have no axial adjustments and no set screws.
 - c Cutter Bar Plate

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 1) Shall be recessed into the pump bowl and shall contain at least 2 shear bars extending diametrically across the intake opening to within 0.010 – 0.030 inch of the rotating cutter nut tooth, for the purpose of preventing intake opening blockage and wrapping of debris at the shaft area.
 - 2) Chopper pumps utilizing individually mounted shear bars shall not be acceptable.
 - 3) Cutter bar shall be cast alloy steel or alloy steel heat-treated to minimum Rockwell C 60.
 - d Cutter Nut
 - 1) The impeller shall be secured to the shaft using a cutter nut, designed to cut stringy materials and prevent binding using a raised, rotating cutter tooth.
 - 2) The cutter nut shall be cast alloy steel heat-treated to minimum Rockwell C 60.
 - e Upper Cutter
 - 1) Shall be threaded into the back pull-out adapter plate behind the impeller, designed to cut against the pump-out vanes and the impeller hub, reducing and removing stringy materials from the mechanical seal area.
 - 2) Upper cutter shall be cast alloy steel heat-treated to minimum Rockwell C 60.
 - 3) The upper cutter teeth are to be positioned as closely as possible to the center of the shaft rotation to minimize cutting torque and nuisance motor tripping.
 - 4) The ratio of upper cutter cutting diameter to shaft diameter in the upper cutter area of the pump shall be 3.0 or less.
 - f Shafting
 - 1) Pump shafting shall be heat-treated alloy steel.
 - 2) The pump shaft shall be directly coupled to the motor shaft with a bolt and keyway.
 - g Pump Painting
 - 1) The pump but not the motor shall be factory painted.
 - 2) The pump exterior shall be degreased.
 - 3) Pump exterior shall be coated with epoxy at 5 to 8 mils dry film thickness (dft).
 - h Nameplate
 - 1) A stainless steel nameplate shall be attached to each pump.
 - 2) Nameplate shall provide:
 - (a) Manufacturer's model number
 - (b) Pump serial number
 - (c) Rated capacity in GPM (at mid-curve)
 - (d) Head in feet (at mid-curve)
 - (e) Rotation speed in RPM (nominal full speed)
 - (f) Impeller diameter
 - (g) All other pertinent data
- 3 DETAILS OF CHOPPER PUMP MOTOR CONSTRUCTION
 - a Sizing
 - 1) The submersible motor shall be sized for non-overloading conditions, or as approved by the jurisdiction.
 - 2) Motor shall have a 1.15 service factor
 - 3) Motor horsepower, nominal rotation speed, frame, and power supply shall be as indicated in Part 3.
 - b Rating
 - 1) The submersible motors shall be UL and CSA listed and suitable for Class 1 Group C & D, Division 1 hazardous locations.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 2) Rated for 15 minutes operation in air with Class F insulation.
 - 3) Motor shall be inverter ready.
 - c Seals
 - 1) Motors shall be equipped with tandem independently mounted mechanical seals in oil bath with dual moisture sensing probes.
 - 2) Moisture probes shall be connected to indicate water intrusion.
 - 3) The inner and outer seals shall be separated by an oil filled chamber.
 - 4) The oil chamber shall act as a barrier to trap moisture and provide sufficient time for a planned repair shutdown.
 - 5) The oil shall also provide lubrication to the internal seal.
 - 6) The inner seal shall be a standard UL listed John Crane Type 21 or equal, with carbon rotating faces and ceramic stationary faces.
 - 7) The outer seal construction shall be designed for easy replacement.
 - 8) Outer mechanical seal shall be 316 stainless steel metal bellows type with silicon carbide faces.
 - 9) Seal shall be positively driven by set screws.
 - 10) Elastomers shall be Viton.
 - d Temperature Sensor
 - 1) Motor shall include two normally closed automatic resetting thermostats connected in series and imbedded in adjoining phases.
 - 2) The thermostats shall be connected per local and state requirements and the National Electric Code to maintain hazardous location rating and to disable motor controls (starter, VFD, etc.) if overheating occurs.
 - e Motor Materials
 - 1) Motor frame and ends shall be cast iron with lifting lugs.
 - 2) Motor shaft shall be 416 stainless steel.
 - 3) External hardware shall be 300 Series stainless steel.
 - 4) Power and control cables shall be butt spliced and sealed in non-wicking epoxy.
 - 5) All machined fits shall be O-ring sealed.
 - f Power and Control Cable
 - 1) Power and control cables shall be of a length required, minimum per Part 3.
 - 2) Cables shall be rated for 600 volts and 90 degrees Celsius.
 - 3) Cables shall have oil and water resistant insulation jacket.
- D PUMP MOUNTING, DISCHARGE, AND REMOVAL**
- 1 A separate mounting base, discharge connection, and removal system assembly shall be furnished and installed for each pump. The assembly shall include pump carrier or guide bracket and pump discharge connection by pump manufacturer and guide rail brackets. The discharge connection shall include a 90-degree elbow. The pump base and discharge connection shall provide a leak proof metal to metal connection at the pump outlet.
 - 2 The mounting base and discharge connection unit shall be cast iron designed to mount directly on and bolted to the wet well floor. The pump supplier shall furnish or recommend required drill-in anchor bolts. The discharge connection shall have a standard 125-pound flat face flange as specified in AWWA C115. The unit design shall be such that the pump discharge connection is made without the need for any bolts, nuts, or gaskets. The unit shall provide for automatic pump connection alignment when the pump is lowered vertically into place on the guide rails secured by the unit assembly. There shall be no need for operating personnel to enter the wet well for pump removal or installation.
 - 3 All fasteners shall be stainless steel including anchor bolts, flange bolts, and guide bracket bolts.

DIVISION 12 - LIFT STATIONS

SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 4 The base/connection/removal assembly shall be painted as required for pumps.
 - 5 Pumping assemblies shall be raised and lowered on two guide rails. The guide rails shall be 2-inch schedule 40 type 304 or type 316 stainless steel pipe. The lower end of the guide rails shall be secured to the pump base / connection / discharge assembly. The upper end of the guide rails shall be secured to the top of the wet well by double stainless-steel brackets with pipe retainers and lift chain hook. When the guide rail length must exceed 20 feet from the base assembly to the upper guide rail bracket, intermediate guide rail brackets are required. The intermediate guide rail bracket shall be fabricated of stainless steel and include a stainless-steel U-bolt and nuts for attachment to the vertical discharge pipe. The intermediate bracket shall maintain straight guide rail alignment.
 - 6 Each pump shall have a stainless-steel bail. A stainless-steel chain of adequate strength shall be connected to the bail to unseat the pump and lift the pump from the wet well. A "grip eye" shall be provided for grabbing the chain. The top of the chain shall be secured to the upper guide rail bracket hook.
 - 7 Pump removal from the wet well shall be accomplished using an existing City owned truck mounted extendable davit crane and winch. The pump station site shall provide for vehicle access to the wet well.
- E PUMP TESTING
- 1 All pumping assemblies shall be visually inspected to confirm that they were built in accordance with the specification as to horsepower, voltage, phase, RPM and hertz. The motor windings shall be meggered to test for insulation defects. The motor shall be run dry to check for proper rotation and RPM. Each volute shall be hydrostatic tested to insure casting integrity.
 - 2 When specified in the Special Provisions or Part 3, submersible pump assemblies shall be performance tested prior to shipping. Performance testing shall include measuring, at the nominal motor speed, the capacity, head, brake horsepower, and efficiency to establish compliance with the anticipated performance as submitted to the City. The Standards of the Hydraulic Institute (HI) shall govern the performance testing and reporting. The performance testing shall be certified by the manufacturer and two (2) copies submitted to the City for each pump.
- F PUMP ASSEMBLY WARRANTY
- 1 The pumping assembly manufacturer and/or supplier shall provide a written warranty against defects in material and assembly for a period of 24 months from the date of project start-up.
 - 2 If the manufacturer's standard warranty duration time differs from those stated in F-1. above, the manufacturer or supplier shall include any and all costs associated with extending the duration as specified. The pumping assembly warranty shall include field labor, travel costs, removal/reinstallation costs, and delivery to and return from appropriate service/repair facilities. (without City Staff involvement)
 - 3 The extended warranty shall cover the pumping assemblies without regard to the manufacturer of the control panel or electrical power components. However, the extended warranty will not cover pump or motor damage caused by the electrical components or controls if electrical/control items are furnished by others. The pump manufacturer shall supply any over-temperature and seal failure sensing and control components to the control panel manufacturer or provide a written approval of such components furnished by others to assure pump/motor warranty coverage.
 - 4 The supplier shall provide required startup reports and information on the controls and electrical components.
 - 5 No warranty coverage beyond the 24 months, from Start-Up, is required.
- 2.03 WET WELL AND VALVE VAULT
- A WET WELL

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 1 The wet well shall be a 72-inch inside diameter (or larger if required for depth or detention) precast concrete manhole with the base cast integrally with the lower segment of side wall. Base reinforcing shall extend into the sidewall. The base shall be extended beyond the sidewall exterior to counteract flotation (8" minimum). Areas inside the wet well not needed for pump/base installation shall be filled with concrete at a 1.5 vertical to 1.0 horizontal slope to form a hopper bottom to direct solids to the pump inlets. See project drawings.
 - 2 Comply with SUDAS Section 6010 and City Supplemental Specifications.
 - 3 The sidewall shall have "B" wall per ASTM C76 and shall have adequate reinforcements for project loadings. Sidewall joints shall have confined gasket and shall have external wrap.
 - 4 The wet well sidewall shall have a butt top (plain end) for the installation of an aluminum cover/lid.
 - 5 No steps are to be installed in the wet well.
 - 6 Inlet pipe connections shall utilize A-Lok, Z-Lok, or PSX Direct Drive boots. Pressure pipe connections to the wet well and valve vault shall be Z-Lok, PSX Direct Drive, or City approved alternate.
- B WET WELL TOP**
- 1 The wet well top shall be fabricated of 6061-T6 aluminum tread plate and have structural support members as required for the 6-foot (or larger) inside diameter.
 - 2 The wet well top shall support 150 PSF and a 300-pound concentrated load.
 - 3 Top fabrication must be coordinated with the wet well layout to avoid interference with pump removal and trash basket removal. See the project drawings and consult the City Engineer and the design engineer.
 - 4 Top shall provide for upper pump guide rail support that has stainless steel hooks for pump removal chains and power and sensing cords, and brackets for level transducer and backup float assembly. The top shall be USF Fabrication, Inc. BPC or equal for the wet well diameter specified/shown with two doors and wire/cable opening in fixed section.
 - 5 The wet well top doors shall open independently. Neither door shall bear on the adjacent door for support. Each door shall have a drop handle and padlock staple of aluminum or stainless steel. Hinges and fasteners shall be stainless steel. The fixed segment of the top shall be bolted to the plain end top of the precast concrete sidewall.
 - 6 All fasteners including anchor bolts for the fixed segment shall be stainless steel. All aluminum in contact with concrete shall be thoroughly painted with a suitable bituminous coating. The fixed top segment is to have a cut out for the power and sensing cords.
- C TRASH BASKET**
- 1 A trash basket when required by DNR design standards shall be Haliday Series B1A, USF Fabrication Debris Basket, or City approved equal.
 - 2 The basket, bail, guide rails with lower stop, and attachment standoff brackets shall be aluminum. Fasteners and lift chain shall be stainless steel.
 - 3 The trash basket assembly shall be designed for the wet well wall (diameter) shown on the drawings. The basket shall accommodate influent sewers up to 12-inches diameter. Larger influent sewers shall require special basket designs as approved by the City Engineer.
 - 4 The trash basket shall have 2-inch diameter openings at 3-inch centers. The basket shall include a drop bottom for ease of cleaning. The basket shall be 28-inches high, 18-inches wide, and 8-inches deep. The bottom shall be installed 9 to 12 inches below the influent pipe flow line. The contractor shall coordinate the location (end) of

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

the influent sewer relative to the trash basket to ensure solids capture and basket removal.

- 5 The trash basket guide rail attachment brackets shall be bituminous painted where in contact with concrete.
- 6 All hardware (fasteners, clips, hinges, mounting anchor bolts, etc) for the trash basket and guide rails shall be stainless steel.
- 7 The City of Dubuque has a truck mounted davit crane suitable for lifting the trash basket. The pumping station site shall provide for vehicle access to the wet well.

D VALVE VAULT

- 1 The valve vault shall be a 72-inch inside diameter (larger if required for meter or air release valve) precast concrete manhole with the base cast integrally with the lower section of sidewall. Base reinforcing shall extend into the sidewall. The base shall be extended beyond the sidewall exterior to counteract flotation (8" minimum). The integral valve vault base shall include a concrete-encased electrode (UFER) for a grounding connection. See the project drawings. The valve vault floor shall be field placed to provide for installation of the 15-inch diameter (or square) by 5-inch deep sump and floor slope at 2% minimum.
- 2 Comply with SUDAS Section 6010 and City Supplemental Specifications.
- 3 The sidewall shall have "B" wall per ASTM C76 and shall have adequate reinforcements for project loadings. Sidewall joints shall have confined gasket and shall have external wrap.
- 4 Valve vault top shall be a precast concrete slip-over joint flat-top with a cast-in aluminum hatch.
 - a An aluminum hatch shall be integrally cast into the valve vault flat-top with corners as close to the inside diameter as possible.
 - b The top shall also have a precast hole for the bypass pumping connection piping (4.80" or 6.9" diameter). Precast company shall coordinate with the contractor.
- 5 Valve Vault Hatch:
 - a The valve vault shall have a 36" by 36" aluminum hatch (USF Fabrication APS 300 or equal).
 - b The hatch shall have a drop handle, automatic hold-open arm, stainless steel hinges, padlock staple, and stainless-steel fasteners.
 - c Aluminum in contact with concrete shall be thoroughly bituminous paint coated.
 - d The hatch shall be located above the ladder with the hinges opposite the ladder.
- 6 Valve Vault Ladder:
 - a An aluminum ladder conforming to OSHA requirements shall be installed for access to the valve vault below the hatch opening.
 - b The ladder shall provide for 18-inch clear width between side rails.
 - c The ladder shall have one (1) safety extension at the center of the ladder.
 - d The ladder with safety extension shall be by USF Fabrication or City approved equivalent.
 - e The ladder shall be attached to the floor and to the wall (with standoffs per OSHA). Aluminum in contact with concrete shall be bituminous paint coated.
 - f Anchor bolts and any assembly hardware shall be stainless steel.
 - g The contractor shall coordinate with the manufacturer so that the top of the ladder is as close to the top of the structure as possible but not interfere with the valve vault hatch.

2.04 PIPING

A PUMP DISCHARGE TO FORCE MAIN

- 1 The wet well and valve vault piping from the pump base elbow to the force main connection shall be ductile iron pipe with flanged fittings and buried MJ fittings (per

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

AWWA C153) or cast couplings (in the wet well or buried). Minimum size is 3 inch for chopper pumps and 4 inch for other pumps.

- 2 Pump discharge and valve vault piping shall be flanged joint Class 53 ductile iron pipe (DIP) per AWWA C151.
 - 3 Flanged fittings for pump discharge piping shall be cast iron or ductile iron per AWWA C110.
 - 4 Flanged joints shall be 125-pound flat face per AWWA C115 and have full face gaskets and stainless-steel assembly bolts/nuts. Pipe flanges shall be solid cast iron or ductile iron. Flange gaskets shall be SBR unless nitrile is required in the Special Provisions or Part 3.
 - 5 The interior of DIP and fittings shall have an interior lining of ceramic epoxy paint.
 - 6 Buried DIP and MJ fittings shall be polyethylene wrapped per AWWA C105.
- B PAINTING DIP AND FITTINGS**
- 1 The interior of the DIP and fittings (flanged and MJ) shall be coated with ceramic epoxy. The exterior of flanged DIP and fittings within the wet well and valve vault shall be coated with epoxy. Epoxy coated DIP and fittings exposed to sunlight shall be top-coated with aliphatic acrylic polyurethane.
 - 2 Ceramic Epoxy
 - a The ceramic epoxy shall be Tnemec Series 431 Perma-Shield PL or Protecto 401.
 - b The pipe and fittings manufacturer(s) or the pipe fabricator shall provide for ceramic epoxy lining by an applicator approved/certified by the paint manufacturer to have sufficient training and experience. Applicator shall perform surface preparation and coating application in full compliance with the coating manufacturer's requirements.
 - c Surface Preparation: Unless otherwise approved by the City Engineering Department surface preparation shall be as follows:
 - 1) All internal surfaces of ductile iron pipe and fittings shall be delivered to the application facility without asphalt or any other protective lining on the interior surface. All oils, small amounts of asphalt paint, grease, and soluble deposits shall be removed in accordance with NAPF 500-03-01 Solvent Cleaning prior to abrasive blasting.
 - 2) Pipe Interior: Uniformly rotary abrasive blast using angular abrasive material to a NAPF 500-03-04 Internal Pipe Surface condition, full removal of annealing oxide layer. Interior surfaces shall be free of all dirt, dust, annealing oxide, rust, mold, coating, or other foreign matter. Any area where rust reappears before lining application shall be reblasted. Surface shall have a minimum angular anchor profile of 3.0 mils per ASTM D4417, Method C.
 - 3) Fittings Interior: Uniformly abrasive blast using angular abrasive material to a NAPF 500-03-05 Fittings Blast Clean #1 condition, no staining. The interior surface shall be free of all visible dirt, dust, annealing oxide, rust, mold, coating or other foreign matter. Reblast areas where rust reappears prior to lining application. Surface shall have a minimum angular profile of 3.0 mils per ASTM D4417, Method C.
 - 4) Comply with pipe manufacturer's and paint manufacturer's recommendations for bell and exterior pipe surface preparation.
 - d Application:
 - 1) The ceramic epoxy lining shall be applied within 8 hours of abrasive blasting.
 - 2) The lining shall be applied when the surface and ambient temperature is above 50-degree Fahrenheit and 5 degree above dew point.

DIVISION 12 - LIFT STATIONS

SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 3) The ceramic epoxy lining shall have a nominal dry film thickness (DFT) of 40 mils in one or more coats. The maximum DFT in joints (bells and 6 inches of pipe exterior for joints and couplings) shall have 6.0 to 10.0 mils of coating as approved by the pipe/fittings manufacturer(s). Flange faces shall not be coated.
 - 4) Coating procedures shall comply with the coating system manufacturer's recommendations regarding number of coats, maximum DFT, minimum and maximum recoat time, joints, etc.
 - 5) Touchup and repair shall be done with ceramic epoxy, touchup kits, or joint compound per lining/coating manufacturer's recommendations. Field touchup and repair shall be done by experienced workers and under supervision of the coating manufacturer.
 - 6) The blast profile shall be tested prior to coating application. Wet film thickness shall be measured at least once per 100 square feet. Dry film thickness shall be checked per SSPC-PA2. The interior lining of all DIP and fittings shall be tested for pin-holes and holidays with a non-destructive 2500-volt test. Any defects found shall be repaired prior to shipment.
 - 7) The date of application of the lining shall be marked on the DIP and fittings and records maintained by the applicator.
 - 8) The pipe and fittings manufacturer(s) shall supply a written certification that the applicator has met lining specification requirements.
 - 3 Polyamidoamine Epoxy
 - a Exposed DIP and flanged fittings in the wet well and valve vault shall be painted with two coats of polyamidoamine epoxy, Tnemec Series N69 Hi-Build Epoxoline or approved alternate. Painting shall conform to paint manufacturer's recommendations.
 - b DIP and fittings shall have surface preparation per National Association of Pipe Fabricators NAPF 500-03 by a qualified person or entity obtained by the pipe fabricator.
 - c DIP and fittings shall be primed with 3.0 to 5.0 mils DFT of polyamidoamine epoxy by a qualified applicator obtained by the pipe fabricator.
 - d Field repair of failed coating or rusty areas shall include SSPC-SP11 Power Tool Cleaning to bare metal and painting with 4.0 to 6.0 mils DFT of polyamidoamine epoxy. If primer is more than 60 days old the entire surface shall be scarified.
 - e Field applied topcoat shall be 3.0 to 5.0 mils DFT of polyamidoamine epoxy after piping assembly. Field applied topcoat color shall be as selected by the City.
 - f Flange hubs and faces shall be sealed using a clear non-silicone caulk after paint cure.
 - 4 Aliphatic Acrylic Polyurethane
 - a DIP and fittings that are exposed to sunlight in exterior locations shall be painted with one coat of aliphatic acrylic polyurethane over the two coats of polyamidoamine epoxy.
 - b The aliphatic acrylic polyurethane shall be Tnemec Series 73 Endura Shield or approved alternate compatible with the shop applied epoxy primer and the field applied epoxy topcoat.
 - c The polyurethane coating shall be 2.0 to 3.0 mils DFT. Color selected by City.
- C FORCE MAIN PIPING
 - 1 See Standard SUDAS Specifications and City Supplemental Specifications to Section 4010.202 and Section 5010.201.
 - 2 Additional modified requirements for force main piping for minor wastewater lift stations are as follows:
 - a Minimum force main velocity shall be 3.0 feet per second.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- b PVC pipe shall have a green color.
- c Iron force main fittings shall have ceramic epoxy lining per Section 12,010. Do not install cement mortar lined fittings. Polyethylene wrap all fittings and joint harnesses.
- d Install tracer wire as required in Supplemental Specifications for Section 5010. Install tracer wire access stations at intervals not exceeding 500 feet. Install traffic rated valve or cleanout boxes if access station is installed in street or sidewalk.

D MISCELLANEOUS PIPING

- 1 PVC Piping: PVC piping for drains, air release, etc. shall be installed where shown on the drawings.
 - a PVC pipe shall be schedule 80 per ASTM D1785 made of materials conforming to ASTM D1784.
 - b PVC fittings shall be schedule 80 per ASTM D2467.
 - c Joints in PVC piping shall be solvent cemented socket and plain end with cement per ASTM D2564.
 - d Joints shall be cleaned, primed, and cemented according to ASTM D2855. Primer shall conform to ASTM F656.
 - e Do not thread PVC pipe. Cement NPT by socket fittings to pipe.
- 2 Brass/Bronze Piping: Brass/bronze piping for drains, air release, sample ports, instrument connections, etc. shall be installed where shown on the drawings.
 - a Brass pipe and nipples shall be schedule 40 and conform to ASTM B687.
 - b Brass/bronze fittings shall be class 150 and comply with ASME B16.15.
 - c Joints shall be NPT per ANSI B1.20.1.
- 3 Stainless Steel Piping: Stainless steel piping for drains, air release, sample ports, instrument connections, etc. shall be installed where shown on the drawings or as required in Part 3.
 - a Stainless steel pipe and nipples shall be schedule 40 and conform to ASTM A312, Type 304 or as otherwise indicated in the Special Provisions or Part 3.
 - b Stainless steel fittings shall be class 150 and comply with ASTM A351.
 - c Joints shall be NPT per ANSI B1.20.1.
- 4 Un-Restrained Couplings: Couplings used to join plain-end pipes without thrust restraint shall have ductile iron center rings and end rings.
 - a Gaskets shall be SBR unless nitrile is required in the Special Provisions or Part 3.
 - b Coupling bolts shall be Type 304 stainless steel unless Type 316 is required in the Special Provisions or Part 3.
 - c The center ring for couplings shall be the manufacturers standard length.
 - d The center ring and end rings shall have a fusion bonded epoxy coating.
 - e Cast couplings shall be Romac Style 501, Romac Macro or USA made approved alternate.
- 5 Restrained Couplings: Restrained couplings shall be installed when thrust restraint is required. See drawings.
 - a Restrained couplings shall be Romac Alpha or USA made approved alternate; or MJ sleeves with wedge type retainer glands, SST T-bolts with anti-galling coating, and nitrile gaskets.
 - b Restrained couplings or restrained mechanical joint sleeves shall be installed in buried horizontal piping between the wet well and valve vault and elsewhere as shown or approved. Sleeves shall be polyethylene wrapped.
 - c Retainer glands for DIP shall be EBAA Series 1100 Mega lug, Romac Roma-Grip, domestic Tyler Union Series 1000 Tuf-Grip or approved equal. Retainer

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- glands for PVC pipe shall be EBAA 2000PV, Romac Roma-Grip for PVC Pipe, or domestic Tyler Union Series 2000 Tuf-Grip for PVC pipe or approved equal.
- d Retainer glands shall be epoxy or polyester coated by the manufacturer.
 - e Sleeves shall be short body and comply with AWWA C153. Sleeves shall have ceramic epoxy lining.
- 6 Flange Adapter: Flange adapters may be installed in locations shown on the drawings and where approved by the City.
- a Flange adapters should not be installed in wet wells but are required for meter connection piping, but not adjacent to the meter.
 - b Flange adapters shall be made of ductile iron with gripping wedges and torque limiting actuating screws. The entire assembly except flange bolts shall be coated with fusion bonded epoxy. Flange bolts shall be type 304 stainless steel.
 - c Flange adapters shall be EBAA Series 2100 Mega-Flange or City approved alternate. If set screw type flange adapters are approved, the set screws must be hardened stainless steel. Flange bolts shall be stainless steel. The adapter shall be epoxy coated.
- 7 Tapping Saddles: Tapping saddles shall be installed for pipe drainage, instrument connections, and as shown on the drawings.
- a Single strap saddles shall be installed for connections to DIP unless double strap saddles are required in the Special Provisions, Part 3, or on the drawings.
 - b Tapping saddles shall have nylon coated saddles and stainless-steel strap(s) attached with stainless steel studs, nuts, and washers.
 - c Single strap tapping saddles shall be Romac Style 101NS or approved USA made alternate. Double strap tapping saddles shall be Romac Style 202NS or approved USA made alternate.
- 8 Pipe Support: Valve vault piping including the flow meter shall be supported from the floor by flange supports or saddle supports at locations shown on the drawings and approved by the City. A minimum of three supports are required in each valve vault.
- a Floor pipe supports shall be fabricated of Type 304 stainless steel. Floor support extension pipes shall be Type 304 or 316 stainless steel. Anchor bolts shall be stainless steel.
 - b Floor flange supports shall be Standon Model S89 and floor saddle supports shall be Standon S92, or City approved USA made alternate.
- 9 Bypass Pumping Connection: A hose connection for bypass pumping shall be installed to above the valve vault top at each lift station. The bypass pumping connection shall include a piping connection in the valve vault, a gate valve, DIP, flanged fittings, piping drain assembly, and a portable pump hose connection.
- a Connection Size: The bypass pumping connection shall be 4 inch (minimum) for station design flows of 135 GPM to 300 GPM and 6 inch for station design flows of 300 GPM to 650 GPM. Connection shall be 8 inch if required by City for larger design flows.
 - b Location: The center of the hose connection shall be horizontal and located 18 inches above the valve vault top.
 - c Hose Connection: The hose connection shall include a companion flange for NPT, an aluminum or stainless steel schedule 40 pipe nipple (4" long for 4 inch pipe and 6" long for 6 inch pipe), PT Couplings coupler by female NPT (4" Part 40D, 6" Part 60D), PT Coupling dust plug (4" Part 40W, 6" Part 60W), and PT Coupling security chain (4" & 6" Part S51).
 - d Painting: Paint bypass ductile iron piping above and below valve vault top as required in painting section of these specifications.
 - e Pipe Opening: The opening in the concrete valve vault top around the DIP shall be covered with an aluminum plate (3/16" minimum thickness), sealed to the DIP

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

and concrete with non-silicone caulk, and secured with stainless steel fasteners to the concrete.

- f Bypass Piping Drain: A drain connection shall be installed in the bypass DIP above the isolation gate valve. Drain connection shall consist of a 2-inch NPT outlet single or double strap tapping saddle, stainless steel 2" nipple, bronze ball valve, and stainless-steel street elbow.

2.05 VALVES

A GATE VALVES

- 1 Gate valves shall be 4-inch minimum resilient seat type for solids handling pumps and 3-inch minimum for chopper pumps and shall conform to AWWA C509 or AWWA C515. Install a buried MJ gate valve in the force main outside the wet well with Adaptor II and valve box.
- 2 The gate valves shall have 125-pound flat face flange piping connections per AWWA C115 with stainless steel flange bolts and nuts in the valve vault, and MJ connections with SST tee bolts for buried service.
- 3 Gate valves shall comply with the following:
 - a Non-rising stem
 - b Minimum 200 PSI working pressure rating
 - c O-ring shaft seals
 - d Interior and exterior epoxy coating per AWWA C550
 - e Hand-wheel operator in valve vault, nut for buried valves
 - f Stainless steel valve assembly bolts (bonnet, stuffing box, and hand-wheel)
 - g Valves shall open left, counter-clockwise (CCW)

B BRONZE BODY BALL VALVE

- 1 Bronze body ball valves shall be installed for air release valve installation, piping drain, etc. as shown on the drawings.
- 2 The bronze body ball valves shall include:
 - a Two-piece design, quarter turn
 - b Full size port
 - c NPT connections
 - d RPTFE seats and stem seals/packing
 - e Chrome plated solid brass ball
 - f Brass stem, bronze retainer and gland
 - g Stainless steel nut and tee handle
- 3 Bronze body ball valves shall be Apollo 77C-A with noted options, or City approved alternate.

C PVC BALL VALVES

- 1 PVC ball valves with 18-inch stem extensions shall be installed for valve vault drain back to wet well. PVC ball valves shall be installed at other locations as shown on the drawings or approved by the City.
- 2 PVC ball valves shall comply with the following:
 - a Double union (or single union in vault drainage sump)
 - b Quarter turn operator
 - c Full port (schedule 80 PVC)
 - d EPDM O-rings
 - e PTFE ball seats
 - f Solvent cement socket to pipe connections
- 3 The ball valves shall be Spears True Union 2000, Spears Single Entry, or City approved alternate. The stem extension shall be Spears BVSE2 with schedule 80 PVC extension or City approved alternate.

D CHECK VALVES

- 1 Pump discharge check valves shall be resilient flexible disc type

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- a Check valves shall comply with AWWA C508.
 - b Minimum size shall be 4-inch for solids handling pumps and 3-inch for chopper pumps.
 - c The check valves shall have a disc closure assist device or accelerator as required by these specifications.
 - 2 Flexible disc check valves shall comply with the following:
 - a Piping connections to be 125-pound flat face flange, full face gaskets for DIP, and stainless-steel flange bolts.
 - b Working pressure rating of 250 PSI
 - c Ductile iron body and cover (ASTM A536)
 - d Flow area equal to connected nominal pipe size
 - e Nylon reinforced disc of Buna-N or EPDM fully encapsulating a steel disc installed at 45 degrees from valve centerline
 - f Stainless steel cover attachment bolts and washers
 - g Backflow actuator of bronze and/or stainless steel
 - h Epoxy coated valve interior and exterior
 - 3 Flexible disc check without closure assist device shall be USA made Val-Matic Swing-flex Series 500BF or Kennedy Kenflex Figure 506.
 - 4 Closure assist/accelerator device shall be included when required by the City Engineer. Criteria may include:
 - a When more than one pump can operate at the same time
 - b The force main length is greater than 400 feet
 - c The static head (wet well level to force main discharge) in less than 25 feet
 - d Force main velocity is greater than 6 feet per second
 - 5 Flexible disc check valve with closure assist device shall be USA made Val-Matic Surgebuster Series 7200BF or Kennedy Kenflex Figure 508 with one buckling spring. All other requirements of items 1 and 2 shall apply to check valves with closure assist device
- E AIR RELEASE VALVES
- 1 Air release valves shall be installed at force main high points to provide:
 - a Air release at pump startup
 - b Air release under pressure
 - c Vacuum relief
 - d Surge control
 - 2 Air release valves (ARV) shall be USA made Vent-Tech by International Valve or City approved alternate. The ARV shall be Vent-Tech Model SWG for minimum 3.0 PSI line pressure and Model SZG for 0 PSI line pressure. Consult ARV manufacturer regarding system pressure.
 - 3 When ARV is installed in a valve vault, the top shall have a female NPT outlet (trophy top). If ARV is installed in an independent manhole, the ARV shall have a screened outlet. The ARV shall comply with the following unless otherwise required/approved by the City:
 - a Consult ARV manufacturer for size (2-inch minimum NPT inlet) and use of bias on air release valve.
 - b 3 to 145 PSI pressure rating for Model SWG and 0 to 145 PSI pressure rating for Model SZG, up to 145 degrees Fahrenheit temperature rating
 - c 1-inch side port connections with full port stainless steel ball valves per ARV manufacturer
 - d 2-inch minimum full port bronze isolation valve, with stainless steel handle
 - e Model SWG to be constructed of 304L and 316L stainless steel and Model SZG to constructed of all 316L stainless steel

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 4 Independent manhole shall be constructed per SUDAS and City Supplemental Specifications with the following modifications:
 - a Manhole shall have minimum 60" interior diameter
 - b Manhole vented to non-traffic area
 - c Off-center sump in sloped floor for pump out
 - 1) Sump dimensions shall be minimum 15" diameter or 15" square by 4" depth
 - d Force main centerline at least 2-feet above floor
 - e A-Lok, Z-Lok, or Direct Drive boot for force main pipe connections
 - 5 Force main piping for ARV shall be DIP and cast iron or ductile iron fittings (all lined as required for value vault piping), and:
 - a DIP shall be flanged by plain-end and plain end by plain end with flange adapter
 - b Fittings shall be a flanged tee with minimum 4-inch branch and tapped (2" NPT) branch blind flange, full face gaskets, stainless steel flange bolts, alternate piping for larger size ARV.
 - c 2-inch minimum brass or stainless-steel nipple for isolation valve installation
 - d Secure or brace ARV to structure with stainless steel support and anchor bolts
 - e Install a flange floor pipe support, see Part 2, 2.04, D.8.
 - 6 ARV outlet piping shall be at least one size larger than the ARV inlet and shall be schedule 80 PVC in the valve vault, above the valve vault, above the manhole, buried and for remote vent.
 - a Vent outlet shall consist of a PVC U-bend (or 2-90-degree bends) and a stainless-steel outlet assembly and screen by Vent-Tech, or approved equal
 - b Manholes in traffic areas shall have a vent installed in a non-traffic area, horizontal pipe shall be 4.0 feet deep
 - c Remote vent shall be marked with a Rhino fiberglass 3 rail green marker post including a "sewer force main" decal
- 2.06 FLOW METER
- A MAGNETIC FLOW METER
- 1 A magnetic flow measuring system shall be installed to measure the discharge from the lift station.
 - 2 Magnetic flow metering system shall be a Rosemount 8750W system to be similar to those in service at the WRRC and include a submersible flow tube and remote mount transmitter.
 - 3 Power supply is to be 120 volts, 60 hertz.
 - 4 System output shall be 4 to 20 mA for flow rate in GPM and scalable pulse to indicate total volume pumped in units of gallons.
 - 5 Accuracy shall be 0.5% of rate over velocity range of 1 to 30 feet per second (FPS).
- B FLOW TUBE
- 1 Flow meter tube shall be constructed of:
 - a Type 304 stainless steel sensor pipe
 - b Carbon steel flanges (150-pound per ANSI)
 - c Carbon steel coil housing
 - d PTFE lining (minimum 0.125" thickness) with liner protectors for industrial wastewater and polyurethane lining for domestic wastewater applications.
 - e Two type 316L stainless steel flush electrodes
 - 2 The flow tube and electrical cable and conduit connections shall be IP 68 (NEMA 6P) submersible rated (33 feet for 48 hours).
 - 3 The flow tube shall be painted for submersible application. Painting shall include:
 - a SSPC-SP10 near white metal abrasive blast cleaning of all carbon steel and SSPC-SP1 solvent cleaning of all surfaces

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- b Coat with a two-component high build coal tar epoxy paint with 16 to 24 mils dry film thickness (DFT); semi-gloss finish; black color; and free from missed areas, foreign materials, sags, runs, or chips
 - c Rosemount ordering code V1
 - 4 Two 316L stainless steel ground rings shall be installed (one on each end of the flow tube) and properly connected.
 - 5 The flow tube shall have sufficient combination cable to reach the location of the remote wall mounted transmitter without splices. Length determined by contractor (50 feet minimum). Cable shall be sealed to provide IP 68 rating.
 - 6 One segment of DIP with flanged ends having a length the same as the flow tube shall be furnished to the City to allow flow tube removal and repair.
 - 7 Flow tube shall have five pipe diameters of straight pipe upstream and two pipe diameters downstream.
 - C TRANSMITTER
 - 1 The transmitter for the magnetic flow metering system shall be a remote wall mounted microprocessor-based unit capable of receiving and processing flow signals from the flow tube (0.04 to 39 FPS range).
 - 2 Transmitter shall include a local operator interface to display flow rate (GPM) and volume (gallons) and operation or fault information in English.
 - 3 The transmitter shall include 4 to 20 mA flow rate signal output and flow volume signal (pulse) output for connection to a lift station monitor and potential City SCADA system,
 - D TRANSMITTER ENCLOSURE
 - 1 If the transmitter is not installed in an enclosed heated structure or in a heated lift station control panel, the transmitter shall be installed in a separate heated NEMA 4X stainless steel or aluminum enclosure. The enclosure shall have sufficient size to house the transmitter (9.01" wide, 12.02" high, and 4.3" deep per Rosemount), accommodate all conduit connections, and the heater.
 - 2 Enclosure shall be Pentair Hoffman or Hammond enclosure and heater:
 - a Hoffman SST A20H1606SSLP
 - b Hoffman aluminum A20H106ALL
 - c Hoffman heater DAH1001A
 - d Hammond SST 1418N4SSC6
 - e Hammond aluminum 1418N4ALC6
 - f Hammond heater FLHTF125A115
 - g Electrician may request City approval for alternate enclosure (manufacturer, size, etc.).
 - 3 Enclosure shall have:
 - a Back plate for transmitter mounting
 - b Lugs or flanges for enclosure mounting to rack
 - c Room for all connections including power, sensor/signal cable, ground, outputs to monitor, etc.
- 2.07 LEVEL MEASUREMENT
- A GENERAL
 - 1 The liquid level in the wet well for pump control (start/stop) and alarms shall be sensed by a submersible level transmitter. A three float system shall provide back-up for lift station operation (start/stop) and redundant alarms.
 - B SUBMERSIBLE LEVEL TRANSMITTER
 - 1 Submersible level transducer shall be for operation on low current with intrinsic safety barrier in the pump control panel. Transducer shall be UL/FM/CSA approved for use in hazardous areas.
 - 2 The submersible level transducer shall comply with the following:

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- a Constructed of 316 stainless steel with non-fouling and protective flange
 - b Accuracy of 0.5% of full scale or better
 - c 0 to 10 PSI (0 to 23 feet) range
 - d Power supply of 12 to 24 volts DC
 - e 4 to 20 mA output of liquid level
 - f minimum 40 feet of cord length, unit cord support, including breather vent tube end filter
 - g Temperature compensation
 - h Kellems stainless steel cord grip
 - 3 Submersible level transducer shall be Measurement Specialties KPSI 750, Blue Ribbon Model BC001 Birdcage, or Jurisdiction approved alternate.
- C Float Switch Backup Control and Alarm System
- 1 Three floats shall be installed. The highest float shall initiate high level alarm. The next float shall start a pump. The low float shall stop the pump and also provide redundant low level stop for all pumps. The floats shall function in the event of transducer level sensing system failure, PLC failure, or when the backup float system is activated by the operator via a control panel switch..
 - 2 Non-mercury float switches shall be low current design with intrinsic safety barrier and mechanical activation. Switch rating shall be 1 amp at 120 VAC.
 - 3 Float switches shall comply with the following:
 - a UL listed
 - b Nominally open, 3 conductor, 14 AWG, SO jacketed cable, flexible stranded copper cable
 - c Teflon coated 316 SST housing
 - d High impact and corrosion resistant
 - e 50 feet cable length unless otherwise required and approved by the City. No splices between float and junction box above the wet well
 - f Reed switch
 - 4 Non-mercury float switches shall be Anchor Scientific Part Number: W50N0-SSTNM, or approved equal, to match existing equipment in use by the WRRC.
 - 5 The float mounting assembly shall include the following:
 - a vinyl coated anchor (10 pounds minimum)
 - b Two inch (2") schedule 40 stainless steel pipe with anchor securely fastened to the bottom of the pipe with stainless steel bolts, quick link, etc. Pipe length as required for control monitoring levels
 - c Type 316 1/8 inch stainless steel chain fastened to the top of the pipe with stainless steel bolts, etc. Top of chain shall be secured to stainless steel eyebolt at the top of the wet well.
 - d Float cable clamps of stainless steel with strain relief, to secure float cables to segment of stainless steel pipe.
 - e Anchor, chain, and cable clamps shall be SJE Rhombus or approved equivalent. Pipe shall be as required for pump removal rails.
 - f Alternate 1 inch Sch 40 SST pipe with Anchor Scientific mounting clamps in place of 2 in pipe and 2 inch clamps will be considered if requested.
- D Control/Monitoring Levels in Wet Well
- 1 The minimum wet well level (pumps stop and redundant pumps off) shall maintain substantial submergence of the pumps and motors to provide for cooling and prevent vortex.
 - 2 The submersible level transducer system shall provide for the following levels:
 - a Pumps stop
 - b Lead pump start
 - c Lag pump start

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- d High level alarm
 - 3 The backup system with three floats shall provide for the following levels
 - a The high level alarm float shall activate at 6-inches above the transducer high alarm level.
 - b The pump start float shall activate at the same elevation as the transducer high alarm level.
 - c The lowest float shall stop the pump in backup mode, provide redundant all-pumps stop, and low level alarm indication and shall activate at 6 inches below the transducer stop level.
 - 4 The distance between lead pump start and pumps stop shall provide for a minimum 1.0 to 1.5 minutes of pump run time. Examples are:
 - a 1.0 feet in a 6 ft. wet well at 150 GPM
 - b 2.0 feet in a 6 ft. wet well at 350 GPM
 - c 3.0 feet in a 6 ft. wet well at 600 GPM.
- 2.08 ELECTRICAL
- A VALVE VAULT LIGHTING
- 1 Lights shall be installed in the valve vault. The lights are to be controlled by a switch located in the valve vault near the access hatch.
 - 2 The valve vault lights shall comply with the following:
 - a LED
 - b 3000 lumens total from 2 or more fixtures
 - c 4000K or greater color temperature
 - d NEMA 4X or IP65 rated
 - e UL 1598 listed
 - f For 120-volt 60 hertz single phase power supply
 - g Minimum 70 lumens per watt
 - h Vapor tight aluminum or non-metallic housing
 - i Frosted globe with guard
 - j 5-year warranty
 - 3 The valve vault light fixtures shall be:
 - a Econolight LED-FXVTJ20/840/MV-WM or CM (ceiling/wall mount)
 - b Hubbell VTC-5K-G-U-(X or W)—G-G (ceiling/wall mount)
 - c Cree C-VT-B-(SMCL or SMWL)-19L-50K-GR
 - d City approved alternate
- B CONDUIT AND WIRE
- 1 Conduit: Conduit systems installed in the valve vault and underground shall be PVC with expansion fittings installed above ground surface. Conduit systems installed entirely above the ground surface shall be aluminum. All conduit systems shall be waterproof and weatherproof NEMA 3R or better. Minimum 1/2-inch for single phase and 3/4-inch for three phase.
 - 2 Rigid Non-Metallic Conduit (RNM): RNM systems shall comply with the following:
 - a NEMA standards and UL 651, Carlon or equal
 - b Gray schedule 80 PVC for conduit, fittings, couplings, adapters, support straps, clamps, elbows, etc.
 - c Mounting fasteners for light fixtures, device boxes, clamps, covers, straps, etc. shall be stainless steel
 - d Toggle switch cover, Carlon E98TSCN-CAR or equal
 - e Receptacle cover, in-use, Carlon E9UDVHMG or equal
 - 3 Rigid Aluminum Conduit (RAC): RAC systems shall comply with the following:
 - a UL 6A listed and manufactured per ANSI C80.5
 - b NPT conduit and device joints
 - c Boxes, extensions, and covers shall be aluminum with stainless steel fasteners

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- d Boxes, extensions, covers, etc. shall be Bell/Taymac/Hubbell or equal; in-use GFCI cover to be Taymac MX3200; and single switch cover to be Bell 5121-0
 - e Mounting fasteners and cover fasteners shall be stainless steel
 - f Supports and clamps for RAC shall be aluminum with stainless steel fasteners
 - g With City approval, aluminum core liquid-tight flexible metallic conduit (LFMC) may also be installed, LFMC shall have IP66/IP67 rating and be Anaconda Type EFL, Titan AEF, or equal
- 4 Power Wire: Power wire shall be copper per ASTM B3 with THHW, THWN-2, or XHHW insulation and comply with the following
 - a 90 degree Celsius and 600 volt minimum unless otherwise required or approved by the City
 - b Wire size as indicated on the drawings and/or as required by NEC and City Codes
 - c Minimum 14 gauge for 15-amp circuit breakers and 12 gauge for 20 amp breakers
 - d 12 gauge and 14-gauge copper wire may be solid or stranded, larger sizes to be stranded
- 5 Control Wiring: Control wiring shall be as required/recommended by the equipment and/or control system manufacturer or provider. Control wiring shall include:
 - a Twisted shielded pair cable
 - b Multi-conductor meter cable
 - c Instrument signal cable
 - d Ethernet cable
 - e Proper gauge for required length of run
- C GROUNDING SYSTEMS
 - 1 The grounding system shall comply with NEC and City Codes and include ground rods and a UFER ground. Grounding system shall comply with the following:
 - a Ground rods to be 5/8-inch diameter by 10 feet or longer/larger if required by NEC
 - b Ground rods to be steel with 10 mil copper coating
 - c Grounding conductor connections shall be irreversible copper compression ground tap, Burndy HYTAP (Type YGHP-C, Figure 6), or approved equal. Threaded fastener clamps are not allowed.
 - d UFER ground shall be a concrete encased electrode installed in the valve vault base
- D SWITCHES
 - 1 Switches: Switches for lighting control shall be single pole with ground and comply with the following:
 - a Commercial specification grade
 - b 15-amp, 120-volt, toggle type, side wired
 - c For mounting in PVC or cast aluminum weatherproof/waterproof boxes with external operator
 - d Single pole switches shall be:
 - 1) Leviton CS115-2GY
 - 2) Eaton CS115GY
 - 3) Legrand CS15AC1-GRY
 - 4) Or equal or alternate color
- E RECEPTACLES
 - 1 Receptacles: All receptacles shall be GFCI or protected/fed by a GFCI. One GFCI receptacle is required in a cast aluminum box with in-use cover, adjacent to the pump control panel. A duplex GFCI receptacle or one fed by a GFCI receptacle shall be installed in the valve vault.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 2 GFCI Receptacles: GFCI receptacle shall comply with the following:
 - a 20-amp, 120 volt, NEMA 5-20R duplex configuration, commercial grade or better
 - b self-test
 - c 20-amp feed through
 - d UL 498 and UL 943
 - e Weather resistant
 - f GFCI receptacles shall be:
 - 1) Leviton GFNT2-GY
 - 2) Legrand PT2097 GRY
 - 3) Eaton WRSGF20GY
 - 4) Or approved equal or alternate color
- 3 Duplex Receptacles: Duplex receptacles shall comply with the following:
 - a 20-amp, 120 volt, NEMA 5-20R duplex configuration, commercial grade or better
 - b Back and side wired with grounding screw connection
 - c UL498
 - d Duplex receptacles shall be:
 - 1) Leviton BR20-JGY
 - 2) Eaton BR20GY
 - 3) Legrand CR20-GRY
 - 4) Or equal or alternate color
- F MAIN BREAKER
 - 1 A main breaker with neutral assembly shall be installed as the service entrance and shall isolate the lift station electrical system. The main breaker shall comply with the following:
 - a UL listed and CSA certified, meet NEMA standards
 - b Thermal magnetic or electronic trip
 - c NEMA 3R painted steel enclosure with padlock hasp
 - d Handle lockout with owner padlock
 - e Interrupting rating sized per available power company fault current, minimum 25 kA at 208 or 240 volts 3 phase, and 18 kA at 480 volts 3 phase
 - f Breaker shall be 80% or 100% rated based on anticipated equipment duty (continuous or intermittent); 90 degree Celsius wire required for 100% rated breaker
 - g Main Breaker shall be Schneider Electric (Square D) Power Pact, B frame (125A maximum), H frame (150A) or J frame (250 A), or larger if required or City approved alternate if with local supplier
 - h Main breaker supplier shall calculate arc fault current from power company data and contractor input, Contractor shall install warning sign on exterior of enclosure
- G SURGE PROTECTION
 - 1 Surge protection shall be installed at the main breaker. Surge protection shall comply with the following:
 - a Type 2, load side of main breaker
 - b UL 1449
 - c Rated for system voltage, e.g. 120/208 volts three phase wye; 277/480 volts three phase wye
 - d NEMA 3R enclosure mounted adjacent to main breaker
 - e Isolation breaker for surge protection is not mandatory
 - f Leviton 32120-DY3 for 120/208 volts 3 phase wye, Leviton 32277-DY3 for 277/480 volts 3 phase wye, or City approved alternate
- H DOUBLE THROW SWITCH

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 1 A double throw switch shall be installed for manual transfer from the normal electrical supply (power company) to a portable standby generator supply. Double throw switch shall comply with the following:
 - a Amp rating equal to or greater than main breaker
 - b 240-volt rating or greater for 208 volts or 240 volts power supply, 600 volts rating for 480 volts power supply
 - c 3 pole, non-fused, solid neutral, 4 wire
 - d NEMA 3R enclosure, painted steel, with enclosure lock and mechanism lock plate
 - e Schneider Electric DTU (Series F) for 100 amps and DTU (Series E for 200 amps at 240 volts; DTU (Series F) for 100 amps and 82000 (Series E) for 200 amps at 600 volts; General Electric; or City approved alternate if with local supplier
- I STATIONARY PLUG FOR GEN-SET
 - 1 A stationary plug shall be installed at or adjacent to the double throw switch for connection of a City owned portable standby generator. Design engineer shall coordinate with WRRC staff to determine necessary stationary plug.
 - 2 The stationary plug for a 120/208-volt 3 phase service for up to a 20-horsepower motor, shall match the existing City generator connection and cord and shall be as follows:
 - a 100-amp, style 1 case ground, 4 wire, 4 pole for 120/208 volt 3 phase power
 - b Stationary plug shall be Appleton Powerlite ADJA 1044-RS, reverse service in mounting box
 - c Stationary plug assembly shall accommodate an Appleton ACP 1044CD-RS receptacle
 - d Connect stationary plug ground to electrical service ground
 - 3 Consult the WRRC staff and City Engineering Department for larger pump motors and/or alternate power supply.
- J JUNCTION BOX ABOVE WET WELL
 - 1 A junction box shall be mounted with the bottom at least 3 feet above the top of the wet well for air gap and vent. The junction box shall provide for connections and wire runs of the pump power, pump sensing, and level sensing cords and cables. All low current device cords (floats and submersible transducer) shall be isolated from power cords by a metal barrier in the junction box.
 - 2 The junction box shall comply with the following:
 - a Stainless steel or aluminum
 - b Minimum size 12" wide by 12" high by 6" deep or as necessary for making all connections to and in the junction box
 - c Wiring terminals on a back plate for making and removing connections
 - d Hinged door with hasp for padlocking and clamps as necessary
 - e NEMA 3R or 4X enclosure
 - f Mounted to top of wet well cover (concrete and aluminum) using aluminum or stainless-steel framing strut and stainless-steel bolts and accessories
 - g Removable (split) perforated (3/4" holes at 2" centers) aluminum or stainless-steel cable/cord guard from the top of the wet well to the bottom of junction box, size of guard to match junction box size and wet well top opening.
 - h Cable/cords to the wet well shall be connected to bottom of junction box with air tight and water tight rubber gasketed cord grip connectors of stainless steel or aluminum that will allow for removal
- K VALVE VAULT FLOOR WATER LEVEL MONITORING
 - 1 A non-mercury float switch or sensor (low current) shall be installed in the valve vault near the floor to sense water level. The narrow range float or sensor shall activate a relay and a panel light. The relay shall provide contacts for a monitor connection to

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

avoid submergence of the flow meter for an extended period. The water alarm shall reset automatically.

L ELECTRICAL EQUIPMENT SUPPORT RACK

- 1 A metal free standing rack shall be installed to support electrical equipment, including:
 - a Self-contained metering or instrument metering with C.T. cabinet
 - b Main breaker with surge protective device
 - c Double throw switch with gen-set plug
 - d Flow meter transmitter enclosure
 - e Pump control panel with exterior GFCI receptacle (if not City approved free standing)
 - f Lift station monitor/alarm if not mounted inside pump control panel
 - g Step down transformer from 480 volts for single phase loads plus secondary circuit breaker or load center (NEMA 3R, lockable)
- 2 The rack shall be constructed of the following:
 - a Two or three 4.5-inch O.D. schedule 40 galvanized steel pipe (ASTM A53, grade A or B) with plain ends and galvanized slip over top caps
 - b Concrete filled 12-inch diameter by 4.5-foot-deep vertical wall hole (couplings may be embedded in concrete)
 - c Horizontal 304 stainless steel metal framing channels or struts (B-Line, Unistrut, or equal) with 304 stainless steel fittings
 - d Stainless steel fasteners for struts to posts and equipment to struts
 - e Plastic strut end caps
- 3 The electrical equipment support rack shall be constructed similar to the Alliant Energy steel post construction free standing meter structure with the following modifications:
 - a Two posts shall be mounted at a maximum spacing of 57.0-inches center to center for 5-foot struts
 - b Three posts shall be mounted at a maximum of 58.5-inches center to center for 10-foot struts
 - c Struts may be installed on both sides of the posts if access and clearance is provided
 - d Post tops may be 6 to 7 feet above the ground surface if operating devices are at code height
 - e Struts and fittings shall be stainless steel
 - f All strut fasteners shall be 316 stainless steel
 - g Posts shall be 4 -inch nominal (4.5" O.D.) galvanized schedule 40 steel
 - h Support rack grounding clamp to be Brundy GAR3905BU, or approved equal. Ground rod connection shall be Brundy HYTAP as required for equipment ground.
 - i Alternate configurations of rack(s) may be as proposed by the contractor and installed, if approved by the City

2.09 PUMP CONTROL PANEL

A GENERAL

- 1 A pump control panel with ethernet based PLC shall be furnished and installed to provide automatic operation of the lift station and connection to a fiber/copper ethernet switch. The pump control panel shall comply with the following:
 - a National Electric Code and City Code compliance
 - b Custom designed and built for the specific project and conforming to the requirements of UL Standard 508A including a serialized label in panel
 - c For power supply indicated on the drawings and/or Part 3 of this specification section

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- d Submittal shall include a custom system schematic drawing for power distribution and control, solid state control components shall include a description of operation
- e The control panel supplier or manufacturer must obtain approval of the City for use of alternate and/or "equivalent" components prior to City bid or contractor selection for private projects
- f Label control panel exterior with name of station and power supply (volts, phase, wires)
- g The pump control panel shall be designed, manufactured, and tested by Alderon, SJE Rhombus, TLC Controls, Jetco, or City approved alternate

B ENCLOSURE

- 1 The pump control panel enclosure shall be NEMA 3R constructed of Type 304 stainless steel or aluminum. Panel shall be rack mounted with brackets or free standing with legs, when approved by the City. The control panel enclosure shall comply with the following:
 - a Dead front door(s) shall have continuous hinges(s), three-point latch, padlocking handle or hasp, stainless steel door stop kit and no door clamps (unless otherwise approved by the City)
 - b Inner hinged door for control device mounting plus openings for operation of components (breakers, overload reset, etc.)
 - c Condensation heater with thermostat
 - d Weatherproof exhaust fan with thermostat and intake if control panel includes soft starters or VFD's
 - e GFCI receptacle in weatherproof box on panel exterior by manufacturer or adjacent to panel by electrician
 - f Mount free standing panel on 8-inch thick concrete pad with slab opening or sleeves for PVC conduits, 12-inches wider and 12-inches longer than panel, reinforced (#4 deformed bar at 12-inches on center each way in center of slab)

C INNER DOOR CONTROL DEVICES

- 1 Operating and indicating devices shall be mounted on the inner door. Devices shall include:
 - a Three position selector switch for each pump (hand-off-auto, HOA), with low level float cut-off in hand and auto
 - b Non-resettable mechanical run time meter (RTM) for each pump (hours and tenths)
 - c LED indicating lights (press-to-test) for:
 - 1) Green pump running
 - 2) Red pump over-temperature
 - 3) Red pump seal failure
 - 4) Red wet well high level
 - 5) Red wet well low level
 - 6) Red valve vault water on floor
 - d LED wet well level indication over operation range, digital in feet and tenths or percentage (with range label)
 - e Seal failure reset push-button
 - f Over-temperature reset push-button
 - g Backup level sensor switch
 - h Rigid plastic nameplates to identify devices with 1/8-inch-high letters/numerals (or larger) including power distribution items

D POWER DISTRIBUTION COMPONENTS

- 1 Power distribution components in the pump control panel shall include:

DIVISION 12 - LIFT STATIONS

SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- a Main circuit breaker matching the breaker as specified in segment 2.08-F of this section (except the separate enclosure is not required) or alternate panel isolation method as may be approved by the City, provide off lock-out
 - b Individual pump circuit breakers as specified in segment 2.08-F of this section (except the separate enclosure is not required), provide off lock-out
 - c Each pump shall have a NEMA style (FVNR) magnetic starter, Schneider Electric Class 8536 with solid-state overload relay protection, Schneider Electric Motor Logic SSOLR; or City approved alternate if with local supplier
 - d One pole circuit breakers (Schneider Electric QO/QOB or equal) shall be installed in the control panel for single phase loads or in a separate NEMA 3R load center:
 - 1) Flow meter (15A)
 - 2) Receptacles/lights (20A)
 - 3) Condensation heater or enclosure heater, panel ventilation if necessary (10/15A)
 - 4) Station monitor and future SCADA system (15A)
 - 5) Control function as necessary (10/15A)
 - 6) All input and output devices shall be individually fused, (Phoenix Contact item number 3004171-en, or approved equal) if there is not a designated circuit breaker required.
 - e Two pole circuit breaker for transformer feed with 480 volt power
 - f If pumps are not VFD controlled, current sensing devices shall be installed to monitor the amperage input to each pump and provide analog signal (4-20 mA) to the PLC for connection to the lift station monitoring system (Red Lion CTL Series, or approved equal).
- E CONTROL SYSTEM INPUT**
- 1 The pumps shall be operated on the basis of the wastewater level in the wet well. That level is to be sensed by a submersible level transducer and three floats (high level alarm, pump start, and low level with redundant pumps stop). See segment 2.07 of this section.
 - 2 The transducer shall provide level measurement to the pumping control.
 - 3 The floats shall provide for alarm indication and redundant low level stop for all pumps, and backup control per 2.07.D.3
 - 4 The control panel shall include intrinsic safe barrier(s) for transducer and floats.
 - 5 A 3-phase voltage monitor shall be installed in the control panel to sense supply power (on control panel main breaker load side). Voltage monitor shall be Littelfuse Model 460 or equal installed to notify operators of power problems or failure.
- F PUMPING CONTROL FUNCTIONS**
- 1 Level: The pumping control system shall sense the wastewater level in the wet well and indicate the level on the panel inner door in feet.
 - a Control panel shall provide power supply and intrinsic safety barrier(s) for transducer and floats
 - 2 Pumps: The control system shall start and stop the lead and lag pumps based on noted or City approved liquid levels (field adjustable), according to the following:
 - a Lead and lag pumps shall alternate after each cycle
 - b Lag pump shall run only if lead pump is not functioning, unless otherwise approved by City
 - c Pump running light and RTM shall be activated/deactivated
 - d Motor overloads shall be set at Class 10
 - 3 Level Alarms: If the wet well level reaches high level or low level, the designated alarms shall be activated:
 - a Panel high and low alarm lights shall be activated with automatic reset

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- b Contacts shall close for lift station monitoring notification
 - c Low level alarm shall act as a redundant pump stop in auto or hand switch position
 - 4 Over-Temperature: Control panel shall provide for pump over-temperature shut down coordinated with all pump manufacturer's requirements including use of equipment provided by or approved by the pump manufacturer.
 - a Control panel shall activate pump over-temperature light
 - b Contacts shall close for lift station monitoring notifications
 - c Over-temperature monitoring, alarm, and shut down shall maintain pump warranty
 - d Over-temperature shall have a manual reset
 - 5 Seal Failure: The control panel shall monitor the presence of water in the pump seal chamber utilizing equipment provided by or approved by the pump manufacturer.
 - a If water is sensed, the panel seal failure light shall be activated and the pump shut down unless otherwise approved
 - b Contacts shall close for lift station monitoring notifications
 - c Seal failure monitor and alarm shall maintain pump warranty
 - d Seal failure shall have a manual reset
 - 6 Valve Vault Water Sensing: Control system shall monitor the water level on the floor of the valve vault with a float switch or approved alternate.
 - a If water is sensed on the floor, the panel light shall be activated
 - b Contacts shall close for lift station monitoring notification
 - c Alarm shall have automatic reset
 - 7 Alarms and Status: Control panel shall function to provide for all status and alarm notifications and data logging by lift station monitoring system. See segment G of section 2.09.
 - a Control panel shall provide for contacts/connections for a potential City installed SCADA system.
- G LIFT STATION MONITORING SYSTEM
- 1 The lift station monitoring system shall include the following equipment:
 - a Ethernet based PLC with ethernet connectivity
 - b HMI for ethernet connectivity
 - c VFD (if part of pump control) with ethernet connectivity
 - d Ethernet/Fiber switch, Cisco Industrial Ethernet IE-2000 Series with 16 ports, with POE 16 ports for CAT6 ethernet connection, and 2 ports for fiber connection, plus 5A at 48VDC powersupply, to match existing City equipment.
 - e Ethernet based cellular modem (Cradlepoint IBR600C Series Router with modem) for connection to the ethernet/fiber switch and provide remote notifications.
 - 2 Monitoring shall include:
 - a Input from VFD, HMI, and PLC
 - b Wet well level from transducer (pump commands, alarms, levels)
 - c Activated floats (high alarm, low alarm)
 - d Current draw of pumps
 - e Pump status (running, off, run hours per 24 hours)
 - f Lift station power monitor alarm
 - g Control panel alarms (pump over temperature, seal failure, valve vault, floor water)
 - h Flow meter pumping rate and volume pumped for previous 24 hours

Part 3: EXECUTION

3.01 PROJECT SPECIFIC INFORMATION (To be indicated by lift station designer herein or an attached pages)

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

A MINOR LIFT STATION GENERAL INFORMATION

- 1 Station location:
- 2 Project owner:
- 3 Design Engineer (name, PE#):
- 4 Organization:
 - a address:
 - b Phone and email:

B POWER COMPANY INFORMATION

- 1 Power company name (Alliant, MVEC):
- 2 Contact person:
- 3 Contact Person's Phone:
- 4 Power supply (voltage, phase, wires):

C PUMP REQUIREMENTS FOR LIFT STATION

- 1 Pump inlet/outlet size (inches):
- 2 Pump design discharge rate (GPM):
- 3 Pump total dynamic head TDH at duty point (feet):
- 4 Pump rotation speed (RPM):
- 5 Duty point efficiency (%):
- 6 Duty point power (HP):
- 7 Maximum power of selected pump curve (HP):
- 8 Name of pump manufacturer/model number/impeller size:
 - a Alternate 1:
 - b Alternate 2:
- 9 Factory pump performance testing if required by City (yes/no):
- 10 Epoxy pump and base painting if required by City (yes/no):

D MOTOR REQUIREMENTS FOR LIFT STATION

- 1 Name plate horsepower (HP):
- 2 Full load efficiency (%):
- 3 Oil filled motor (yes/no):
- 4 Air filled motor if City approved (yes/no):

E VALVE VAULT BASE UFER GROUND

- 1 Shown on drawings (yes/no):

F PIPING INFORMATION FOR LIFT STATION

- 1 Exposed DIP & fittings exterior fabricator primer painting required (yes/no):
- 2 Exposed DIP & fittings exterior field painting required (yes/no):
- 3 DIP & flange fittings interior painting required (yes/no):
- 4 MJ fittings interior painting required (yes/no):
- 5 MJ gasket material (SBR, nitrile):
- 6 Flange gasket material (SBR, nitrile):
- 7 Restrained pipe length on drawings (yes/no, where):
- 8 Unrestrained coupling gaskets/bolts (SBR/Nitrile; 304/316):
- 9 Saddles (single/double strap):

G VALVE VAULT FOR LIFT STATION

- 1 Valve vault lighting (yes/no):
- 2 Valve vault receptacle (yes/no):

H TRASH BASKET

- 1 Required (yes/no):
- 2 Shown on drawings (yes/no):

I DESIGN CALCULATIONS

- 1 The lift station design engineer shall submit pumping station and electrical design calculations to the City for review.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 2 Design engineer shall respond to all City questions and provide additional information upon request.
- J Electrical Design
 - 1 The lift station design engineer shall include and electrical design on project drawings including the wiring schematic with specific equipment, materials, sizes indicated.
- 3.02 WET WELL AND VALVE VAULT INSTALLATION
 - A EXCAVATION: Wet well and valve vault installation shall be as indicated on the project drawings and per applicable SUDAS manhole installation requirements and City Supplemental Specifications. The excavation shall be dewatered as necessary for installation and backfill compaction. The contractor shall provide a safe excavation per OSHA, which may include flatter side slopes, trench boxes, sheeting, etc.
 - B STONE BASE: The wet well shall be installed on a 12-inch-thick compacted crushed stone base placed on undisturbed soil/rock (for leveling, uniform support, possibly drainage). The valve vault shall be installed as required for the wet well, if the support soil is undisturbed. If the soil below the valve vault has been disturbed due to wet well installation, compacted crushed stone shall be placed to the elevations required. Compact base/foundation stone to 95% of standard Proctor density or an appropriate relative density. Crushed stone shall be Class I material per City Supplemental Specifications to SUDAS.
 - C LEVEL/PLUMB: The wet well and valve vault shall be installed with the sidewall vertical/plumb and the base level within pre-casting tolerances.
- 3.03 PIPING CONNECTIONS
 - A SEWER: The influent sewer shall be connected to the wet well using a resilient connector. The sewer connection shall be water tight.
 - B FORCE MAIN: The pressure/force main connections to the wet well and to the valve vault and from the valve vault shall be by use of resilient connectors. The pressure/force main connections shall be water tight.
 - C SUDAS: Resilient connections shall comply with applicable portions of SUDAS.
 - D ELECTRICAL: Electrical conduit connections into the wet well are prohibited. Electrical conduit penetration through the valve vault wall shall be sealed water tight. Electrical conduits shall be assembled to provide water tightness.
 - E VAULT DRAIN: A valve vault drain shall be installed as shown on the drawings. Valve vault and wet well wall penetrations shall be sealed water tight with resilient connectors or rubber compression bushings. A PVC ball valve with a true union connection(s) shall be installed in the valve vault sump. An extended operator shall be installed to allow the operator to open the valve and drain the valve vault. The drain piping from the valve vault to the submerged outlet in the wet well shall be water tight and air tight to prevent gases from entering the valve vault.
- 3.04 WET WELL AND VALVE VAULT PIPING
 - A LAYOUT/PAINTING: The piping in the wet well, from the wet well to the valve vault, in the valve vault, and to the force main connection shall be as shown on the drawings. Exposed pipe, fittings, accessories, etc. made of iron shall have surface preparation and be primer painted and finish painted.
 - B FLANGED JOINTS: Ductile iron pipe shall be installed with flanges parallel and not force-fit. The full-face flange gasket shall be uniformly compressed by the stainless-steel flange bolts. Flange bolts shall have Loctite heavy duty anti-seize or equal applied prior to assembly.
 - C STANDARDS: Flanged piping shall be installed in accordance with suggested procedures in the appendices of AWWA C110 (fittings) and AWWA C115 (joints), and the manufacturer's recommendations.
 - D FLANGE SEALING: Flange faces, and hubs shall be sealed with a clear non-silicone caulk after assembly and any field painting.
 - E PVC JOINTS: Joints in PVC piping shall be solvent cemented except where NPT or flanged connections are necessary. Solvent cement joints shall be cleaned, primed, and cemented

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- per the requirements of ASTM D2855. The solvent cement, primer, and cleaner shall be handled in accordance with ASTM F402 and the recommendations of the pipe/fittings/valves manufacturer(s). Pipe ends shall be cut square, de-burred, and slightly rounded. Solvent cement joints shall be made by a trained and experienced worker at the required temperature and shall not be moved until the joint has set per ASTM D2855 and the recommendations of the manufacturer.
- F PVC NPT JOINTS: NPT joints in PVC piping shall be made by solvent cement socket by threaded adapter. The PVC pipe shall not be threaded. Pipe joint paste or thread sealing tape shall be used per the recommendations of the adapter fittings manufacturer.
 - G PVC FLANGE JOINTS: Flanged joints in PVC piping shall be made using a flange by socket adapter and shall have full face 1/8-inch-thick gaskets as recommended by the PVC flange manufacturer. Install flat washers under all bolt heads and nuts. Flange bolts/nuts/washers shall be stainless steel.
 - H PVC ACCESSORIES: Unions, couplings (restrained as necessary), flanges, true union ball valves, etc. shall be installed as shown on the drawings and as required to provide for equipment removal, pipe cleaning, damaged pipe replacement, etc.
 - I BRASS/STAINLESS STEEL PIPING: Brass or stainless-steel pipe, nipples, and fittings shall be installed where shown on the drawings or for connections as required. Carbon steel pipe and nipples shall not be installed. Generally brass and stainless-steel pipe shall be 2-inch size or smaller and have NPT joints.
 - J THREAD SEALING: NPT threads shall be sealed with pipe thread tape or a sealing compound approved for brass pipe or stainless-steel pipe; or approved for PVC threaded adapters and the attached equipment or item (i.e. service saddle, valves, etc.).
- 3.05 COUPLINGS, TAPPING SADDLES, AND FLANGE ADAPTERS
- A COUPLINGS: Couplings shall be installed at locations shown on the drawings. Couplings shall be restrained if thrust could separate the plain end pipes. Couplings in the vertical wet well piping do not require restraint. Horizontal pipe couplings between the wet well and valve vault and for the pressure/force main connections shall be restrained.
 - B TAPPING SADDLES: Tapping saddles shall be used for connections to DIP for drainage and other purposes, as shown on the drawings. DIP shall not be directly tapped unless shown or approved by the City Engineer. Tapping saddles shall have NPT outlets. Seal NPT joints with sealing tape or compound.
 - C FLANGE ADAPTERS: Flange adapters as specified shall be installed at locations shown on the drawings. Flange adapters may be installed at other locations if approved by the City Engineer. The flange adapters shall be installed per the recommendations of the manufacturer including gasket lubrication and placement, flange alignment and bolting, anchoring assembly, etc.
 - D PIPE ENDS AND ALIGNMENT: Pipe ends shall be cut or machined square, de-burred and slightly rounded to prevent gasket damage in couplings or flange adapters. Couplings and flange adapters shall not be used to correct misaligned pipe unless approved by the City Engineer.
- 3.06 PIPING PAINTING
- A CITY REQUIREMENTS: The exposed exterior of the DIP and flanged fittings shall be painted. The interior of the DIP and fittings (flanged and MJ) shall be painted. Stainless steel, brass, and PVC piping and valves shall not be painted. Factory finished items such as couplings, tapping saddles, pipe supports, gate valves, check valves, air release valves, etc. shall not be painted unless otherwise required in the Special Provisions or in this Part 3 (3.01). Damage to factory coatings shall be repaired per the manufacturer or as approved by the City Engineer.
 - B SURFACE PREPARATION: Surface preparation for the exterior of DIP and flanged fittings shall be completed by the pipe fabricator and accomplished by trained and experienced

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

workers. Surface preparation for the interior of DIP and fittings (MJ and flanged) shall be completed by an entity certified by the paint manufacturer.

- C PRIMING: The exterior of DIP and flanged fittings shall be primed by/for the pipe fabricator. Factory finished items shall be primed/painted with epoxy, polyester, or fluoropolymer. Any item that does not have a fully factory finish or fabricator applied epoxy primer shall receive a barrier coat of epoxy prior to top coating and shall be applied per the recommendations of the paint manufacturer.
- D TOP COAT: The field applied topcoat shall be applied after piping assembly and if possible after pressure testing. The topcoat color shall be selected by the City.
- E AMBIENT CONDITIONS: Painting shall be completed (applied and cured) during periods when the temperatures (ambient and surface) and humidity conditions are within the recommendations of the paint manufacturer. It may be necessary to heat and dehumidify the wet well and valve vault during paint application and curing.
- F OTHER PAINTING REQUIREMENTS
 - 1 Properly ventilate areas during paint application and cure to handle.
 - 2 Mask off or protect areas that are not to be painted, including concrete walls, factory finished items/piping other than DIP and flanged fittings, fixed ladders, pumps, guide rails, level control items, etc.
 - 3 Refer to system requirements in Part 2 for field painting and touchup requirements.
 - 4 Mix and thin coatings according to the recommendations of the paint manufacturer.
 - 5 Comply with the recommendations of the paint manufacturer for pot life, application procedures and equipment, cure time to handle and recoat, etc.
 - 6 The painter shall perform quality control inspections including wet film thickness and dry film thickness (DFT) measurements, temperature and humidity monitoring, film characteristics observation (final coat shall have a uniform smooth finish), curing time control for any recoating (e.g. film thickness deficiency), etc.
 - 7 The City may also inspect the painting for specification compliance, including uniformity of coating, dry film thickness, surface preparation, etc.

3.07 MISCELLANEOUS INSTALLATIONS

- A TRASH BASKET: The trash basket shall be installed according to the recommendations of the manufacturer. The drop bottom basket shall be placed in front of, centered on, and below the influent sewer. The basket shall be raised from and lowered to the collecting position on non-binding rails by a stainless-steel chain. All fasteners shall be stainless steel.
- B BASKET LIFTING: The trash basket shall be lifted and lowered using a City truck mounted davit crane.
- C VALVE VAULT DRAIN: The valve vault drain piping shall convey water from the valve vault to the wet well and be installed as indicated on the drawings. The valve vault shall have a 15-inch diameter or 15-inch by 15-inch square, by 5-inch deep sump. The valve vault floor shall be sloped to the sump (2% minimum).
- D DRAIN VALVE: A PVC single or double union ball valve is to be installed on the drain pipe in the sump. The valve installation shall allow for valve removal for flushing the pipe and replacing the valve.
- E PIPE SEALING: The drain pipe shall be sealed in the valve vault wall with rubber sleeves, boots, or donuts. Flexible couplings (2 minimum) are to be installed on the drain piping between the valve vault and the wet well. The drain pipe shall be sealed in the wet well wall with a Z-Lok or boot. A vertical section of drain pipe shall be attached to the line from the valve vault and extended down to terminate below the low alarm level in the wet well to minimize the potential for sewer gases in the valve vault.
- F DRAIN ATTACHMENT: The vertical drain pipe section shall be attached to the wet well wall with stainless-steel clamps/brackets using stainless steel fasteners.
- G JUNCTION BOX ABOVE WET WELL: A junction box shall be mounted with the bottom 36-inches above the top of the wet well (fixed segment opening). This junction box shall serve

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

for making electrical connections to electrical wires and cables from the wet well, including pump power cords, pump sensing cords, floats, and level sensing transducer. All low current device cords (floats, transducer, seal failure as appropriate, and heat sensor as appropriate) shall be isolated from power cords by a metal barrier in the junction box (same material as box). Wiring shall be connected to terminals installed on a back plate. A removable cable guard shall be installed from the top of the wet well to the bottom of the junction box. Cables/cords to the wet well shall be connected to the bottom of the junction box with air tight and water tight rubber gasketed cord connectors/grommets (aluminum or stainless steel) that will allow for cord removal.

- H FLOW METER: The flow meter shall be installed as required for a segment of DIP and include the ground rings. Install flange gaskets on both sides of ground rings. Flange bolts shall be stainless steel. Electrical connections shall maintain IP68 rating. Comply with meter manufacturer's recommendations (5 pipe diameters upstream and 2 downstream).
- I PIPE SUPPORT: Install pipe support in the valve vault to secure discharge piping from movement, avoid stress on joints, and maintain piping alignment. Longer flange bolts may be necessary for flange supports. Unless otherwise approved, the pipe support base plate shall be bolted to the valve vault floor with stainless steel anchor bolts. Support extension pipes shall be vertical.
- J BYPASS PIPING: The bypass connection piping shall be installed as required for DIP and flanged fittings. Bypass piping shall be supported by other piping and pipe floor supports. The bypass piping drain shall be installed directed toward the drainage sump.
- K THRUST RESTRAINT: Force main piping and fittings thrust restraint shall be accomplished by joint restraint (push-on and mechanical joints). The thrust restraint shall be adequate for the force main test pressure of 150% of the pump total dynamic head or 50 PSI (per SUDAS), whichever is greater. Restrained mechanical joint fittings and PVC joint harnesses shall be polyethylene wrapped per AWWA C105.

3.08 PUMPING ASSEMBLY INSTALLATION

- A AS RECOMMENDED: The pumping assembly including the submersible pump and motor, pump discharge connection, and base elbow shall be installed according to the recommendations of the pump manufacturer and as shown on the drawings.
- B BASE ELBOW: The base elbow shall be installed level and firm using stainless steel anchor bolts. The anchor bolts shall be as recommended by the pump manufacturer or supplier. The pump guide rails shall be installed plumb at a uniform separation distance with a top support and intermediate support if over 20 feet in length.

3.09 ELECTRICAL

- A GENERAL: The electrical work shall consist of all procedures necessary for a complete and functioning code compliant wastewater pumping facility. Electrical requirements are to be shown on the drawings with components indicated in PART 2 PRODUCTS. Contractors/electricians shall discuss electrical requirements with the supplier of pumps, meter, monitor, and controls.
- B SERVICE: Electrical work shall include the electrical service as required by the power company. This may include primary underground conduit and trenching, concrete transformer pad, secondary underground conduit with wire, self contained meter socket or CT metering cabinet and meter socket, etc. The contractor/electrician shall review the service requirements of the power company. The City will pay any power company fees for the electrical service on City projects. The power company may be Alliant Energy or Maquoketa Valley Rural Electric (MVEC).
- C NEC/CITY CODE: All secondary electrical work shall comply with NEC as adopted by and amended by the City of Dubuque. The contractor shall obtain an electrical permit from Building Services, but the City fee will be waived for City projects. Coordinate inspections with the City electrical inspector.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- D STANDARDS: All materials shall be new and shall comply with applicable standards including UL, ASTM, NEMA, IEEE, NEC, NECA, ANSI, NFPA, or other acceptable industry standards. All work shall be completed by and/or supervised by a licensed electrician.
- E LABELS: Circuit breakers, starter resets, switches, lights, controller interface, etc. in the control panel shall be labeled. Remote devices such as main service breaker, flow meter, lift station monitor, manual transfer switch, etc. shall be labeled. Labels shall be engraved plastic name plates with 1/8-inch high letters fastened or cemented in place, unless otherwise approved.
- F CONDUITS: Underground conduits shall be installed at a minimum 24-inch depth with sweep bends. Field heating and bending PVC conduit is acceptable provided the interior is not distorted. Control and signal wire/cables shall be installed in conduits separate from power wire conduits. Conduits in the valve vault shall be surface mounted PVC. Flexible liquid tight conduit shall be installed for connections to meters and any equipment in the valve vault. Maintain flow meter IP rating when connecting conduits. Install conduit and wire per NEC requirements as may be modified by City code. Joints in PVC conduit shall be made using couplings and integral bells and solvent cement to provide water tight joints. An expansion joint fitting shall be installed in RNMC (PVC conduits) just above the ground surface for all connected conduits.
- G WIRE: Install wires and cables in dry conduits using suitable pulling grips and lubricants.
- H GROUND: Install a minimum of two ground rods and a UFER ground at the service entrance per NEC requirements. Do not ground to the valve vault piping because of the connection to the PVC pressure/force main. Grounding conductor size per NEC. Do not install grounding conductor in metal conduit.
- I TESTING: All wiring shall be tested for shorts and grounds with a megohm meter and any defects corrected. The resistance to ground shall be tested to assure service grounding.
- J LIGHTING: Install light fixtures uniformly spaced in the valve vault. Install the light switch in a PVC box with an external operator in the valve vault near the entry hatch and top of the ladder to allow illumination prior to entry. A convenience receptacle is to be installed exterior to the control panel for maintenance equipment. A receptacle in the valve vault is also required.
- K LOCKOUTS: Install circuit breaker lockouts (if not done by others) as required, including service entrance main breaker, control panel isolation breaker/device, all pumps, and dry transformer. Subsequent to placing the pumping facilities into operation, install City furnished padlocks on control panel, double throw switch, main breaker, and other exterior mounted enclosures. Use temporary locks during construction.
- L UFER GROUND: A concrete-encased electrode for grounding (UFER ground) shall be installed in the extended valve vault base and connected to the system ground. Refer to the detail at the State of Iowa Electrical Inspection website and any detail on the drawing. The contractor shall be responsible for coordinating the UFER ground installation and connection with the precast concrete supplier.
- M LEVEL TRANSDUCER: The submersible level transducer cable may be spliced in the junction box with a metal barrier. The vent and vent screen shall be in the junction box. Intrinsic safe barriers (current limit) shall be installed in the control panel for the level transducer.
- N FLOATS: Three float switches shall be installed in the wet well for backup to the submersible level transducer (primary device) and pump control system. Refer to Section 2.07.C Float Switch Backup Control and Alarm System. The floats shall function to provide a secondary high level alarm, low level indication and redundant pumps stop, and pump start with backup control when required. The backup controls with intrinsic safe barriers shall be part of the lift station control panel.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 1 Floats shall be secured to a segment of stainless steel pipe. Pipe shall have an anchor and shall be suspended by stainless steel chain connected to a stainless steel eye bolt at the top of the wet well.
 - 2 No electrical connections are allowed in the wet well. All splices are to be in the junction box 3 feet above the wet well top.
- O ALUMINUM ISOLATION: Aluminum shall be isolated from concrete (heavy coating, stainless steel or rubber washers, rubber sheet, etc.).
- P SURGE PROTECTION: A surge protective device (SPD) shall be installed on the load side of the service entrance breaker and connected to the system ground. An isolation breaker is not mandatory.
- 3.10 TESTING AND STARTUP
- A PRESSURE TESTING: Piping between the pump discharge through the valve vault and the force main shall be pressure tested per SUDAS and AWWA C600 and AWWA C605.
- 1 Test pressure shall be 150% of the pump duty point head or 50 PSI whichever is greater.
 - 2 A plate or plug shall be installed and secured to the base elbow in the wet well.
 - 3 The check valve shall be open during pressure testing.
 - 4 The test monitoring may be at the bypass hose connection or drain connection, the base elbow, or the force main discharge (pressure adjusted for elevation difference). Do not remove plugs in valves for pressure testing connection.
 - 5 Force main outlet shall have a tapped and restrained cap with valve for air release and/or testing unless otherwise approved by the City.
 - 6 Pressure testing shall include the flow meter and air release valve(s).
- B PUMP STARTUP: The pump supplier shall provide startup services. The minimum time on-site (excluding travel) shall be 8 hours with 4 hours for checking installation and 4 hours for operator training. Additional time shall be provided without charge to the City if the pumping station does not operate properly during startup and training. The contractor shall assist in startup providing water/wastewater for pumping, electrician for coordination, etc.
- 1 The pump supplier shall provide two copies of a Submersible Wastewater Pump Association (SWPA) startup report and check list subsequent to the on-site startup, to the City Engineer.
- C AIR RELEASE VALVE STARTUP: The ARV supplier or manufacturer's representative shall visit the project site for ARV startup and operator maintenance training.
- 1 ARV is to be pressure tested when the piping is tested (open isolation valve).
 - 2 If ARV must be isolated to pass pressure test, the ARV representative shall repair/adjust the valve to prevent pressure loss and leakage.
 - 3 Repaired/adjusted valve shall be retested independent of the piping using air pressure and lower side port valved stem (at maximum valve pressure rating).
 - 4 ARV discharge piping shall be filled with water and checked for leaks. Repair/replace discharge piping if leakage is detected.
 - 5 Representative shall provide 2 copies of a startup report to the City Engineer.
- D METER STARTUP: A trained representative of the meter supplier or manufacturer shall provide at least two (2) site visits at 4 hours each for meter installation verification, calibration, startup, and operator training.
- 1 Representative shall perform measurements of wet well pump drawn-down time for a gross verification of pumping rate.
 - 2 The flow rate signal and volume pulse signal outputs shall be verified.
 - 3 The connections for the lift station monitor shall be checked for proper installation.
 - 4 Representative shall provide two (2) copies of a startup report to the City Engineer.
- E LEVEL SENSING STARTUP: The supplier(s) of the submersible level transducer and the floats shall provide or arrange for startup of the level sensing items in conjunction with the control panel startup.

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

- 1 Transducer shall be checked for suitable installation depth and non-turbulent location.
 - 2 The transducer shall be calibrated to provide liquid depth to the control panel including the level indication on the panel inner door.
 - 3 Installation of the floats shall be checked to verify activation levels are as required on the drawings unless otherwise approved by the City Engineer.
 - 4 Provide 2 copies of startup report(s) to the City Engineer as part of control panel startup report.
- F CONTROL SYSTEM STARTUP: The control system and the lift station monitor supplier(s) and/or manufacturers shall provide installation verification, calibration, startup, and operator training.
- 1 The minimum time on-site shall be two 8-hour days properly coordinated with the contractor and City staff.
 - 2 The controls and monitor startup may be performed essentially at the same time as the pump startup if all systems are ready for operation.
 - 3 The suppliers or manufacturers shall coordinate with the contractor and City regarding the power supply and the cellular phone service.
 - 4 Two (2) copies of a startup report shall be furnished to the City Engineer.

END OF SECTION

DIVISION 12 - LIFT STATIONS
SECTION 12,010 - MINOR WASTEWATER LIFT STATION

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