



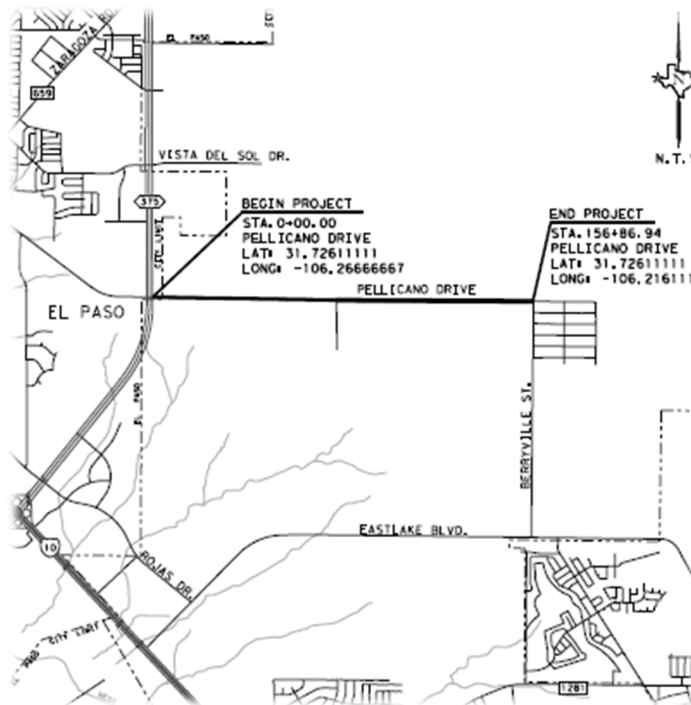
PELLICANO DR. WIDENING/BUILD

EL PASO COUNTY, TEXAS

TxDOT CSJ 0924-06-534

PROJECT CBI 2020 (432)

TECHNICAL SPECIFICATIONS



**Camino Real Regional Mobility Authority
300 N. Campbell Street
El Paso, Texas 79901**

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LIST OF GOVERNING SPECIFICATIONS AND SPECIAL PROVISIONS

Camino Real Regional Mobility Authority (CRRMA)

GOVERNING SPECIFICATIONS AND SPECIAL PROVISIONS

ALL SPECIFICATIONS AND SPECIAL PROVISIONS APPLICABLE TO THIS PROJECT
ARE IDENTIFIED AS FOLLOWS:

STANDARD SPECIFICATIONS: ADOPTED BY THE TEXAS DEPARTMENT OF
----- TRANSPORTATION NOVEMBER 1, 2014.
STANDARD SPECIFICATIONS ARE INCORPORATED
INTO THE CONTRACT BY REFERENCE.

ITEMS 1L TO 9L INCL., GENERAL REQUIREMENTS AND COVENANTS
ITEM 100 PREPARING RIGHT OF WAY (103)
ITEM 104 REMOVING CONCRETE
ITEM 105 REMOVING TREATED AND UNTREATED BASE AND ASPHALT PAVEMENT
ITEM 110 EXCAVATION (132)
ITEM 132 EMBANKMENT (100) (160) (204) (210) (216) (260) (400)
ITEM 170 IRRIGATION SYSTEM (402) (403) (618) (620) (622) (624) (628)
ITEM 192 LANDSCAPE PLANTING (161) (166) (168)
ITEM 193 LANDSCAPE ESTABLISHMENT (166) (192)
ITEM 247 FLEXIBLE BASE (105) (204) (210) (216) (520)
ITEM 305 SALVAGING, HAULING, AND STOCKPILING RECLAIMABLE ASPHALT PAVEMENT
ITEM 310 PRIME COAT (300) (316)
ITEM 341 DENSE-GRADED HOT-MIX ASPHALT (300) (301) (320) (520) (585)
ITEM 351 FLEXIBLE PAVEMENT STRUCTURE REPAIR (421) (422) (438) (440) (529)
(585)
ITEM 360 CONCRETE PAVEMENT (421) (422) (438) (440) (529) (585)
ITEM 400 EXCAVATION AND BACKFILL FOR STRUCTURES (110) (132) (401) (402)
(403) (416) (420) (421) (423)
ITEM 401 FLOWABLE BACKFILL (421)
ITEM 402 TRENCH EXCAVATION PROTECTION
ITEM 416 DRILLED SHAFT FOUNDATIONS (405) (420) (421) (423) (440) (448)
ITEM 432 RIPRAP (247) (420) (421) (431) (440) (DMS-6200)
ITEM 464 REINFORCED CONCRETE PIPE (400) (402) (403) (467) (476)
ITEM 465 JUNCTION BOXES, MANHOLES, AND INLETS (400) (420) (421) (424)
(440) (471)
ITEM 466 HEADWALLS AND WINGWALLS (400) (420) (421) (432) (440) (464)
ITEM 479 ADJUSTING MANHOLES AND INLETS (400) (421) (465) (471)
ITEM 496 REMOVING STRUCTURES
ITEM 500 MOBILIZATION
ITEM 502 BARRICADES, SIGNS AND TRAFFIC HANDLING
ITEM 506 TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL CONTROLS
(161) (432) (556)
ITEM 529 CONCRETE CURB, GUTTER AND COMBINED CURB AND GUTTER (360) (420)
(421) (440)
ITEM 530 INTERSECTIONS, DRIVEWAYS, AND TURNOUTS (247) (260) (263) (275)
(276) (292) (316) (330) (334) (340) (360) (421) (440)

ITEM 531 SIDEWALKS (104) (360) (420) (421) (440) (530)
 ITEM 538 RIGHT OF WAY MARKERS (420) (421) (440)
 ITEM 550 CHAIN LINK FENCE (421) (445)
 ITEM 610 ROADWAY ILLUMINATION ASSEMBLIES (416) (421) (432) (441) (442)
 (445) (449) (614) (616) (618) (620) (622) (624) (628)
 ITEM 618 CONDUIT (400) (476)
 ITEM 620 ELECTRICAL CONDUCTORS (610) (628)
 ITEM 624 GROUND BOXES (420) (421) (432) (440) (618) (620)
 ITEM 625 ZINC-COATED STEEL WIRE STRAND
 ITEM 628 ELECTRICAL SERVICES (441) (445) (449) (618) (620) (627) (656)
 ITEM 636 SIGNS (643)
 ITEM 644 SMALL ROADSIDE SIGN ASSEMBLIES (421) (440) (441) (442) (445)
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 (316)
 ITEM 678 PAVEMENT SURFACE PREPARATION FOR MARKINGS (677)
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 (624) (625) (627) (628) (636) (644) (656) (680) (682) (684)
 (686) (687) (688) (690)
 ITEM 682 VEHICLE AND PEDESTRIAN SIGNAL HEADS
 ITEM 684 TRAFFIC SIGNAL CABLES
 ITEM 686 TRAFFIC SIGNAL POLE ASSEMBLIES (STEEL) (416) (421) (441) (442)
 (445) (449)
 ITEM 687 PEDESTAL POLE ASSEMBLY (445) (449) (656) (682)
 ITEM 688 PEDESTRIAN DETECTORS AND VEHICLE LOOP DETECTORS (618) (624)
 (682) (684)
 ITEM 690 MAINTENANCE OF TRAFFIC SIGNALS (416) (421) (476) (610) (618)
 (620) (622) (624) (625) (627) (628) (636) (656) (680) (682)
 (684) (685) (686) (687) (688)

SPECIAL PROVISIONS: SPECIAL PROVISIONS WILL GOVERN AND TAKE
 ----- PRECEDENCE OVER THE SPECIFICATIONS ENUMERATED
 HEREON WHEREVER IN CONFLICT THEREWITH.

SPECIAL PROVISION "SCHEDULE OF LIQUIDATED DAMAGES" (000---001L)
 SPECIAL PROVISION "NONDISCRIMINATION" (000---002L)
 SPECIAL PROVISION "CERTIFICATION OF NONDISCRIMINATION IN EMPLOYMENT
 (000---003L)
 SPECIAL PROVISION "NOTICE OF REQUIREMENT FOR AFFIRMATIVE ACTION TO
 ORDER 11246) (000---004L)
 SPECIAL PROVISION "STANDARD FEDERAL EQUAL EMPLOYMENT OPPORTUNITY
 CONSTRUCTION CONTRACT SPECIFICATIONS (EXECUTIVE ORDER 11246)"
 (000---005L)
 SPECIAL PROVISION "CERTIFICATE OF INTERESTED PARTIES" (FORM 1295)
 (000---384)
 SPECIAL PROVISION "DISADVANTAGED BUSINESS ENTERPRISE IN FEDERAL AID
 CONTRACTS" (000---094L)

SPECIAL PROVISION "LEGAL RELATIONS AND RESPONSIBILITIES"
(007---001L)

SPECIAL PROVISION "TEMPORARY EROSION, SEDIMENTATION, AND ENVIRONMENTAL
CONTROLS" (506---001L)

SPECIAL SPECIFICATIONS:

SPECIAL SPECIFICATIONS TO ITEM 1002 LANDSCAPE AMENITY
SPECIAL SPECIFICATIONS TO ITEM 1005 LOOSE AGGREGATE FOR GROUNDCOVER
SPECIAL SPECIFICATIONS TO ITEM 6002 VIDEO IMAGING VEHICLE DETECTION
SYSTEM
SPECIAL SPECIFICATIONS TO ITEM 6027 VIDEO IMAGING VEHICLE DETECTION
SYSTEM
SPECIAL SPECIFICATIONS TO ITEM 7016 WATER AND SANITARY SEWER SYSTEM

REQUIRED CONTRACT PROVISIONS, FEDERAL-AID CONSTRUCTION CONTRACTS
(FORM FHWA 1273, MAY 1, 2012)

WAGE RATES EFFECTIVE JANUARY 04, 2019

GENERAL: THE ABOVE-LISTED SPECIFICATION ITEMS ARE THOSE UNDER WHICH
----- PAYMENT IS TO BE MADE. THESE, TOGETHER WITH SUCH OTHER
PERTINENT ITEMS, IF ANY, AS MAY BE REFERRED TO IN THE ABOVE LISTED
SPECIFICATION ITEMS, AND INCLUDING THE SPECIAL PROVISIONS LISTED
ABOVE, CONSTITUTE THE COMPLETE SPECIFICATIONS FOR THIS PROJECT.

TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014 Modified Items

1L-9L modifies Item 1-9 to meet all local, state, and federal statutory requirements for projects Let by Local Governments [As this Document modifies TxDOT publication “Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges 2014”]. In general, the Owner” or the “Engineer” references the CRRMA or their representatives (Consulting Engineers, etc.) Reference to “Department” or “Engineer” in the construction and maintenance specifications refers to the CRRMA except when it is referencing a TxDOT Applicaton, manual, material specification, Material Producers List or test method.

Foreword

OUTLINE OF SPECIFICATIONS

Each specification is outlined by articles and sections. The basic articles required for a specification are:

1. **DESCRIPTION**
2. **MATERIALS**
3. **EQUIPMENT**
4. **CONSTRUCTION OR WORK METHODS**
5. **MEASUREMENT**
6. **PAYMENT**

Some articles are not used in every item. Measurement and Payment articles are combined when the work described is subsidiary to bid items of the Contract.

HIERARCHY OF ORGANIZATIONAL ELEMENTS

Here “XXX” represents the item number. The hierarchy of organizational elements available below the item level is as follows:

XXX.1., Article
XXX.1.1., Section
XXX.1.1.1., Section
XXX.1.1.1.1., Section
XXX.1.1.1.1.1., Section
XXX.1.1.1.1.1.1., Section

The term section is used for all breaks below the article.

Items 1L-9L

Local Government General Requirements and Covenants

Item 1L

Abbreviations and Definitions

1. **APPLICABILITY**

Wherever the following terms are used in these specifications or other Contract documents, the intent and meaning will be interpreted as shown below.

2. **ABBREVIATIONS**

AAR	Association of American Railroads
AASHTO	American Association of State Highway and Transportation Officials ACI American Concrete Institute
ACPA	American Concrete Pipe Association AI Asphalt Institute
AIA	American Institute of Architects
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AITC	American Institute of Timber Construction ALSC American Lumber Standard Committee, Inc.
AMRL	AASHTO Materials Reference Laboratory ANLA American Nursery and Landscape Association
ANSI	American National Standards Institute
APA	The Engineered Wood Association
API	American Petroleum Institute APWA American Public Works Association
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASBI	American Segmental Bridge Institute
ASCE	American Society of Civil Engineers
ASLA	American Society of Landscape Architects ASME American Society of Mechanical Engineers ASNT American Society for Nondestructive Testing
ASTM	American Society for Testing and Materials AWC American Wood Council
AWG	American Wire Gage
AWPA	American Wood Protection Association
AWPI	American Wood Preservers Institute AWS American Welding Society
AWWA	American Water Works Association
BMP	Best Management Practices
CFR	Code of Federal Regulations
CMP	Corrugated Metal Pipe
COE	U.S. Army Corps of Engineers
CRRMA	Camino Real Regional Mobile Authority

CRSI	Concrete Reinforcing Steel Institute
DBE	Disadvantaged Business Enterprise DMS Departmental Material Specification EIA Electronic Industries Alliance
EPA	United States Environmental Protection Agency
FHWA	Federal Highway Administration, U.S. Department of Transportation FSS Federal Specifications and Standards (General Services Administration) GSA United States General Services Administration
HUB	Historically Underutilized Business ICEA Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers IESNA Illuminating Engineering Society of North America IMSA International Municipal Signal Association
ISO	International Organization for Standardization ITS Intelligent Transportation System
ITE	Institute of Transportation Engineers
LG	Local Government
LRFD	Load and Resistance Factor Design MASH Manual for Assessing Safety Hardware
MPL	Material Producer List (TxDOT document)
NCHRP	National Cooperative Highway Research Program NCR Nonconformance Report (TxDOT form)
NEC	National Electrical Code (Published by NFPA) NEMA National Electrical Manufacturers Association
NEPA	National Environmental Policy Act
NESC	National Electrical Safety Code NFPA National Fire Protection Association
NIST	National Institute of Standards and Technology NRM Nonhazardous Recyclable Material
NRMCA	National Ready Mixed Concrete Association
NSBA	National Steel Bridge Alliance
NTPEP	National Transportation Product Evaluation Program
OSHA	Occupational Safety & Health Administration, U.S. Department of Labor PCA Portland Cement Association
PCI	Precast/Prestressed Concrete Institute
PE	Professional Engineer
PPI	Plastics Pipe Institute
PS&E	Plans, Specifications, and Estimates PSL Project-Specific Location
PTI	Post-Tension Institute
QA	Quality Assurance
QC	Quality Control
RCP	Reinforced Concrete Pipe
RPLS	Registered Public Land Surveyor
RRC	Railroad Commission of Texas
SBE	Small Business Enterprise

SFPA	Southern Forest Products Association
SI	International System of Units
SPIB	Southern Pine Inspection Bureau
SSPC	The Society for Protective Coatings
TAC	Texas Administrative Code
TCEQ	Texas Commission on Environmental Quality
TDLR	Texas Department of Licensing and Regulation
TGC	Texas Government Code
TMUTCD	Texas Manual on Uniform Traffic Control Devices
TxDOT	Texas Department of Transportation
UL	Underwriters Laboratory, Inc.
USC	United States Code
WRI	Wire Reinforcement Institute
WWPA	Western Wood Products Association

3. DEFINITIONS

- 3.1. **Abrasive Blasting.** Spraying blasts of pressurized air combined with abrasive media.
- 3.2. **Actual Cost.** Contractor's actual cost to provide labor, material, equipment, and project overhead necessary for the work.
- 3.3. **Addendum.** Change in bid documents developed between advertising and bid submittal deadline.
- 3.4. **Additive Alternate.** A bid item contained in the bid documents that is not a regular item or a replacement alternate bid item. The additive alternate items include work that may be added to the base bid work.
- 3.5. **Deductive Alternate.** A bid item contained in the bid documents that is not a regular item or a replacement alternate bid item. The deductive alternate items include work that may be deducted from the base bid work.
- 3.6. **Advertisement.** The public announcement required by law inviting bids for work to be performed or materials to be furnished.
- 3.7. **Affiliates.** Two or more firms are affiliated if they share common officers, directors, or stockholders; a family member of an officer, director, or stockholder of one firm serves in a similar capacity in another of the firms; an individual who has an interest in, or controls a part of, one firm either directly or indirectly also has an interest in, or controls a part of, another of the firms; the firms are so closely connected or associated that one of the firms, either directly or indirectly, controls or has the power to control another

firm; one firm controls or has the power to control another of the firms; or the firms are closely allied through an established course of dealings, including, but not limited to, the lending of financial assistance.

- 3.8. **Air Blasting.** Spraying blasts of pressurized air free of oil and moisture.
- 3.9. **Air Temperature.** The temperature measured in degrees Fahrenheit (°F) in the shade, not in the direct rays of the sun, and away from artificial heat.
- 3.10. **Anticipated Profit.** Profit for work not performed.
- 3.11. **Apparent Low Bidder.** The Bidder determined to have the numerically lowest total bid as a result of the tabulation of bids by the Owner.
- 3.12. **Architect of Record.** A person registered as an architect or licensed as a landscape architect, in accordance with State law, exercising overall responsibility for the design or a significant portion of the design and performs certain Contract administration responsibilities as described in the Contract; or a firm employed by the Owner to provide professional architectural services.
- 3.13. **Arterial Highway.** A highway used primarily for through traffic and usually on a continuous route.
- 3.14. **Notice of Award.** The Owner's acceptance of a Contractor's bid for a proposed Contract that authorizes the Owner to enter into a Contract.
- 3.15. **Base Bid.** The total bid amount without additive alternates.
- 3.16. **Bid.** The offer from the Bidder for performing the work described in the bid documents, submitted on the prescribed bid form, considering addenda issued and giving unit bid prices for performing the work described in the bid documents.
- 3.17. **Bid Bond.** The security executed by the Contractor and the Surety furnished to the Owner to guarantee payment of liquidated damages if the Contractor fails to enter into an awarded Contract.
- 3.18. **Bid Documents.** The complete set of documents necessary for a Bidder to submit a bid. The documents may include plans, specifications, special specifications, special provisions, addenda, and the prescribed form a Bidder is to submit as the Bid. Other terms used may include general conditions, proposal, instructions to bidders, bid packet, and construction specifications.
- 3.19. **Bid Error.** A mathematical mistake made by a Bidder in the unit price entered onto the bid documents.

- 3.20. **Bid Form.** The portion of the bid documents that a prospective Bidder must submit to the Owner for their bid to be considered.
- 3.21. **Bidder.** An individual, partnership, limited liability company, corporation, or joint venture submitting a bid for a proposed Contract.
- 3.22. **Blast Cleaning.** Using one of the blasting methods, including, but not limited to, water blasting, low-pressure water blasting, high-pressure water blasting, abrasive blasting, water-abrasive blasting, shot blasting, slurry blasting, water injected abrasive blasting, and brush blasting.
- 3.23. **Bridge.** A structure, including supports, erected over a depression or an obstruction (e.g., water, a highway, or a railway) having a roadway or track for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 ft. between faces of abutments, spring lines of arches, or extreme ends of the openings for multiple box culverts.
- 3.24. **Brush Blasting.** Sweeping lightly with an abrasive blast to remove loose material.
- 3.25. **Building Contract.** A Contract entered under State law for the construction or maintenance of an Owner building or appurtenance facilities. Building Contracts are considered to be construction Contracts.
- 3.26. **Certificate of Insurance.** A form approved by the Owner covering insurance requirements stated in the Contract.
- 3.27. **Change Order.** Written order to the Contractor detailing changes to the specified work, item quantities or any other modification to the Contract.
- 3.28. **Concrete Construction Joint.** A joint formed by placing plastic concrete in direct contact with concrete that has attained its initial set.
- 3.29. **Concrete Repair Manual.** TxDOT manual specifying methods and procedures for concrete repair as an extension of the standard specifications.
- 3.30. **ConcreteWorks®.** TxDOT-owned software for concrete heat analysis. Software is available on the TxDOT's website.
- 3.31. **Construction Contract.** A Contract entered under State law for the construction, reconstruction, or maintenance of a segment of the Owner's transportation system.
- 3.32. **Consultant.** The licensed professional engineer or engineering firm, or the architect or architectural firm, registered in the State of Texas and under Contract to the Owner to

perform professional services. The consultant may be the Engineer or architect of record or may provide services through and be subcontracted to the Engineer or architect of record.

- 3.33. **Contract.** The agreement between the Owner and the Contractor establishing the obligations of the parties for furnishing of materials and performance of the work prescribed in the Contract documents.
- 3.34. **Contract Documents.** Elements of the Contract, including, but not limited to, the plans, specifications incorporated by reference, special provisions, special specifications, Contract bonds, change orders, addendums, and supplemental agreements.
- 3.35. **Contract Time.** The number of days specified for completion of the work, including authorized additional working days.
- 3.36. **Contractor.** The individual, partnership, limited liability company, corporation, or joint venture and all principals and representatives with which the Contract is made by the Owner.
- 3.37. **Controlled Access Highway.** Any highway to or from which access is denied or controlled, in whole or in part, from or to abutting land or intersecting streets, roads, highways, alleys, or other public or private ways.
- 3.38. **Control of Access.** The condition in which the right to access of owners or occupants of abutting land or other persons in connection with a highway is fully or partially controlled by public authority.
- 3.39. **Control Point.** An established point shown on the plans to provide vertical and horizontal references for geometric control for construction.
- 3.40. **Cross-Sections.** Graphic representations of the original ground and the proposed facility, at right angles to the centerline or base line.
- 3.41. **Culvert.** Any buried structure providing an opening under a roadway for drainage or other purposes. Culverts may also be classified as bridges. (See Section 1.3.23., "Bridge.")
- 3.42. **Cycle.** The activity necessary for performing the specified work within the right of way project limits once.
- 3.43. **Daily Road User Cost.** Damages based on the estimated daily cost of inconvenience to the traveling public resulting from the work.
- 3.44. **Date of Written Authorization.** Date of the written Notice to proceed authorizing the Contractor to begin work.

- 3.45. **Debar (Debarment).** Action taken by the Owner, State, or federal government pursuant to regulation that prohibits a person or company from entering into a Contract, or from participating as a subcontractor, or supplier of materials or equipment used in a highway improvement Contract as defined in local, state, or federal law.
- 3.46. **Detour.** A temporary traffic route around a closed portion of a road.
- 3.47. **Department.** When used in the context of the party with whom the Contractor has a Construction Contract, Department refers to Owner. When used in other contexts such as technical specifications, refers to the Texas Department of Transportation.
- 3.48. **Departmental Material Specifications.** Reference specifications for various materials published by TxDOT's Construction Division with a DMS-XXXXX numbering system.
- 3.49. **Direct Traffic Culvert.** Concrete box culvert whose top slab is used as the final riding surface or is to have an overlay or other riding surface treatment.
- 3.50. **Disadvantaged Business Enterprise.** A small business certified through the Texas Unified Certification Program in accordance with 49 CFR Part 26, that is at least 51% owned by one or more socially and economically disadvantaged individuals, or in the case of a publicly owned business, in which is at least 51% of the stock is owned by one or more socially and economically disadvantaged individuals, and whose management and daily business operations are controlled by one or more of the individuals who own it.
- 3.51. **Divided Highway.** A highway with separate roadways intended to move traffic in opposite directions.
- 3.52. **Easement.** A real property right acquired by one party to use land belonging to another party for a specified purpose.
- 3.53. **Engineer.** The Professional Engineer licensed in Texas who represents the interests of the Owner.
- 3.54. **Entity.** Political subdivision for which the project is designed and constructed. Either a Municipality (City) or a County or other entity organized under the authority of State of Texas statutes. May also be referred to as an Owner.
- 3.55. **Expressway.** A divided arterial highway for through traffic with full or partial control of access and generally with grade separations at intersections.
- 3.56. **Family Member.** A family member of an individual is the individual's parent, parent's

spouse, step-parent, step-parent's spouse, sibling, sibling's spouse, spouse, child, child's spouse, spouse's child, spouse's child's spouse, grandchild, grandparent, uncle, uncle's spouse, aunt, aunt's spouse, first cousin, or first cousin's spouse.

- 3.57. **Force Account.** Payment for directed work based on the actual cost of labor, equipment, and materials furnished with markups for project overhead and profit.
- 3.58. **Freeway.** An expressway with full control of access.
- 3.59. **Frontage Road.** A local street or road auxiliary to and located along an arterial highway for service to abutting property and adjacent areas and for control of access (sometimes known as a service road, access road, or insulator road).
- 3.60. **Hazardous Materials or Waste.** Hazardous materials or waste include, but are not limited to, explosives, compressed gas, flammable liquids, flammable solids, combustible liquids, oxidizers, poisons, radioactive materials, corrosives, etiologic agents, and other material classified as hazardous by 40 CFR 261, or applicable state and federal regulations.
- 3.61. **High-Pressure Water Blasting.** Water blasting with pressures between 5,000 and 10,000 PSI.
- 3.62. **Highway, Street, or Road.** General terms denoting a public way for purposes of vehicular travel, including the entire area within the right of way. Recommended usage in urban areas is highway or street; in rural areas, highway or road.
- 3.63. **Historically Underutilized Business.** A corporation, sole proprietorship, partnership, or joint venture formed for the purpose of making a profit certified by the Texas Comptroller of Public Accounts, and 51% owned by one or more persons who are economically disadvantaged because of their identification as members of certain groups, including African Americans, Hispanic Americans, Asian-Pacific Americans, Native Americans, or women, and have a proportionate interest and demonstrate active participation in the control, operation, and management of the business' affairs. Individuals meeting the HUB definition are required to be residents of the State of Texas. Businesses that do not have their primary headquarters in the State of Texas are not eligible for HUB certification.
- 3.64. **Incentive/Disincentive Provisions.** An adjustment to the Contract price of a predetermined amount for each day the work is completed ahead of or behind the specified milestone, phase, or Contract completion dates. The amount of the incentive/disincentive is determined based on estimated costs for engineering, traffic control, delays to the motorists, and other items involved in the Contract.
- 3.65. **Independent Assurance Tests.** Tests used to evaluate the sampling and testing

techniques and equipment used in the acceptance program. The tests are performed by the Owner or the Owner's representative and are not used for acceptance purposes.

- 3.66. **Inspector.** The person assigned by the Owner to inspect any or all parts of the work and the materials used for compliance with the Contract.
- 3.67. **Intelligent Transportation System.** An integrated system that uses video and other electronic detection devices to monitor traffic flows.
- 3.68. **Intersection.** The general area where 2 or more highways, streets, or roads join or cross, including the roadway and roadside facilities for traffic movements within it.
- 3.69. **Island.** An area within a roadway from which vehicular traffic is intended to be excluded, together with any area at the approach occupied by protective deflecting or warning devices.
- 3.70. **Joint Venture.** Any combination of individuals, partnerships, limited liability companies, or corporations submitting a single bid form.
- 3.71. **Lane Rental.** A method to assess the Contractor daily or hourly rental fees for each lane, shoulder, or combination of lanes and shoulder taken out of service.
- 3.72. **Letting.** The receipt, opening, tabulation, and determination of the apparent low Bidder.
- 3.73. **Letting Official.** The Owner representative empowered by the Owner to officially receive bids and close the receipt of bids at a letting.
- 3.74. **Licensed Professional Engineer.** A person who has been duly licensed by the Texas Board of Professional Engineers to engage in the practice of engineering in the State of Texas; also referred to as a Professional Engineer.
- 3.75. **Limits of Construction.** An area with established boundaries, identified within the highway right of way and easements, where the Contractor is permitted to perform the work.
- 3.76. **Local Street or road** A street or road primarily for access to residence, business, or other abutting property.
- 3.77. **Low Pressure Water Blasting.** Water blasting with pressures between 3,000 and 5,000 PSI.
- 3.78. **Major Item.** An item of work included in the Contract that has a total cost equal to or greater than 5% of the original Contract or \$100,000 whichever is less. A major item at the time of bid will remain a major item. An item not originally a major item does not

become one through the course of the Contract.

- 3.79. **Material Producer List.** TxDOT-maintained list of approved products. Referenced as “Department’s MPL”.
- 3.80. **Materially Unbalanced Bid.** A bid that generates a reasonable doubt that award to the Bidder submitting a mathematically unbalanced bid will result in the lowest ultimate cost to the Owner.
- 3.81. **Mathematically Unbalanced Bid.** A bid containing 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.
- 3.82. **Median.** The portion of a divided highway separating the traffic lanes in opposite directions.
- 3.83. **Milestone Date.** The date that a specific portion of the work is to be completed, before the completion date for all work under the Contract.
- 3.84. **Monolithic Concrete Placement.** The placement of plastic concrete in such manner and sequence to prevent a construction joint.
- 3.85. **National Holidays.** January 1, the last Monday in May, July 4, the first Monday in September, the fourth Thursday in November, and December 24 or December 25.
- 3.86. **New.** Any time this word appears in the documents it shall be considered as work necessary to complete the required improvements as shown on the plans. The contractor shall include all “New” items as part of the bid. The terms “Proposed” and “New” shall be considered equal when bidding this project.
- 3.87. **Nonhazardous Recyclable Material.** A material recovered or diverted from the nonhazardous waste stream for the purposes of reuse or recycling in the manufacture of products that may otherwise be produced using raw or virgin materials.
- 3.88. **Nonresident Bidder.** A Bidder whose principal place of business is not in Texas. This includes a Bidder whose ultimate parent company or majority owner does not have its principal place of business in Texas.
- 3.89. **Nonresponsive Bid.** A bid that does not meet the criteria for acceptance contained in the bid documents.
- 3.90. **Non-Site-Specific Contracts.** Contracts in which a geographic region is specified for the work and for which work orders, with or without plans, further detail the limits and work to be performed.

- 3.91. **Notice to Proceed**, Written notification to the Contractor authorizing work to begin.
- 3.92. **Notification**. Either written or oral instruction to the Contractor concerning the work. Voice mail is oral notification.
- 3.93. **Owner**, Political subdivision for whom the project is designed and constructed. Either a Municipality (City), a County or other entity organized under the authority of State of Texas statutes. May also be referred to as an Entity.
- 3.94. **Pavement**. That part of the roadway having a constructed surface for the use of vehicular traffic.
- 3.95. **Pavement Structure**. Combination of surface course and base course placed on a subgrade to support the traffic load and distribute it to the roadbed.
- 3.95.1. **Surface Course**. Pavement structure layers designed to accommodate the traffic load. The top layer resists skidding, traffic abrasion, and the disintegrating effects of climate and is sometimes called the wearing course.
- 3.95.2. **Base Course**. One or more layers of specified material thickness placed on a subgrade to support a surface course.
- 3.95.3. **Subgrade**. The top surface of a roadbed upon which the pavement structure, shoulders, and curbs are constructed.
- 3.95.4. **Subgrade Treatment**. Modifying or stabilizing material in the subgrade.
- 3.96. **Payment Bond**. The security executed by the Contractor and the Surety, furnished to the Owner to guarantee payment of all legal debts of the Contractor pertaining to the Contract.
- 3.97. **Performance Bond**. The security executed by the Contractor and the Surety, furnished to the Owner to guarantee the completion of the work in accordance with the terms of the Contract.
- 3.98. **Plans**. The approved drawings, including true reproductions of the drawings that show the location, character, dimensions, and details of the work and are a part of the Contract.
- 3.99. **Power of Attorney for Surety Bonds**. An instrument under corporate seal appointing an attorney in fact to act on behalf of a Surety in signing bonds.
- 3.100. **Qualification**. The process for determining a Contractor's eligibility to be awarded a construction contract
- 3.101. **Prequalification**. The process for determining a Contractor's eligibility to bid work.

- 3.102. **Prequalification Statement.** The forms on which required information is furnished concerning the Contractor's ability to perform and finance the work.
- 3.103. **Prequalified Contractor.** A contractor that is approved to bid on TxDOT contracts by satisfying their Prequalification Process.
- 3.104. **Post Qualification.** The owner will determine if contractors are qualified to bid on the project after bids are open. The bid documents will identify the minimum requirements that contractor must meet to be qualified for the project. Unqualified contractors' bids will be considered non-responsive and not accepted.
- 3.105. **Project-Specific Location.** A material source, plant, waste site, parking area, storage area, field office, staging area, haul road, or other similar location either outside the project limits or within the project limits but not specifically addressed in the Contract.
- 3.106. **Proposed.** Any time this word appears in the documents it shall be considered as work necessary to complete the required improvements as shown on the plans. The contractor shall include all "Proposed" items as part of the bid. The terms "Proposed" and "New" shall be considered equal when bidding this project.
- 3.107. **Proposal Guaranty.** The security furnished by the Bidder as a guarantee that the Bidder will enter into a Contract if awarded the work.
- 3.108. **Quality Assurance.** Sampling, testing, inspection, and other activities conducted by the Engineer to determine payment and make acceptance decisions.
- 3.109. **Quality Control.** Sampling, testing, and other process control activities conducted by the Contractor to monitor production and placement operations.
- 3.110. **Ramp.** A section of highway for the primary purpose of making connections with other highways.
- 3.111. **Referee Tests.** Tests requested to resolve differences between Contractor and Owner test results. The referee laboratory is the Owners.
- 3.112. **Regular Item.** A bid item contained in the bid documents and not designated as an additive alternate or replacement alternate bid item.
- 3.113. **Rental Rate Blue Book for Construction Equipment.** Publication containing equipment rental rates.
- 3.114. **Replacement Alternate.** A bid item identified on the bid documents that a Bidder may substitute for a specific regular item of work.
- 3.115. **Responsive Bid.** A bid that meets all requirements of the advertisement and the bid

documents for acceptance.

- 3.116. **Right of Way.** A general term denoting land or property devoted to transportation purposes.
- 3.117. **Roadbed.** The graded portion of a highway prepared as foundation for the pavement structure and shoulders. On divided highways, the depressed median type and the raised median type highways are considered to have 2 roadbeds. Highways with a flush median are considered to have 1 roadbed. Frontage roads are considered separate roadbeds.
- 3.118. **Road Master.** A railroad maintenance official in charge of a division of railway.
- 3.119. **Roadside.** The areas between the outside edges of the shoulders and the right of way boundaries. Unpaved median areas between inside shoulders of divided highways and areas within interchanges are included.
- 3.120. **Roadway.** The portion of the highway (including shoulders) used by the traveling public.
- 3.121. **Sandblasting, Dry.** Spraying blasts of pressurized air combined with sand.
- 3.122. **Sandblasting, Wet.** Spraying blasts of pressurized water combined with sand.
- 3.123. **Shoulder.** That portion of the roadway contiguous with the traffic lanes for accommodation of stopped vehicles for emergency use or for lateral support of base and surface courses.
- 3.124. **Shot Blasting.** Spraying blasts of pressurized air combined with metal shot.
- 3.125. **Sidewalk.** Portion of the right of way constructed exclusively for pedestrian use.
- 3.126. **Slurry Blasting.** Spraying blasts of pressurized air combined with a mixture of water and abrasive media.
- 3.127. **Special Provisions.** Additions or revisions to these standard specifications or special specifications.
- 3.128. **Special Specifications.** Supplemental specifications applicable to the Contract not covered by these standard specifications.
- 3.129. **Specifications.** Directives or requirements issued or made pertaining to the method and manner of performing the work or to quantities and qualities of materials to be furnished under the Contract. References to DMSS, ASTM or AASHTO specifications, or TxDOT bulletins and manuals, imply the latest standard or tentative standard in effect on the date of the bid. The Owner will consider incorporation of subsequent changes to these documents in accordance with Item 4L, "Scope of Work."

- 3.130. **Small Business Enterprise.** A firm (including affiliates) whose annual gross receipts do not exceed the U.S. Small Business Administration's size standards for 4 consecutive years.
- 3.131. **State.** The State of Texas.
- 3.132. **State Holiday.** A holiday authorized by the State Legislature excluding optional state holidays and not listed in Section 1.3.85., "National Holidays." A list of state holidays can be found on the TxDOT's website.
- 3.133. **Station.** A unit of measurement consisting of 100 horizontal feet.
- 3.134. **Subcontract.** The agreement between the Contractor and subcontractor establishing the obligations of the parties for furnishing of materials and performance of the work prescribed in the Contract documents.
- 3.135. **Subcontractor.** An individual, partnership, limited liability company, corporation, or any combination thereof that the Contractor sublets, or proposes to sublet, any portion of a Contract, excluding a material supplier, a hauling firm hauling only from a commercial source to the project, truck owner-operator, wholly-owned subsidiary, or specialty-type businesses such as security companies and rental companies.
- 3.136. **Subsidiary.** Materials, labor, or other elements that because of their nature or quantity have not been identified as a separate item and are included within the items on which they necessarily depend.
- 3.137. **Substructure.** The part of the structure below the bridge seats, but not including bearings, drilled shafts, or piling. Parapets, back walls, wing walls of the abutments, and drainage structures are considered parts of the substructure.
- 3.138. **Superintendent.** The representative of the Contractor who is available at all times and able to receive instructions from the Owner or authorized Owner representatives and to act for the Contractor.
- 3.139. **Superstructure.** The part of the structure above the bridge seats or above the springing lines of arches and including the bearings. Flatwork construction may be considered superstructure.
- 3.140. **Supplemental Agreement.** Written agreement entered into between the Contractor and the Owner and approved by the Surety, covering alterations and changes in the Contract. A supplemental agreement is used by the Owner whenever the modifications include assignment of the Contract from one party to another or other cases as desired by the Owner.
- 3.141. **Surety.** The corporate body or bodies authorized to do business in Texas bound with and for the Contractor for the faithful performance of the work covered by the Contract and

- for the payment for all labor and material supplied in the prosecution of the work.
- 3.142. **Surplus Materials.** Any debris or material related to the Contract but not incorporated into the work.
- 3.143. **Suspension.** Action taken by the Owner, State, or federal government pursuant to regulation that prohibits a person or company from entering into a Contract, or from participating as a subcontractor, or supplier of materials or equipment used in a contract
- 3.144. **Tex –XXX-X.** TxDOT material test methods found on TxDOT’s Construction Division Web Site.
- 3.145. **Traffic Lane.** The strip of roadway intended to accommodate the forward movement of a single line of vehicles.
- 3.146. **Traveled Way.** The portion of the roadway for the movement of vehicles, exclusive of shoulders and auxiliary lanes.
- 3.147. **Truck Owner-Operator.** An individual who owns and operates 1 truck for hire.
- 3.148. **UT-Bridge.** TxDOT-owned software for steel girder erection. Software is available on TxDOT’s website.
- 3.149. **UT-Lift.** TxDOT-owned software for steel girder erection. Software is available on TxDOT’s website.
- 3.150. **Utility. Privately,** publicly, or cooperatively owned lines, facilities, and systems for producing, transmitting, or distributing communications, power, heat, gas, oil, water, waste, or storm water that are not connected with the highway drainage, signal systems, or other products that directly or indirectly serve the public; the utility company.
- 3.151. **Verification Tests.** Tests used to verify accuracy of QC and QA and mixture design testing.
- 3.152. **Water-Abrasive Blasting.** Spraying blasts of pressurized water combined with abrasive media.
- 3.153. **Water Blasting.** Spraying blasts of pressurized water of at least 3,000 PSI.
- 3.154. **Water-Injected Abrasive Blasting.** Abrasive blasting with water injected into the abrasive/air stream at the nozzle.
- 3.155. **Wholly-Owned Subsidiary.** A legal entity owned entirely by the Contractor or subcontractor.

- 3.156. **Work.** The furnishing of all labor, materials, equipment, and other incidentals necessary for the successful completion of the Contract.
- 3.157. **Written Notice.** Written notice is considered to have been duly given if delivered in person to the individual or member to whom it is intended or if sent by regular, registered, or certified mail and delivered to the last known business address; sent by facsimile to the last known phone number; or sent by e-mail to the last known address. The date of the letter will serve as the beginning day of notice. Unclaimed mail or failure to provide current mailing address will not be considered a failure to provide written notice.

Item 2L

Instructions to Bidders

1. Introduction

Instructions to the Contractor in these specifications are generally written in active voice, imperative mood. The subject of imperative sentences is understood to be “the Contractor.” The Owner’s responsibilities are generally written in passive voice, indicative mood. Phrases such as “as approved,” “unless otherwise approved,” “upon approval,” “as directed,” “as verified,” “as ordered,” and “as determined” refer to actions of the Engineer unless otherwise stated, and it is understood that the directions, orders, or instructions to which they relate are within the limitations of and authorized by the Contract.

2. Eligibility of Bidders

Bidders on this project must be prequalified through TxDOT. Refer to TxDOT’s web site for prequalification requirements. Assume prequalification documents are submitted to CRRMA at least 14 days before bid opening. Comply with all technical prequalification requirements in the bid documents.

3. Issuing Bid documents

Bid Documents for prequalified bidders may be obtained at **Atkins North America at (915) 533-6601**. Copies will be available in CD format at no cost.

At the time Bid Documents are obtained, Bidder must provide a working e-mail address, so as to receive any addenda or clarification issued by the Owner.

The Owner will not issue bid documents if one or more of the following apply:

- the Bidder is prohibited from rebidding a specific project due to a bid error on the original bid documents,
- the Bidder failed to enter into a Contract on the original award,
- the Bidder was defaulted or terminated on the original Contract, unless the Owner terminated for convenience, or
- the Bidder or a subsidiary or affiliate of the Bidder has received compensation from the Owner to participate in the preparation of the plans or specifications on which the bid or Contract is based.

4. Interpreting Estimated Quantities

The quantities listed in the bid documents are approximate and will be used for the comparison of bids. Payments will be made for actual quantities of work performed in accordance with the Contract.

5. Examining Documents and Work Locations

Examine the bid documents and specified work locations before submitting a bid for the work. Submitting a bid will be considered evidence that the Bidder has performed this examination. Borings, soil profiles, water elevations, and underground utilities shown on the plans were obtained for the use of the Owner in the preparation of plans. This information is provided for the Bidder's information only and the Owner makes no representation as to the accuracy of the data. Be aware of the difficulty of accurately classifying all material encountered in making foundation investigations, the possible erosion of stream channels and banks after survey data have been obtained, and the unreliability of water elevations other than for the date recorded.

Oral explanations, instructions, or consideration for Contractor-proposed changes in the bid documents given during the bidding process are not binding. Only requirements included in the bid documents and Owner-issued addenda are binding. Request explanations of documents at least five (5) days prior to the bid opening.

Immediately notify the Owner of any error, omission, or ambiguity discovered in any part of the bid documents. The Owner will issue addenda when appropriate.

6. Preparing the Bid

Prepare the bid form furnished by the Owner. Informational bid forms printed from the Owner's website will not be accepted.

Specify a unit price in dollars and cents for each regular item, additive alternate item, deductive alternate item or replacement alternate item for which an estimated quantity is given.

When "Working Days" is an item, submit the number of working days to be used to complete the Contract or phases of the Contract.

The Owner will not accept an incomplete bid. A bid that has one or more of the deficiencies listed below is considered incomplete:

- the bid form was not signed,
- all certifications were not acknowledged,

- a regular item, additive alternate item or deductive alternate item is left blank,
- a regular item and the corresponding replacement alternate item are left blank,
- the bid form submitted had the incorrect number of items, or
- all addenda were not acknowledged.

7. **Nonresponsive Bid**

The Owner will not accept a nonresponsive bid. A bid that has one or more of the deficiencies listed below is considered nonresponsive:

- The bid was not in the hands of the Letting Official at the time and location specified in the advertisement.
- A bid was submitted for the same project by a Bidder or Bidders and one or more of its partners or affiliates.
- The Bidder failed to acknowledge receipt of all addenda issued.
- The bid form was signed by a person who was not authorized to bind the Bidder or Bidders.
- The bid guaranty did not comply with the requirements contained in this Item.
- The bid was in a form other than the official bid form issued by the Owner.
- The Bidder modified the bid in a manner that altered the conditions or requirements for work as stated in the bid documents.
- The Bidder bid more than the maximum or less than the minimum number of allowable working days when working days was an item.
- The Bidder did not attend a specified mandatory pre-bid conference.
- The Bidder did not meet the requirements of the technical qualification.
- The Bidder did not include a signed State of Texas Child Support Business Ownership Form.
- The bidder is not prequalified by TxDOT

8. **Submittal of bids**

8.1 **Electronic Bids** Electronic bidding is not available

8.2 **Printed Bid.**

8.2.1 **Bid Form.** Mark all entries in ink. As an alternative to hand writing the unit prices in the bid form, submit a typed bid form.

8.2.2. When regular bid items have corresponding replacement alternate items, select the bid item or group of items to be used for the bid tabulation. Acknowledge all addenda by checking the appropriate box on the addendum acknowledgement page. Provide the complete and correct name of the Bidder submitting the bid. A person authorized to bind the Bidder must sign the bid form. In the case of a joint venture, provide the complete and correct name of all Bidders submitting the bid. In the case of a joint venture, the person signing the bid form must be authorized to bind all joint venture participants.

If a bid form contains both regular items for domestic steel or iron materials and replacement alternate items for foreign steel or iron materials, the Bidder must either:

- Submit unit bid prices for domestic items only, or
- Submit unit bid prices for both the domestic and foreign items.

8.2.3. **Bid Guaranty.** Provide a bid guaranty in the amount indicated on the bid documents. Use either a guaranty check or a printed bid bond. An electronic bid bond may be used as the guaranty. Ensure the electronic bid bond meets the requirements of Section 2.8.1.2., “Bid Guaranty,” and submit the electronic bid bond with the printed bid.

8.2.4. **Guaranty Check.** Make the check payable to the Owner. The check must be a cashier’s check, money order, or teller’s check drawn by or on a state or national bank, or a state or federally chartered credit union (collectively referred to as “bank”). The check must be dated on or before the date of the bid opening. Postdated checks will not be accepted. The type of check or money order must be indicated on the face of the instrument, except in the case of a teller’s check, and the instrument must be no more than 90 days old. A check must be made payable at or through the institution issuing the instrument; be drawn by a bank and on a bank; or be payable at or through a bank. The Owner will not accept personal checks, certified checks, or other types of money orders.

8.2.5. **Bid Bond.** Use the bid bond form provided by the Owner. Submit the bid bond with the powers of attorney attached, and in the amount specified. The bond must be dated on or before the date of the bid opening, bear the impressed seal of the Surety, and be signed by the Bidder or Bidders and an authorized individual of the Surety. As an alternative for joint venture Bidders, each of the Bidders may submit a separate bid bond completed as outlined in this section. Bid bonds will only be accepted from Sureties authorized to execute a bond under and in accordance with State law.

- 8.2.6. **Submittal of Bid.** Place the completed bid form and the bid guaranty in a sealed envelope marked to indicate the contents.

When submitting by mail or delivery service, place the envelope in another sealed envelope and address as indicated in the official advertisement or in the bid documents. It is the Bidder's responsibility to ensure that the sealed bid arrives at the location described on or before the time and date set for the bid opening. To be accepted, the bid must be in the hands of the Letting Official by that time of opening regardless of the method chosen for delivery.

- 8.2.7. **Revising the Bid Form.** Make desired changes to the bid form in ink and submit the bid to the Letting Official. The Owner will not make revisions to a bid on behalf of a Bidder.

- 8.2.8. **Withdrawing a Bid.** Submit a written request to withdraw a bid before the time and date set for the opening. The Owner will not accept oral requests. A written request must be signed and submitted to the Letting Official with proof of identification. The request must be made by a person authorized to bind the Bidder or Bidders. In the case of joint venture, the Owner will accept a request from any person authorized to bind a party to the joint venture. The Owner may require written delegation of authority to withdraw a bid when the individual sent to withdraw the bid is not authorized to bind the Bidder or Bidders.

9. Opening and Reading of Bids

At the time, date, and location specified in the official advertisement, the Owner will publicly open and read bids.

10. Tabulating Bids

- 10.1. **Official Total Bid Amount.** The Owner will sum the products of the quantities and the unit prices bid in the bid form to determine the official total bid amount, except as provided in Section 2.11., "Consideration of Unit Prices." The official total bid amount is the basis for determining the apparent low Bidder. The total bid amounts will be compared, and the results made public.

- 10.2. **Rounding of Unit Prices.** The Owner will round off all unit bids involving fractional parts of a cent to the nearest one-tenth cent (\$0.001) in determining the amount of the bid as well as computing the amount due for payment of each item under the Contract. For rounding purposes, entries of five-hundredths of a cent (\$0.0005) or more will be rounded up to the next highest tenth of a cent, while entries less than five-hundredths of a cent will be rounded down to the next lowest tenth of a cent.

10.3. **Interpretation of Unit Prices.** The Owner will make a documented determination of the unit bid price if a unit bid price is illegible or conflicting in the case of replacement alternate items. The Owner's determination will be final.

10.4. **Consideration of Unit Prices.**

10.4.1 **A + B Bidding.** The official total bid amount will be determined by the summation of the Contract amount and the time element. The Owner will use the following formula to make the calculation:

$$A + B1 + B2 + BX + \dots + BT$$

The Contract amount, equal to A in the formula, is determined by the summation of the products of the approximate quantities shown in the bid and the unit bid prices bid. The time element, equal to B1, B2, BX (when phases are included as bid components), and BT (substantial completion of the project when included as a bid component), of the bid is determined by multiplying the number of working days bid to substantially complete the project, or phases, by the daily road-user cost (RUC) provided on the bid documents. When partial days are bid they will be rounded up to the nearest whole day.

The formula above determines the low Bidder and establishes the Contract time.

10.4.1.1 **Additive Alternate Items.** The Camino Real Mobility Authority (CRRMA) will sum the products of the quantities and the unit prices bid for the regular items in the proposal form to determine the total bid amount for the base bid. The official total bid amount will be determined by the summation of the base bid plus a pre-determined order of additive alternate items, not to exceed the CRRMA's budgeted amount for the Contract. An estimate of the budgeted amount may be shown on the plans.

The Contract will identify the base bid work and additive alternate work to be performed. The CRRMA makes no guarantee that the additive alternate work will be required.

10.4.2 **"Buy America."** Comply with Buy America in accordance with Article 6.1.1. For a Bidder who proposes to use foreign steel or iron materials to be considered the apparent low Bidder, their total bid must be at least 25% lower than the next lowest bid if that bid proposes to use domestic steel or iron materials.

This requirement does not apply to minimal use of steel or iron materials provided that the total cost of all foreign source items used in the project, as delivered to the project site, is less than \$2,500 or one-tenth-of-one-percent (1/10 of 1%) of the Contract amount, whichever is greater.

11. Consideration of Bid Errors.

The Owner will consider a claim of a bid error by the apparent low Bidder if the following requirements have been met:

- Submit written notification to the Owner within 5 business days after the date the bid is opened.
 - Identify the items of work involved and include bidding documentation.
- The Owner may request clarification of submitted documentation.

The Owner will evaluate the claim of an error by the apparent low Bidder by considering the following:

- The bid error relates to a material item of work.
- The bid error amount is a significant portion of the total bid.
- The bid error occurred despite the exercise of ordinary care.
- The delay of the proposed work will not impact cost and safety to the public.

Acceptance of the bid error claim by the Owner will result in the rejection of the bid of the apparent low bidder and the Owner may consider the second responsive bid. The erring Contractor will not be allowed to bid the project if it is relet. Rejection of bids due to the Contractor's bid error may result in the application of sanctions by the Owner.

12. Tie Bids

If the official total bid amount for 2 or more Bidders is equal and those bids are the lowest submitted, each tie Bidder will be given an opportunity to withdraw their bid. If 2 or more tie Bidders do not withdraw their bids, the low Bidder will be determined by a coin toss. If all tie Bidders request to withdraw their bids, no withdrawals will be allowed, and the low Bidder will be determined by a coin toss. The Letting Official will preside over the proceedings for the coin toss.

Item 3L

Award and Execution of Contract

1. Award of Contract

The Owner will award, reject, or defer the Contract within 30 days after the opening of the bid. The Owner reserves the right to reject any or all bids and to waive technicalities in the best interest of the Owner.

- 1.1. Award. The Owner will award the Contract to the low Bidder as determined by Article 2.10., "Tabulating Bids." The Owner may award a Contract to the second lowest Bidder when the following requirements have been met:

- The low Bidder withdraws its bid.
- The low Bidder fails to enter into a contract with the Owner after Award
- The second low Bidder's unit bid prices are reasonable.

- 1.2. Rejection. The Owner will reject the Contract if:

- Collusion may have existed among the Bidders. Collusion participants will not be allowed to bid future bids for the same Contract.
- The low bid is mathematically and materially unbalanced. The Bidder will not be allowed to bid future bids for the same Contract.
- The lowest bid is higher than the Owner's estimate and re-advertising for bids may result in a lower bid.
- Rejection of the Contract is in the best interest of the Owner.

- 1.3. **Deferral.** The Owner may defer the award or rejection of the Contract when deferral is in the best interest of the Owner.

2. Rescinding of Award

The Owner reserves the right to cancel the award of any Contract before Contract execution with no compensation due when the cancellation is in the best interest of the Owner. The Owner will return the bid guaranty to the Contractor.

3. Disadvantaged Business Enterprise (DBE)/HISTORICALLY UNDERUTILIZED BUSINESS/Small Business Enterprise (SBE)

Submit all DBE/HUB/SBE information in the time frame specified when required by the bid documents.

4. Execution of Contract

Provide the following within 15 days after written notification of award of the Contract:

- 4.1. Contract. Executed by Contractor and Surety.
- 4.2. Bonds. Executed performance bond and payment bond in the full amount of the Contract price with powers of attorney. Provide bonds in accordance with Table 1. Furnish the payment and performance bonds as a guaranty for the protection of the claimants and the Owner for labor and materials and the faithful performance of the work.

Table 1
Bonding Requirements

Contract Amount	Required Bonds
Less than \$25,000	None
\$25,000 to \$100,000	Payment
More than \$100,000	Performance and Payment

- 4.3. **Insurance.** Submit a Certificate of Insurance showing coverages in accordance with Contract requirements.

Insurances must cover the contracted work for the duration of the Contract and must remain in effect until final acceptance. Failure to obtain and maintain insurance for the contracted work may result in suspension of work or default of the Contract. If the insurance expires and coverage lapses for any reason, stop all work until the Owner receives an acceptable Certificate of Insurance.

Provide the Owner with a Certificate of Insurance verifying the types and amounts of coverage shown in Table 2. Provide as additional insured the Camino Real Regional Mobility Authority and City of El Paso, Texas. The Certificate of Insurance must be in a form approved by the Owner. Any Certificate of Insurance provided must be available for public inspection.

Table 2
Insurance Requirements

Type of Insurance	Amount of Coverage
Commercial General Liability Insurance	Not Less Than: \$600,000 each occurrence
Business Automobile Policy	Not Less Than: \$600,000 combined single limit
Workers' Compensation	Not Less Than: Statutory
All Risk Builder's Risk Insurance (For building-facilities Contracts only)	100% of Contract Price

By signing the Contract, the Contractor certifies compliance with all applicable laws, rules, and regulations pertaining to workers' compensation insurance. This certification includes all subcontractors. Pay all deductibles stated in the policy.

Subcontractors must meet the requirements of Table 2 either through their own coverage or through the Contractor's coverage.

The Workers' Compensation policy must include a waiver of subrogation endorsement in favor of the Owner.

For building-facilities Contracts, provide All Risk Builder's Risk Insurance to protect the Owner against loss by storm, fire or extended coverage perils on work and materials intended for use on the project including the adjacent structure. Name the Owner under the Lost Payable Clause.

For Contracts with railroad requirements, see project-specific details for additional insurance requirements.

Provide a substitute Surety on the Contract bonds in the original full Contract amount within 15 days of notification if the Surety is declared bankrupt or insolvent, the Surety's underwriting limitation drops below the Contract amount or the Surety's right to do business is terminated by the Owner. The substitute Surety must be authorized by the laws of the State and acceptable to the Owner. Work will be suspended until a substitute Surety is provided. Working day charges will be suspended for 15 days or until an acceptable Surety is provided, whichever is sooner.

The work performed under this section will not be measured or paid for directly but will be subsidiary to pertinent items.

- 4.4. **Railroad Documents.** Provide all required documents for satisfaction of railroad requirements for projects that have work which involves railroad right of way.

5. Failure to Enter Contract

If the Contractor fails to comply with all of the requirements in Article 3.4., "Execution of Contract," the bid guaranty will become the property of the Owner, not as a penalty, but as liquidated damages. The Contractor forfeiting the bid guaranty will not be considered in future bids for the same work unless there has been a substantial change in design of the work.

6. Approval and Execution of Contract

The Contract will be approved and signed under authority of the Owner.

7. Return of Bid Guaranty

The bid guaranty check of the low Bidder will be retained until after the Contract has been rejected or awarded and executed. Bid bonds will not be returned.

8. Beginning of Work

Do not begin work until authorized in writing by the Owner.

When callout work is required, provide a method of contact available from 8 A.M. until 5 P.M. every work day and 24 hr. a day, 7 days a week for projects with emergency mobilization, unless otherwise shown on the plans. The time of notice will be the transmission time of the notice sent, provided orally, or provided in person by the Owner's representative.

Verify all quantities of materials shown on the plans before ordering.

For projects with alternate bid items, the work order will identify the base bid work and additive or deductive alternate work to be performed. The Owner makes no guarantee that the additive or deductive alternate work will be required.

9. Assignment of Contract

Do not assign, sell, transfer, or otherwise dispose of the Contract or any portion rights, title, or interest (including claims) without the approval of the Owner or designated representative. The Owner must deem any proposed assignment justified and legally acceptable before the assignment can take place.

10. Excluded Parties

The Contractor certifies by signing the Contract that the Contractor will not enter into any subcontract with a subcontractor that is debarred or suspended by the Owner or by any state or federal.

Item 4L

Scope of Work

1. Contract Intent

The intent of the Contract is to describe the completed work to be performed. Furnish materials, supplies, tools, equipment, labor, and other incidentals necessary for the proper prosecution and completion of the work in accordance with Contract documents.

2. Preconstruction Conference

Before starting work, schedule and attend a preconstruction conference with the Owner. Failure to schedule and attend a preconstruction conference is not grounds for delaying the beginning of working day charges.

Work with the Owner to resolve all issues during the course of the Contract. Refer to Article 4.7., "Dispute or Claims Procedure," for all unresolved issues.

3. Partnering

The intent of this Article is to promote an environment of trust, mutual respect, integrity, and fair-dealing between the Owner and the Contractor.

Informal partnering does not make use of a facilitator, while formal partnering uses the services of a facilitator (internal or external).

3.1. **Procedures for Partnering Meetings and Format.** Informal partnering is required, unless formal partnering is mutually agreed to instead of the informal partnering.

3.2. **Facilitators.** The facilitator is to act as a neutral party seeking to initiate cooperative working relationships. This individual must have the technical knowledge and ability to lead and guide discussions. Choose either an internal or external facilitator. The facilitator must be acceptable to the Engineer.

3.2.1. **Internal Facilitators.** An Owner or Contractor internal (staff) facilitator may be selected as the facilitator at no additional cost to either party.

3.2.2. **External Facilitators.** A private firm or individual that is independent of the Contractor and the Owner may be selected as the facilitator. Submit the

facilitator's name and estimated fees for approval before contracting with the facilitator.

- 3.3. **Meetings and Arrangements.** Coordinate with the Engineer for meeting dates and times, locations including third party facilities, and other needs and appurtenances, including, but not limited to, audio or visual equipment. Make all meeting arrangements for formal partnering. Use Owner facilities or facilities in the vicinity of the project if available. Submit the estimated meeting costs for approval before finalizing arrangements.

Coordinate facilitator discussions before the partnering meeting to allow the facilitator time to prepare an appropriate agenda. Prepare a list of attendees with job titles and include critical Contractor, subcontractor, and supplier staff in the list. Provide the facilitator the list of attendees and invite the attendees listed.

The Owner will invite and provide a list of attendees that includes, but is not limited to, Owner, TxDOT, other local governments, law enforcement, railroad, and utility representatives.

Participate in additional partnering meetings as mutually agreed.

- 3.4. **Payment.** Expenses for labor, Contractor equipment, or overhead will not be allowed. Markups as prescribed in Article 9.7., "Payment for Extra Work and Force Account Method," will not be allowed.

Informal partnering will be conducted with each party responsible for their own costs.

For formal partnering using internal facilitators, the Contractor will be responsible for arrangements and for expenses incurred by its internal facilitator, including, but not limited to, meals, travel, and lodging. Owner facilitators, if available, may be used at no additional cost.

For formal partnering using external facilitators, submit an invoice to the Engineer for reimbursement. The Owner will reimburse the Contractor for half of the eligible expenses as approved. For external facilitators not approved by the Owner but used at the Contractor's option, the Contractor will be responsible for all costs of the external facilitator.

For meeting facilities and appurtenances, submit an invoice to the Engineer for reimbursement. The Owner will reimburse the Contractor for half of the eligible expenses as approved.

4. Changes in the Work

The Engineer reserves the right to make changes in the work including addition, reduction, or elimination of quantities and alterations needed to complete the Contract. Perform the work as altered. These changes will not invalidate the Contract nor release the Surety. The Contractor is responsible for notifying the sureties of any changes to the Contract.

If the changes in quantities or the alterations do not significantly change the character of the work under the Contract, the altered work will be paid for at the Contract unit price. If the changes in quantities or the alterations significantly change the character of the work, the Contract will be amended by a change order. If no unit prices exist, this will be considered extra work and the Contract will be amended by a change order. Provide cost justification as requested, in an acceptable format. Payment will not be made for anticipated profits on work that is eliminated.

Agree on the scope of work and the basis of payment for the change order before beginning the work. If there is no agreement, the Engineer may order the work to proceed under Article 9.7., "Payment for Extra Work and Force Account Method," or by making an interim adjustment to the Contract. In the case of an adjustment, the Engineer will consider modifying the compensation after the work is performed.

A significant change in the character of the work occurs when:

- the character of the work for any item as altered differs materially in kind or nature from that in the Contract or
- a major item of work varies by more or less than 25% from the original Contract quantity.

When the quantity of work to be done under any major item of the Contract is more than 125% of the original quantity stated in the Contract, then either party to the Contract may request an adjustment to the unit price on the portion of the work that is above 125%.

When the quantity of work to be done under any major item of the Contract is less than 75% of the original quantity stated in the Contract, then either party to the Contract may request an adjustment to the unit price. When mutually agreed, the unit price may be adjusted by multiplying the Contract unit price by the factor in Table 1. If an adjusted unit price cannot be agreed upon, the Engineer may determine the unit price by multiplying the Contract unit price by the factor in Table 1.

Table 1
Quantity-Based Price Adjustment Factors

% of Original Quantity	Factor
≥ 50 and < 75	1.05
≥ 25 and < 50	1.15
<	1.25

If the changes require additional working days to complete the Contract, Contract working days will be adjusted in accordance with Item 8, "Prosecution and Progress".

5. Differing Site Conditions

During the progress of the work, differing subsurface or latent physical conditions may be encountered at the site. The 2 types of differing site conditions are defined as:

- those that differ materially from those indicated in the Contract and
- unknown physical conditions of an unusual nature differing materially from those ordinarily encountered and generally recognized as inherent in the work provided for in the Contract.

Notify the Engineer in writing when differing site conditions are encountered. The Engineer will notify the Contractor when the Owner discovers differing site conditions. Unless directed otherwise, do not work on the affected items and leave the site undisturbed. The Engineer will investigate the conditions and determine whether differing site conditions exist. If the differing site conditions cause an increase or decrease in the cost or number of working days specified for the performance of the Contract, the Engineer will make adjustments, excluding the loss of anticipated profits, in accordance with the Contract. Additional compensation will be made only if the required written notice has been provided.

6. Requests for Additional Compensation

Notify the Engineer in writing of any intent to request additional compensation once there is knowledge of the basis for the request. An assessment of damages is not required to be part of this notice but is desirable. The intent of the written notice requirement is to provide the Owner an opportunity to evaluate the request and to keep an accurate account of the actual costs that may arise.

Minimize impacts and costs.

If written notice is not given, the Contractor waives the right to additional compensation unless the circumstances could have reasonably prevented the

Contractor from knowing the cost impact before performing the work. Notice of the request and the documentation of the costs will not be construed as proof or substantiation of the validity of the request. Submit the request in enough detail to enable the Owner to determine the basis for entitlement, adjustment in the number of working days specified in the Contract, and compensation.

The Owner will not consider fees and interest on requests for additional compensation. Fees include, but are not limited to: preparation, attorney, printing, shipping, and various other fees.

Damages occur when impacts that are the responsibility of the Owner result in additional costs to the Contractor that could not have been reasonably anticipated at the time of letting. Costs of performing additional work are not considered

damages. For Contractor damages, the intent is to reimburse the Contractor for actual expenses arising out of a compensable impact. No profit or markups, other than labor burden, will be allowed. For damages, labor burden will be reimbursed at 35% unless the Contractor can justify higher actual cost. Justification for a higher percentage must be in accordance with the methodology provided by the Owner, submitted separately for project overhead labor and direct labor, and determined and submitted by a Certified Public Accountant (CPA). Submit CPA- prepared labor burden rates directly to the Owner.

If the Contractor requests compensation for delay damages and the delay is determined to be compensable, then standby equipment costs and project overhead compensation will be based on the duration of the compensable delay and will be limited as follows:

6.1. **Standby Equipment Costs.** Payment will be made in accordance with Section 9.7.1.4.3., "Standby Equipment Costs."

6.2. **Project Overhead.** Project overhead is defined as the administrative and supervisory expenses incurred at the work locations. When delay to project completion occurs, reimbursement for project overhead for the Contractor will be made using the following options:

- Reimbursed at 6% (computed as daily cost by dividing 6% of the original Contract amount by the number of original Contract work days), or
- Actual documented costs for the impacted period.

Project overhead for delays impacting subcontractors will be determined from actual documented costs submitted by the Contractor.

Time extensions and suspensions alone will not be justification for reimbursement for project overhead.

- 6.3 **Home Office Overhead.** The Owner will not compensate the Contractor for home overhead.

7. Dispute or Claims Procedure

The dispute resolution policy promotes a cooperative attitude between the Engineer and Contractor. Emphasis is placed on resolving issues while they are still current, at the project office, and in an informal manner. Open sharing of information is encouraged by all parties involved so the information provided completely and accurately reflects the issues and facts. If information is not shared, decisions may be limited to relying on the documentation that is available for review.

The Owner's goal is to have a dispute settled by the Engineer before elevating it as a claim.

If a dispute cannot be resolved, initiate the Contract claim procedure by filing a Contract claim after the completion of the Contract or when required for orderly performance of the Contract. Submit the claim to the Owner in accordance with state law.

For a claim resulting from enforcement of a warranty period, file the claim no later than one year after expiration of the warranty period. For all other claims, file the claim no later than the date the Owner issues notice to the Contractor that they are in default, the date the Owner terminates the Contract, or one year after the date of final acceptance of the Contract. It is the Contractor's responsibility to submit requests in a timely manner.

Item5L

Control of Work

1. **Authority of Engineer**

The Engineer has the authority to observe, test, inspect, approve, and accept the work on behalf of the Owner. The Engineer decides all questions about the quality and acceptability of materials, work performed, work progress, Contract interpretations, and acceptable Contract fulfillment. The Engineer has the authority to enforce and make effective these decisions.

The Engineer acts as a referee in all questions arising under the terms of the Contract. The Engineer's decisions will be final and binding.

2. **Plans and Working Drawings**

When required, provide working drawings to supplement the plans with all necessary details not included on the Contract plans. Prepare and furnish working drawings in a timely manner and obtain approval, if required, before the beginning of the associated work. For all working drawing submittal requirements, the Engineer may allow electronic and other alternative submission procedures. Have a licensed professional engineer sign, seal, and date the working drawings as indicated in Table 1.

Prepare working drawings using United States standard measures in the English language. The routing of submittals for review and approval will be established at the preconstruction conference. The Contractor is responsible for the accuracy, coordination, and conformity of the various components and details of the working drawings. Owner approval of the Contractor's working drawings will not relieve the Contractor of any responsibility under the Contract. The work performed under this article will not be measured or paid for directly but will be subsidiary to pertinent items.

Table 1**Signature and Approval Requirements for Working Drawings**

Working Drawings For		Requires Licensed Professional Engineer's Signature, Seal, and Date	Requires Owner Approval
1. Alternate or optional designs submitted by Contractor		Yes	Yes
2. Supplementary shop and fabrication drawings for structural Items		No unless required on the plans	See applicable Item
3. Contractor-proposed temporary facilities that affect the public safety, not included on the plans		Yes	Yes
4. Form and falsework details	Bridges, retaining walls, and other major structures	Yes unless otherwise shown on the plans	No ¹
	Minor structures	No unless otherwise shown on the plans	No
5. Erection drawings		Yes	No ^{1,2}
6. Contractor-proposed major modifications to traffic control plan		Yes	Yes

1. The Engineer may require that the Contractor have a licensed professional engineer certify that the temporary works are constructed according to the sealed drawings.
2. Approval is required for items spanning over live traffic or where safety of the traveling public is affected, in the opinion of the Engineer.

3. Conformity with Plans, Specifications, and Special Provisions

Furnish materials and perform work in reasonably close conformity with the lines, grades, cross-sections, dimensions, details, gradations, physical and chemical characteristics of materials, and other requirements shown in the Contract (including additional plans for non-site-specific work). Reasonably close conformity limits will be as defined in the respective items of the Contract or, if not defined, as determined by the Engineer. Obtain approval before deviating from the plans and approved working drawings. Do not perform work beyond the lines and grades shown on the plans or any extra work without the Engineer's approval. Work performed beyond the lines and grades shown on the plans or any extra work performed without approval is considered unauthorized and excluded from pay consideration. The Owner will not pay for material rejected due to improper fabrication, excess quantity, or any other reasons within the Contractor's control.

- 3.1. **Acceptance of Defective or Unauthorized Work.** When work fails to meet Contract requirements, but is adequate to serve the design purpose, the Engineer will decide the extent to which the work will be accepted and remain in place. The Engineer will document the basis of acceptance by a letter and may adjust the Contract price.

- 3.2. **Correction of Defective or Unauthorized Work.** When work fails to meet Contract requirements and is inadequate to serve the design purpose it will be considered defective. Correct, or remove and replace, the work at the Contractor's expense, as directed.

The Engineer has the authority to correct or to remove and replace defective or unauthorized work. The cost may be deducted from any money due or to become due to the Contractor.

4. **Coordination of Plans, Specifications, and Special Provisions**

The specifications, accompanying plans (including additional plans for non-site-specific work), special provisions, change orders, and supplemental agreements are intended to work together and be interpreted as a whole.

Numerical dimensions govern over scaled dimensions. Special provisions govern over plans (including general notes), which govern over standard specifications and special specifications. Job-specific plan sheets govern over standard plan sheets.

However, in the case of conflict between plans (including general notes) and specifications regarding responsibilities for hazardous materials and traffic control in Items 1L through 9L and Item 502, "Barricades, Signs, and Traffic Handling," special provisions govern over standard specifications and special specifications, which govern over the plans.

Notify the Engineer promptly of any omissions, errors, or discrepancies discovered so that necessary corrections and interpretations can be made. Failure to promptly notify the Engineer will constitute a waiver of all claims for misunderstandings or ambiguities that result from the errors, omissions, or discrepancies discovered

5. **Cooperation of Contractor**

Cooperate with the Engineer. Respond promptly to instructions from the Engineer. Provide all information necessary to administer the Contract.

Designate in writing a competent, English-speaking Superintendent employed by the Contractor. The Superintendent must be experienced with the work being performed and capable of reading and understanding the Contract. Ensure the Superintendent is available at all times and able to receive instructions from the Engineer or authorized Owner representatives and to act for the Contractor. The Engineer may suspend work without suspending working day charges if a Superintendent is not available or does not meet the above criteria.

At the written request of the Engineer, immediately remove from the project any employee or representative of the Contractor or a subcontractor who, in the opinion of the Engineer, does not perform work in a proper and skillful manner or who is disrespectful, intemperate, disorderly, uncooperative, or otherwise objectionable. Do not reinstate these individuals without the written consent of

the Engineer.

Furnish suitable machinery, equipment, and construction forces for the proper prosecution of the work. Provide adequate lighting to address quality requirements and inspection of nighttime work.

The Engineer may suspend the work without suspending working day charges until the Contractor complies with this requirement. All work associated with fulfilling this requirement is subsidiary to the various items of the Contract and no direct compensation will be made.

6. Cooperating with Utilities

Use established safety practices when working near utilities. Consult with the appropriate utilities before beginning work. Notify the Engineer immediately of utility conflicts. The Engineer will decide whether to adjust utilities or adjust the work to eliminate or lessen the conflict. Unless otherwise shown on the plans, the Engineer will make necessary arrangements with the utility owner when utility adjustments are required.

Use work procedures that protect utilities or appurtenances that remain in place during construction. Cooperate with utilities to remove and rearrange utilities to avoid service interruption or duplicate work by the utilities. Allow utilities access to the right of way.

Immediately notify the appropriate utility of service interruptions resulting from damage due to construction activities. Cooperate with utilities until service is restored. Maintain access to active fire hydrants at all times unless approved by the Engineer.

7. Cooperation between Contractors

Cooperate and coordinate with other Contractors working within the limits or adjacent to the limits.

8. Cooperation with Railroads

Plan and prosecute portions of the work involving a railway to avoid interference with or hindrance to the railroad company.

If the work is on railroad right of way, do not interfere with the operation of the railroad company's trains or other property.

8.1. Project-Specific Information. Refer to project-specific plan sheets in the Contract for specific information concerning the work to be completed by both the Contractor and the railroad within railroad right of way; railroad right of way locations impacted by construction; percentage of Contract work at each location; train movements at each location; and requirements for railroad insurance, flagging, and Right of Entry (ROE) Agreements.

8.2. Right of Entry Agreement (if required). The process for obtaining a fully

executed ROE Agreement will be as follows:

- The Owner will send the unexecuted ROE Agreement to the Contractor with the unexecuted construction Contract.
- Partially execute the ROE Agreement and return it to the Department with the required insurance attached.
- The Owner will coordinate with the railroad company regarding the further execution of the ROE Agreement and associated fees. The Owner will pay any ROE Agreement fees directly to the railroad company.
- Once the Owner has received the fully-executed ROE Agreement from the railroad company, the Owner will forward the fully-executed ROE Agreement to the Contractor.

9. Construction Surveying

Use Method A unless otherwise specified in the Contract. Upon request, the Engineer will allow the Contractor to copy available earthwork cross-sections, computer printouts or data files, and other information necessary to establish and control work. Maintain the integrity of control points. Preserve all control points, stakes, marks, and right of way markers. Assume cost and responsibility of replacing disturbed control points, stakes, marks, and right of way markers damaged by the Contractor's or its subcontractor operations. If the Owner repairs disturbed control points, stakes, marks, or right of way markers, the cost of repair may be deducted from money due or to become due to the Contractor. Replace right of way markers under the direction of a RPLS. This work will be subsidiary to pertinent items.

The Engineer reserves the right to make measurements and surveys to determine the accuracy of the work and determine pay quantities. The Engineer's measurements and surveys do not relieve the Contractor's responsibility for accuracy of work. Allow the Engineer adequate time to verify the surveying.

- 9.1. **Method A.** The Engineer will set control points for establishing lines, slopes, grades, and centerlines and for providing both vertical and horizontal control. At a minimum, provide a controlling pair of monument points at both the beginning and end of construction project for projects less than 2 miles in length. For projects greater than 2 miles in length, monuments will be set in pairs of 2 at a minimum of 2 miles based on the overall length of the project. Use these control points as reference to perform the work.

Furnish materials, equipment, and qualified workforce necessary for the construction survey work. Place construction points, stakes, and marks at intervals sufficient to control work to established tolerances. Place construction stakes at intervals of no more than 100 ft., or as directed. Place stakes and marks so as not to interfere with normal maintenance operations.

9.2. **Method B.** The Engineer will set adequate control points, stakes, and marks to establish lines, slopes, grades, and centerlines. Furnish additional work, stakes, materials, and templates necessary for marking and maintaining points and lines.

9.3. **Method C.** Set adequate control points, stakes, and marks to establish lines, slopes, grades, and centerlines.

10. Inspection

Inspectors are authorized representatives of the Engineer. Inspectors are authorized to examine all work performed and materials furnished, including preparation, fabrication, and material manufacture. Inspectors inform the Contractor of failures to meet Contract requirements. Inspectors may reject work or materials and may suspend work until any issues can be referred to and decided by the Engineer. Inspectors cannot alter, add, or waive Contract provisions, issue instructions contrary to the Contract, act as foremen for the Contractor, or interfere with the management of the work. Inspection, or lack of inspection, will not relieve the Contractor from obligation to provide materials or perform the work in accordance with the Contract.

Provide safe access to all parts of the work and provide information and assistance to the Engineer to allow a complete and detailed inspection. Give the Engineer sufficient notice to inspect the work. Work performed without suitable inspection, as determined by the Engineer, may be ordered removed and replaced at Contractor's expense. Remove or uncover portions of finished work as directed. Once inspected, restore work to Contract requirements. If the uncovered work is acceptable, the costs to uncover, remove, and replace or make good the parts removed will be paid for in accordance with Article 4.4., "Changes in the Work." If the work is unacceptable, assume all costs associated repair or replacement, including the costs to uncover, remove, and replace or make good the parts removed.

When a government entity, utility, railroad company, or other entity accepts or pays a portion of the Contract, that organization's representatives may inspect the work but cannot direct the Contractor. The right of inspection does not make that entity a party to the Contract and does not interfere with the rights of the parties to the Contract.

11. Final Cleanup

Upon completion of the work, remove litter, debris, objectionable material,

temporary structures, excess materials, and equipment from the work locations. Clean and restore property damaged by the Contractor's operations during the prosecution of the work. Leave the work locations in a neat and presentable condition. This work will not be paid for directly but will be considered subsidiary to items of the Contract.

Remove from the right of way cofferdams, construction buildings, material and fabrication plants, temporary structures, excess materials, and debris resulting from construction. Where work is in a stream, remove debris to the ground line of the bed of the stream. Leave stream channels and rights of way in a neat and presentable condition. Clean structures to the flow line or the elevation of the outfall channel, whichever is higher. Dispose of all excess material in accordance with federal, state, and local regulations.

12. Final Acceptance

12.1. Final acceptance is made when all work is complete and the Engineer, in writing, accepts all work for the work locations in the Contract. Final acceptance relieves the Contractor from further Contract responsibilities.

12.1.1 Work Completed. Work completed must include work for vegetative establishment and maintenance, test, and performance periods and work to meet the requirements of Article 5.11., "Final Cleanup."

12.1.2 Final Inspection. After all work is complete, the Contractor will request a final inspection by the Engineer authorized to accept the work.

The final inspection will be made as soon as possible, and not later than 10 calendar days after the request. No working day charges will be made between the date of request and final inspection.

After the final inspection, if the work is satisfactory, the Engineer will notify the Contractor in writing of the final acceptance of the work. If the final inspection finds any work to be unsatisfactory, the Engineer will identify in writing all deficiencies in the work requiring correction. Correct the deficiencies identified. Working day charges will resume if these deficiencies are not corrected within 7 calendar days, unless otherwise approved. Upon correction, the Engineer will make an inspection to verify that all deficiencies were corrected satisfactorily. The Engineer will provide written notice of the final acceptance.

12.1.3 Final Measurement. Final measurements and pay quantity adjustments may be made after final acceptance.

12.1.4 Removal of Traffic Control Devices. Remove construction traffic control devices and advance warning signs upon final acceptance or as directed.

Item 6L

Control of Materials

1. Source Control

Use only materials that meet Contract requirements. Unless otherwise specified or approved, use new materials for the work. Secure the Engineer's approval of the proposed source of materials to be used before their delivery. Materials can be approved at a supply source or staging area but may be re-inspected in accordance with Article 6.4., "Sampling, Testing, and Inspection."

1.1. **Buy America.** Comply with the latest provisions of Buy America as listed at 23 CFR 635.410. Use steel or iron materials manufactured in the United States except when:

- the cost of materials, including delivery, does not exceed 0.1% of the total Contract cost or \$2,500, whichever is greater;
- the Contract contains a replacement alternate item for a foreign source steel or iron product and the Contract is awarded based on the replacement alternate item; or
- the materials are temporarily installed.

Provide a notarized original of the TxDOT FORM D-9-USA-1 (or equivalent) with the proper attachments for verification of compliance.

Manufacturing is any process that modifies the chemical content, physical shape or size, or final finish of a product. Manufacturing begins with initial melting and mixing and continues through fabrication (cutting, drilling, welding, bending, etc.) and coating (paint, galvanizing, epoxy, etc.).

1.2. **Convict Produced Materials.** Materials produced by convict labor may only be incorporated in the work if such materials have been:

- produced by convicts who are on parole, supervised release, or
- probation from prison; or produced in a qualified prison facility.

A "qualified prison facility" means any prison facility in which convicts, during the 12-month period ending July 1, 1987, produced materials for use in federal-aid highway construction projects.

2. Material Quality

Correct or remove materials that fail to meet Contract requirements or that do not produce satisfactory results. Reimburse the Owner for cost incurred if additional sampling and testing is required by a change of source.

Materials not meeting Contract requirements will be rejected, unless the Engineer approves corrective actions. Upon rejection, immediately remove and replace rejected materials.

If the Contractor does not comply with this article, the Owner may have defective material removed and replaced. The cost of testing, removal, and replacement will be deducted from the estimate.

3. Manufacturer Warranties

Transfer to the Owner warranties and guarantees required by the Contract or received as part of normal trade practice.

4. Sampling, Testing, and Inspection

Incorporate into the work only material that has been inspected, tested, and accepted by the Engineer. Remove, at the Contractor's expense, materials from the work locations that are used without prior testing and approval or written permission.

Unless otherwise mutually agreed, the material requirements and standard test methods in effect at the time the proposed Contract is advertised govern. Unless otherwise noted, the Engineer will perform testing at Owner's expense. In addition to facilities and equipment required by the Contract, furnish facilities and calibrated equipment required for tests to control the manufacture of construction items. If requested, provide a complete written statement of the origin, composition, and manufacture of materials.

All materials used are subject to inspection or testing at any time during preparation or use. Material which has been tested and approved at a supply source or staging area may be re-inspected or tested before or during incorporation into the work and rejected if it does not meet Contract requirements. Copies of test results are to be made available upon request. Do not use material that, after approval, becomes unfit for use.

Unless otherwise noted in the Contract, all testing must be performed within the United States and witnessed by the Engineer. If materials or processes require testing outside the contiguous 48 United States, reimburse the Owner for inspection expenses.

5. Plant Inspection and Testing

The Engineer may, but is not obligated to, inspect materials at the acquisition or manufacturing source. Material samples will be obtained and tested for compliance with quality requirements.

If inspection is at the plant, meet the following conditions unless otherwise specified:

- Cooperate fully and assist the Engineer during the inspection.
- Ensure the Engineer has full access to all parts of the plant used to manufacture or produce materials.
- In accordance with pertinent items and the Contract, provide a facility at the plant for use by the Engineer as an office or laboratory.
- Provide and maintain adequate safety measures and restroom facilities.
- Furnish and calibrate scales, measuring devices, and other necessary equipment.

The Engineer may provide inspection for periods other than daylight hours if:

- continuous production of materials for Owner use is necessary due to the production volume being handled at the plant, and
- the lighting is adequate to allow satisfactory inspection.

6. Storage of Materials

Store and handle materials to preserve their quality and fitness for the work. Store materials so that they can be easily inspected and retested. Place materials under cover, on wooden platforms, or on other hard, clean surfaces as necessary or when directed.

Obtain approval to store materials on the right of way. Storage space off the right of way is at the Contractor's expense.

7. Owner-furnished Material

The Owner will supply materials as shown in the Contract documents. The cost of handling and placing materials supplied by the Owner will not be paid for directly but is subsidiary to the item in which they are used. Assume responsibility for materials upon receipt.

8. Use of Materials Found on the Right of Way

Material found in the excavation areas and meeting the Owner's specifications may be used in the work. This material will be paid for at the Contract bid price for excavation and under the item for which the material is used.

Do not excavate or remove any material from within the right of way that is not within the limits of the excavation without written permission. If excavation is allowed within a right of way project-specific location (PSL), replace the removed material with suitable material at no cost to the Owner as directed.

9. Recycled Materials

The Owner will not allow hazardous wastes, as defined in 30 TAC 335, proposed for recycling to be used on the project. Use nonhazardous recyclable materials (NRMs) only if the specification for the item does not disallow or restrict use.

Determine if NRMs are regulated under 30 TAC 312, 330, 332, 334, or 335, and comply with all general prohibitions and requirements. Use NRMs in accordance with DMS-11000, "Evaluating and Using Nonhazardous Recyclable Materials Guidelines," and furnish all documentation required by that specification.

10. Hazardous Materials

Use materials that are free of hazardous materials as defined in Item 1L, "Abbreviations and Definitions."

Notify the Engineer immediately when a visual observation or odor indicates that materials in required material sources or on sites owned or controlled by the owner may contain hazardous materials. Except when the contract includes bid items for the contractor to remove hazardous materials, the Engineer is responsible for testing and removing or disposing of hazardous materials not introduced by the Contractor on sites owned or controlled by the Owner as indicated below.

The plans will indicate locations where paint on steel is suspected to contain hazardous materials and where regulated asbestos containing materials have been found. The Engineer may suspend work wholly or in part during the testing, removal, or disposition of hazardous materials on sites owned or controlled by the Owner, except in the case of when the contract includes removing and disposing of hazardous materials.

When a visual observation or odor indicates that materials delivered to the work locations by the Contractor may contain hazardous materials, have an approved commercial laboratory test the materials for contamination.

Remove, remediate, and dispose of any of these materials found to be contaminated. Testing, removal, and disposition of hazardous materials introduced onto the work locations by the Contractor will be at the Contractor's expense. Working day charges will not be suspended and extensions of working days will not be granted for activities related to handling hazardous material delivered by the Contractor.

10.1. Painted Steel Requirements. Paint containing hazardous materials will be removed as shown on the plans.

10.1.1. Paint Removed by Third Party. The Owner may provide a third party to remove paint containing hazardous materials where paint must be removed to

perform work or to allow dismantling of the steel.

10.1.2. Paint Removed by the Contractor. This work may only be performed by a firm or company with one of the following certifications:

- SSPC-QP2 certification for lead painting operations, or
- Certified Lead Firm by the Texas Department of State Health Services.

Maintain certification for the duration of the work. Provide copies of audits or certification if requested.

Comply with worker and public safety regulations, including, but not limited to, OSHA 29 CFR Parts 1910.1025, 1926.62, and 1926.63. Monitor permissible exposure limits in accordance with OSHA requirements.

Remove paint containing hazardous materials from designated areas shown on the plans or as directed. Comply with access limitations shown on the plans.

Provide power hand tools, equipped with high-efficiency particulate air filter vacuums to mechanically remove paint.

Contain, collect, store, transport, and dispose of all waste generated by cleaning operation in accordance with local, state, and federal requirements including 40 CFR 302. Properly characterize and dispose of all wastes.

Manage any hazardous wastes in accordance with regulatory requirements and dispose in a facility authorized to accept such wastes. Provide copies of disposal manifests.

The work performed, materials furnished, equipment, labor, tools, and incidentals will be paid for in accordance with Item 446, "Field Cleaning and Painting Steel."

10.2. **Removal and Disposal of Painted Steel.** Painted steel will be disposed of at a steel recycling or smelting facility unless otherwise shown on the plans. If the paint contains hazardous materials, maintain and make available to the Engineer invoices and other records obtained from the facility showing the received weight of the steel and the facility name.

For steel that is dismantled by unbolting, no paint stripping will be required. Use care to not damage existing paint. When dismantling is performed using flame or saw-cutting methods to remove steel elements coated with paint containing hazardous materials, the plans will show stripping locations.

The work provided, materials furnished, equipment, labor, tools, and incidentals will be paid for in accordance with Item 496, "Removing Structures," and Item 497, "Sale of Salvageable Material."

10.3. **Asbestos Requirements.** The plans will indicate locations or elements where asbestos containing materials (ACM) have been found. At locations where

previously, unknown ACM has been found, the Owner will arrange for abatement by a third party. For work at these locations, notify the Engineer of proposed dates of demolition or removal of structural elements with ACM at least 60 days before work is to begin to allow the Owner enough time to abate the asbestos.

- 10.4. **Work Performed by a Third Party.** When the work for removal of paint or asbestos abatement is to be provided by a third party, coordinate and cooperate with the third party and the Owner. Continue other work detailed on the plans not directly involved in the paint removal or asbestos abatement work. Provide notice to the Owner regarding the progress of the work to allow the Owner enough time to schedule the third-party work.

11. Surplus Materials

Take ownership of surplus materials unless otherwise shown on the plans or as directed by the Engineer. Remove and dispose of materials in accordance with federal, state, and local regulations. If requested, provide an appropriate level of documentation to verify proper disposal. When materials are disposed of on private property, provide written authorization from the property owner for the use of the property for this purpose upon request.

Item 7L

Legal Relations and Responsibilities

1. Safety

- 1.1. **Point of Contact.** Designate a Contractor Safety Point of Contact (CSPOC). The Owner will assign an Owner employee for their point of contact designated as Owner's Safety Point of Contact OSPOC. The CSPOC will ensure that the Contractor's and Subcontractor's employees' use the appropriate personal protection equipment (hard hats, safety vests, protective toe footwear, etc.).

The CSPOC will ensure that crew leaders and foremen (including subcontractors) have attended the required training.

- 1.2. **Safety Preconstruction Meeting.** In cooperation with the Engineer, schedule and attend a safety preconstruction meeting (may be a part of the preconstruction conference in Article 4.2., "Preconstruction Conference." Attendees for this safety preconstruction meeting will be:

- the Contractor,
- subcontractors,
- Owner,
- local law enforcement, and
- other personnel that play an active role on the project.

- 1.3. **Public Safety and Convenience.** Ensure the safety and convenience of the public and property as provided in the Contract and as directed by the Engineer. Keep existing roadways open to traffic or construct and maintain detours and temporary structures for safe public travel. Manage construction to minimize disruption to traffic. Maintain the roadway in a good and passable condition, including proper drainage and provide for ingress and egress to adjacent property.

Store all equipment not in use in a manner and at locations that will not interfere with the safe passage of traffic. Provide qualified flaggers in accordance with Item 502.2.2., "Flaggers," for the safety and convenience of the traveling public and workers, as directed.

If the Engineer determines that any of the requirements of this article have not been met, the Engineer may take any necessary corrective action. This will not change the legal responsibilities set forth in the Contract. The cost to the Owner for this work will be deducted from any money due or to become due to the Contractor.

- 1.4. **Use of Blue Warning Lights.** Texas Transportation Code 547.105 authorizes the use of warning lights to promote safety and provides an effective means of gaining the travelling public's attention as they drive in areas where construction crews are present. In order to influence the public to move over when high risk

construction activities are taking place, minimize the utilization of blue warning lights. These lights must be used only while performing work on or near the travel lanes or shoulder where the travelling public encounters construction crews that are not protected by a standard work zone set up such as a lane closure, shoulder closure, or one- way traffic control. Refrain from leaving the warning lights engaged while travelling from one work location to another or while parked on the right of way away from the pavement or a work zone.

- 1.5. **Barricades, Warning and Detour Signs, and Traffic Handling.** Provide, install, move, replace, maintain, clean, and remove all traffic control devices in accordance with the traffic control devices specifications and as shown on the plans and as directed. If details are not shown on the plans, provide devices and work in accordance with the TMUTCD and as directed by the Engineer. When authorized or directed by the Engineer, provide additional signs or traffic control devices not required by the plans.

If an unexpected situation arises that causes the Contractor to believe that the traffic control should be changed, make all reasonable efforts to promptly contact the Engineer. Take prudent actions until the Engineer can be contacted.

The Engineer may authorize or direct in writing the removal or relocation of project limit advance warning signs. When project limit advance warning signs are removed before final acceptance, traffic control in accordance with the TMUTCD may be used for minor operations as approved. Removal or relocation of project limit advance warning signs does not imply final acceptance.

2. **Laws to be Observed**

Comply with all federal, state, and local laws, ordinances, and regulations that affect the performance of the work. Indemnify and save harmless the Owner and its representatives against any claim arising from violation by the Contractor of any law, ordinance, or regulation.

This Contract is between the Owner and the Contractor only. No person or entity may claim third-party beneficiary status under this Contract or any of its provisions, nor may any non-party sue for personal injuries or property damage under this Contract.

3. **Permits, Licenses, and Taxes**

Procure all permits and licenses; pay all charges, fees, and taxes; and give all notices necessary and incidental to the due and lawful prosecution of work, except for permits provided by the Owner and as specified in Article 7.6., "Preservation of Cultural and Natural Resources and the Environment'.

4. Patented Devices, Material, and Processes

Indemnify and save harmless the Owner from any claims for infringement from the Contractor's use of any patented design, device, material, process, trademark, or copyright selected by the Contractor and used in connection with the work. Indemnify and save harmless the Owner against any costs, expenses, or damages that it may be obliged to pay, by reason of this infringement, at any time during the prosecution or after the completion of the work.

5. Personal Liability of Public Officials

Owner employees are agents and representatives of the Owner and will incur no liability, personal or otherwise, in carrying out the provisions of the Contract or in exercising any power or authority granted under the Contract.

6. Preservation of Cultural and Natural Resources and the Environment

If the Contractor initiates changes to the Contract and the Owner approves the changes, the Contractor is responsible for obtaining clearances and coordinating with the appropriate regulatory agencies.

6.1. **Cultural Resources.** Cease all work immediately if a site, building, or location of historical, archeological, educational, or scientific interest is discovered within the right of way. The site, building, or location will be investigated and evaluated by the Owner.

6.2. **Texas Pollutant Discharge Elimination System (TPDES) Permits and Storm Water Pollution Prevention Plans (SWP3).** The Contractor will file the Notice of Intent (NOI) and the Notice of Termination (NOT) for work shown on the plans in the right of way. Adhere to all requirements of the SWP3.

6.3. **Work in Waters of the United States.** For work in the right of way, the Owner will obtain any required Section 404 permits from the U.S. Army Corps of Engineers before work begins. Adhere to all agreements, mitigation plans, and standard best management practices required by the permit. When Contractor-initiated changes in the construction method changes the impacts to waters of the U.S., obtain new or revised Section 404 permits.

6.4. **Work in Navigable Waters of the United States.** For work in the right of way, the Owner will obtain any required Section 9 permits from the U.S. Coast Guard before work begins. Adhere to the stipulations of the permits and associated best management practices. When Contractor-initiated changes in the construction method changes the impacts to navigable waters of the U.S., obtain new or revised Section 9 permits.

6.5. **Work Over the Recharge or Contributing Zone of Protected Aquifers.** Make every reasonable effort to minimize the degradation of water quality resulting from impacts relating to work over the recharge or contributing zones of protected aquifers, as defined and delineated by the TCEQ. Use best management practices and perform work in accordance with Contract requirements.

6.6. **Project-Specific Locations.** For all project-specific locations (PSLs) on or off the right of way (material sources, waste sites, parking areas, storage areas, field offices, staging areas, haul roads, etc.), signing the Contract certifies compliance with all applicable laws, rules, and regulations pertaining to the preservation of cultural resources, natural resources, and the environment as issued by the following or other agencies:

- Occupational Safety and Health Administration,
- Texas Commission on Environmental Quality,
- Texas Department of Transportation,
- Texas Historical Commission,
- Texas Parks and Wildlife Department,
- Texas Railroad Commission,
- U.S. Army Corps of Engineers,
- U.S. Department of Energy,
- U.S. Department of Transportation,
- U.S. Environmental Protection Agency,
- U.S. Federal Emergency Management Agency, and
- U.S. Fish and Wildlife Service.

All subcontractors must also comply with applicable environmental laws, rules, regulations, and requirements in the Contract. Maintain documentation of certification activities including environmental consultant reports, Contractor documentation on certification decisions and contacts, and correspondence with the resource agencies. Provide documentation upon request.

Obtain written approval from the Engineer for all PSLs in the right of way not specifically addressed on the plans. Prepare an SWP3 for all Contractor facilities, such as asphalt or concrete plants located within public right of way. Comply with all TCEQ permit requirements for portable facilities, such as concrete batch plants, rock crushers, asphalt plants, etc. Address all environmental issues, such as Section 404 permits, wetland delineation, endangered species consultation requirements, or archeological and historic site impacts. Obtain all permits and clearances in advance.

7. Agricultural Irrigation

Regulate the sequence of work and make provisions as necessary to provide for agricultural irrigation or drainage during the work. Meet with the Irrigation District or land owner to determine the proper time and sequence when irrigation demands will permit shutting-off water flows to perform work.

Unless otherwise provided on the plans, the work performed under this article will not be measured or paid for directly but will be subsidiary to pertinent items.

8. Sanitary Provisions

Provide and maintain adequate, neat, and sanitary toilet accommodations for employees, including Owner employees, in compliance with the requirements and regulations of the Texas Department of Health or other authorities with jurisdiction.

9. Abatement and Mitigation of Excessive or Unnecessary Noise

Minimize noise throughout all phases of the Contract. Exercise particular and special efforts to avoid the creation of unnecessary noise impact on adjacent noise sensitive receptors in the placement of non-mobile equipment such as air compressors, generators, pumps, etc. Place mobile and stationary equipment to cause the least disruption of normal adjacent activities.

All equipment associated with the work must be equipped with components to suppress excessive noise and these components must be maintained in their original operating condition considering normal depreciation. Noise-attenuation devices installed by the manufacturer such as mufflers, engine covers, insulation, etc. must not be removed nor rendered ineffectual nor be permitted to remain off the equipment while the equipment is in use.

10. Using Explosives

Use of explosives is prohibited under this contract.

11. Responsibility for Hazardous Materials

Indemnify and save harmless the Owner and its agents and employees from all suits, actions, or claims and from all liability and damages for any injury or damage to any person or property arising from the generation or disposition of

hazardous materials introduced by the Contractor on any work done by the Contractor on Owner- owned or controlled sites. Indemnify and save harmless the Owner and its representatives from any liability or responsibility arising out of the Contractor's generation or disposition of any hazardous materials obtained, processed, stored, shipped, etc., on sites not owned or controlled by the Owner. Reimburse the Owner for all payments, fees, or restitution the Owner is required to make as a result of the Contractor's actions.

12. Asbestos Containing Material

In Texas, the Department of State Health Services (DSHS), Asbestos Programs Branch, is responsible for administering the requirements of the National Emissions Standards for Hazardous Air Pollutants, 40 CFR, Subpart M (NESHAP) and the Texas Asbestos Health Protection Rules (TAHPR). Based on EPA guidance and regulatory background information, bridges are considered to be a regulated "facility" under NESHAP. Therefore, federal standards for demolition and renovation apply.

Provide notice to the Owner of demolition or renovation to the structures listed on the plans at least 30 calendar days before initiating demolition or renovation of each structure or load bearing member. Provide the scheduled start and completion date of structure demolition, renovation, or removal.

When demolition, renovation, or removal of load-bearing members is planned for several phases, provide the start and completion dates identified by separate phases.

DSHS requires that notifications be postmarked at least 10 working days before initiating demolition or renovation. If the date of actual demolition, renovation, or removal is changed, the Owner will be required to notify DSHS at least 10 days in advance of the work. This notification is also required when a previously scheduled (notification sent to DSHS) demolition, renovation, or removal is delayed. Therefore, if the date of actual demolition, renovation, or removal is changed, provide the Engineer, in writing, the revised dates in enough time to allow for the Owner's notification to DSHS to be postmarked at least 10 days in advance of the actual work.

Failure to provide the above information may require the temporary suspension of work under Article 8.4., "Temporary Suspension of Work or Working Day Charges," due to reasons under the control of the Contractor. The Owner retains the right to determine the actual advance notice needed for the change in date to address post office business days and staff availability.

13. Restoring Surfaces Opened by Permission

Do not authorize anyone to make an opening in the highway for utilities, drainage, or any other reason without written permission by the Engineer. Repair all openings as directed by the Engineer. Payment for repair of surfaces opened by permission will be made in accordance with pertinent items or Article 4.4., "Changes in the Work." Costs associated with openings made with Contractor authorization but without Owner approval will not be paid.

14. Protecting Adjacent Property

Protect adjacent property from damage. If any damage results from an act or omission on the part of or on behalf of the Contractor, take corrective action to restore the damaged property to a condition similar or equal to that existing before the damage was done.

15. Responsibility for Damage Claims

Indemnify and save harmless the Owner and its agents and employees from all suits, actions, or claims and from all liability and damages for any injury or damage to any person or property due to the Contractor's negligence in the performance of the work and from any claims arising or amounts recovered under any laws, including workers' compensation and the Texas Tort Claims Act. Indemnify and save harmless the Owner and assume responsibility for all damages and injury to property of any character occurring during the prosecution of the work resulting from any act, omission, neglect, or misconduct on the Contractor's part in the manner or method of executing the work; from failure to properly execute the work; or from defective work or material.

Pipelines and other underground installations that may or may not be shown on the plans may be located within the right of way. Indemnify and save harmless the Owner from any suits or claims resulting from damage by the Contractor's operations to any pipeline or underground installation. Make available the scheduled sequence of work to the respective utility owners so that they may coordinate and schedule adjustments of their utilities that conflict with the proposed work.

16. Hauling and Loads on Roadways and Structures

Comply with federal and state laws concerning legal gross and axle weights. Except for the designated Interstate system, vehicles with a valid yearly

overweight tolerance permit may haul materials to the work locations at the permitted load. Provide copies of the yearly overweight tolerance permits to the Engineer upon request. Construction equipment is not exempt from oversize or overweight permitting requirements on roadways open to the traveling public.

Protect existing bridges and other structures that will remain in use by the traveling public during and after the completion of the Contract. Construction traffic on roadways, bridges, and culverts within the limits of the work, including any structures under construction that will remain in service during and after completion of the Contract is subject to legal size and weight limitations.

Additional temporary fill may be required by the Engineer for hauling purposes for the protection of certain structures. This additional fill will not be paid directly but will be subsidiary.

Replace or restore to original condition any structure damaged by the Contractor's operations.

The Engineer may allow equipment with oversize or non-divisible overweight loads to operate without a permit within the work locations on pavement structures not open to the traveling public. Submit Contractor-proposed changes to traffic control plans for approval, in accordance with Item 502, "Barricades, Signs, and Traffic Handling." The following sections further address overweight allowances. The Owner will make available to the Contractor any available plans and material reports for existing structures.

- 16.1. **Overweight Construction Traffic Crossing Structures.** The Engineer may allow crossing of a structure not open to the public within the work locations, when divisible or non-divisible loads exceed legal weight limitations, including limits for load-posted bridges. Obtain written permission to make these crossings. Submit for approval a structural analysis by a licensed professional engineer indicating that the excessive loads should be allowed. Provide a manufacturer's certificate of equipment weight that includes the weight distribution on the various axles and any additional parts such as counterweights, the configuration of the axles, or other information necessary for the analysis. Submit the structural analysis and supporting documentation sufficiently in advance of the move to allow for review. Permission may be granted if the Engineer finds that no damage or overstresses in excess of those normally allowed for occasional overweight loads will result to structures that will remain in use after Contract completion. Provide temporary matting or other protective measures as directed.

Schedule loads so that only one vehicle is on any span or continuous unit at any

time. Use barricades, fences, or other positive methods to prevent other vehicular access to structures at any time the overweight load is on any span or continuous unit.

- 16.2. **Construction Equipment Operating on Structures.** Cranes and other construction equipment used to perform construction operations that exceed legal weight limits may be allowed on structures. Before any operation that may require placement of equipment on a structure, submit for approval a detailed structural analysis prepared by a licensed professional engineer.

Submit the structural analysis and supporting documentation sufficiently in advance of the use to allow for review and approval. Include all axle loads and configurations, spacing of tracks or wheels, tire loads, outrigger placements, center of gravity, equipment weight, and predicted loads on tires and outriggers for all planned movements, swings, or boom reaches. The analysis must demonstrate that no overstresses will occur in excess of those normally allowed for occasional overweight loads.

- 16.3. **Loads on Structures.** Do not store or stockpile material on bridge structures without written permission. If required, submit a structural analysis and supporting documentation by a licensed professional engineer for review. Permission may be granted if the Engineer finds that no damage or overstresses in excess of those normally allowed for occasional overweight loads will result to structures that will remain in use after Contract completion. Provide temporary matting or other protective measures as directed.

- 16.4. **Hauling Divisible Overweight Loads on Pavement within the Work Locations.** The Engineer may allow divisible overweight loads on pavement structures within the work locations not open to the traveling public. Obtain written approval before hauling the overweight loads. Include calculations to demonstrate that there will be no damage or overstress to the pavement structure.

17. Contractor's Responsibility for Work

Until final acceptance of the Contract, take every precaution against injury or damage to any part of the work by the action of the elements or by any other cause, whether arising from the execution or from the non-execution of the work. Protect all materials to be used in the work at all times, including periods of suspension.

When any roadway or portion of the roadway is in suitable condition for travel, it may be opened to traffic as directed. Opening of the roadway to traffic does not constitute final acceptance.

Repair damage to all work until final acceptance. Repair damage to existing facilities in accordance with the Contract or as directed. Repair damage to existing facilities or work caused by Contractor operations at the Contractor's expense.

Repair work for damage that was not due to the Contractor's operations will not be paid for except as provided below.

17.1. **Reimbursable Repair.** Except for damage to appurtenances listed in Section 7.17.2.1., "Unreimbursed Repair" the Contractor will be reimbursed for repair of damage caused by:

- motor vehicle, watercraft, aircraft, or railroad-train incident;
- vandalism; or
- Acts of God, such as earthquake, tidal wave, tornado, hurricane, or other cataclysmic phenomena of nature.

17.2. **Appurtenances.**

17.2.1. **Unreimbursed Repair.** Except for destruction (not reusable) due to hurricanes, reimbursement will not be made for repair of damage to the following temporary appurtenances, regardless of cause:

- signs,
- barricades,
- changeable message signs, and
- other work zone traffic control devices.

Crash cushion attenuators and guardrail end treatments are the exception to the above listing and are to be reimbursed in accordance with Section 7.17.2.2., "Reimbursed Repair."

For the devices listed in this section, reimbursement may be made for damage due to hurricanes. Where the Contractor retains replaced appurtenances after completion of the project, the Owner will limit the reimbursement to the cost that is above the salvage value at the end of the project.

- 17.2.2. **Reimbursed Repair.** Reimbursement will be made for repair of damage due to the causes listed in Section 7.17.1., “Reimbursable Repair,” to appurtenances (including temporary and permanent crash cushion attenuators and guardrail end treatments).

- 17.3. **Roadways and Structures.** Until final acceptance, the Contractor is responsible for all work constructed under the Contract. The Owner will not reimburse the Contractor for repair work to new construction, unless the failure or damage is due to one of the causes listed in Section 7.17.1., “Reimbursable Repair.”

The Owner will be responsible for the cost for repair of damage to existing roadways and structures not caused by the Contractor’s operations.

- 17.4. **Detours.** The Contractor will be responsible for the cost of maintenance of detours constructed under the Contract, unless the failure or damage is due to one of the causes listed in Section 7.17.1., “Reimbursable Repair.” The Engineer may consider failures beyond the Contractor’s control when determining reimbursement for repairs to detours constructed. The Owner will be responsible for the cost of maintenance of existing streets and roadways used for detours or handling traffic.

- 17.5. **Relief from Maintenance.** The Engineer may relieve the Contractor from responsibility of maintenance as outlined in this section. This relief does not release the Contractor from responsibility for defective materials or work or constitute final acceptance.

- 17.5.1. **Isolated Work Locations.** For isolated work locations, when all work is completed, including work for Article 5.11., “Final Cleanup,” the Engineer may relieve the Contractor from responsibility for maintenance.

- 17.5.2. **Work Except for Vegetative Establishment and Test Periods.** When all work for all or isolated work locations has been completed, including work for Article 5.11., “Final Cleanup,” with the exception of vegetative establishment and maintenance periods and test and performance periods, the Engineer may relieve the Contractor from responsibility for maintenance of completed portions of work.

- 17.5.3. **Work Suspension.** When all work is suspended for an extended period of time, the Engineer may relieve the Contractor from responsibility for maintenance of completed portions of work during the period of suspension.

- 17.5.4. **When Directed by the Engineer.** The Engineer may relieve the Contractor from the responsibility for maintenance when directed.
- 17.6. **Basis of Payment.** When reimbursement for repair work is allowed and performed, payment will be made in accordance with pertinent items or Article 4.4., "Changes in the Work."

18. ELECTRICAL REQUIREMENTS

18.1. Definitions.

18.1.1. Electrical Work. Electrical work is work performed for:

- Item 610, "Roadway Illumination Assemblies,"
- Item 614, "High Mast Illumination Assemblies,"
- Item 616, "Performance Testing of Lighting Systems,"
- Item 617, "Temporary Roadway Illumination,"
- Item 618, "Conduit,"
- Item 620, "Electrical Conductors,"
- Item 621, "Tray Cable,"
- Item 622, "Duct Cable,"
- Item 628, "Electrical Services,"
- Item 680, "Highway Traffic Signals,"
- Item 681, "Temporary Traffic Signals,"
- Item 684, "Traffic Signal Cables,"
- Item 685, "Roadside Flashing Beacon Assemblies,"
- other items that involve either the distribution of electrical power greater than 50 volts or the installation of conduit and duct banks,
- the installation of conduit and wiring associated with Item 624, "Ground Boxes," and Item 656, "Foundations for Traffic Control Devices," and
- the installation of the conduit system for communication and fiber optic cable.

Electrical work does not include the installation of communications or fiber optic cable, or the connections for low voltage and inherently power limited circuits such as electronic or communications equipment. Assembly and placement of

poles, structures, cabinets, enclosures, manholes, or other hardware will not be considered electrical work as long as no wiring, wiring connections, or conduit work is done at the time of assembly and placement.

18.1.2. Specialized Electrical Work. Specialized electrical work is work that includes the

electrical service and feeders, sub-feeders, branch circuits, controls, raceways, and enclosures for the following:

- pump stations,
- moveable bridges,
- ferry slips,
- motor control centers,
- facilities required under Item 504, "Field Office and Laboratory,"
- rest area or other public buildings,
- weigh-in-motion stations,
- electrical services larger than 200 amps,
- electrical services with main or branch circuit breaker sizes not shown in the Contract, and
- any 3-phase electrical power.

18.1.3. **Certified Person.** A certified person is a person who has passed the test from the TxDOT course TRF450, "TxDOT Roadway Illumination and Electrical Installations," or other courses as approved by the Owner. Submit a current and valid certification upon request.

18.1.4. **Licensed Electrician.** A licensed electrician is a person with a current and valid unrestricted master electrical license, or unrestricted journeyman electrical license that is supervised or directed by an unrestricted master electrician. An unrestricted master electrician need not be on the work locations at all times electrical work is being done, but the unrestricted master electrician must approve work performed by the unrestricted journeyman. Licensed electrician requirements by city ordinances do not apply to on state system work.

The unrestricted journeyman and unrestricted master electrical licenses must be issued by the Texas Department of Licensing and Regulation or by a city in Texas with a population of 50,000 or greater that issues licenses based on passing a written test and demonstrating experience.

The Engineer may accept other states' electrical licenses. Submit documentation of the requirements for obtaining that license. Acceptance of the license will be based on sufficient evidence that the license was issued based on:

- passing a test based on the NEC similar to that used by Texas licensing officials, and
- sufficient electrical experience commensurate with general standards for an unrestricted master and unrestricted journeyman electrician in the State of Texas.

18.2. **Work Requirements.** The qualifications required to perform electrical work and specialized electrical work are listed in Table 2.

TABLE 2
WORK REQUIREMENTS

TYPE OF WORK	QUALIFICATIONS TO PERFORM WORK
ELECTRICAL WORK WITH PLANS	LICENSED ELECTRICIAN, CERTIFIED PERSON, OR WORKERS DIRECTLY SUPERVISED BY A LICENSED ELECTRICIAN OR CERTIFIED PERSON
ELECTRICAL WORK WITHOUT PLANS	LICENSED ELECTRICIAN OR WORKERS DIRECTLY SUPERVISED BY A LICENSED ELECTRICIAN
SPECIALIZED ELECTRICAL WORK	LICENSED ELECTRICIAN OR WORKERS DIRECTLY SUPERVISED BY A LICENSED ELECTRICIAN
REPLACE LAMPS, STARTING AIDS, AND CHANGING FIXTURES	LICENSED ELECTRICIAN, CERTIFIED PERSON, OR WORKERS DIRECTLY SUPERVISED BY A LICENSED ELECTRICIAN OR CERTIFIED PERSON
CONDUIT IN PRECAST SECTION WITH APPROVED WORKING	INSPECTION BY LICENSED ELECTRICIAN OR CERTIFIED PERSON
CONDUIT IN CAST-IN-PLACE SECTION	INSPECTION BY LICENSED ELECTRICIAN OR CERTIFIED PERSON
ALL OTHER ELECTRICAL WORK (TROUBLESHOOTING, REPAIRS, COMPONENT REPLACEMENT,	LICENSED ELECTRICIAN OR WORKERS DIRECTLY SUPERVISED BY A LICENSED ELECTRICIAN

A licensed electrician must be physically present during all electrical work when Table 2 states that workers are to be directly supervised by a licensed electrician or certified person.

A non-certified person may install conduit in cast-in-place concrete sections if the work is verified by a certified person before concrete placement.

When the plans specify IMSA certification, the requirements of Table 2 will still apply to the installation of the conduit, ground boxes, electrical services, pole grounding, and electrical conductors installed under Item 620, "Electrical Conductors."

Item 8L

Prosecution and Progress

1. Prosecution of Work

Unless otherwise shown in the Contract, begin work within 30 calendar days after the authorization date to begin work as shown on the Notice to Proceed. Prosecute the work continuously to completion within the working days specified. Unless otherwise shown in the Contract documents, work may be prosecuted in concurrent phases if no changes are required in the traffic control plan or if a revised traffic control plan is approved. Notify the Engineer at least 24 hr. before beginning work or before beginning any new operation. Do not start new operations to the detriment of work already begun. Minimize interference to traffic.

2. Subcontracting

Do not sublet any portion of a construction Contract without the Engineer's written approval. A subcontract does not relieve any responsibility under the Contract and bonds. Ensure that all subcontracted work complies with all governing labor provisions.

The Contractor certifies by signing the Contract that the Contractor will not enter into any subcontract with a subcontractor that is debarred or suspended by the Owner, or any state or federal agency.

For federally funded Contracts, ensure the required federal documents are physically attached to each subcontract agreement including all tiered subcontract agreements.

For all DBE/HUB/SBE subcontracts including all tiered DBE/HUB/SBE subcontracts, submit a copy of the executed subcontract agreement.

Submit a copy of the executed non-DBE subcontracts including all tiered non-DBE subcontracts when requested.

- 2.1. **Construction Contracts.** Perform work with own organization on at least 30% of the total original Contract cost (25% if the Contractor is an SBE on a wholly State or local funded Contract) excluding any items determined to be specialty items. Specialty items are those that require highly specialized knowledge, abilities, or equipment not usually available in the contracting firm expected to bid on the proposed Contract as a whole.

Specialty items will be shown on the plans or as directed by the Engineer. Bid cost of specialty items performed by subcontractors will be deducted from the total original Contract cost before computing the required amount of work to be performed by

the Contractor's own organization. The term "perform work with own organization" includes only:

- workers employed and paid directly by the Contractor or wholly owned subsidiary;
- equipment owned by the Contractor or wholly owned subsidiary;
- rented or leased equipment operated by the Contractor's employees or wholly owned subsidiary's employees;
- materials incorporated into the work if the majority of the value of the work involved in incorporating the material is performed by the Contractor's own organization, including a wholly owned subsidiary's organization; and
- labor provided by staff leasing firms licensed under Chapter 91 of the Texas Labor Code for nonsupervisory personnel if the Contractor or wholly owned subsidiary maintains direct control over the activities of the leased employees and includes them in the weekly payrolls.

When staff leasing firms provide materials or equipment, they are considered subcontractors. In these instances, submit staff leasing firms for approval as a subcontractor. Copies of cancelled checks and certified statements may be required to verify compliance with the requirements of this section.

- 2.2. **Payments to Subcontractors.** Report payments for DBE/HUB/SBE subcontracts including tiered DBE/HUB/SBE subcontracts in the manner as prescribed by the Owner.
- 2.3. **Payment Records.** Make payment records, including copies of cancelled checks, available for inspection by the Owner. Submit payment records upon request. Retain payment records for a period of 3 yr. following completion of the Contract work or as specified by the Owner.

Failure to submit this information to the Engineer by the 20th day of each month will result in the Owner taking actions, including, but not limited to, withholding estimates and suspending the work. This work will not be measured or paid for directly but will be subsidiary to pertinent items.

3. **Computation of Contract Time for Completion**

Upon request, the Engineer will provide the conceptual time determination schedule to the Contractor for informational purposes only. The schedules assume generic resources, production rates, sequences of construction and average weather conditions based on historic data. The Owner will not adjust the number of working days and milestones, if any, due to differences in opinion regarding any assumptions made in the preparation of the schedule

or for errors, omissions, or discrepancies found in the Owner's conceptual time schedule.

The number of working days is established by the Contract. Working day charges will begin 30 calendar days after the date of the written authorization to begin work. Working day charges will continue in accordance with the Contract. The Engineer may consider increasing the number of working days under extraordinary circumstances.

- 3.1. **Working Day Charges.** Working days will be charged in accordance with Section 8.3.1.4., "Standard Workweek," unless otherwise shown in the Contract documents. Working days will be computed and charged in accordance with one of the following:
 - 3.1.1. **Five-Day Workweek.** Working days will be charged Monday through Friday, excluding national holidays, regardless of weather conditions or material availability. The Contractor has the option of working on Saturdays. Provide sufficient advance notice when scheduling work on Saturdays. Work on Sundays and national holidays will not be permitted without written permission. If work requiring an Inspector to be present is performed on a Saturday, Sunday, or national holiday, and weather and other conditions permit the performance of work for 7 hr. between 7 A.M. and 6 P.M., a working day will be charged.
 - 3.1.2. **Six-Day Workweek.** Working days will be charged Monday through Saturday, excluding national holidays, regardless of weather conditions or material availability. Work on Sundays and national holidays will not be permitted without written permission. If work requiring an Inspector to be present is performed on a Sunday or a national holiday, and weather or other conditions permit the performance of work for 7 hr. between 7 A.M. and 6 P.M., a working day will be charged.
 - 3.1.3. **Seven-Day Workweek.** Working days will be charged Monday through Sunday, excluding national holidays, regardless of weather conditions or material availability. Work on national holidays will not be permitted without written permission. If work is performed on any of these holidays requiring an Inspector to be present, and weather or other conditions permit the performance of work for 7 hr. between 7 A.M. and 6 P.M., a working day will be charged.
 - 3.1.4. **Standard Workweek.** Working days will be charged Monday through Friday, excluding national or state holidays, if weather or other conditions permit the performance of the principal unit of work underway, as determined by the Engineer, for a continuous period of at least 7 hr. between 7 A.M. and 6 P.M., unless otherwise shown in the Contract. The Contractor has the option of working on Saturdays or state holidays. Provide sufficient advance notice to the Engineer when scheduling work on Saturdays. Work on Sundays and

national holidays will not be permitted without written permission. If work requiring an Inspector to be present is performed on a Saturday, Sunday, or holiday, and weather or other conditions permit the performance of work for 7 hr. between 7 A.M. and 6 P.M., a working day will be charged.

- 3.1.5. **Calendar Day.** Working days will be charged Sunday through Saturday, including all holidays, regardless of weather conditions, material availability, or other conditions not under the control of the Contractor.
- 3.1.6. **Other.** Working days will be charged as shown in the Contract documents.
- 3.2. **Restricted Work Hours.** Restrictions on Contractor work hours and the related definition for working day charges are as prescribed in this article unless otherwise shown in the Contract documents.
- 3.3. **Nighttime Work.** Nighttime work is allowed only when shown in the Contract documents or as directed. Nighttime work is defined as work performed from 30 min. after sunset to 30 min. before sunrise.
 - 3.3.1. **Five-, Six-, and Seven-Day Workweeks.** Nighttime work that extends past midnight will be assigned to the following day for the purposes of approval for allowing work on Sundays or national holidays.
 - 3.3.2. **Standard Workweek.**
 - 3.3.2.1. **Nighttime Work Only.** When nighttime work is allowed or required, and daytime work is not allowed, working day charges will be made when weather and other conditions permit the performance of the principal unit of work underway, as determined by the Engineer, for a continuous period of at least 7 hr. for the nighttime period, as defined in Section 8.3.3., "Nighttime Work," unless otherwise shown in the Contract documents.
 - 3.3.2.2. **Nighttime Work and Daytime Work Requiring Inspector.** When nighttime work is performed or required, and daytime work is allowed, working day charges will be made when weather and other conditions permit the performance of the principal unit of work underway, as determined by the Engineer, for a continuous period of at least 7 hr. for the nighttime period, as defined in Section 8.3.3., "Nighttime Work," or for a continuous period of at least 7 hr. for the alternative daytime period unless otherwise shown in the Contract documents. Only one day will be charged for each 24-hr. time period. When the Engineer agrees to restrict work hours to the nighttime period only, working day charges will be in accordance with Section 8.3.3.2.1., "Nighttime Work Only."
- 3.4. **Time Statements.** The Engineer will furnish the Contractor a monthly time statement. Review the monthly time statement for correctness. Report

protests in writing, no later than 30 calendar days after receipt of the time statement, providing a detailed explanation for each day protested. Not filing a protest within 30 calendar days will indicate acceptance of the working day charges and future consideration of that statement will not be permitted.

4. Temporary Suspension of Work or Working Day Charges

The Engineer may suspend the work, wholly or in part, and will provide notice and reasons for the suspension in writing. Suspend and resume work only as directed in writing.

When part of the work is suspended, the Engineer may suspend working day charges only when conditions not under the control of the Contractor prohibit the performance of critical activities. When all of the work is suspended for reasons not under the control of the Contractor, the Engineer will suspend working day charges.

5. Project Schedules

Prepare, maintain, and submit project schedules. Project schedules are used to convey the Contractor's intended work plan to the Owner. Prepare project schedules with a level of effort sufficient for the work being performed. Project schedules will not be used as a basis to establish the amount of work performed or for the preparation of the progress payments.

5.1. Project Scheduler. Designate an individual who will develop and maintain the progress schedule. The Project Scheduler will be prepared to discuss, in detail, the proposed sequence of work and methods of operation, and how that information will be communicated through the Progress Schedule at the Preconstruction Meeting. This individual will also attend the project meetings and make site visits to prepare, develop, and maintain the progress schedules.

5.2. Construction Details. Before starting work, prepare and submit a progress schedule based on the sequence of work and traffic control plan shown in the Contract documents. At a minimum, prepare the progress schedule as a Bar Chart or Critical Path Method (CPM), as shown on the plans. Include all planned work activities and sequences and show Contract completion within the number of working days specified. Incorporate major material procurements, known utility relocations, and other activities that may affect the completion of the Contract in the progress schedule. Show a beginning date, ending date, and duration in whole working days for each activity. Do not use activities exceeding 20 working days, except for agreed upon activities. Show an estimated production rate per working day for each work activity.

5.3. Schedule Format. Format all project schedules according to the following:

- Begin the project schedule on the date of the start of Contract time or start of activities affecting work on the project;
- Show the sequence and interdependence of activities required for complete performance of the work. If using a CPM schedule, show a predecessor and a successor for each activity; and
- Ensure all work sequences are logical and show a coordinated plan of the work.

CPM schedules must also include:

- Clearly and accurately identify the critical path as the longest continuous path;
- Provide a legend for all abbreviations, run date, data date, project start date, and project completion date in the title block of each schedule submittal; and
- Through the use of calendars, incorporate seasonal weather conditions into the schedule for work (e.g., earthwork, concrete paving, structures, asphalt, drainage, etc.) that may be influenced by temperature or precipitation. Also, incorporate non-work periods such as holidays, weekends, or other non-work days as identified in the Contract.

5.4. **Activity Format.** For each activity on the project schedule provide:

- A concise description of the work represented by the activity;
- An activity duration in whole working days;
- Code activities so that organized plots of the schedule may be produced.

CPM schedules must also include the quantity of work and estimated production rate for major items of work. Provide enough information for review of the work being performed.

5.5. **Schedule Types.**

5.5.1. **Bar Chart.** Seven calendar days before the preconstruction meeting, prepare and submit a hard copy of the schedule using the bar chart method.

5.5.1.1. **Progress Schedule Reviews.** Update the project schedule and submit a hard copy when changes to the schedule occur or when requested.

5.5.2. **Critical Path Method.** Prepare and submit the schedule using the CPM.

5.5.2.1. **Preliminary Schedule.** Seven calendar days before the preconstruction meeting, submit both the plotted and electronic copies of the project schedule showing work to be performed within the first 90 calendar days of the project.

- 5.5.2.2. **Baseline Schedule.** The baseline schedule will be considered the Contractor's plan to successfully construct the project within the time frame and construction sequencing indicated in the Contract. Submit both plotted and electronic copies of the baseline schedule. Submit 2 plots of the schedule: one organized with the activities logically grouped using the activity coding; and the other plot showing only the critical path determined by the longest path, not based on critical float.

Develop and submit the baseline schedule for review within the first 45 calendar days of the project unless the time for submission is extended.

- 5.5.2.2.1. **Review.** Within 15 calendar days of receipt of the schedule, the Engineer will evaluate, and inform the Contractor if the schedule has been accepted. If the schedule is not accepted, the Engineer will provide comments to the Contractor for incorporation. Provide a revised schedule based on the Engineer's comments, or reasons for not doing so within 10 calendar days. The Engineer's review and acceptance of the project schedule is for conformance to the requirements of the Contract documents only and does not relieve the Contractor of any responsibility for meeting the interim milestone dates (if specified) or the Contract completion date. Review and acceptance does not expressly or by implication warrant, acknowledge, or admit the reasonableness of the logic or durations of the project schedule. If the Contractor fails to define any element of work, activity, or logic and the Engineer's review does not detect this omission or error, the Contractor is responsible for correcting the error or omission.

Submit an acceptable baseline schedule before the 90th calendar day of the project unless the time for submission is extended.

- 5.5.2.3. **Progress Schedule.** Maintain the project schedule for use by both the Contractor and the Engineer. Submit both the plotted and electronic copy as it will become an as-built record of the daily progress achieved on the project. If continuous progress of an activity is interrupted for any reason except non-work periods (such as holidays, weekend, or interference from temperature or precipitation), then the activity will show the actual finish date as that date of the start of the interruption and the activity will be broken into a subsequent activity (or activities, based on the number of interruptions) similarly numbered with successive alpha character as necessary. The original duration of the subsequent activity will be that of the remaining duration of the original activity. Relationships of the subsequent activity will match those of the original activity so that the integrity of the project schedule logic is maintained. Once established, the original durations and actual dates of all activities must remain unchanged. Revisions to the schedule may be made as necessary.

The project schedule must be revised when changes in construction phasing and sequencing occur or other changes that cause deviation from the original

project schedule occur. Any revisions to the schedule must be listed in the monthly update narrative with the purpose of the revision and description of the impact on the project schedule's critical path and project completion date. Create the schedule revision using the latest update before the start of the revision.

Monthly updating of the project schedule will include updating of:

- The actual start dates for activities started;
- The actual finish dates for activities completed;
- The percentage of work completed and remaining duration for each activity started but not yet completed; and
- The calendars to show days actual work was performed on the various work activities.

The cut-off day for recording monthly progress will be the last day of each month. Submit the updated project schedule no later than the 20th calendar day of the following month. The Engineer will evaluate the updated schedule within 5 calendar days of receipt and inform the Contractor if it has or has not been accepted. If the schedule is not accepted, the Engineer will provide comments to the Contractor for incorporation. Provide a revised schedule based on the Engineer's comments, or reasons for not doing so within 5 calendar days.

Provide a brief narrative in a bulleted statement format for major items that have impacted the schedule. Notify the Engineer if resource-leveling is being used.

- 5.5.2.3.1. **Project Schedule Summary Report (PSSR).** When shown on the plans, provide the PSSR instead of the narrative required in Section 8.5.5.2.3., "Progress Schedule." The PSSR includes a listing of major items that have impacted the schedule as well as a summary of progress in days ahead or behind schedule. Include an explanation of the project progress for the period represented on the form provided by the Owner.
- 5.5.3. **Notice of Potential Time Impact.** Submit a "Notice of Potential Time Impact" when a Contract time extension or adjustment of milestone dates may be justified or when directed. Failure to provide this notice in the time frames outlined above will compromise the Owner's ability to mitigate the impacts and the Contractor forfeits the right to request a time extension or adjustment of milestone dates unless the circumstances are such that the Contractor could not reasonably have had knowledge of the impact at the time.
- 5.5.4. **Time Impact Analysis.** When directed, provide a time impact analysis. A time impact analysis is an evaluation of the effects of impacts on the project. A time

impact analysis consists of the following steps:

- **Step 1.** Establish the status of the project immediately before the impact.
- **Step 2.** Predict the effect of the impact on the schedule update used in Step 1.
- **Step 3.** Track the effects of the impact on the schedule during its occurrence.
- **Step 4.** Establish the status of the project after the impact's effect has ended and provide details identifying any mitigating actions or circumstances used to keep the project ongoing during the impact period.

Determine the time impact by comparing the status of the work before the impact (Step 1) to the prediction of the effect of the impact (Step 2), if requested, and to actual effects of the impact once it is complete (Step 4). Unless otherwise approved, Steps 1, 3, and 4, must be completed before consideration of a Contract time extension or adjustment of a milestone date will be provided. Time extensions will only be considered when delays that affect milestone dates or the Contract completion date are beyond the Contractor's control. Submit Step 4 no later than 15 calendar days after the impact's effects

have ended or when all the information on the effect has been realized.

Submit one electronic backup copy of the complete time impact analysis and a copy of the full project schedule incorporating the time impact analysis. If the project schedule is revised after the submittal of a time impact analysis, but before its approval, indicate in writing the need for any modification to the time impact analysis.

The Engineer will review the time impact analysis upon completion of step 4. If this review detects revisions or changes to the schedule that had not been performed and identified in a narrative, the Engineer may reject the time impact analysis. If the Engineer is in agreement with the time impact analysis, a change order may be issued to grant additional working days, or to adjust interim milestones. Once a change order has been executed, incorporate the time impact analysis into the project schedule. The time impact analysis may also be used to support the settlement of disputes and claims. Compensation related to the time impact analysis may be provided at the completion of the analysis or the completion of the project to determine the true role the impact played on the final completion.

The work performed under this article will not be measured or paid for directly but will be subsidiary to pertinent items.

6. Failure to Complete Work on Time

The time established for the completion of the work is an essential element of the Contract. If the Contractor fails to complete the work within the number of working days specified, working days will continue to be charged. Failure to complete the Contract, a separate work order, or callout work within the number of working days specified, including any approved additional working days, will result in liquidated damages for each working day charged over the number of working days specified in the Contract. The dollar amount specified in the Contract will be deducted from any money due or to become due the Contractor for each working day the Contract remains incomplete. This amount will be assessed not as a penalty but as liquidated damages.

7. Default of the Contract

7.1. Declaration of Default. The Engineer may declare the Contractor to be in default of the Contract if the Contractor:

- fails to begin the work within the number of days specified,
- fails to prosecute the work to assure completion within the number of days specified,
- is uncooperative, disruptive or threatening,
- fails to perform the work in accordance with the Contract requirements,
- neglects or refuses to remove and replace rejected materials or unacceptable work,
- discontinues the prosecution of the work without the Engineer's approval,
- makes an unauthorized assignment,
- fails to resume work that has been discontinued within a reasonable number of days after notice to do so,
- fails to conduct the work in an acceptable manner, or
- commits fraud or other unfixable conduct as determined by the Owner.

If any of these conditions occur, the Engineer will give notice in writing to the Contractor and the Surety of the intent to declare the Contractor in default. If the Contractor does not proceed as directed within 10 days after the notice, the Owner will provide written notice to the Contractor and the Surety to declare the Contractor to be in default of the Contract. The Owner will also provide written notice of default to the Surety. If the Contractor provides the Owner written notice of voluntary default of the Contract, the Owner may waive the 10-day notice of intent to declare the Contractor in default and immediately provide

written notice of default to the Contractor and the Surety. Working day charges will continue until completion of the Contract. The Owner may suspend work in accordance with Section 8.4., "Temporary Suspension of Work or Working Day Charges," to investigate apparent fraud or other unfixable conduct before defaulting the Contractor. The Contractor may be subject to sanctions under the state and/or federal laws and regulations.

The Owner will determine the method used for the completion of the remaining work as follows:

- **Contracts without Performance Bonds.** The Owner will determine the most expeditious and efficient way to complete the work and recover damages from the Contractor.
- **Contracts with Performance Bonds.** The Owner will, without violating the Contract, demand that the Contractor's Surety complete the remaining work in accordance with the terms of the original Contract. A completing Contractor will be considered a subcontractor of the Surety. The Owner reserves the right to approve or reject proposed subcontractors. Work may resume after the Owner receives and approves Certificates of Insurance as required in Section 3.4.3., "Insurance." Certificates of Insurance may be issued in the name of the completing Contractor. The Surety is responsible for making every effort to expedite the resumption of work and completion of the Contract. The Owner may complete the work using any or all materials at the work locations that it deems suitable and acceptable. Any costs incurred by the Owner for the completion of the work under the Contract will be the responsibility of the Surety.

From the time of notification of the default until work resumes (either by the Surety or the Owner), the Owner will maintain traffic control devices and will do any other work it deems necessary, unless otherwise agreed upon by the Owner and the Surety. All costs associated with this work will be deducted from money due to the Surety.

The Owner will hold all money earned but not disbursed by the date of default. Upon resumption of the work after the default, all payments will be made to the Surety. All costs and charges incurred by the Owner as a result of the default, including the cost of completing the work under the Contract, costs of maintaining traffic control devices, costs for other work deemed necessary, and any applicable liquidated damages or disincentives will be deducted from money due the Contractor for completed work. If these costs exceed the sum that would have been payable under the Contract, the Surety will be liable and pay the Owner the balance of these costs in excess of the Contract price. In case the costs incurred by the Owner are less than the amount that would have been payable under the Contract if the work had been completed by the

Contractor, the Owner will be entitled to retain the difference.

Comply with Article 8.2., "Subcontracting," and abide by the DBE/HUB/SBE commitments previously approved by the Owner.

No markups as defined in Article 9.7., "Payment for Extra Work and Force Account Method," will be allowed for the Surety.

- 7.2. **Wrongful Default.** Submit a written request to the Owner within 14 calendar days of receipt of the notice of default for consideration of wrongful default.

The Owner will determine if the Contractor has been wrongfully defaulted, and will proceed with the following:

- If the Owner determines the default is proper, the default will remain. If the Contractor is in disagreement, the Contractor may file a claim in accordance with Article 4.7., "Dispute or Claims Procedure."
- If the Owner determines it was a wrongful default, the Owner will terminate the Contract for convenience, in accordance with Article 8.8., "Termination of the Contract."

8. **Termination of the Contract**

The Owner may terminate the Contract in whole or in part whenever:

- the Contractor is prevented from proceeding with the work as a direct result of an executive order of the President of the United States or the Governor of the State;
- the Contractor is prevented from proceeding with the work due to a national emergency, or when the work to be performed under the Contract is stopped, directly or indirectly, because of the freezing or diversion of materials, equipment or labor as the result of an order or a proclamation of the President of the United States;
- the Contractor is prevented from proceeding with the work due to an order of any federal authority;
- the Contractor is prevented from proceeding with the work by reason of a preliminary, special, or permanent restraining court order where the issuance of the restraining order is primarily caused by acts or omissions of persons or agencies other than the Contractor; or
- the Owner determines that termination of the Contract is in the best interest of the Owner or the public. This includes, but is not limited to, the discovery of significant hazardous material problems, right of way acquisition problems, or utility conflicts that would cause substantial delays or expense to the Contract.

8.1. **Procedures and Submittals.** The Engineer will provide written notice to the Contractor of termination specifying the extent of the termination and the effective date. Upon notice, immediately proceed in accordance with the following: stop work as specified in the notice;

- place no further subcontracts or orders for materials, services, or facilities, except as necessary to complete a critical portion of the Contract, as approved;
- terminate all subcontracts to the extent they relate to the work terminated;
- complete performance of the work not terminated;
- settle all outstanding liabilities and termination settlement proposals resulting from the termination for public convenience of the Contract;
- create an inventory report, including all acceptable materials and products obtained for the Contract that have not been incorporated in the work that was terminated (include in the inventory report a description, quantity, location, source, cost, and payment status for each of the acceptable materials and products); and
- take any action necessary, or that the Engineer may direct, for the protection and preservation of the materials and products related to the Contract that are in the possession of the Contractor and in which the Owner has or may acquire an interest.

8.2. **Settlement Provisions.** Within 60 calendar days of the date of the notice of termination, submit a final termination settlement proposal, unless otherwise approved. The Engineer will prepare a change order that reduces the affected quantities of work and adds acceptable costs for termination. No claim for loss of anticipated profits will be considered. The Owner will pay reasonable and verifiable termination costs including:

- all work completed at the unit bid price and partial payment for incomplete work;
- the percentage of Item 500, "Mobilization," equivalent to the percentage of work complete or actual cost that can be supported by cost records, whichever is greater;
- expenses necessary for the preparation of termination settlement proposals and support data;
- the termination and settlement of subcontracts;
- storage, transportation, restocking, and other costs incurred necessary for the preservation, protection, or disposition of the termination inventory; and
- other expenses acceptable to the Owner.

Item 9L

Measurement and Payment

1. Measurement of Quantities

The Engineer will measure all completed work using United States standard measures, unless otherwise specified.

- 1.1. **Linear Measurement.** Unless otherwise specified, all longitudinal measurements for surface areas will be made along the actual surface of the roadway and not horizontally. No deduction will be made for structures in the roadway with an area of 9 sq. ft. or less. For all transverse measurements for areas of base courses, surface courses, and pavements, the dimensions to be used in calculating the pay areas will be the neat dimensions and will not exceed those shown on the plans, unless otherwise directed.

- 1.2. **Volume Measurement.** Transport materials measured for payment by volume in approved hauling vehicles. Display a unique identification mark on each vehicle. Furnish information necessary to calculate the volume capacity of each vehicle. The Engineer may require verification of volume through weight measurement. Use body shapes that allow the capacity to be verified. Load and level the load to the equipment's approved capacity. Loads not hauled in approved vehicles may be rejected.

- 1.3. **Weight Measurement.** Transport materials measured for payment by weight or truck measure in approved hauling vehicles. Furnish certified measurements, tare weights, and legal gross weight calculations for all haul units. Affix a permanent, legible number on the truck and on the trailer to correspond with the certified information. Furnish certified weights of loaded haul units transporting material if requested.

The material will be measured at the point of delivery. The cost of supplying these volume and weight capacities is subsidiary to the pertinent item. For measurement by the ton, in the field, provide measurements in accordance with Item 520, "Weighing and Measuring Equipment," except for items where ton measurements are measured by standard tables.

The Engineer may reject loads and suspend hauling operations for overloading.

- 1.3.1. **Hauling on Routes Accessible to the Traveling Public.** For payment purposes on haul routes accessible to the traveling public, the net weight of the load will be calculated as follows:

- If the gross vehicle weight is less than the maximum allowed by state law, including applicable yearly weight tolerance permit, the net weight of the load will be determined by deducting the tare weight of the vehicle from the gross weight.

- If the gross vehicle weight is more than the maximum allowed by state law, including applicable yearly weight tolerance permit, the net weight of the load will be determined by deducting the tare weight of the vehicle from the maximum gross weight allowed.

1.3.2. **Hauling on Routes Not Accessible to the Traveling Public.** For payment purposes on haul routes that are not accessible to the traveling public where advance permission is obtained in writing from the Engineer:

- If the gross vehicle weight is less than the maximum allowed, including applicable yearly weight tolerance permit, the net weight of the load will be determined by deducting the tare weight of the vehicle from the gross weight.
- If the gross vehicle weight is more than the maximum allowed, the net weight of the load will be determined by deducting the tare weight of the vehicle from the maximum gross weight allowed.

2. **Plans Quantity Measurement**

Plans quantities may or may not represent the exact quantity of work performed or material moved, handled, or placed during the execution of the Contract. The estimated bid quantities are designated as final payment quantities, unless revised by the governing specifications or this article.

If the quantity measured as outlined under “Measurement” varies by more than 5% (or as stipulated under “Measurement” for specific Items) from the total estimated quantity for an individual item originally shown in the Contract, an adjustment may be made to the quantity of authorized work done for payment purposes.

When quantities are revised by a change in design approved by the Owner, by change order, or to correct an error on the plans, the plans quantity will be increased or decreased by the amount involved in the change, and the 5% variance will apply to the new plans quantity.

If the total Contract quantity multiplied by the unit bid price for an individual item is less than \$250 and the item is not originally a plans quantity item, then the item may be paid as a plans quantity item if the Engineer and Contractor agree in writing to fix the final quantity as a plans quantity.

For Contracts with callout work and work orders, plans quantity measurement requirements are not applicable.

3. **Adjustment of Quantities**

The party to the Contract requesting the adjustment will provide field measurements and calculations showing the revised quantity. When approved, this revised quantity will constitute the final quantity for which payment will be made. Payment for

revised quantity will be made at the unit price bid for that item, except as provided for in Article 4.4., "Changes in the Work."

4. Scope of Payment

Payment of the Contract unit price is full compensation for all materials, equipment, labor, tools, and supplies necessary to complete the item of work under the Contract. Until final acceptance in accordance with Article 5.12., "Final Acceptance," assume liability for completing the work according to the Contract documents and any loss or damage arising from the performance of the work or from the action of the elements, infringement of patent, trademark, or copyright, except as provided elsewhere in the Contract.

The Owner will only pay for material incorporated into the work in accordance with the Contract. Payment of progress estimates will in no way affect the Contractor's obligation under the Contract to repair or replace any defective parts in the construction or to replace any defective materials used in the construction and to be responsible for all damages due to defects if the defects and damages are discovered on or before final inspection and acceptance of the work.

5. Progress Payments

The Engineer will prepare a monthly estimate of the amount of work performed, including materials in place. Incomplete items of work may be paid at an agreed upon percentage as approved. Payment of the monthly estimate is determined at the Contract item prices less any withholdings or deductions in accordance with the Contract. Progress payments may be withheld for failure to comply with the Contract.

6. Payment for Material on Hand (MOH)

If payment for MOH is desired, request compensation for the invoice cost of acceptable nonperishable materials that have not been used in the work before the request, and that have been delivered to the work location or are in acceptable storage places. Nonperishable materials are those that do not have a shelf life or whose characteristics do not materially change when exposed to the elements. Include only materials that have been sampled, tested, approved, or certified, and are ready for incorporation into the work. Only materials which are completely constructed or fabricated on the Contractor's order for a specific Contract and are so marked and on which an approved test report has been issued are eligible. Payment for MOH may include the following types of items: concrete traffic barrier, precast concrete box culverts, concrete piling, reinforced concrete pipe, and illumination poles. Any repairs required after fabricated materials have been approved for storage will require approval of the Engineer before being made and will be made at the Contractor's expense. Include only those materials that have an invoice cost of at least \$1,000 in the request for MOH payment.

If the request is acceptable, the Engineer will include payment for MOH in a progress

payment. Payment for MOH does not constitute acceptance of the materials. Payment will not exceed the actual cost of the material as established by invoice, or the total cost for the associated item less reasonable placement costs, whichever is less. Materials for which the Contractor does not have a paid invoice within 60 days will not be eligible for payment and will be removed from the estimate. Payment may be limited to a portion of the invoice cost or unit price if shown elsewhere in the Contract. Payment for precast products fabricated or constructed by the Contractor for which invoices or freight bills are not available may be made based on statements of actual cost.

Submit the request on forms provided by the Owner. These forms may be electronically reproduced, provided they are in the same format and contain all the required information and certifications. Continue to submit monthly MOH forms until the total value of MOH is \$0.

By submitting a request for MOH payment, the Contractor expressly authorizes the Owner to audit MOH records, and to perform process reviews of the record-keeping system. If the Owner determines noncompliance with any of the requirements of this provision, the Owner may exclude payment for any or all MOH for the duration of the Contract.

Maintain all records relating to MOH payment until final acceptance. Provide these records to the Engineer upon request.

7. Payment for Extra Work AND FORCE ACCOUNT METHOD

Payment for extra work directed, performed, and accepted will be made in accordance with Article 4.4., "Changes in the Work." Payment for extra work may be established by agreed unit prices or by Force Account Method.

Agreed unit prices are unit prices that include markups and are comparable to recent bid prices for the same character of work. These unit prices may be established without additional breakdown justification.

When using Force Account Method, determine an estimated cost for the proposed work and establish labor and equipment rates and material costs. Maintain daily records of extra work and provide copies of these records daily, signed by the Contractor's representative, for verification by the Engineer. Request payment for the extra work no later than the 10th day of the month following the month in which the work was performed. Include copies of all applicable invoices. If the extra work to be performed has an estimated cost of less than \$10,000, submit for approval and payment an invoice of actual cost for materials, equipment, labor, tools, and incidentals necessary to complete the extra work.

7.1. Markups. Payment for extra work may include markups as compensation for the use of small tools, overhead expense, and profit.

7.1.1. Labor. Compensation will be made for payroll rates for each hour that the labor,

foremen, or other approved workers are actually engaged in the work. In no case will the rate of wages be less than the minimum shown in the Contract for a particular category. An additional 25% of this sum will be paid as compensation for overhead, superintendence, profit, and small tools.

7.1.2. **Insurance and Taxes.** An additional 55% of the labor cost, excluding the 25% compensation provided in Section 9.7.1.1., "Labor," will be paid as compensation for labor insurance and labor taxes including the cost of premiums on non- project-specific liability (excluding vehicular) insurance, workers compensation insurance, Social Security, unemployment insurance taxes, and fringe benefits.

7.1.3. **Materials.** Compensation will be made for materials associated with the work based on actual delivered invoice costs, less any discount. An additional 25% of this sum will be paid as compensation for overhead and profit.

7.1.4. **Equipment.** Payment will be made for the established equipment hourly rates for each hour that the equipment is involved in the work. An additional 15% of this sum will be paid as compensation for overhead and profit not included in the rates.

Transportation cost for mobilizing equipment will be included if the equipment is mobilized from an off-site location.

7.1.4.1. **Contractor-Owned Equipment.** For Contractor-owned machinery, trucks, power tools, or other equipment, use the FHWA rental rates found in the *Rental Rate Blue Book* multiplied by the regional adjustment factor and the rate adjustment factor to establish hourly rates. Use the rates in effect for each section of the *Rental Rate Blue Book* at the time of use.

If a rate has not been established for a particular piece of equipment in the *Rental Rate Blue Book*, the Engineer will allow a reasonable hourly rate. This price will include operating costs.

Payment for equipment will be made for the actual hours used in the work. The Owner reserves the right to withhold payment for low production or lack of progress. Payment will not be made for time lost for equipment breakdowns, time spent to repair equipment, or time after equipment is no longer needed.

7.1.4.2. **Equipment Not Owned by the Contractor.** For equipment rented from a third party not owned by the Contractor, payment will be made at the invoice daily rental rate for each day the equipment is needed for the work. The Owner reserves the right to limit the daily rate to comparable *Rental Rate Blue Book* rates. When the invoice specifies that the rental rate does not include fuel, lubricants, repairs, and servicing, the *Rental Rate Blue Book* hourly operating cost for each hour the equipment is operated will be added.

When the invoice specifies equipment operators as a component of the equipment

rental, payment will be made at the invoice rate for each operator for each day the equipment is needed for the work.

7.1.4.3. **Standby Equipment Costs.** Payment for standby equipment will be made in accordance with Section 9.7.1.4., “Equipment,” except that:

7.1.4.3.1. **Contractor-Owned Equipment.** For Contractor-owned machinery, trucks, power tools, or other equipment:

- Standby will be paid at 50% (to remove operating cost) of the FHWA rental rates found in the *Rental Rate Blue Book* multiplied by the regional adjustment factor and the rate adjustment factor.
- Standby costs will not be allowed during periods when the equipment would have otherwise been idle.

7.1.4.3.2. **Equipment Not Owned by the Contractor.** For equipment rented from a third party not owned by the Contractor:

- Standby will be paid at the invoice daily rental rate, excluding operating cost, which includes fuel, lubricants, repairs, and servicing. The Owner reserves the right to limit the daily standby rate to comparable FHWA rental rates found in the *Rental Rate Blue Book* multiplied by the regional adjustment factor and the rate adjustment factor.
- Standby will be paid for equipment operators when included on the invoice and equipment operators are actually on standby.
- Standby costs will not be allowed during periods when the equipment would have otherwise been idle.

7.1.5. **Subcontracting.** An additional 5% of the actual invoice cost will be paid to the Contractor as compensation for administrative cost, superintendence, and profit.

7.1.6. **Law Enforcement.** An additional 5% of the actual invoice cost will be paid as compensation for administrative costs, superintendence, and profit.

7.1.7. **Railroad Flaggers.** An additional 5% of the actual invoice cost will be paid as compensation for administrative cost, superintendence, and profit.

7.1.8. **Bond Cost.** An additional 1% of the total compensation provided in Article 9.7., “Payment for Extra Work and Force Account Method,” will be paid for the increase in bond.

8. Retainage

The Owner will not withhold retainage on the Contractor. The Contractor may withhold retainage on subcontractors in accordance with state and federal

regulations.

9. Payment Provisions for Subcontractors

For the purposes of this article only, the term subcontractor includes suppliers and the term work includes materials provided by suppliers at a location approved by the Engineer. These requirements apply to all tiers of subcontractors. Incorporate the provisions of this article into all subcontract or material purchase agreements.

Pay subcontractors for work performed within 10 days after receiving payment for the work performed by the subcontractor. Also, pay any retainage on a subcontractor's work within 10 days after satisfactory completion of all of the subcontractor's work. Completed subcontractor work includes vegetative establishment, test, maintenance, performance, and other similar periods that are the responsibility of the subcontractor.

For the purpose of this section, satisfactory completion is accomplished when:

- the subcontractor has fulfilled the Contract requirements of both the Owner and the subcontract for the subcontracted work, including the submittal of all information required by the specifications and the Owner; and
- the work done by the subcontractor has been inspected, approved, and paid by the Owner.

Provide a certification of prompt payment in accordance with the Owner's prompt payment procedure to certify that all subcontractors and suppliers were paid from the previous months payments and retainage was released for those whose work is complete. Submit the completed form each month and the month following the month when final acceptance occurred at the end of the project.

The inspection and approval of a subcontractor's work does not eliminate the Contractor's responsibilities for all the work as defined in Article 7.17., "Contractor's Responsibility for Work."

The Owner may pursue actions against the Contractor, including withholding of estimates and suspending the work, for noncompliance with the subcontract requirements of this section upon receipt of written notice with sufficient details showing the subcontractor has complied with contractual obligations.

10.

Final Payment

When the Contract has been completed, all work has been approved, final acceptance has been made in accordance with Article 5.12., "Final Acceptance," and Contractor submittals have been received, the Engineer will prepare a final estimate for payment showing the total quantity of work completed and the money owed the Contractor. The final payment will reflect the entire sum due, less any sums previously paid.

Special Provision to Item 000

Schedule of Liquidated Damages

The dollar amount of daily contract administration Liquidated Damages per Working Day is \$3,150.00

Special Provision to Item 000

Nondiscrimination

3. DESCRIPTION

All recipients of federal financial assistance are required to comply with various nondiscrimination laws including Title VI of the Civil Rights Act of 1964, as amended, (Title VI). Title VI forbids discrimination against anyone in the United States on the grounds of race, color, or national origin by any agency receiving federal funds.

Owner, as a recipient of Federal financial assistance, and under Title VI and related statutes, ensures that no person shall on the grounds of race, religion (where the primary objective of the financial assistance is to provide employment per 42 U.S.C. § 2000d-3), color, national origin, sex, age or disability be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under any of Owner's programs or activities.

4. DEFINITION OF TERMS

Where the term "contractor" appears in the following six nondiscrimination clauses, the term "contractor" is understood to include all parties to contracts or agreements with the Owner.

5. NONDISCRIMINATION PROVISIONS

During the performance of this contract, the contractor agrees as follows:

- 5.1. **Compliance with Regulations.** The Contractor shall comply with the Regulations relative to nondiscrimination in Federally-assisted programs of the Department of Transportation (hereinafter, "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.
- 5.2. **Nondiscrimination.** The contractor, with regard to the work performed by it during the contract, shall not discriminate on the grounds of race, color, or national origin in the selection and retention of subcontractors, including procurements 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.
- 5.3. **Solicitations for Subcontracts, Including Procurements 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 procurements 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 nondiscrimination on the grounds of race, color, or national origin.
- 5.4. **Information and Reports:** The contractor shall provide all information and reports required by the Regulations or directives issued pursuant thereto, and shall permit access to its books, records, accounts, other sources of information, and its facilities as may be determined by the Owner or the Texas Department of Transportation 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 Owner or the Texas Department of Transportation as appropriate, and shall set forth what efforts it has made to obtain the information.

- 5.5. **Sanctions for Noncompliance.** In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the Owner shall impose such contract sanctions as it, the Owner may determine to be appropriate, including, but not limited to:
- withholding of payments to the contractor under the contract until the contractor complies, and/or
 - cancellation, termination or suspension of the contract, in whole or in part.
- 5.6. **Incorporation of Provisions.** The contractor shall include the provisions of paragraphs (3.1) through (3.6) in every subcontract, including procurements 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 Owner 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 Owner to enter into such litigation to protect the interests of the Owner, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

Special Provision to Item 000

Certification of Nondiscrimination in Employment

1. GENERAL

By signing this proposal, the Bidder certifies that Bidder has participated in a previous contract or subcontract subject to the equal opportunity clause, as required by Executive Orders 10925, 11114, or 11246, or if Bidder has not participated in a previous contract of this type, or if Bidder has had previous contract or subcontracts and has not filed, Bidder will file with the Joint Reporting Committee, the Director of the Office of Federal Contract Compliance, a Federal Government contracting or administering agency, or the former President's Committee on Equal Employment Opportunity, all reports due under the applicable filing requirements.

Note—The above certification is required by the Equal Employment Opportunity Regulations of the Secretary of Labor (41 CFR 60-1.7(b)(1)), and must be submitted by Bidders and proposed subcontractors only in connection with contracts and subcontracts which are subject to the equal opportunity clause. Contracts and subcontracts which are exempt from the equal opportunity clause are set forth in 41 CFR 60-1.5. (Generally only contracts or subcontracts of \$10,000 or under are exempt.)

Currently, Standard Form 100 (EEO-1) is the only report required by the Executive Orders or their implementing regulations.

Proposed prime contractors and subcontractors who have participated in a previous contract or subcontract subject to the Executive Orders and have not filed the required reports should note that 41 CFR 60-1.7(b)(1) prevents the award of contracts and subcontracts unless such contractor submits a report covering the delinquent period or such other period specified by the Federal Highway Administration or by the Director, Office of Federal Contract Compliance, U.S. Department of Labor.

Special Provision to Item 000

Notice of Requirement for Affirmative Action to Ensure Equal Employment Opportunity (Executive Order 11246)

1. GENERAL

In addition to the affirmative action requirements of the Special Provision titled "Standard Federal Equal Employment Opportunity Construction Contract Specifications" as set forth elsewhere in this proposal, the Bidder's attention is directed to the specific requirements for utilization of minorities and females as set forth below.

2. GOALS

2.1. Goals for minority and female participation are hereby established in accordance with 41 CFR 60-4.

2.2. The goals for minority and female participation expressed in percentage terms for the Contractor's aggregate work force in each trade on all construction work in the covered area are as follows:

Goals for minority participation in each trade, %	Goals for female participation in each trade, %
See Table 1	6.9

2.3. These goals are applicable to all the Contractor's construction work (whether or not it is Federal or federally assisted) performed in the covered area. If the Contractor performs construction work in a geographical area located outside of the covered area, it will apply the goals established for such geographical area where the work is actually performed. With regard to this second area, the Contractor also is subject to the goals for both its federally involved and non-federally involved construction. The Contractor's compliance with the Executive Order and the regulations in 41 CFR Part 60-4 will be based on its implementation of the Standard Federal Equal Employment Opportunity Construction Contract Specifications Special Provision and its efforts to meet the goals. The hours of minority and female employment and training must be substantially uniform throughout the length of the Contract, and in each trade, and the Contractor must make a good faith effort to employ minorities and women evenly on each of its projects. The transfer of minority and female employees or trainees from Contractor to Contractor or from project to project for the sole purpose of meeting the Contractor's goals will be a violation of the Contract, the Executive Order and the regulations in 41 CFR Part 60-4. Compliance with the goals will be measured against the total work hours performed.

2.4. A Contractor or subcontractor will be considered in compliance with these provisions by participation in the Texas Highway-Heavy Branch, AGC, Statewide Training and Affirmative Action Plan. Provided that each Contractor or subcontractor participating in this plan must individually comply with the equal opportunity clause set forth in 41 CFR 60-1.4 and must make a good faith effort to achieve the goals set forth for each participating trade in the plan in which it has employees. The overall good performance of other Contractors and subcontractors toward a goal in an approved plan does not excuse any covered Contractor's or subcontractor's failure to make good faith efforts to achieve the goals contained in these provisions. Contractors or subcontractors participating in the plan must be able to demonstrate their participation and document their compliance with the provisions of this Plan.

3. SUBCONTRACTING

The Contractor must provide written notification to the Owner within 10 working days of award of any construction subcontract in excess of \$10,000 at any tier for construction work under the Contract resulting from this solicitation pending concurrence of the Owner in the award. The notification will list the names,

address and telephone number of the subcontractor; employer identification number; estimated dollar amount of the subcontract; estimated starting and completion dates of the subcontract; and the geographical area in which the Contract is to be performed.

4. COVERED AREA

As used in this special provision, and in the Contract resulting from this solicitation, the geographical area covered by these goals for female participation is the State of Texas. The geographical area covered by these goals for other minorities are the counties in the State of Texas as indicated in Table 1.

5. REPORTS

The Contractor is hereby notified that he may be subject to the Office of Federal Contract Compliance Programs (OFCCP) reporting and record keeping requirements as provided for under Executive Order 11246 as amended. OFCCP will provide direct notice to the Contractor as to the specific reporting requirements that he will be expected to fulfill.

Table 1
Goals for Minority Participation

County	Participation, %	County	Participation, %
Anderson	22.5	Chambers	27.4
Andrews	18.9	Cherokee	22.5
Angelina	22.5	Childress	11.0
Aransas	44.2	Clay	12.4
Archer	11.0	Cochran	19.5
Armstrong	11.0	Coke	20.0
Atascosa	49.4	Coleman	10.9
Austin	27.4	Collin	18.2
Bailey	19.5	Collingsworth	11.0
Bandera	49.4	Colorado	27.4
Bastrop	24.2	Comal	47.8
Baylor	11.0	Comanche	10.9
Bee	44.2	Concho	20.0
Bell	16.4	Cooke	17.2
Bexar	47.8	Coryell	16.4
Blanco	24.2	Cottle	11.0
Borden	19.5	Crane	18.9
Bosque	18.6	Crockett	20.0
Bowie	19.7	Crosby	19.5
Brazoria	27.3	Culberson	49.0
Brazos	23.7	Dallam	11.0
Brewster	49.0	Dallas	18.2
Briscoe	11.0	Dawson	19.5
Brooks	44.2	Deaf Smith	11.0
Brown	10.9	Delta	17.2
Burleson	27.4	Denton	18.2
Burnet	24.2	DeWitt	27.4
Caldwell	24.2	Dickens	19.5
Calhoun	27.4	Dimmit	49.4
Callahan	11.6	Donley	11.0
Cameron	71.0	Duval	44.2
Camp	20.2	Eastland	10.9
Carson	11.0	Ector	15.1
Cass	20.2	Edwards	49.4
Castro	11.0	Ellis	18.2

County	Participation, %	County	Participation, %
El Paso	57.8	Kenedy	44.2
Erath	17.2	Kent	10.9
Falls	18.6	Kerr	49.4
Fannin	17.2	Kimble	20.0
Fayette	27.4	King	19.5
Fisher	10.9	Kinney	49.4
Floyd	19.5	Kleberg	44.2
Foard	11.0	Knox	10.9
Fort Bend	27.3	Lamar	20.2
Franklin	17.2	Lamb	19.5
Freestone	18.6	Lampasas	18.6
Frio	49.4	LaSalle	49.4
Gaines	19.5	Lavaca	27.4
Galveston	28.9	Lee	24.2
Garza	19.5	Leon	27.4
Gillespie	49.4	Liberty	27.3
Glasscock	18.9	Limestone	18.6
Goliad	27.4	Lipscomb	11.0
Gonzales	49.4	Live Oak	44.2
Gray	11.0	Llano	24.2
Grayson	9.4	Loving	18.9
Gregg	22.8	Lubbock	19.6
Grimes	27.4	Lynn	19.5
Guadalupe	47.8	Madison	27.4
Hale	19.5	Marion	22.5
Hall	11.0	Martin	18.9
Hamilton	18.6	Mason	20.0
Hansford	11.0	Matagorda	27.4
Hardeman	11.0	Maverick	49.4
Hardin	22.6	McCulloch	20.0
Harris	27.3	McLennan	20.7
Harrison	22.8	McMullen	49.4
Hartley	11.0	Medina	49.4
Haskell	10.9	Menard	20.0
Hays	24.1	Midland	19.1
Hemphill	11.0	Milam	18.6
Henderson	22.5	Mills	18.6
Hidalgo	72.8	Mitchell	10.9
Hill	18.6	Montague	17.2
Hockley	19.5	Montgomery	27.3
Hood	18.2	Moore	11.0
Hopkins	17.2	Morris	20.2
Houston	22.5	Motley	19.5
Howard	18.9	Nacogdoches	22.5
Hudspeth	49.0	Navarro	17.2
Hunt	17.2	Newton	22.6
Hutchinson	11.0	Nolan	10.9
Irion	20.0	Nueces	41.7
Jack	17.2	Ochiltree	11.0
Jackson	27.4	Oldham	11.0
Jasper	22.6	Orange	22.6
Jeff Davis	49.0	Palo Pinto	17.2
Jefferson	22.6	Panola	22.5
Jim Hogg	49.4	Parker	18.2
Jim Wells	44.2	Parmer	11.0
Johnson	18.2	Pecos	18.9
Jones	11.6	Polk	27.4
Karnes	49.4	Potter	9.3
Kaufman	18.2	Presidio	49.0
Kendall	49.4	Randall	9.3

County	Participation, %	County	Participation, %
Rains	17.2	Reagan	20.0
Real	49.4	Throckmorton	10.9
Red River	20.2	Titus	20.2
Reeves	18.9	Tom Green	19.2
Refugio	44.2	Travis	24.1
Roberts	11.0	Trinity	27.4
Robertson	27.4	Tyler	22.6
Rockwall	18.2	Upshur	22.5
Runnels	20.0	Upton	18.9
Rusk	22.5	Uvalde	49.4
Sabine	22.6	Val Verde	49.4
San Augustine	22.5	Van Zandt	17.2
San Jacinto	27.4	Victoria	27.4
San Patricio	41.7	Walker	27.4
San Saba	20.0	Waller	27.3
Schleicher	20.0	Ward	18.9
Scurry	10.9	Washington	27.4
Shackelford	10.9	Webb	87.3
Shelby	22.5	Wharton	27.4
Sherman	11.0	Wheeler	11.0
Smith	23.5	Wichita	12.4
Somervell	17.2	Wilbarger	11.0
Starr	72.9	Willacy	72.9
Stephens	10.9	Williamson	24.1
Sterling	20.0	Wilson	49.4
Stonewall	10.9	Winkler	18.9
Sutton	20.0	Wise	18.2
Swisher	11.0	Wood	22.5
Tarrant	18.2	Yoakum	19.5
Taylor	11.6	Young	11.0
Terrell	20.0	Zapata	49.4
Terry	19.5	Zavala	49.4

Special Provision to Item 000

Standard Federal Equal Employment Opportunity Construction Contract Specifications (Executive Order 11246)

1. GENERAL

- 1.1. As used in these specifications:
- "Covered area" means the geographical area described in the solicitation from which this Contract resulted;
 - "Director" means Director, Office of Federal Contract Compliance Programs, United States Department of Labor, or any person to whom the Director delegates authority;
 - "Employer identification number" means the Federal Social Security number used on the Employer's Quarterly Federal Tax Return, U.S. Treasury Department Form 941.
 - "Minority" includes:
 - Black (all persons having origins in any of the Black African racial groups not of Hispanic origin);
 - Hispanic (all persons of Mexican, Puerto Rican, Cuban, Central or South American or other Spanish Culture or origin, regardless of race);
 - Asian and Pacific Islander (all persons having origins in any of the original peoples of the Far East, Southeast Asia, the Indian Subcontinent, or the Pacific Islands); and
 - American Indian or Alaskan Native (all persons having origins in any of the original peoples of North American and maintaining identifiable tribal affiliations through membership and participation or community identification).
- 1.2. Whenever the Contractor, or any Subcontractor at any tier, subcontracts a portion of the work involving any construction trade, it will physically include in each subcontract in excess of \$10,000 the provisions of these specifications and the Notice which contains the applicable goals for minority and female participation and which is set forth in the solicitations from which this Contract resulted.
- 1.3. If the Contractor is participating (pursuant to 41 CFR 60-4.5) in a Hometown Plan approved by the U. S. Department of Labor in the covered area either individually or through an association, its affirmative action obligations on all work in the Plan area (including goals and timetables) will be in accordance with that plan for those trades which have unions participating in the Plan. Contractors must be able to demonstrate their participation in and compliance with the provisions of any such Hometown Plan. Each Contractor or Subcontractor participating in an approved Plan is individually required to comply with its obligations under the equal employment opportunity (EEO) clause, and to make a good faith effort to achieve each goal under the Plan in each trade in which it has employees. The overall good faith performance by other Contractors or Subcontractors toward a goal in an approved Plan does not excuse any covered Contractor's or Subcontractor's failure to take good faith efforts to achieve the Plan goals and timetables.
- 1.4. The Contractor will implement the specific affirmative action standards provided in Section 1.7.1. through Section 1.7.16. of these specifications. The goals set forth in the solicitation from which this Contract resulted are expressed as percentages of the total hours of employment and training of minority and female utilization the Contractor should reasonably be able to achieve in each construction trade in which it has employees in the covered area. Covered construction Contractors performing Contracts in geographical areas where they do not have a Federal or federally assisted construction Contract will apply the minority and female goals established for the geographical area where the Contract is being performed. Goals are published periodically in the Federal Register in notice form and such notices may be obtained from any Office of Federal Contract Compliance Programs office or any Federal procurement contracting officer. The

Contractor is expected to make substantially uniform progress toward its goals in each craft during the period specified.

- 1.5. Neither the provisions of any collective bargaining agreement, nor the failure by a union with whom the Contractor has a collective bargaining agreement, to refer either minorities or women will excuse the Contractor's obligations under these specifications, Executive Order 11246, or the regulations promulgated pursuant thereto.
- 1.6. In order for the nonworking training hours of apprentices and trainees to be counted in meeting the goals, such apprentices and trainees must be employed by the Contractor during the training period, and the Contractor must have made a commitment to employ the apprentices and trainees at the completion of their training, subject to the availability of employment opportunities. Trainees must be trained pursuant to training programs approved by the U. S. Department of Labor.
- 1.7. The Contractor will take specific affirmative actions to ensure equal employment opportunity. The evaluation of the Contractor's compliance with these specifications will be based upon its effort to achieve maximum results from its actions. The Contractor will document these efforts fully, and will implement affirmative action steps at least as extensive as the following:
 - 1.7.1. Ensure and maintain a working environment free of harassment, intimidation, and coercion at all sites, and in all facilities at which the Contractor's employees are assigned to work. The Contractor, where possible, will assign two or more women to each construction project. The Contractor will specifically ensure that all foremen, superintendents, and other on-site supervisory personnel are aware of and carry out the Contractor's obligation to maintain such a working environment, with specific attention to minority or female individuals working at such sites or in such facilities.
 - 1.7.2. Establish and maintain a current list of minority and female recruitment sources, provide written notification to minority and female recruitment sources and to community organizations when the Contractor or its unions have employment opportunities available, and maintain a record of the organizations' responses.
 - 1.7.3. Maintain a current file of the names, addresses and telephone numbers of each minority and female off-the-street applicant and minority or female referral from a union, a recruitment source or community organization and of what action was taken with respect to each such individual. If such individual was sent to the union hiring hall for referral and was not referred back to the Contractor by the union or, if referred, not employed by the Contractor, this will be documented in the file with the reason therefor, along with whatever additional actions the Contractor may have taken.
 - 1.7.4. Provide immediate written notification to the Director when the union or unions with which the Contractor has a collective bargaining agreement has not referred to the Contractor a minority person or woman sent by the Contractor, or when the Contractor has other information that the union referral Process has impeded the Contractor's efforts to meet its obligations.
 - 1.7.5. Develop on-the-job training opportunities and/or participate in training programs for the area which expressly include minorities and women, including upgrading programs and apprenticeship and trainee programs relevant to the Contractor's employment needs, especially those programs funded or approved by the U.S. Department of Labor. The Contractor will provide notice of these programs to the sources compiled under 7b above.
 - 1.7.6. Disseminate the Contractor's EEO policy by providing notice of the policy to unions and training programs and requesting their cooperation in assisting the Contractor in meeting its EEO obligations; by including it in any policy manual and Collective bargaining agreement; by publicizing it in the company newspaper, annual report, etc.; by specific review of the policy with all management personnel and with all minority and female employees at least once a year; and by posting the company EEO policy on bulletin boards accessible to all employees at each location where construction work is performed.

- 1.7.7. Review, at least annually, the company's EEO policy and affirmative action obligations under these specifications with all employees having any responsibility for hiring, assignment, layoff, termination or other employment decisions including specific review of these items with on-site supervisory personnel such as Superintendents, General Foremen, etc., before the initiation of construction work at any job site. A written record must be made and maintained identifying the time and place of these meetings, persons attending, subject matter discussed, and disposition of the subject matter.
- 1.7.8. Disseminate the Contractor's EEO policy externally by including it in any advertising in the news media, specifically including minority and female news media, and providing written notification to and discussing the Contractor's EEO policy with other Contractors and Subcontractors with whom the Contractor does or anticipates doing business.
- 1.7.9. Direct its recruitment efforts, both oral and written, to minority, female and community organizations, to schools with minority and female students and to minority and female recruitment and training organizations serving the Contractor's recruitment area and employment needs. Not later than one month before the date for the acceptance of applications for apprenticeship or other training by any recruitment source, the Contractor will send written notification to organizations such as the above, describing the openings, screening procedures, and tests to be used in the selection process.
- 1.7.10. Encourage present minority and female employees to recruit other minority persons and women and, where reasonable, provide after school, summer and vacation employment to minority and female youth both on the site and in other areas of a Contractor's workforce.
- 1.7.11. Validate all tests and other selection requirements where there is an obligation to do so under 41 CFR Part 60-3.
- 1.7.12. Conduct, at least annually, an inventory and evaluation at least of all minority and female personnel for promotional opportunities and encourage these employees to seek or to prepare for, through appropriate training, etc., such opportunities.
- 1.7.13. Ensure that seniority practices, job classifications, work assignments and other personnel practices, do not have a discriminatory effect by continually monitoring all personnel and employment-related activities to ensure that the EEO policy and the Contractor's obligations under these specifications are being carried out.
- 1.7.14. Ensure that all facilities and company activities are non-segregated except that separate or single-user toilet and necessary changing facilities will be provided to assure privacy between the sexes.
- 1.7.15. Document and maintain a record of all solicitations of offers for subcontracts from minority and female construction contractors and suppliers, including circulation of solicitations to minority and female contractor associations and other business associations.
- 1.7.16. Conduct a review, at least annually, of all supervisors' adherence to and performance under the Contractor's EEO policies and affirmative action obligations.
- 1.8. Contractors are encouraged to participate in voluntary associations which assist in fulfilling one or more of their affirmative action obligations (Section 7.1. through Section 7.16.). The efforts of a contractor association, joint contractor-union, contractor-community, or other similar group of which the Contractor is a member and participant, may be asserted as fulfilling any one or more of its obligations under Section 7.1. through Section 7.16. of these Specifications provided that the Contractor actively participates in the group, makes every effort to assure that the group has a positive impact on the employment of minorities and women in the industry, ensures that the concrete benefits of the program are reflected in the Contractor's minority and female workforce participation, makes a good faith effort to meet its individual goals and timetables, and can provide access to documentation which demonstrates the effectiveness of actions taken on behalf of the Contractor. The obligation to comply, however, is the Contractor's and failure of such a group to fulfill an obligation will not be a defense for the Contractor's noncompliance.

- 1.9. A single goal for minorities and a separate single goal for women have been established. The Contractor, however, is required to provide equal employment opportunity and to take affirmative action for all minority groups, both male and female, and all women, both minority and non-minority. Consequently, the Contractor may be in violation of the Executive Order if a particular group is employed in a substantially disparate manner (for example, even though the Contractor has achieved its goals for women generally, the Contractor may be in violation of the Executive Order if a specific minority group of women is underutilized).
- 1.10. The Contractor shall not use the goals and timetables or affirmative action standards to discriminate against any person because of race, color, religion, sex, or national origin.
- 1.11. The Contractor will not enter into any Subcontract with any person or firm debarred from Government Contracts pursuant to Executive Order 11246.
- 1.12. The Contractor will carry out such sanctions and penalties for violation of these specifications and of the Equal Opportunity Clause, including suspension, termination and cancellation of existing subcontracts as may be imposed or ordered pursuant to Executive Order 11246, as amended, and its implementing regulations, by the Office of Federal Contract Compliance Programs. Any Contractor who fails to carry out such sanctions and penalties will be in violation of these specifications and Executive Order 11246, as amended.
- 1.13. The Contractor, in fulfilling its obligations under these specifications, will implement specific affirmative action steps, at least as extensive as those standards prescribed in paragraph 7 of these specifications, so as to achieve maximum results from its efforts to ensure equal employment opportunity. If the Contractor fails to comply with the requirements of the Executive Order, the implementing regulations, or these specifications, the Director will proceed in accordance with 41 CFR 60-4.8.
- 1.14. The Contractor will designate a responsible official to monitor all employment-related activity to ensure that the company EEO policy is being carried out, to submit reports relating to the provisions hereof as may be required by the Government and to keep records. Records must at least include for each employee the name, address, telephone numbers, construction trade, union affiliation if any, employee identification number when assigned, social security number, race, sex, status (e.g., mechanic, apprentice, trainee, helper, or laborer), dates of changes in status, hours worked per week in the indicated trade, rate of pay, and locations at which the work was performed. Records must be maintained in an easily understandable and retrievable form; however, to the degree that existing records satisfy this requirement, Contractors shall not be required to maintain separate records.
- 1.15. Nothing herein provided will be construed as a limitation upon the application of other laws which establish different standards of compliance or upon the application of requirements for the hiring of local or other area residents (e.g., those under the Public Works Employment Act of 1977 and the Community Development Block Grant Program).
- 1.16. In addition to the reporting requirements set forth elsewhere in this Contract, the Contractor and the subcontractors holding subcontracts, not including material suppliers, of \$10,000 or more, will submit for every month of July during which work is performed, employment data as contained under Form PR 1391 (Appendix C to 23 CFR, Part 230), and in accordance with the included instructions.

Special Provision 000

Certificate of Interested Parties (Form 1295)

Submit a notarized Form 1295, "Certificate of Interested Parties," in the following instances:

- at contract execution for contracts awarded by the Commission;
- at contract execution for contracts awarded by the District Engineer with an award amount of \$1,000,000 or more;
- at any time an existing contract awarded by the District Engineer increases in value to \$1,000,000 or more due to changes in the contract;
- at any time there is an increase of \$1,000,000 or more to an existing contract (change orders, extensions, and renewals); or
- at any time there is a change to the information in Form 1295, when the form was filed for an existing contract.

Form 1295 and instructions on completing and filing the form are available on the Texas Ethics Commission website.

Special Provision to Item 000

Disadvantaged Business Enterprise in Federal Aid Contracts

1. DESCRIPTION

The purpose of this Special Provision is to carry out the U.S. Department of Transportation's (DOT) policy of ensuring nondiscrimination in the award and administration of DOT-assisted Contracts and creating a level playing field on which firms owned and controlled by individuals who are determined to be socially and economically disadvantaged can compete fairly for DOT-assisted Contracts.

2. Disadvantaged Business Enterprise in Federal-Aid Contracts

- 2.1. **Policy.** It is the policy of the DOT and the Texas Department of Transportation (Department) that DBEs, as defined in 49 CFR Part 26, Subpart A, and the Department's DBE Program, will have the opportunity to participate in the performance of Contracts financed in whole or in part with federal funds. The DBE requirements of 49 CFR Part 26, and the Department's DBE Program, apply to this Contract as follows.

The Contractor will solicit DBEs through reasonable and available means, as defined in 49 CFR Part 26, Appendix A, and the Department's DBE Program, or show a good faith effort to meet the DBE goal for this Contract.

The Contractor, subrecipient, or subcontractor will not discriminate on the basis of race, color, national origin, or sex in the performance of this Contract. Carry out applicable requirements of 49 CFR Part 26 in the award and administration of DOT-assisted Contracts. Failure to carry out these requirements is a material breach of this Contract, which may result in the termination of this Contract or such other remedy as the recipient deems appropriate.

The requirements of this Special Provision must be physically included in any subcontract.

By signing the Contract proposal, the Bidder is certifying that the DBE goal as stated in the proposal will be met by obtaining commitments from eligible DBEs or that the Bidder will provide acceptable evidence of good faith effort to meet the commitment.

2.2. Definitions.

- 2.2.1. **Administrative Reconsideration.** A process by which the low bidder may request reconsideration when the Department determines the good faith effort (GFE) requirements have not been met.

- 2.2.2. **Commercially Useful Function (CUF).** A CUF occurs when a DBE has the responsibility for the execution of the work and carrying out such responsibilities by actually performing, managing, and supervising the work.

- 2.2.3. **Disadvantaged Business Enterprise (DBE).** A for-profit small business certified through the Texas Unified Certification Program in accordance with 49 CFR Part 26, that is at least 51% owned by one or more socially and economically disadvantaged individuals, or in the case of a publicly owned business, in which is at least 51% of the stock is owned by one or more socially and economically disadvantaged individuals, and whose management and daily business operations are controlled by one or more of the individuals who own it.

- 2.2.4. **DBE Joint Venture.** An association of a DBE firm and one or more other firms to carry out a single business enterprise for profit for which purpose they combine their property, capital, efforts, skills, and knowledge, and in which the DBE is responsible for a distinct, clearly defined portion of the work of the Contract and whose share

in the capital contribution, control, management, risks, and profits of the joint venture are commensurate with its ownership interest.

- 2.2.5. **DOT.** The U.S. Department of Transportation, including the Office of the Secretary, the Federal Highway Administration (FHWA), the Federal Transit Administration (FTA), and the Federal Aviation Administration (FAA).
- 2.2.6. **Federal-Aid Contract.** Any Contract between the Owner and a Contractor that is paid for in whole or in part with DOT financial assistance.
- 2.2.7. **Good Faith Effort.** All necessary and reasonable steps to achieve the contract goal which, by their scope, intensity, and appropriateness to the objective, could reasonably be expected to obtain sufficient DBE participation, even if not fully successful. Good faith efforts are evaluated prior to award and throughout performance of the Contract. For guidance on good faith efforts, see 49 CFR Part 26, Appendix A.
- 2.2.8. **North American Industry Classification System (NAICS).** A designation that best describes the primary business of a firm. The NAICS is described in the North American Industry Classification Manual—United States, which is available on the Internet at the U.S. Census Bureau website:
<http://www.census.gov/eos/www/naics/>.
- 2.2.9. **Race-Conscious.** A measure or program that is focused specifically on assisting only DBEs, including women-owned businesses.
- 2.2.10. **Race-Neutral DBE Participation.** Any participation by a DBE through customary competitive procurement procedures.
- 2.2.11. **Texas Unified Certification Program (TUCP) Directory.** An online directory listing all DBEs currently certified by the TUCP. The Directory identifies DBE firms whose participation on a Contract may be counted toward achievement of the assigned DBE Contract goal.
- 2.3. **Contractor's Responsibilities.**
 - 2.3.1. **DBE Liaison Officer.** Designate a DBE liaison officer who will administer the Contractor's DBE program and who will be responsible for maintenance of records of efforts and contacts made to subcontract with DBEs.
 - 2.3.2. **Compliance Tracking System (CTS).** This Contract is subject to Contract compliance tracking. Contractors and DBEs are required to provide any noted and requested Contract compliance-related data to the Owner. This includes, but is not limited to, commitments, payments, substitutions, and good faith efforts. Contractors and DBEs are responsible for responding by any noted response date or due date to any instructions or request for information by the Owner.
 - 2.3.3. **Apparent Low Bidder.** The apparent low bidder must submit DBE commitments to satisfy the DBE goal or submit good faith effort Form 2603 and supporting documentation demonstrating why the goal could not be achieved, in whole or part, no later than 5 calendar days after bid opening. The means of transmittal and the risk of timely receipt of the information will be the bidder's responsibility and no extension of the 5-calendar-day timeframe will be allowed for any reason.
 - 2.3.4. **DBE Contractor.** A DBE Contractor may receive credit toward the DBE goal for work performed by its own forces and work subcontracted to DBEs. In the event a DBE subcontracts to a non-DBE, that information must be reported monthly.
 - 2.3.5. **DBE Committal.** Only those DBEs certified by the TUCP are eligible to be used for goal attainment. The Directory can be accessed at the following Internet address:
<https://txdot.txdotcms.com/FrontEnd/VendorSearchPublic.asp?TN=txdot&XID=2340>.

A DBE must be certified on the day the commitment is considered and at time of subcontract execution. It is the Contractor's responsibility to ensure firms identified for participation are approved certified DBE firms.

The Bidder is responsible to ensure that all submittals are checked for accuracy. Any and all omissions, deletions, and/or errors that may affect the end result of the commitment package are the sole liabilities of the bidder.

Commitments in excess of the goal are considered race-neutral commitments.

2.3.6. **Good Faith Effort Requirements.** A Contractor who cannot meet the Contract goal, in whole or in part, must make adequate good faith efforts to obtain DBE participation as so stated and defined in 49 CFR Part 26, Appendix A.

2.3.6.1. **Administrative Reconsideration.** If the Owner determines that the apparent low bidder has failed to satisfy the good faith efforts requirement, the Owner will notify the Bidder of the failure and will give the Bidder an opportunity for administrative reconsideration.

The Bidder must request an administrative reconsideration of that determination within 3 days of the date of receipt of the notice. The request must be submitted directly to the Owner.

If a reconsideration request is timely received, the reconsideration decision will be made by the Owner's DBE liaison officer or, if the DBE liaison officer took part in the original determination that the Bidder failed to satisfy the good faith effort requirements, an Owner employee who holds a senior leadership position and reports directly to the executive officer, and who did not take part in the original determination will act as an administrative hearing officer. The Bidder may provide written documentation or argument concerning whether the assigned DBE contract goal was met or whether adequate good faith efforts were made to meet the Contract goal.

The DBE liaison or other Owner employee making the reconsideration determination may request a meeting with the Bidder to discuss whether the goal commitments were met or whether adequate good faith efforts were made to obtain the commitments to meet the Contract goal.

The meeting must be held within 7 days of the date of the request submitted under this section. If the Bidder is unavailable to meet during the 7-day period, the reconsideration decision will be made on the written information provided by the Bidder.

The Owner will provide to the Bidder a written decision that explains the basis for finding that the Bidder did not meet the Contract goal or did not make adequate good faith efforts to meet the Contract goal, within 7 days of the date of the notice issued in this section.

The reconsideration decision is final and not subject to administrative appeal.

2.3.7. **Determination of DBE Participation.** The work performed by the DBE must be reasonably construed to be included in the work area and NAICS work code identified by the Contractor in the approved commitment.

Participation by a DBE on a Contract will not be counted toward DBE goals until the amount of the participation has been paid to the DBE.

Payments made to a DBE that was not on the original commitment may be counted toward the Contract goal if that DBE was certified as a DBE before the execution of the subcontract and has performed a Commercially Useful Function.

The total amount paid to the DBE for work performed with its own forces is counted toward the DBE goal. When a DBE subcontracts part of the work of its Contract to another firm, the value of the subcontracted work may be counted toward DBE goals only if the subcontractor is itself a DBE.

DBE Goal credit for the DBE subcontractors leasing of equipment or purchasing of supplies from the Contractor or its affiliates is not allowed. Project materials or supplies acquired from an affiliate of the Contractor cannot directly or indirectly (second or lower tier subcontractor) be used for DBE goal credit.

If a DBE firm is declared ineligible due to DBE decertification after the execution of the DBE's subcontract, the DBE firm may complete the work and the DBE firm's participation will be counted toward the Contract goal. If the DBE firm is decertified before the DBE firm has signed a subcontract, the Contractor is obligated to replace the ineligible DBE firm or demonstrate that it has made good faith efforts to do so.

The Contractor may count 100% of its expenditure to a DBE manufacturer. According to 49 CFR 26.55(e)(1)(i), a DBE manufacturer is a firm that operates or maintains a factory or establishment that produces, on the premises, the materials, supplies, articles, or equipment required under the Contract and of the general character described by the specifications.

The Contractor may count only 60% of its expenditure to a DBE regular dealer. According to 49 CFR 26.55(e)(2)(i), a DBE regular dealer is a firm that owns, operates, or maintains a store, warehouse, or other establishment in which the materials, supplies, articles, or equipment of the general character described by the specifications and required under the Contract are bought, kept in stock, and regularly sold or leased to the public in the usual course of business. A firm may be a regular dealer in such bulk items as petroleum products, steel, cement, gravel, stone, or asphalt without owning, operating, or maintaining a place of business if the firm both owns and operates distribution equipment for the products. Any supplementing of regular dealers' own distribution equipment must be by a long-term lease agreement and not on an ad hoc or contract-by-contract basis. A long-term lease with a third-party transportation company is not eligible for 60% goal credit.

With respect to materials or supplies purchased from a DBE that is neither a manufacturer nor a regular dealer, the Contractor may count the entire amount of fees or commissions charged for assistance in the procurement of the materials and supplies, or fees or transportation charges for the delivery of materials or supplies required on a job site.

A Contractor may count toward its DBE goal a portion of the total value of the Contract amount paid to a DBE joint venture equal to the distinct, clearly defined portion of the work of the Contract performed by the DBE.

2.3.8. **Commercially Useful Function.** It is the Contractor's obligation to ensure that each DBE used on federal-assisted contracts performs a commercially useful function on the Contract.

The Owner will monitor performance during the Contract to ensure each DBE is performing a CUF.

Under the terms established in 49 CFR 26.55, a DBE performs a CUF when it is responsible for execution of the work of the Contract and is carrying out its responsibilities by actually performing, managing, and supervising the work involved.

With respect to material and supplies used on the Contract, a DBE must be responsible for negotiating price, determining quality and quantity, ordering the material, installing the material, if applicable, and paying for the material itself.

With respect to trucking, the DBE trucking firm must own and operate at least one fully licensed, insured, and operational truck used on the Contract. The DBE may lease trucks from another DBE firm, including an owner-operator who is certified as a DBE. The DBE who leases trucks from another DBE receives credit for the total value of the transportation services the lessee DBE provides on the Contract. The DBE may also lease trucks from a non-DBE firm, including from an owner-operator. The DBE that leases trucks equipped with drivers from a non-DBE is entitled to credit for the total value of transportation services provided by non-DBE leased trucks equipped with drivers not to exceed the value of transportation services on the Contract provided by DBE-owned trucks or leased trucks with DBE employee drivers. Additional participation by non-DBE owned trucks equipped with drivers receives credit only for the fee or commission it receives as a result of the lease arrangement.

A DBE does not perform a CUF when its role is limited to that of an extra participant in a transaction, Contract, or project through which funds are passed in order to obtain the appearance of DBE participation. The Owner will evaluate similar transactions involving non-DBEs in order to determine whether a DBE is an extra participant.

If a DBE does not perform or exercise responsibility for at least 30% of the total cost of its Contract with its own work force, or the DBE subcontracts a greater portion of the work than would be expected on the basis of normal industry practice for the type of work involved, the Owner will presume that the DBE is not performing a CUF.

If the Owner determines that a DBE is not performing a CUF, no work performed by such DBE will count as eligible participation. The denial period of time may occur before or after a determination has been made by the Owner.

In case of the denial of credit for non-performance, the Contractor will be required to provide a substitute DBE to meet the Contract goal or provide an adequate good faith effort when applicable.

- 2.3.8.1. **Rebuttal of a Finding of No Commercially Useful Function.** Consistent with the provisions of 49 CFR 26.55(c)(4)&(5), before the Owner makes a final finding that no CUF has been performed by a DBE, the Owner will notify the DBE and provide the DBE the opportunity to provide rebuttal information.

CUF determinations are not subject to administrative appeal.

- 2.3.9. **Joint Check.** The use of joint checks between a Contractor and a DBE is allowed with Owner approval. To obtain approval, the Contractor must submit a completed Form 2178, "DBE Joint Check Approval," to the Owner.

The Owner will closely monitor the use of joint checks to ensure that such a practice does not erode the independence of the DBE nor inhibit the DBE's ability to perform a CUF. When joint checks are utilized, DBE credit toward the Contract goal will be allowed only when the subcontractor is performing a CUF in accordance with 49 CFR 26.55(c)(1).

Long-term or open-ended joint checking arrangements may be a basis for further scrutiny and may result in the lack of participation towards the Contract goal requirement if DBE independence cannot be established.

Joint checks will not be allowed simply for the convenience of the Contractor.

If the proper procedures are not followed or the Owner determines that the arrangements result in a lack of independence for the DBE involved, no credit for the DBE's participation as it relates to the material cost will be used toward the Contract goal requirement, and the Contractor will need to make up the difference elsewhere on the project.

- 2.3.10. **DBE Termination and Substitution.** No DBE named in the commitment submitted under Section 2.3.5. will be terminated for convenience, in whole or part, without the Owner's approval. This includes, but is not limited to, instances in which a Contractor seeks to perform work originally designated for a DBE subcontractor with its own forces or those of an affiliate, a non-DBE firm, or with another DBE firm.

Unless consent is provided, the Contractor will not be entitled to any payment for work or material unless it is performed or supplied by the listed DBE.

The Contractor, prior to submitting its request to terminate, must first give written notice to the DBE of its intent to terminate and the reason for the termination. The Contractor will copy the Owner on the Notice of Intent to terminate.

The DBE has 5 calendar days to respond to the Contractor's notice and will advise the Contractor and the Owner of the reasons, if any, why it objects to the proposed termination of its subcontract and why the Owner should not approve the prime Contractor's request for termination.

The Owner may provide a shorter response time if required in a particular case as a matter of public necessity.

The Owner will consider both the Contractor's request and DBE's stated position prior to approving the request. The Owner may provide a written approval only if it agrees, for reasons stated in its concurrence document, that the Contractor has good cause to terminate the DBE. If the Owner does not approve the request, the Contractor

must continue to use the committed DBE firm in accordance with the Contract. For guidance on what good cause includes, see 49 CFR 26.53.

Good cause does not exist if the Contractor seeks to terminate, reduce, or substitute a DBE it relied upon to obtain the Contract so that the Contractor can self-perform the work for which the DBE firm was engaged.

When a DBE subcontractor is terminated, make good faith efforts to find, as a substitute for the original DBE, another DBE to perform, at least to the extent needed to meet the established Contract goal, the work that the original DBE was to have performed under the Contract.

Submit the completed Form 2228, "DBE Termination Substitution Request," within seven (7) days, which may be extended for an additional 7 days if necessary at the request of the Contractor. The Owner will provide a written determination to the Contractor stating whether or not good faith efforts have been demonstrated.

- 2.3.11. **Reports and Records.** By the 15th of each month and after work begins, report payments to meet the DBE goal and for DBE race-neutral participation on projects with or without goals. These payment reports will be required until all DBE subcontracting or material supply activity is completed. Negative payment reports are required when no activity has occurred in a monthly period.

Notify the Owner if payment to any DBE subcontractor is withheld or reduced.

Before receiving final payment from the Owner, the Contractor must indicate a final payment on the compliance tracking system. The final payment is a summary of all payments made to the DBEs on the project.

All records must be retained for a period of 3 years following completion of the Contract work, and must be available at reasonable times and places for inspection by authorized representatives of the Owner, Texas Department of Transportation or the DOT. Provide copies of subcontracts or agreements and other documentation upon request.

- 2.3.12. **Failure to Comply.** If the Owner determines the Contractor has failed to demonstrate good faith efforts to meet the assigned goal, the Contractor will be given an opportunity for reconsideration by the Owner.

A Contractor's failure to comply with the requirements of this Special Provision will constitute a material breach of this Contract. In such a case, the Owner reserves the right to terminate the Contract; to deduct the amount of DBE goal not accomplished by DBEs from the money due or to become due the Contractor; or to secure a refund, not as a penalty but as liquidated damages, to the Owner or such other remedy or remedies as the Owner deems appropriate.

- 2.3.13. **Investigations.** The Owner may conduct reviews or investigations of participants as necessary. All participants, including, but not limited to, DBEs and complainants using DBE Subcontractors to meet the Contract goal, are required to cooperate fully and promptly with compliance reviews, investigations, and other requests for information.

- 2.3.14. **Falsification and Misrepresentation.** If the Owner determines that a Contractor or subcontractor was a knowing and willing participant in any intended or actual subcontracting arrangement contrived to artificially inflate DBE participation or any other business arrangement determined by the Owner to be unallowable, or if the Contractor engages in repeated violations, falsification, or misrepresentation, the Owner may:

- refuse to count any fraudulent or misrepresented DBE participation;
- withhold progress payments to the Contractor commensurate with the violation;
- refer the matter to the Office of Inspector General of the US Department of Transportation for investigation; and/or
- seek any other available contractual remedy.

Special Provision to Item 7L

Legal Relations and Responsibilities

Item 7, "Legal Relations and Responsibilities," of the Standard Specifications is amended with respect to the clauses cited below. No other clauses or requirements of this Item are waived or changed.

Section 2.6.5., "Training", is supplemented by the following:

Coordinate enrollment, pay associated fees, and successfully complete approved Training or Contractor Delivered Training. Training is valid for the period prescribed by the provider but no less than 3 yrs. from the date of completion. The Owner may require training at a frequency less than the period prescribed or 3 yrs. based on Owner's needs. Training and associated fees will not be measured or paid for directly but are considered subsidiary to pertinent Items.

2.6.5.1. Approved Training. Approved training is listed below:

2.6.5.1.1 Contractor Responsible Person and Alternate.

Provider	Course Title
American Traffic Safety Services Association	Traffic Control Supervisor
National Highway Institute	Maintenance of Traffic Control for Supervisors

2.6.5.1.2. Flagger Instructor Training.

Provider	Course Title
American Traffic Safety Services Association	Flagging Instructor Training Course
Texas Engineering Extension Services	Train-the-Trainer Flaggers
National Safety Council	Flagger (Instructor)
University of Texas at Arlington, Division for Enterprise Development	Certified Flagger Instructor

Flagger Training.

Provider	Course Title
Texas Engineering Extension Services	Flaggers in Work Zones
National Safety Council	Flagger (Novice)
University of Texas at Arlington, Continuing Education Department	Flaggers in Work Zones (TxDOT Training)
University of Texas at Arlington, Continuing Education Department	WZ Traffic Control/Qualified Flagger
Associated Builders and Contractors, Austin Chapter	Flagger Training
LDI Safety Training	Flagger Training
Tipton Compliance and Safety	Flagger Training

2.6.5.1.3.**Law Enforcement Personnel.**

Provider	Course Title
National Highway Institute	Safe and Effective Use of Law Enforcement Personnel in Work Zones

2.6.5.1.4.**Other Work Zone Personnel.**

Provider	Course Title
American Traffic Safety Services Association	Traffic Control Technician Training
Texas Engineering Extension Services	Work Zone Traffic Control
National Highway Institute	Maintenance of Traffic Control for Technicians
National Highway Institute	Maintenance Training Series: Basics of Work Zone Traffic Control

2.6.5.2.

Contractor Delivered Training. Develop Contractor Delivered Training curriculum and submit the curriculum to the Owner for approval. Do not implement the training curriculum before receiving written approval from the Owner. The work performed and materials furnished to develop the curriculum and provide training will not be measured or paid for directly but will be considered subsidiary to pertinent Items.

A contractor's certified flagging instructor is permitted to train other flaggers.

Special Provision to Item 506

Temporary Erosion, Sedimentation, and Environmental Controls

For this project, item 506, "Temporary Erosion, Sedimentation, and Environmental Controls," of the standard specifications, is hereby voided and replaced with the following.

1. DESCRIPTION

Install, maintain, and remove erosion, sedimentation, and environmental control measures to prevent or reduce the discharge of pollutants in accordance with the Storm Water Pollution Prevention Plan (SWP3) in the plans and the Texas Pollutant Discharge Elimination System (TPDES) General Permit TXR150000.

2. MATERIALS

Furnish materials in accordance with the following:

- Item 161, "Compost"
- Item 432, "Riprap"
- Item 556, "Pipe Underdrains"

2.1. Rock Filter Dams.

2.1.1. Aggregate. Furnish aggregate with hardness, durability, cleanliness, and resistance to crumbling, flaking, and eroding acceptable to the Owner. Provide the following:

- Types 1, 2, and 4 Rock Filter Dams. Use 3 to 6 in. aggregate.
- Type 3 Rock Filter Dams. Use 4 to 8 in. aggregate.

2.1.2. Wire. Provide minimum 20 gauge galvanized wire for the steel wire mesh and tie wires for Types 2 and 3 rock filter dams. Type 4 dams require:

- a double-twisted, hexagonal weave with a nominal mesh opening of 2-1/2 in. × 3-1/4 in.;
- minimum 0.0866 in. steel wire for netting;
- minimum 0.1063 in. steel wire for selvages and corners; and
- minimum 0.0866 in. for binding or tie wire.

2.1.3. Sandbag Material. Furnish sandbags meeting Section 506.2.8., "Sandbags," except that any gradation of aggregate may be used to fill the sandbags.

2.2. Temporary Pipe Slope Drains. Provide corrugated metal pipe, polyvinyl chloride (PVC) pipe, flexible tubing, watertight connection bands, grommet materials, prefabricated fittings, and flared entrance sections that conform to the plans. Recycled and other materials meeting these requirements are allowed if approved.

Furnish concrete in accordance with Item 432, "Riprap."

2.3. Temporary Paved Flumes. Furnish asphalt concrete, hydraulic cement concrete, or other comparable non-erodible material that conforms to the plans. Provide rock or rubble with a minimum diameter of 6 in. and a maximum volume of 1/2 cu. ft. for the construction of energy dissipaters.

2.4. Construction Exits. Provide materials that meet the details shown on the plans and this Section.

- 2.4.1. **Rock Construction Exit.** Provide crushed aggregate for long- and short-term construction exits. Furnish aggregates that are clean, hard, durable, and free from adherent coatings such as salt, alkali, dirt, clay, loam, shale, soft or flaky materials, and organic and injurious matter. Use 4- to 8-in. aggregate for Type 1. Use 2- to 4-in. aggregate for Type 3.
- 2.4.2. **Timber Construction Exit.** Furnish No. 2 quality or better railroad ties and timbers for long-term construction exits, free of large and loose knots and treated to control rot. Fasten timbers with nuts and bolts or lag bolts, of at least 1/2 in. diameter, unless otherwise shown on the plans or allowed. Provide plywood or pressed wafer board at least 1/2 in. thick for short-term exits.
- 2.4.3. **Foundation Course.** Provide a foundation course consisting of flexible base, bituminous concrete, hydraulic cement concrete, or other materials as shown on the plans or directed.
- 2.5. **Embankment for Erosion Control.** Provide rock, loam, clay, topsoil, or other earth materials that will form a stable embankment to meet the intended use.
- 2.6. **Pipe.** Provide pipe outlet material in accordance with Item 556, "Pipe Underdrains," and details shown on the plans.
- 2.7. **Construction Perimeter Fence.**
- 2.7.1. **Posts.** Provide essentially straight wood or steel posts that are at least 60 in. long. Furnish soft wood posts with a minimum diameter of 3 in., or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/5 in. Furnish T- or L-shaped steel posts with a minimum weight of 0.5 lb. per foot.
- 2.7.2. **Fence.** Provide orange construction fencing as approved.
- 2.7.3. **Fence Wire.** Provide 11 gauge or larger galvanized smooth or twisted wire. Provide 16 gauge or larger tie wire.
- 2.7.4. **Flagging.** Provide brightly-colored flagging that is fade-resistant and at least 3/4 in. wide to provide maximum visibility both day and night.
- 2.7.5. **Staples.** Provide staples with a crown at least 1/2 in. wide and legs at least 1/2 in. long.
- 2.7.6. **Used Materials.** Previously used materials meeting the applicable requirements may be used if approved.
- 2.8. **Sandbags.** Provide sandbag material of polypropylene, polyethylene, or polyamide woven fabric with a minimum unit weight of 4 oz. per square yard, a Mullen burst-strength exceeding 300 PSI, and an ultraviolet stability exceeding 70%.

Use natural coarse sand or manufactured sand meeting the gradation given in Table 1 to fill sandbags. Filled sandbags must be 24 to 30 in. long, 16 to 18 in. wide, and 6 to 8 in. thick.

Table 1
Sand Gradation

Sieve #	Retained (% by Weight)
4	Maximum 3%
100	Minimum 80%
200	Minimum 95%

Aggregate may be used instead of sand for situations where sandbags are not adjacent to traffic. The aggregate size shall not exceed 3/8 in.

- 2.9. **Temporary Sediment Control Fence.** Provide a net-reinforced fence using woven geo-textile fabric. Logos visible to the traveling public will not be allowed.

- 2.9.1. **Fabric.** Provide fabric materials in accordance with DMS-6230, "Temporary Sediment Control Fence Fabric."
- 2.9.2. **Posts.** Provide essentially straight wood or steel posts with a minimum length of 48 in., unless otherwise shown on the plans. Furnish soft wood posts at least 3 in. in diameter, or use nominal 2 × 4 in. boards. Furnish hardwood posts with a minimum cross-section of 1-1/2 × 1-1/2 in. Furnish T- or L-shaped steel posts with a minimum weight of 1.3 lb. per foot.
- 2.9.3. **Net Reinforcement.** Provide net reinforcement of at least 12-1/2 gauge galvanized welded wire mesh, with a maximum opening size of 2 × 4 in., at least 24 in. wide, unless otherwise shown on the plans.
- 2.9.4. **Staples.** Provide staples with a crown at least 3/4 in. wide and legs 1/2 in. long.
- 2.9.5. **Used Materials.** Use recycled material meeting the applicable requirements if approved.
- 2.10. **Biodegradable Erosion Control Logs.**
- 2.10.1. **Core Material.** Furnish core material that is biodegradable or recyclable. Use compost, mulch, aspen excelsior wood fibers, chipped site vegetation, agricultural rice or wheat straw, coconut fiber, 100% recyclable fibers, or any other acceptable material unless specifically called out on the plans. Permit no more than 5% of the material to escape from the containment mesh. Furnish compost meeting the requirements of Item 161, "Compost."
- 2.10.2. **Containment Mesh.** Furnish containment mesh that is 100% biodegradable, photodegradable, or recyclable such as burlap, twine, UV photodegradable plastic, polyester, or any other acceptable material.
- Furnish biodegradable or photodegradable containment mesh when log will remain in place as part of a vegetative system.
- Furnish recyclable containment mesh for temporary installations.
- 2.10.3. **Size.** Furnish biodegradable erosion control logs with diameters shown on the plans or as directed. Stuff containment mesh densely so logs do not deform.

3. CONSTRUCTION

- 3.1. **Contractor Responsibilities.** Implement the Owner's Storm Water Pollution Prevention Plan (SWP3) for the project in accordance with the plans and specifications, TPDES General Permit TXR150000, and as directed by the Owner. Develop and implement an SWP3 for project-specific material supply plants within and outside of the Owner's right of way in accordance with the specific or general storm water permit requirements. Prevent water pollution from storm water associated with construction activity from entering any surface water or private property on or adjacent to the project site.
- 3.2. **General.**
- 3.2.1. **Phasing.** Implement control measures in the area to be disturbed before beginning construction, or as directed. Limit the disturbance to the area shown on the plans or as directed. If, in the opinion of the Owner, the Contractor cannot control soil erosion and sedimentation resulting from construction operations, the Owner will limit the disturbed area to that which the Contractor is able to control. Minimize disturbance to vegetation.
- 3.2.2. **Maintenance.** Immediately correct ineffective control measures. Implement additional controls as directed. Remove excavated material within the time requirements specified in the applicable storm water permit.
- 3.2.3. **Stabilization.** Stabilize disturbed areas where construction activities will be temporarily stopped in accordance with the applicable storm water permit. Establish a uniform vegetative cover. The project will not be accepted until a 70% density of existing adjacent undisturbed areas is obtained, unless otherwise shown

on the plans. When shown on the plans, the Owner may accept the project when adequate controls are in place that will control erosion, sedimentation, and water pollution until sufficient vegetative cover can be established.

- 3.2.4. **Finished Work.** Upon acceptance of vegetative cover, remove and dispose of all temporary control measures, temporary embankments, bridges, matting, falsework, piling, debris, or other obstructions placed during construction that are not a part of the finished work, or as directed.
- 3.2.5. **Restricted Activities and Required Precautions.** Do not discharge onto the ground or surface waters any pollutants such as chemicals, raw sewage, fuels, lubricants, coolants, hydraulic fluids, bitumens, or any other petroleum product. Operate and maintain equipment on-site to prevent actual or potential water pollution. Manage, control, and dispose of litter on-site such that no adverse impacts to water quality occur. Prevent dust from creating a potential or actual unsafe condition, public nuisance, or condition endangering the value, utility, or appearance of any property. Wash out concrete trucks only as described in the TPDES General Permit TXR150000. Utilize appropriate controls to minimize the offsite transport of suspended sediments and other pollutants if it is necessary to pump or channel standing water (i.e. dewatering). Prevent discharges that would contribute to a violation of Edwards Aquifer Rules, water quality standards, the impairment of a listed water body, or other state or federal law.
- 3.3. **Installation, Maintenance, and Removal Work.** Perform work in accordance with the SWP3, according to manufacturers' guidelines, and in accordance with the TPDES General Permit TXR150000. Install and maintain the integrity of temporary erosion and sedimentation control devices to accumulate silt and debris until soil disturbing activities are completed and permanent erosion control features are in place or the disturbed area has been adequately stabilized as determined by the Owner. If a device ceases to function as intended, repair or replace the device or portions thereof as necessary. Remove sediment, debris, and litter. When approved, sediments may be disposed of within embankments, or in the right of way in areas where the material will not contribute to further siltation. Dispose of removed material in accordance with federal, state, and local regulations.
- Remove devices upon approval or as directed. Finish-grade and dress the area upon removal. Stabilize disturbed areas in accordance with the permit, and as shown on the plans or directed. Materials removed are considered consumed by the project. Retain ownership of stockpiled material and remove it from the project when new installations or replacements are no longer required.
- 3.3.1. **Rock Filter Dams for Erosion Control.** Remove trees, brush, stumps, and other objectionable material that may interfere with the construction of rock filter dams. Place sandbags as a foundation when required or at the Contractor's option.
- Place the aggregate to the lines, height, and slopes specified, without undue voids for Types 1, 2, 3, and 5. Place the aggregate on the mesh and then fold the mesh at the upstream side over the aggregate and secure it to itself on the downstream side with wire ties, or hog rings for Types 2 and 3, or as directed. Place rock filter dams perpendicular to the flow of the stream or channel unless otherwise directed. Construct filter dams according to the following criteria unless otherwise shown on the plans:
- 3.3.1.1. **Type 1 (Non-reinforced).**
- 3.3.1.1.1. **Height.** At least 18 in. measured vertically from existing ground to top of filter dam.
- 3.3.1.1.2. **Top Width.** At least 2 ft.
- 3.3.1.1.3. **Slopes.** No steeper than 2:1.
- 3.3.1.2. **Type 2 (Reinforced).**
- 3.3.1.2.1. **Height.** At least 18 in. measured vertically from existing ground to top of filter dam.

- 3.3.1.2.2. **Top Width.** At least 2 ft.
- 3.3.1.2.3. **Slopes.** No steeper than 2:1.
- 3.3.1.3. **Type 3 (Reinforced).**
 - 3.3.1.3.1. **Height.** At least 36 in. measured vertically from existing ground to top of filter dam.
 - 3.3.1.3.2. **Top Width.** At least 2 ft.
 - 3.3.1.3.3. **Slopes.** No steeper than 2:1.
- 3.3.1.4. **Type 4 (Sack Gabions).** Unfold sack gabions and smooth out kinks and bends. Connect the sides by lacing in a single loop–double loop pattern on 4- to 5-in. spacing for vertical filling. Pull the end lacing rod at one end until tight, wrap around the end, and twist 4 times. Fill with stone at the filling end, pull the rod tight, cut the wire with approximately 6 in. remaining, and twist wires 4 times.

Place the sack flat in a filling trough, fill with stone, connect sides, and secure ends as described above for horizontal filling.

Lift and place without damaging the gabion. Shape sack gabions to existing contours.
- 3.3.1.5. **Type 5.** Provide rock filter dams as shown on the plans.
- 3.3.2. **Temporary Pipe Slope Drains.** Install pipe with a slope as shown on the plans or as directed. Construct embankment for the drainage system in 8-in. lifts to the required elevations. Hand-tamp the soil around and under the entrance section to the top of the embankment as shown on the plans or as directed. Form the top of the embankment or earth dike over the pipe slope drain at least 1 ft. higher than the top of the inlet pipe at all points. Secure the pipe with hold-downs or hold-down grommets spaced a maximum of 10 ft. on center. Construct the energy dissipaters or sediment traps as shown on the plans or as directed. Construct the sediment trap using concrete or rubble riprap in accordance with Item 432, "Riprap," when designated on the plans.
- 3.3.3. **Temporary Paved Flumes.** Construct paved flumes as shown on the plans or as directed. Provide excavation and embankment (including compaction of the subgrade) of material to the dimensions shown on the plans unless otherwise indicated. Install a rock or rubble riprap energy dissipater, constructed from the materials specified above, to a minimum depth of 9 in. at the flume outlet to the limits shown on the plans or as directed.
- 3.3.4. **Construction Exits.** Prevent traffic from crossing or exiting the construction site or moving directly onto a public roadway, alley, sidewalk, parking area, or other right of way areas other than at the location of construction exits when tracking conditions exist. Construct exits for either long- or short-term use.
 - 3.3.4.1. **Long-Term.** Place the exit over a foundation course as required. Grade the foundation course or compacted subgrade to direct runoff from the construction exits to a sediment trap as shown on the plans or as directed. Construct exits with a width of at least 14 ft. for one-way and 20 ft. for two-way traffic for the full width of the exit, or as directed.
 - 3.3.4.1.1. **Type 1.** Construct to a depth of at least 8 in. using crushed aggregate as shown on the plans or as directed.
 - 3.3.4.1.2. **Type 2.** Construct using railroad ties and timbers as shown on the plans or as directed.
 - 3.3.4.2. **Short-Term.**
 - 3.3.4.2.1. **Type 3.** Construct using crushed aggregate, plywood, or wafer board. This type of exit may be used for daily operations where long-term exits are not practical.

- 3.3.4.2.2. **Type 4.** Construct as shown on the plans or as directed.
- 3.3.5. **Earthwork for Erosion Control.** Perform excavation and embankment operations to minimize erosion and to remove collected sediments from other erosion control devices.
- 3.3.5.1. **Excavation and Embankment for Erosion Control Features.** Place earth dikes, swales, or combinations of both along the low crown of daily lift placement, or as directed, to prevent runoff spillover. Place swales and dikes at other locations as shown on the plans or as directed to prevent runoff spillover or to divert runoff. Construct cuts with the low end blocked with undisturbed earth to prevent erosion of hillsides. Construct sediment traps at drainage structures in conjunction with other erosion control measures as shown on the plans or as directed.
- Create a sediment basin, where required, providing 3,600 cu. ft. of storage per acre drained, or equivalent control measures for drainage locations that serve an area with 10 or more disturbed acres at one time, not including offsite areas.
- 3.3.5.2. **Excavation of Sediment and Debris.** Remove sediment and debris when accumulation affects the performance of the devices, after a rain, and when directed.
- 3.3.6. **Construction Perimeter Fence.** Construct, align, and locate fencing as shown on the plans or as directed.
- 3.3.6.1. **Installation of Posts.** Embed posts 18 in. deep or adequately anchor in rock, with a spacing of 8 to 10 ft.
- 3.3.6.2. **Wire Attachment.** Attach the top wire to the posts at least 3 ft. from the ground. Attach the lower wire midway between the ground and the top wire.
- 3.3.6.3. **Flag Attachment.** Attach flagging to both wire strands midway between each post. Use flagging at least 18 in. long. Tie flagging to the wire using a square knot.
- 3.3.7. **Sandbags for Erosion Control.** Construct a berm or dam of sandbags that will intercept sediment-laden storm water runoff from disturbed areas, create a retention pond, detain sediment, and release water in sheet flow. Fill each bag with sand so that at least the top 6 in. of the bag is unfilled to allow for proper tying of the open end. Place the sandbags with their tied ends in the same direction. Offset subsequent rows of sandbags 1/2 the length of the preceding row. Place a single layer of sandbags downstream as a secondary debris trap. Place additional sandbags as necessary or as directed for supplementary support to berms or dams of sandbags or earth.
- 3.3.8. **Temporary Sediment-Control Fence.** Provide temporary sediment-control fence near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the fence into erosion-control measures used to control sediment in areas of higher flow. Install the fence as shown on the plans, as specified in this Section, or as directed.
- 3.3.8.1. **Installation of Posts.** Embed posts at least 18 in. deep, or adequately anchor, if in rock, with a spacing of 6 to 8 ft. and install on a slight angle toward the runoff source.
- 3.3.8.2. **Fabric Anchoring.** Dig trenches along the uphill side of the fence to anchor 6 to 8 in. of fabric. Provide a minimum trench cross-section of 6 × 6 in. Place the fabric against the side of the trench and align approximately 2 in. of fabric along the bottom in the upstream direction. Backfill the trench, then hand-tamp.
- 3.3.8.3. **Fabric and Net Reinforcement Attachment.** Attach the reinforcement to wooden posts with staples, or to steel posts with T-clips, in at least 4 places equally spaced unless otherwise shown on the plans. Sewn vertical pockets may be used to attach reinforcement to end posts. Fasten the fabric to the top strand of reinforcement by hog rings or cord every 15 in. or less.

- 3.3.8.4. **Fabric and Net Splices.** Locate splices at a fence post with a minimum lap of 6 in. attached in at least 6 places equally spaced unless otherwise shown on the plans. Do not locate splices in concentrated flow areas.

Requirements for installation of used temporary sediment-control fence include the following:

- fabric with minimal or no visible signs of biodegradation (weak fibers),
- fabric without excessive patching (more than 1 patch every 15 to 20 ft.),
- posts without bends, and
- backing without holes.

- 3.3.9. **Biodegradable Erosion Control Logs.** Install biodegradable erosion control logs near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. Incorporate the biodegradable erosion control logs into the erosion measures used to control sediment in areas of higher flow. Install, align, and locate the biodegradable erosion control logs as specified below, as shown in plans or as directed.

Secure biodegradable erosion control logs in a method adequate to prevent displacement as a result of normal rain events, prevent damage to the logs, and to the satisfaction of the Owner such that flow is not allowed under the logs. Temporarily removing and replacing biodegradable erosion logs as to facilitate daily work is allowed at the Contractor's expense.

- 3.3.10. **Vertical Tracking.** Perform vertical tracking on slopes to temporarily stabilize soil. Provide equipment with a track undercarriage capable of producing a linear soil impression measuring a minimum of 12 in. long × 2 to 4 in. wide × 1/2 to 2 in. deep. Do not exceed 12 in. between track impressions. Install continuous linear track impressions where the 12 in. length impressions are perpendicular to the slope. Vertical tracking is required on projects where soil disturbing activities have occurred unless otherwise approved.

4. MEASUREMENT

- 4.1. **Rock Filter Dams.** Installation or removal of rock filter dams will be measured by the foot or by the cubic yard. The measured volume will include sandbags, when used.
- 4.1.1. **Linear Measurement.** When rock filter dams are measured by the foot, measurement will be along the centerline of the top of the dam.
- 4.1.2. **Volume Measurement.** When rock filter dams are measured by the cubic yard, measurement will be based on the volume of rock computed by the method of average end areas.
- 4.1.2.1. **Installation.** Measurement will be made in final position.
- 4.1.2.2. **Removal.** Measurement will be made at the point of removal.
- 4.2. **Temporary Pipe Slope Drains.** Temporary pipe slope drains will be measured by the foot.
- 4.3. **Temporary Paved Flumes.** Temporary paved flumes will be measured by the square yard of surface area. The measured area will include the energy dissipater at the flume outlet.
- 4.4. **Construction Exits.** Construction exits will be measured by the square yard of surface area.
- 4.5. **Earthwork for Erosion and Sediment Control.**
- 4.5.1. **Equipment and Labor Measurement.** Equipment and labor used will be measured by the actual number of hours the equipment is operated and the labor is engaged in the work.
- 4.5.2. **Volume Measurement.**

- 4.5.2.1. **In Place.**
- 4.5.2.1.1. **Excavation.** Excavation will be measured by the cubic yard in its original position and the volume computed by the method of average end areas.
- 4.5.2.1.2. **Embankment.** Embankment will be measured by the cubic yard in its final position by the method of average end areas. The volume of embankment will be determined between:
- the original ground surfaces or the surface upon that the embankment is to be constructed for the feature and
 - the lines, grades and slopes of the accepted embankment for the feature.
- 4.5.2.2. **In Vehicles.** Excavation and embankment quantities will be combined and paid for under "Earthwork (Erosion and Sediment Control, In Vehicle)." Excavation will be measured by the cubic yard in vehicles at the point of removal. Embankment will be measured by the cubic yard in vehicles measured at the point of delivery. Shrinkage or swelling factors will not be considered in determining the calculated quantities.
- 4.6. **Construction Perimeter Fence.** Construction perimeter fence will be measured by the foot.
- 4.7. **Sandbags for Erosion Control.** Sandbags will be measured as each sandbag or by the foot along the top of sandbag berms or dams.
- 4.8. **Temporary Sediment-Control Fence.** Installation or removal of temporary sediment-control fence will be measured by the foot.
- 4.9. **Biodegradable Erosion Control Logs.** Installation or removal of biodegradable erosion control logs will be measured by the foot along the centerline of the top of the control logs.
- 4.10. **Vertical Tracking.** Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.

5. PAYMENT

The following will not be paid for directly but are subsidiary to pertinent Items:

- erosion-control measures for Contractor project-specific locations (PSLs) inside and outside the right of way (such as construction and haul roads, field offices, equipment and supply areas, plants, and material sources);
- removal of litter, unless a separate pay item is shown on the plans;
- repair to devices and features damaged by Contractor operations;
- added measures and maintenance needed due to negligence, carelessness, lack of maintenance, and failure to install permanent controls;
- removal and reinstallation of devices and features needed for the convenience of the Contractor;
- finish grading and dressing upon removal of the device; and
- minor adjustments including but not limited to plumbing posts, reattaching fabric, minor grading to maintain slopes on an erosion embankment feature, or moving small numbers of sandbags.

Stabilization of disturbed areas will be paid for under pertinent Items.

Furnishing and installing pipe for outfalls associated with sediment traps and ponds will not be paid for directly but is subsidiary to the excavation and embankment under this Item.

- 5.1. **Rock Filter Dams.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

5.1.1. **Installation.** Installation will be paid for as "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

5.1.2. **Removal.** Removal will be paid for as "Rock Filter Dams (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.

When the Owner directs that the rock filter dam installation or portions thereof be replaced, payment will be made at the unit price bid for "Rock Filter Dams (Remove)" and for "Rock Filter Dams (Install)" of the type specified. This price is full compensation for furnishing and operating equipment, finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.

5.2. **Temporary Pipe Slope Drains.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Pipe Slope Drains" of the size specified. This price is full compensation for furnishing materials, removal and disposal, furnishing and operating equipment, labor, tools, and incidentals.

Removal of temporary pipe slope drains will not be paid for directly but is subsidiary to the installation Item. When the Owner directs that the pipe slope drain installation or portions thereof be replaced, payment will be made at the unit price bid for "Temporary Pipe Slope Drains" of the size specified, which is full compensation for the removal and reinstallation of the pipe drain.

Earthwork required for the pipe slope drain installation, including construction of the sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

Riprap concrete or stone, when used as an energy dissipater or as a stabilized sediment trap, will be measured and paid for in accordance with Item 432, "Riprap."

5.3. **Temporary Paved Flumes.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Temporary Paved Flume (Install)" or "Temporary Paved Flume (Remove)." This price is full compensation for furnishing and placing materials, removal and disposal, equipment, labor, tools, and incidentals.

When the Owner directs that the paved flume installation or portions thereof be replaced, payment will be made at the unit prices bid for "Temporary Paved Flume (Remove)" and "Temporary Paved Flume (Install)." These prices are full compensation for the removal and replacement of the paved flume and for equipment, labor, tools, and incidentals.

Earthwork required for the paved flume installation, including construction of a sediment trap, will be measured and paid for under "Earthwork for Erosion and Sediment Control."

5.4. **Construction Exits.** Contractor-required construction exits from off right of way locations or on-right of way PSLs will not be paid for directly but are subsidiary to pertinent Items.

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" for construction exits needed on right of way access to work areas required by the Owner will be paid for at the unit price bid for "Construction Exits (Install)" of the type specified or "Construction Exits (Remove)." This price is full compensation for furnishing and placing materials, excavating, removal and disposal, cleaning vehicles, labor, tools, and incidentals.

When the Owner directs that a construction exit or portion thereof be removed and replaced, payment will be made at the unit prices bid for "Construction Exit (Remove)" and "Construction Exit (Install)" of the type specified. These prices are full compensation for the removal and replacement of the construction exit and for equipment, labor, tools, and incidentals.

Construction of sediment traps used in conjunction with the construction exit will be measured and paid for under "Earthwork for Erosion and Sediment Control."

5.5. **Earthwork for Erosion and Sediment Control.**

- 5.5.1. **Initial Earthwork for Erosion and Sediment Control.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Excavation (Erosion and Sediment Control, In Place)," "Embankment (Erosion and Sediment Control, In Place)," "Excavation (Erosion and Sediment Control, In Vehicle)," "Embankment (Erosion and Sediment Control, In Vehicle)," or "Earthwork (Erosion and Sediment Control, In Vehicle)."

This price is full compensation for excavation and embankment including hauling, disposal of material not used elsewhere on the project; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

- 5.5.2. **Maintenance Earthwork for Erosion and Sediment Control for Cleaning and Restoring Control Measures.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid under a Contractor Force Account Item from invoice provided to the Owner.

This price is full compensation for excavation, embankment, and re-grading including removal of accumulated sediment in various erosion control installations as directed, hauling, and disposal of material not used elsewhere on the project; excavation for construction of erosion-control features; embankments including furnishing material from approved sources and construction of erosion-control features; and equipment, labor, tools, and incidentals.

Earthwork needed to remove and obliterate erosion-control features will not be paid for directly but is subsidiary to pertinent Items unless otherwise shown on the plans.

Sprinkling and rolling required by this Item will not be paid for directly, but will be subsidiary to this Item.

- 5.6. **Construction Perimeter Fence.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Construction Perimeter Fence." This price is full compensation for furnishing and placing the fence; digging, fence posts, wire, and flagging; removal and disposal; and materials, equipment, labor, tools, and incidentals.

Removal of construction perimeter fence will not be paid for directly but is subsidiary to the installation Item. When the Owner directs that the perimeter fence installation or portions thereof be removed and replaced, payment will be made at the unit price bid for "Construction Perimeter Fence," which is full compensation for the removal and reinstallation of the construction perimeter fence.

- 5.7. **Sandbags for Erosion Control.** Sandbags will be paid for at the unit price bid for "Sandbags for Erosion Control" (of the height specified when measurement is by the foot). This price is full compensation for materials, placing sandbags, removal and disposal, equipment, labor, tools, and incidentals.

Removal of sandbags will not be paid for directly but is subsidiary to the installation Item. When the Owner directs that the sandbag installation or portions thereof be replaced, payment will be made at the unit price bid for "Sandbags for Erosion Control," which is full compensation for the reinstallation of the sandbags.

- 5.8. **Temporary Sediment-Control Fence.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:

- 5.8.1. **Installation.** Installation will be paid for as "Temporary Sediment-Control Fence (Install)." This price is full compensation for furnishing and operating equipment finish backfill and grading, lacing, proper disposal, labor, materials, tools, and incidentals.
- 5.8.2. **Removal.** Removal will be paid for as "Temporary Sediment-Control Fence (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.
- 5.9. **Biodegradable Erosion Control Logs.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid as follows:
- 5.9.1. **Installation.** Installation will be paid for as "Biodegradable Erosion Control Logs (Install)" of the size specified. This price is full compensation for furnishing and operating equipment finish backfill and grading, staking, proper disposal, labor, materials, tools, and incidentals.
- 5.9.2. **Removal.** Removal will be paid for as "Biodegradable Erosion Control Logs (Remove)." This price is full compensation for furnishing and operating equipment, proper disposal, labor, materials, tools, and incidentals.
- 5.10. **Vertical Tracking.** Vertical tracking will not be measured or paid for directly but is considered subsidiary to this Item.

SPECIAL SPECIFICATIONS

Special Specification 1002

Landscape Amenity

1. DESCRIPTION

Install landscape amenity as shown on the plans or as directed.

2. MATERIALS

Furnish materials and use construction methods in accordance with the plans.

3. CONSTRUCTION

Use construction methods in accordance with the plans.

4. MEASUREMENT

This Item will be measured by the each.

5. PAYMENT

The work performed, and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Landscape Amenity" or "Landscape Amenity" of type specified. This price is full compensation for furnishing all materials, equipment, labor, and incidentals.

Special Specification 1005

Loose Aggregate for Groundcover

1. DESCRIPTION

Furnish and install loose aggregate for groundcover as shown on the plans or as directed.

2. MATERIALS

Furnish material in accordance with the plans.

3. CONSTRUCTION

Use construction methods in accordance with the plans.

4. MEASUREMENT

This Item will be measured by the cubic yard or square yard of the depth specified.

5. PAYMENT

The work performed, and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Loose Aggregate for Groundcover" of type specified. This price is full compensation for furnishing all materials, equipment, labor, and incidentals.

Special Specification 6002

Video Imaging Vehicle Detection System

1. DESCRIPTION

Install a Video Imaging Vehicle Detection System (VIVDS) that monitors vehicles on a roadway via processing of video images and provides detector outputs to a traffic controller or similar device.

A VIVDS configuration for a single intersection will consist of variable focal length cameras, VIVDS card rack processor system, and all associated equipment required to setup and operate in a field environment, including a video monitor and laptop (if required), connectors, and camera mounting hardware.

The system is composed of these principal items: the cameras, the field communications link between the camera and the VIVDS processor unit, and the VIVDS processor unit along with a PC, video monitor, or associated equipment required to setup the VIVDS and central control software to communicate to the VIVDS processor.

The VIVDS Card Rack Processor must be either NEMA TS 2 TYPE 1 or TYPE 2. TYPE 2 must have RS 485 SDLC.

2. DEFINITIONS

- 2.1. **VIVDS Processor Unit.** The electronic unit that converts the video image provided by the cameras, generates vehicle detections for defined zones, and collects vehicular data as specified.
- 2.2. **VIVDS Processor System.** One or more VIVDS processor modular units required to handle the number of camera inputs.
- 2.3. **Central Control.** A remotely located control center, which communicates with the VIVDS. The VIVDS operator at the central control has the ability to monitor the operation and modify detector placement and configuration parameters. The equipment that constitutes central control is comprised of a workstation microcomputer along with the associated peripherals as described in this Special Specification.
- 2.4. **Field Setup Computer.** A portable microcomputer used to set up and monitor the operation of the VIVDS processor unit. If required to interface with the VIVDS processor unit, the field setup computer with the associated peripherals described in this Special Specification and a video monitor, also described in this Special Specification, must be supplied as part of the VIVDS.
- 2.5. **Field Communications Link.** The communications connection between the camera and the VIVDS processor unit. The primary communications link media may be coaxial cable or fiber optic cable.
- 2.6. **Remote Communications Link.** The communications connection between the VIVDS processor unit and the central control.
- 2.7. **Camera Assembly.** The complete camera or optical device assembly used to collect the visual image. The camera assembly consists of a charged coupled device (CCD) camera, environmental enclosure, sun shield, temperature control mechanism, and all necessary mounting hardware.
- 2.8. **Occlusion.** The phenomenon when a vehicle passes through the detection zone but the view from the sensor is obstructed by another vehicle. This type of occlusion results in the vehicle not being detected by the sensor or when a vehicle in one lane passes through the detection zone of an adjacent lane. This type of occlusion can result in the same vehicle being counted in more than one lane.
- 2.9. **Detection Zone.** The detection zone is a line or area selected through the VIVDS processor unit that when occupied by a vehicle, sends a vehicle detection to the traffic controller or freeway management system.

- 2.10. **Detection Accuracy.** The measure of the basic operation of a detection system (shows detection when a vehicle is in the detection zone and shows no detection when there is not a vehicle in the detection zone).
- 2.11. **Live Video.** Video being viewed or processed at 30 frames per second.
- 2.12. **Lux.** The measure of light intensity at which a camera may operate. A unit of illumination equal to one lumen per square meter or to the illumination of a surface uniformly one meter distant from a point source of one candle.
- 2.13. **Video Monitor.** As a minimum must be a 9-in. black and white monitor with BNC connectors for video in and out.

3. FUNCTIONAL CAPABILITIES

The system software must be able to detect either approaching or departing vehicles in multiple traffic lanes. A minimum of 4 detector outputs per video processor module card and each card must have a minimum of 24 detection zones. Each zone and output must be user definable through interactive graphics by placing lines or boxes in an image on a video or VGA monitor. The user must be able to redefine previously defined detection zones.

The VIVDS must provide real time vehicle detection (within 112 milliseconds (ms) of vehicle arrival).

The VIVDS processor unit must be capable of simultaneously processing information from various video sources, including CCTV video image sensors and video tape players.

The video sources may be, but are not required to be, synchronized or line-locked. The video must be processed at a rate of 30 times per second by the VIVDS processor unit.

The system must be able to detect the presence of vehicles in a minimum of 12 detection zones within the combined field of view of all cameras (a minimum of 12 detection zones per camera input to the VIVDS processor unit).

Provide detection zones that are sensitive to the direction of vehicle travel. The direction to be detected by each detection zone must be user programmable.

The VIVDS processor unit must compensate for minor camera movement (up to 2% of the field of view at 400 ft.) without falsely detecting vehicles. The camera movement must be measured on the unprocessed video input to the VIVDS processor unit.

The camera must operate while directly connected to VIVDS Processor Unit.

Once the detector configuration has been downloaded or saved into the VIVDS processor unit, the video detection system must operate with the monitoring equipment (monitor or laptop) disconnected or online.

When the monitoring equipment is directly connected to the VIVDS processor unit, it must be possible to view vehicle detections in real time as they occur on the field setup computer's color VGA display or the video monitor.

4. VEHICLE DETECTION

- 4.1. **Detection Zone Placement.** The video detection system must provide flexible detection zone placement anywhere within the combined field of view of the image sensors. Preferred presence detector configurations must be lines or boxes placed across lanes of traffic or lines placed in line with lanes of traffic. A single detector must be able to replace one or more conventional detector loops. Detection zones must be able to be fully overlapped. In addition, detection zones must have the capability of implementing "AND" and "OR" logical functions including presence, extension and delay timing. These logical functions may be excluded if provisions are made to bring each detector separately into the controller and the controller can provide these functions.
- 4.2. **Detection Zone Programming.** Placement of detection zones must be by means of a graphical interface using the video image of the roadway. The monitor must show images of the detection zones superimposed on the video image of traffic while the VIVDS processor is running.

The detection zones must be created by using the mouse or keypad to draw detection zones on the monitor. The detection zones must be capable of being sized, shaped and overlapped to provide optimal road coverage and detection. It must be possible to upload detector configurations to the VIVDS processor unit and to retrieve the detector configuration that is currently running in the VIVDS processor unit.

The mouse or keypad must be used to edit previously defined detector configurations so as to fine tune the detection zone placement size and shape. Once a detection configuration has been created, the system must provide a graphic display of the new configuration on its monitor. While this fine-tuning is being done, the detection must continue to operate from the detector configuration that is currently called.

When a vehicle occupies a detection zone, the detection zone on the live video must indicate the presence of a vehicle, thereby verifying proper operation of the detection system. With the absence of video, the card must have an LED that will indicate proper operation of the detection zones.

Provide detection zones that are sensitive to the direction of vehicle travel. The direction to be detected by each detection zone must be user programmable. The vehicle detection zone should not activate if a vehicle traveling any direction other than the one specified for detection occupies the detection zone. Cross-street and wrong way traffic should not cause a detection.

- 4.3. **Design Field of View.** The video detection system must reliably detect vehicle presence in the design field of view. The design field of view must be defined as the sensor view when the image sensor is mounted 24 ft. or higher above the roadway, when the camera is adjacent (within 15 ft.) to the edge of the nearest vehicle travel lane, and when the length of the detection area is not greater than 10 times the mounting height of the image sensor. Within this design field of view, the VIVDS processor unit must be capable of setting up a single detection zone for point detection (equivalent to the operation of a 6 ft. × 6 ft. inductive loop). A single camera, placed at the proper mounting height with the proper lens, must be able to monitor up to and including 5 traffic lanes simultaneously.
- 4.4. **Detection Performance.** Detection accuracy of the video detection system must be comparable to properly operating inductive loops. Detection accuracy must include the presence of any vehicle in the defined detection zone regardless of the lane, which the vehicle is occupying. Occlusion produced by vehicles in the same or adjacent lanes must not be considered a failure of the VIVDS processor unit, but a limitation of the camera placement. Detection accuracy (a minimum of 95%) must be enforced for the entire design field of view on a lane by lane and on a time period basis. When specified on the plans, furnish up to 24 continuous hours of recorded video of all installed intersection cameras within the 30 day test period for verification of proper camera placement, field of view, focus, detection zone placement, processor setup and operation. The video from each camera must show vehicle detections for all zones.
- 4.5. **Equipment Failure.** Either camera or VIVDS processor unit must result in constant vehicle detection on affected detection zones.

5. VIVDS PROCESSOR UNIT

- 5.1. **Cabinet Mounting.** The VIVDS processor unit must be rack mountable.
- 5.2. **Environmental Requirements.** The VIVDS processor unit must be designed to operate reliably in the adverse environment found in the typical roadside traffic cabinet. It must meet the environmental requirements set forth by the latest NEMA (National Electrical Manufacturers Association) TS1 and TS2 standards as well as the environmental requirements for Type 170, Type 179 and 2070 controllers. Operating temperature must be from - 30°F to +165°F at 0% to 95% relative humidity, non-condensing.
- 5.3. **Electrical.** The VIVDS must have a modular electrical design.

The VIVDS must operate within a range of 89 to 135 VAC, 60 Hz single phase. Power to the VIVDS must be from the transient protected side of the AC power distribution system in the traffic control cabinet in which the VIVDS is installed.

Serial communications to the field setup computer must be through an RS 232, USB or Ethernet port. This port must be able to download the real time detection information needed to show detector actuations. A connector on the front of the VIVDS processor unit must be used for serial communications.

The unit must be equipped with RS 170 (monochrome) or RS170A (color) composite video inputs video inputs, so that signals from image sensors or other synchronous or asynchronous video sources can be processed in real time. BNC connectors on the front of the VIVDS processor unit or video patch panel must be used for all video inputs.

The unit must be equipped with a single RS 170 composite video output. This output must be capable of corresponding to any one of the video inputs, as selected remotely via the field setup computer or front panel switch. Multiple video outputs requiring external cable connections to create a combined single video output must not be acceptable. A BNC or RCA connector must be used for video output on the front of the processor unit. Any other video formats must be approved by a Department TRF Signal Operation Engineer before use.

Software upgrades or changes must be presented to and approved by the Department's TRF-TM Division before use. Failure to do so will be grounds for termination of contract and probation for responsible parties.

The unit software and the supervisor software must include diagnostic software to allow testing the VIVDS functions. This must include the capability to set and clear individual detector outputs and display the status of inputs to enable setup and troubleshooting in the field.

6. CAMERA ASSEMBLY

6.1. **Camera.** The video detection system must use medium resolution, monochrome image sensors as the video source for real time vehicle detection. The cameras must be approved for use with the VIVDS processor unit by the supplier of the VIVDS. As a minimum, each camera must provide the following capabilities:

- Images must be produced with a Charge Coupled Device (CCD) sensing element with horizontal resolution of at least 480 lines for black and white or 470 lines for color and vertical resolution of at least 350 lines for black and white or color. Images must be output as a video signal conforming to RS170.
- Useable video and resolvable features in the video image must be produced when those features have luminance levels as low as 0.1 lux for black and white, and as low as 1.0 lux for color, for night use.
- Useable video and resolvable features in the video image must be produced when those features have luminance levels as high as 10,000 lux during the day.
- The camera must include an electronic shutter or auto-iris control based upon average scene luminance and must be equipped with an electronic shutter or auto-iris lens with variable focal length and variable focus that can be adjusted without opening up the camera housing to suit the site geometry. The variable focal length must be adjustable from 6 mm to 34 mm.

6.2. **Camera and Lens Assembly.** The camera and lens assembly must be housed in an environmental enclosure that provides the following capabilities:

- The enclosure must be waterproof and dust tight to the latest NEMA 4 specifications.
- The enclosure must allow the camera to operate satisfactorily over an ambient temperature range from -30°F to +140°F while exposed to precipitation as well as direct sunlight.
- The enclosure must allow the camera horizon to be rotated in the field during installation.
- The enclosure must include a provision at the rear of the enclosure for connection of power and video signal cables fabricated at the factory. Input power to the environmental enclosure must be nominally 115 VAC 60 Hz.
- A thermostatically controlled heater must be at the front of the enclosure to prevent the formation of ice and condensation, as well as to assure proper operation of the lens's iris mechanism. The heater must not interfere with the operation of the camera electronics, and it must not cause interference with the video signal.
- The enclosure must be light colored or unfinished and must include a sun shield to minimize solar heating. The front edge of the sunshield must protrude beyond the front edge of the environmental enclosure and

must include provision to divert water flow to the sides of the sunshield. The amount of overhang of the sun shield must be adjustable to block the view of the horizon to prevent direct sunlight from entering the lens. Any plastics used in the enclosure must include ultra violet inhibitors.

- The total weight of the image sensor in the environmental enclosure with sunshield must be less than 10 lb.
- When operating in the environmental enclosure with power and video signal cables connected, the image sensor must meet FCC class B requirements for electromagnetic interference emissions.

The video output of the cameras must be isolated from earth ground. All video connections for the cameras to the video interface panel must also be isolated from earth ground.

Use waterproof, quick disconnect connectors to the image sensor for both video and power.

Provide a camera interface panel capable of being mounted to sidewalls of a controller cabinet for protection of the VIVDS processor unit, camera video and power inputs/outputs. The panel must consist of, as a minimum, 4 Edco CX06 coax protectors, an Edco ACP-340 for the cameras and VIVDS processor unit power, a 10 amp breaker, a convenience outlet protected the ACP-340 and a terminal strip with a minimum of sixteen 8-32 binder head screws. The terminal strip must be protected by a piece of 1/8 in. Plexiglas.

When the connection between the image sensor and the VIVDS processor unit is coaxial cable, the coaxial cable used must be a low loss, 75 ohm, precision video cable suited for outdoor installation, such as Belden 8281 or a Department-approved equal.

Camera mounting hardware must allow for vertical or horizontal mounting to the camera enclosure. Pelco AS-0166-4-62 or equivalent is acceptable.

7. FIELD COMMUNICATION LINK

The field communications link must be a one way communications connection from the camera to the equipment cabinet. The primary communications link media may be coaxial cable or fiber optic cable accompanied by a 3 conductor minimum 18 AWG, 24 VDC or 115 VAC camera power cable, or appropriate cable as approved.

The following requirements must govern for the various types of field communications link media described on the plans:

- 7.1. **Coaxial Cable.** In locations where the plans indicate coaxial cable is required as the primary communications link, this cable must be of the RG 59 type with a nominal impedance of 75 ohms. All cable must have a polyethylene dielectric with copper braid shield having a minimum of 98% shield coverage and not greater than 0.78 dB attenuation per 100 feet at 10 MHz with a minimum 18 AWG external 3 conductor power cable or approved equivalent as directed.

- 7.2. **Fiber Optic Cable.** If shown on the plans, furnish fiber optic cable in accordance with the Special Specification for fiber optic cable.

- 7.3. **Twisted Wire Pairs.** Must be Belden 9556 or equivalent 18 AWG TWP control cable.

All connection cables must be continuous from the equipment cabinet to the camera. No splices of any type will be permitted.

Install lightning and transient surge suppression devices on the processor side of the field communications link to protect the peripheral devices. The suppression devices must be all solid state. Lightning protection is not required for fiber optic communication lines. The devices must present high impedance to, and must not interfere with, the communications lines during normal operation. The suppression devices must not allow the peak voltage on any line to exceed 300% of the normal operating peak voltage at any time. The response time of the devices must not exceed 5 nanoseconds.

8. VIVDS SET-UP SYSTEM

The minimum VIVDS set-up system, as needed for detector setup and viewing of vehicle detections, must consist of a field setup computer and Windows based interface software (if required) or a video monitor with interface software built-in to the VIVDS processor unit. Live video (30 frames per second) must be available on the field

setup computer to determine proper operation of detectors. The field set-up computer as a minimum, must have an NTSC video input port or equivalent.

If a field setup computer is required for system set-up, it must be supplied by the supplier of the VIVDS.

The field setup computer must include all necessary cabling and a Windows based program to interface with the VIVDS processor unit. This software must provide an easy to use graphical user interface and support all models/versions of the supplied VIVDS.

Live video with the detection overlaid is required for field verification of the system.

9. TEMPORARY USE AND RETESTING

- 9.1. **Temporary Use.** When shown on the plans, the VIVDS equipment must be used to provide vehicle detection on a temporary basis. When the permanent vehicle detection system and related equipment are installed and made operational, the VIVDS equipment must be carefully removed and delivered to the location shown on the plans.
- 9.2. **State Retesting and Acceptance.** Before acceptance, all VIVDS equipment may be retested by the Department, even if the system was operating properly before removal. Repair or replace any equipment damaged during removal or transport and any equipment that does not meet the various test requirements.

10. OPERATION FROM CENTRAL CONTROL

The central control must transmit and receive all information needed for detector setup, monitor the vehicle detection, view the vehicle traffic flow at a rate of 2 frames per second or greater for telephone, or 5 frames per second or greater for ISDN lines (as specified by the plans), and interrogate all required stored data. The remote communications link between the VIVDS processor unit and central control may be dial-up (telephone or ISDN lines) or dedicated twisted wire pair communications cable which may be accompanied with coaxial cable or fiber-optic cable, as shown on the plans. Communications with the central control must not interfere with the on-street detection of the VIVDS processor. Quality of the video at 2 frames per second rate must be such that the view with the traffic flow is clear and in focus.

11. INSTALLATION AND TRAINING

The supplier of the video detection system must supervise the installation and testing of the video and computer equipment. A factory certified representative from the supplier must be on site during installation. If the field setup computer is furnished by the Department, such installation and testing must be done at the time that training is conducted.

Provide up to 2 days of training to personnel of the Department in the operation, setup and maintenance of the video detection system. Provide instruction and materials for a maximum of 20 persons and conduct at a location selected by the Department. The Department will be responsible for any travel and room and board expenses for its own personnel.

Instruction personnel are required to be certified by the equipment manufacturer. The User's Guide is not an adequate substitute for practical, classroom training and formal certification by an approved agency.

Formal levels of factory authorized training are required for installers, contractors, and system operators. All training must be certified by the manufacturer.

12. WARRANTY, MAINTENANCE, AND SUPPORT

The video detection system must be warranted to be free of defects in material and workmanship for a period of 5 yr. from date of shipment from the supplier's facility. During the warranty period, the supplier must repair with new or refurbished materials, or replace at no charge, any product containing a warranty defect provided the product is returned FOB to the supplier's factory or authorized repair site. Return product repair or replaced under warranty by the supplier with transportation prepaid. This warranty does not apply to products damaged by accident, improperly operated, abused, serviced by unauthorized personnel or unauthorized modification.

During the warranty period, technical support must be available from the supplier via telephone within 4 hr. of the time a call is made by a user, and this support must be available from factory certified personnel or factory certified installers.

Ongoing software support by the supplier must include updates of the VIVDS processor unit and supervisor software (if a field setup computer is required for set up). Provide these updates free of charge during the warranty period. The update of the VIVDS software to be NTCIP compliant must be included.

The supplier must maintain a program for technical support and software updates following expiration of the warranty period. Make this program available to the Department in the form of a separate agreement for continuing support.

The supplier must maintain an ongoing program of technical support for the wireless camera system. This technical support must be available via telephone or personnel sent to the installation site.

The supplier must maintain an adequate inventory of parts to support maintenance and repair of the camera system.

13. MEASUREMENT

The VIVDS will be measured as each major system component furnished, installed, made fully operational, and tested in accordance with this Special Specification or as directed.

The VIVDS communication cable will be measured by the foot of the appropriate media type furnished, installed, made fully operational, and tested in accordance with this Specification, other referenced Special Specifications or as directed.

When the VIVDS is used on a temporary basis, the VIVDS will be measured as each system furnished, installed, made fully operational, including reconfiguration and removal if required by the plans, and tested in accordance with this Special Specification or as directed.

This is a plans quantity measurement item. The quantity to be paid is the quantity shown in the proposal unless modified by Article 9.2., "Plans Quantity Measurement." Additional measurements or calculations will be made if adjustments of quantities are required.

When recorded video is required by the plans it will be paid for by each camera recorded.

14. PAYMENT

The work performed, materials, and all accompanying software furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid for "VIVDS Processor System," "VIVDS Camera Assembly," "VIVDS Central Control," "VIVDS Set-up System," "VIVDS Temporary," "VIVDS Communication Cable (Coaxial)," "VIVDS Communication Cable (Fiber Optic)," and "VIVDS Video Recording." These prices are full compensation for furnishing, placing, and testing all materials and equipment, and for all tools, labor, equipment, hardware, operational software packages, supplies, support, personnel training, shop drawings, documentation, and incidentals. A 3-conductor power cable must be included with the communication cable.

These prices also include any and all interfaces required for the field and remote communications links along with any associated peripheral equipment, including cables; all associated mounting hardware and associated field equipment; required for a complete and fully functional visual image vehicle detection system component.

Special Specification 6002

Video Imaging Vehicle Detection System

1. DESCRIPTION

Prepare conduits, ground boxes, or manholes; replace conduits, ground boxes, or manholes, when necessary; replace conduit fittings with junction boxes; replace damaged ground box or manholes covers; adjust ground box or manholes covers; install pull lines in conduits; install cable racks in ground boxes or manholes.

2. MATERIALS

Provide new materials that comply with the details shown on the plans, the requirements of this Item, and to the pertinent requirements of the following Items:

- Item 624, "Ground Boxes"
- Item 465, "Manholes and Inlets"

When conduit replacement is required, provide conduit meeting the requirements of Item 618, "Conduit." Use conduit of same size and type of that being replaced or as directed.

Provide 24 in. × 24 in. × 12 in. (L × W × D) minimum size NEMA 4X junction boxes with screw covers.

Provide polyester tapes or rope pull cords with a tensile strength of at least 1200 lb.

Provide heavy duty, non-metallic, non-corrosive cable racks that can support a minimum dead load of 300 lbs. Ensure cable racks are resistant to the effects of oils, hydrocarbons, common esters, ketones, ethers, or amides. Ensure cable racks are adjustable between 8 in. and 14 in. wide. Do not provide grounding or insulators for cable racks.

3. CONSTRUCTION

Check existing conduit and ground boxes.

- 3.1. **Preparation of Conduit, Ground Box or Manhole.** Pull a mandrel through empty conduits. Use a mandrel with a diameter greater than 70% of the inside diameter of the conduit and 2 in. length. Repair or replace conduit runs that will not allow passage of the mandrel. Replace conduit deemed impractical to repair or remains unsuitable in accordance with Item 618, "Conduit." Clean the conduit by pulling a rubber swab slightly larger in diameter than the conduit.

Blow compressed air through conduits that contain wires. Remove debris from the conduit by pushing a fish tape through the conduit. Do not use water to clear debris. Retest the conduit by blowing compressed air.

Install 1 pull cord in each conduit for use in installing the conductors, cables, or innerduct. Leave 1 pull cord in each conduit after the conductors, cables, or innerduct have been installed.

Remove silt and debris from ground boxes or manholes prior to installing cable.
- 3.2. **Installation of Ground Box or Manhole.** Furnish new ground boxes or manholes as directed. Install ground boxes or manholes as shown the plans or as directed.

Backfill disturbed surface with material equal in composition and density to the surrounding area. Replace surfacing material with similar material to an equivalent condition.

- 3.3. **Installation or Adjustment of Ground Box or Manhole Covers.** Remove, dispose, and install ground box or manhole covers as shown on the plans or as directed. Adjust ground box or manhole covers as shown on the plans or as directed. Adjustment may include welding, raising, or lowering.

Backfill disturbed surface with material equal in composition and density to the surrounding area. Replace surfacing material with similar material to an equivalent condition.

- 3.4. **Installation of Junction Box.** Locate conduit fittings in conduits carrying fiber optic cables. Replace the conduit fitting and associated section of conduit with a junction box. Install junction boxes as shown on the plans.

- 3.5. **Installation of Cable Rack Assembly.** Install cable racks to permit coiling of conductors or cables without violating the manufacturer's minimum bending radius. Install 2 cable rack supports and 4 adjustable levels on each support, at a minimum, on each wall of the ground box or manhole as shown on plans or as directed. Anchor the cable rack support permanently to the ground box wall with mechanical or powder actuated fasteners. Use fasteners with an ultimate pull out strength of at least 2500 lb. and ultimate shear strength of at least 3000 lb. Provide sufficient cable supports for the particular number of conductors or cables coiled or passing through the ground box or manhole as shown on the plans or as directed.

4. MEASUREMENT

This Item will be measured by the foot of conduit cleared, tested, replaced and repaired, by each cable rack, junction box, ground box, or manhole installed or prepared, and by each ground box or manhole cover replaced or adjusted.

5. PAYMENT

The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Conduit (Prepare)," "Junction Box (Install)," "Manhole (Install)," "Ground Box (Install)," "Manhole (Prepare)," "Ground Box (Prepare)," "Cover (Replace)" of the sizes specified, "Cover (Adjust)," and "Cable Rack Assembly (Install)." This price is full compensation for cleaning and testing conduit, ground boxes, and manholes; furnishing and installing pull cords, ground boxes, manholes, junction boxes, and cable racks; excavating and backfilling; adjusting ground boxes and manholes covers; disposal of unsalvageable material; and equipment, materials, labor, tools, and incidentals.

Repair of existing conduit will be paid for by the Department in accordance with Article 9.7., "Payment for Extra Work and Force Account Method."

Special Specification 7016

WATER AND SANITARY SEWER SYSTEMS



1. DESCRIPTION

This Item will govern for furnishing new materials and installing water and sanitary sewer systems shown on the plans.

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3. WATER MAINS

3.1. **Description.** Furnish all labor, materials, equipment and incidentals required to install water mains as shown on the plans and as specified.

3.2. **Materials.**

3.2.1. **Polyvinyl Chloride (PVC) Pressure Pipe.** The following specifications cover the requirements for polyvinyl chloride (PVC) pressure plastic pipe materials and installation for potable water use and apply to PVC pipe, sizes 4 inch through 16 inch diameters.

3.2.1.1. **Quality Assurance.** Color-code PVC pipe in blue to provide positive identification and prevent accidental damage to or interruption of the water facilities. Pipe will conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 "Drinking Water System Components - Health Effects" and be certified by and organization accredited by ANSI. Provide compliance affidavit from the manufacturer or vendor. If the pipe does not conform to this standard, information from the manufacturer regarding action being taken to comply with this standard must be submitted.

Only pipe manufactured in the United States of America will be accepted.

Pipe must be suitable for use in the conveyance of water for human consumption. Mark each piece of pipe with two seals of the testing agency that certified the pipe material as being suitable for potable water use.

3.2.1.2. **Submittals.** Furnish all necessary shop drawings, certificates, etc. for review and acceptance. A certification from the manufacturer must be furnished attesting compliance with appropriate ASTM Standards and

ANSI/NSF Standard 61. Such compliance will be evidenced by an affidavit from the manufacturer or vendor. If the pipe does not presently conform to this standard, information from the manufacturer regarding action being taken to comply with this standard must be submitted. Failure to provide this information may result in rejection of pipeline material. Include documentation on pipe products, fittings, and related materials as may be required by the plans or the Engineer. Review all submittals prior to submission. Submit it in a timely manner so as not to delay the project. Allow sufficient time for Engineer's review and resubmission, if necessary. Include certifications from manufacturer that the product complies with appropriate ASTM standards

3.2.1.3. Standards. Comply with the applicable requirements of the following items listed below. In case of conflict between the requirements of this Specification and those of the listed documents, the requirements of this Section will prevail.

- ANSI/NSF 61 Drinking Water System Components - Health Effects
- ASTM F-477 Specifications for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM D-1784 Specifications for Rigid Polyvinyl Chloride (PVC) Compounds and Chlorinated Polyvinyl Chloride (CPVC) Compounds
- ASTM D-2241 Specification for Poly (Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR-Series)
- ASTM D-2774 Recommended Practice for Underground Installation of Thermoplastic Pressure Piping
- ASTM D-2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials
- ASTM D-3139 Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals
- AWWA C-651 Standard for Disinfecting Water Mains
- AWWA C-900 Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4-inch through 12-inches, for Water Distribution
- AWWA C-905 Standard for Polyvinyl Chloride (PVC) Water Transmission Pipe, Nominal Diameters 14-inch through 36-Inches
- AWWA M-23 Manual: PVC Pipe - Design and Installation
- UNI-BELL-3 Polyvinyl Chloride (PVC) Pressure Pipe (Complying with AWWA Standard C-900)
- UNI-BELL-11 Polyvinyl Chloride (PVC) Water Transmission Pipe Nominal Diameters 14-36 inches
- Texas Commission on Environmental Quality, Chapter 290 - Public Drinking Water

3.2.1.4. Delivery and Storage. Pipe, fittings, and accessories will be inspected upon delivery and during progress of the work. Any material found defective will be rejected and must be promptly removed from the site.

Unload at point of delivery all pipe, fittings, and other accessories, unless otherwise directed, haul to and distribute at the work site. In loading and unloading, lift materials by hoists or roll on skidways to avoid shock or damage. Do not incorporate materials that have been dropped. Do not skid or roll pipe handled on skidways against pipe already on the ground.

Do not store PVC pipe outside exposed to prolonged periods of sunlight. Any discoloration of pipe due to such exposure is an indication of reduced pipe impact strength, and will be sufficient cause for rejection of the pipe. Remove rejected all pipe from the job site.

3.2.1.5. Pipe Materials. Meet the requirements of AWWA C-900 for 4 inch through 12 inch sizes, and AWWA C-905 for 14 inch through 36 inch pipe. Provide pipe that is Underwriters Laboratories (UL) approved. Furnish all PVC pressure pipe in cast iron pipe equivalent outside diameters and a standard laying length of 20 feet. Provide a minimum pressure class of 235 psi (DR 18) for 4 inch through 12 inch diameters and 200 psi (DR 21) for 14 inch through 16 inch pipe.

3.2.1.6. Joints. Furnish push-on flexible, elastomeric gasketed pipe joints. The pipe length must contain one bell-end or couple with a synthetic elastomeric gasket.

Gaskets must meet the requirements of ASTM F-477. The bell will be an integral part of the pipe length, and have the same strength and DR as the pipe. The spigot pipe end will be beveled.

All push-on joint PVC pipe must have dual insertion marks on the spigot indicating proper penetration when the joint is assembled and only one mark remains visible. The sockets and/or spigot configurations for the fittings and couplings will be compatible to the pipe. Socket configuration must prevent improper installation of gasket and will ensure that the gasket remains in place during joining operations.

Cartridge-style restrained joint PVC pipe will be joined using a non-metallic coupling to form an integral system. Coupling will be designed for use at or above the pressure class of the pipe with which they are utilized and will incorporate twin elastomeric sealing gaskets meeting ASTM F-477. High strength, flexible thermoplastic splines will be inserted mating, machined grooves in the pipe and coupling to provide full 360° restraint.

Restrained joint pipe systems must have a restrained joint that in and of itself prevents over bellng of the pipe during assembly of the joint and every joint already assembled in that string of pipe. Restrained joint system will allow the installer to both push and pull the pipe during installation without the risk of over bellng of any of the pipe joints in the string. Joint will not require electrical power or other additional equipment (other than hand tools) to assemble.

3.2.1.7. Fittings. Provide DIP, cement lined pipe fittings in accordance with AWWA C-110 and Article 7, "Valves and Fittings". Provide mechanical joint (MJ) pipe fittings unless otherwise specified.

3.2.1.8. Provisions for Thrust. For 12-inch diameter water mains and smaller, concrete thrust blocks or other approved thrust restraint method will be installed at all fittings and valves per design plans and in accordance with these Specifications. If approved, thrust restraint devices may be installed in lieu of thrust blocks as per manufacturer's specifications.

For 16-inch diameter water mains and larger, thrust restraint devices must be installed at all fittings and valves per manufacturer's specifications and as shown on design plans. Concrete thrust blocks in conjunction with thrust restraint devices are allowed unless approved by the Engineer.

Acceptable thrust restraint devices include EBAA Iron, Ford Uni-Flange, or approved equal.

NOTE: At connection of new water line to existing main, both concrete thrust blocking in accordance with this Specification and thrust restraint devices must be used, regardless of main size.

Thrust restraint devices must be used for a sufficient distance from each bend, tee, plug, or other fitting to resist thrust which will be developed at the test pressure of the pipe. For the purposes of thrust restraint, test pressure will be 1.5 times the design working pressure indicated. Length of pipe with restrained joints to resist thrust forces will be determined by pipe manufacturer.

3.2.1.9. Pipe Trenching, Installation and Backfill. Except as noted, Pipe Trenching, Installation and Backfill for PVC Pressure Pipe will be in accordance with AWWA M-23, C-900, C-905, and conforming to "Excavation and Backfill for Structures" Item 400 and details shown on construction plans.

3.2.1.9.1. Trench Width. Provide a minimum trench clear width of 1foot greater than the outside diameter of the pipe and a maximum clear width at a point 1 foot above the top of the pipe equal to the pipe outside diameter plus 2 feet. If the maximum recommended trench width is exceeded or if the pipe is installed in a compacted embankment, compact pipe embedment to a minimum point of 2 1/2 pipe diameters from the side of the pipe or to the trench walls.

3.2.1.9.2. Pipe Zone Embedment. Unless otherwise specified, embed PVC pressure pipe in Class II material as defined in Item 400, "Excavation and Backfill for Structures". Native material or imported material meeting or exceeding Class II requirements may be used. Class I material is acceptable at the Engineer's discretion.

- 3.2.1.9.3. **Installation.** Install plastic pressure pipe in accordance with AWWA M 23 and C-900/C-905 and/or manufacturer's printed recommendations, whichever is applicable. Where a conflict arises, this Specification controls.
- Exercise care to insert the pipe spigot to the correct reference mark per manufacturer's recommendation to prevent buckling or separation of the pipe joint. The second insertion mark must be visible after installation and not be further than 3/4-inch from the leading edge of the pipe bell. Verify that the manufacturer's reference marks are correct per manufacturer's literature.
- Do not drop pipe or accessories into the trench. When pipe laying is not in progress, close the open ends of installed pipe to prevent entrance of trench water, dirt, and foreign matter into the line.
- 3.2.1.9.4. **Marking Tape.** Mark PVC pressure water pipe by installing the appropriate marking tape for detection purposes concurrently. Provide a high visibility blue detectable tape consisting of a 5.0 mil inert polyethylene plastic material with the standard warning and identification for potable water imprinted on the tape. Provide a minimum width of 6 inches for all potable water lines and bury tape to a depth of 36 inches, measured from finished grade. Use detecting tape manufactured by Empire, Lineguard, or approved equal.
- 3.2.1.9.5. **Deflection.** Maximum ring deflection (cross-sectional deflection) of installed PVC pressure pipe is 5 percent. Joint deflection (horizontal deflection) will not exceed manufacturer's recommendations for the particular pipe size.
- 3.2.1.9.6. **Corrosion Protection.** As a precaution against corrosion, coat all flanges, bolts, nuts and other exposed metal surfaces underground with Texaco, Koppers, or approved equal rustproof compound.
- 3.2.1.10. **Testing.** Disinfect and test the piping system as detailed in AWWA C-651 and in accordance with Article 10, "Cleaning, Disinfection, and Testing of Water System".
- 3.2.2. **Ductile Iron Pipe.** The following specifications cover the requirements for ductile iron pipe (DIP) materials.
- 3.2.2.1. **Quality Assurance.** Manufacturer must have a minimum of ten years successful experience in designing and manufacturing DIP, pipe joints of similar design, pipe diameter, and pressure class of the type specified. The entire pipeline will be the product of one manufacturer. Pipe must conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 "Drinking Water System Components - Health Effects" and be certified by an organization accredited by ANSI. Such compliance will be evidenced by an affidavit from the manufacturer or vendor. If the pipe does not presently conform to this standard, information from the manufacturer regarding action being taken to comply with this standard must be submitted.
- 3.2.2.2. **Submittals.** Submit documentation on pipe products, fittings, and related materials as required by the plans or Engineer. Review all submittals prior to submission. Submit in a timely manner so as not to delay the project. Allow sufficient time for Engineer's review and resubmission, if necessary. Include certifications from manufacturer that the DIP complies with appropriate AWWA Standards and ANSI/NSF Standard 61. Provide by an affidavit from the manufacturer or vendor as evidence of compliance. If the pipe does not presently conform to this standard, information from the manufacturer regarding action being taken to comply with this standard must be submitted. If requested, provide copies of results of factory hydrostatic tests.
- 3.2.2.3. **Standards.** Comply with applicable requirements of the following items listed below. In case of conflict between the requirements of this Specification and those of the listed documents, the requirements of this Section will prevail:
- ANSI/NSF 61 Drinking Water System Components - Health Effects
 - ASTM A-536 Specification for Ductile Iron Castings
 - AWWA C-104 Standard for Cement Mortar Lining for Ductile Iron Pipe and Fittings
 - AWWA C-105 Standard for Polyethylene Encasement for Ductile Iron Piping
 - AWWA C-110 Standard for Ductile Iron and Gray Iron Fittings

- AWWA C-111 Standard for Rubber Gasket Joints for Ductile Iron Pipe and Fittings
- AWWA C-150 Standard for Thickness Design of Ductile Iron Pipe
- AWWA C-151 Standard for Ductile Iron Pipe
- AWWA C-214 Tape Coating Systems for the Exterior of Steel Water Pipelines
- AWWA C-600 Standard for Installation of Ductile Iron Water Mains & Appurtenances
- AWWA C-651 Disinfecting Water Mains
- Texas Commission on Environmental Quality, Chapter 290 - Public Drinking Water

3.2.2.4. **Pipe Materials.** Manufacture DIP in accordance with AWWA C-151 and conform to ASTM Specification A-536 with physical properties of Grade 60-40-18 with a minimum pressure class rating of 350 psi, unless otherwise specified. Design pipe for five (5) feet of cover or for the depths shown on the plans, whichever is greater. Provide a standard joint length of 18 or 20 feet and an industry standard inside diameter. Replace any material found to be damaged or defective in manufacture at Contractor's expense.

3.2.2.5. **Joints.** Provide push-on standard joints for DIP manufactured in accordance with AWWA C-111, AWWA C-151. Where indicated on the plans, joints will be mechanical or flanged. Flanged joints will have pressure ratings equal to or greater than adjacent pipe. Flange pattern will match pattern of valve, fitting, or appurtenance to be attached.

3.2.2.6. **Fittings.** Provide DIP in accordance with AWWA C-110 and Article 7 of this Specification. Fittings will be rated for a minimum working pressure of 250 psi, unless otherwise specified. Factory welded outlets, minimum pressure rating 250 psi, may be used in lieu of tee fittings for 18 inch and larger tee fittings. Do not use factory welded outlets near sources of vibration, such as pump stations or roads, unless specifically noted on the plans.

3.2.2.7. **Exterior Coating.** Provide a standard asphaltic coating in accordance with AWWA C-151, unless otherwise specified. The finished coating will be continuous, and smooth and strongly adherent to the pipe.

For DIP sizes 30 inches and smaller, use a 30 mils minimum thickness polyethylene wrap applied wrap in accordance with AWWA C-105/A21.5.

Tape coat DIP 36 inches and larger. The exterior of the pipe must have a prefabricated cold-applied tape coating system conforming to the requirements of ANSI/AWWA C-214, except as noted herein. Blast clean the surface to achieve a surface preparation at least equal to that specified in SSPC SP6. The blast profile must have an anchor pattern as specified by the tape manufacturer. Hold the coating back from the end of the pipe the minimum distance recommended by the pipe manufacturer for the type of joint used. Taper the tape wrap cut back. Provide a nominal thickness of 80 mils.

3.2.2.8. **Interior Lining.** DIP Pipe and fittings will have a cement mortar lining in accordance with AWWA C-104 and bituminous seal coat. Cement Type for lining will be appropriate for pipe application. Provide lining thickness as specified in AWWA C-104.

3.2.2.9. **Provisions for Thrust.** Where indicated and where required for thrust restraint, joints must be restrained. Restrained joints will be mechanically interlocking joints. Provide restrained joints such as U.S. Pipe "TR Flex", American Cast Iron Pipe "Flex Ring", or Clow Corporation "Super-Lock" that are capable of sustaining the specified design pressure. If thrust cannot be accommodated using restrained joints, such as bends adjacent to casing pipe, use approved thrust restraint devices.

Thrust at bends, tees, plugs, or other fittings must be resisted using thrust restraint devices. Concrete thrust blocks are not allowed unless approved by the Engineer. Acceptable thrust restraint devices are as manufactured by EBAA Iron, Ford Uni-Flange, or approved equal.

NOTE: At connection of new water line to existing main, both concrete thrust blocking (per Article II of these Specifications) and thrust restraint devices must be used.

Restrained joints and thrust restraint devices must be used for a sufficient distance from each bend, tee, plug, or other fitting to resist thrust which will be developed at the design pressure of the pipe. For the purposes of thrust restraint, design pressure is 1.5 times the design working pressure class indicated. Length of pipe with restrained joints and restraint devices will be determined by pipe manufacturer and/or in accordance with the Handbook of Ductile Iron Pipe.

The following parameters will be used: laying condition equal to AWWA C-600 Type 5 soil, safety factor of 1.8, a unit bearing resistance equal to zero, and a factor for polyethylene encasement as recommended by DIPRA (Ductile Iron Pipe Research Association), if required.

- 3.2.2.10. Pipe Trenching, Installation, and Backfill. Except as noted, perform pipe trenching, Installation, and Backfill for DIP in accordance with AWWA C-600 and Article 6 of this Specification.
- 3.2.2.10.1. General. Repair any damage to polyethylene wrap according to AWWA C-105. Keep pipe clean during installation. Provide two coats of Koppers Bitumastic No. 50, or approved equal to exposed ferrous metal that cannot be protected with field-applied tape coating. Install pipe and fittings to line and grade indicated. In areas where the line and grades indicated cannot be achieved using standard manufactured bends and fittings, make slight adjustments by deflecting joints according to the limitations of AWWA C-600.
- 3.2.2.10.2. Pipe Zone Embedment. Unless otherwise specified, embed DIP in Class II material as defined in Article 6. Native material or imported material meeting or exceeding Class II requirements may be used.
- 3.2.2.10.3. Marking Tape. Mark DIP by installing the appropriate marking tape for detection purposes concurrently. Provide a high visibility blue detectable tape consisting of a 5.0 mil inert polyethylene plastic material with the standard warning and identification for potable water imprinted on the tape. Provide a minimum width of 6 inches for all potable water lines and bury tape to a depth of 36 inches, measured from finished grade. Use detecting tape manufactured by Empire, Lineguard, or approved equal.
- 3.2.2.10.4. Pipe Cutting. When required, machine cut DIP leaving a smooth cut at right angles to the axis of the pipe. Bevel ends of cut pipe to be used with a push-on joint bell to comply with manufactured spigot end. Do not damage cement lining.
- 3.2.2.10.5. Corrosion Protection. As a precaution against corrosion, coat all flanges, bolts, nuts and other exposed metal surfaces underground with Texaco, Koppers, or equal rustproof compound.
- 3.2.2.11. Testing. Disinfect and test the piping system in accordance with Article 10 of this Specification and as detailed in AWWA C-651.
- 3.2.3. **Cathodic Protection.**
- 3.2.3.1. Anodes. Magnesium bar in pre-packaged backfill with test lead wire in weights shown on plans.
- 3.2.3.2. Chemical Composition of Magnesium Anodes: Percent by weight in accordance with Table 2.

Table 2.
Chemical Composition of Magnesium Anodes

Chemical	Standard	High Potential
Aluminum	5.0-7.0	0.01 Max.
Zinc	2.0-4.0	0.05 Max.
Manganese	0.150 Min.	0.5-1.30
Copper	0.100 Max.	0.02 Max.
Silicon	0.300 Max	0.05 Max.
Iron	0.003 Max	0.03 Max.
Nickel	0.003 Max	0.001 Max.
Others	0.300 Max	0.50 each or 0.300 Max Total
Magnesium	Balance	Balance

3.2.3.3. Pre-packaged Backfill.

- 75 percent ground hydrated gypsum
- 20 percent powdered bentonite
- 5 percent anhydrous sodium sulfate
- In water permeable fabric sack with anode centered in sack

3.2.3.4. Lead Wire: No. 12 AWG 600 volts solid copper wire with THW, THWN, or THHN white insulation, at least 15-feet long and factory connected to core with silver brazing alloy with minimum silver content of 15 percent.

3.2.3.5. Detectable Warning Tape. Yellow Mylar encased aluminum foil, minimum 6 inches wide, with imprinted words "CATHODIC PROTECTION".

3.2.3.6. Thermite Welding Of Wires. Thermite weld test lead and joint bond wires to ductile iron and steel pipe joints and fittings, except where limited use of lugs is permitted following standard details. This weld process may be specified for use on other metallic structures.

3.2.3.7. Select and use thermite welding equipment following equipment manufacturer's instructions and standard details.

- Use equipment and molds to accommodate wire size, metallic structure's shape, wire position of attachment (vertical or horizontal) and other criteria specified.
- Before a mold is used, remove and clean slag, dirt, and other foreign matter from mold.
- Use cartridge and charge size based on manufacturer's recommendations for specific application.
- Different charges are required for steel and ductile iron.

3.2.3.8. Surface Preparation

Surfaces with Little or No Coating. Clean to bare metal by grinding or filing area approximately 3-inches square to produce bright metal surface. Remove coating, dirt, mill scale, oxide, grease, moisture, and other foreign matter from weld areas.

Surfaces with High Performance or Thick Coating. Cut 4 inch square window through coating and clean 3 inch square of surface to bright metal, avoiding damage to surrounding coating.

3.2.3.9. Preparation for Welding. Before welding, remove wire insulation as required to fit mold, avoiding damage to exposed copper wire

- If wire is cut or nicked over half way through its diameter, cut off and strip new end.
- If manufacturer requires use of copper sleeve, crimp it securely to wire and remove excess wire protruding from end of sleeve.

3.2.3.10. Test Connection. After charge is set, remove mold and slag from weld area with welder's hammer. Strike top and sides of weld with hammer to test secureness of connection. If weld does not hold, remove scrap weld material, clean, and begin weld process again. After welding and before coating cleaned weld area, joint bond wires may be test for electrical continuity.

3.2.3.11. Weld Caps. When weld passes test for soundness and electrical continuity, repair coating in weld area with petrolatum or petroleum wax mastic and weld cap placed over weld following standard details.

- Apply mastic to fill weld cap or pre-filled weld cap and cover exposed metal of structure and wire to minimum thickness of 1/4 inch. Repair damage to coating around weld area following coating manufacturer's recommendations.
- If weld cap will not fit due to physical space limitations, coat bare metal and wire in weld area with minimum 1/4-inch thickness of petrolatum or petroleum wax mastic

3.3. **Measurement.**

3.3.1. **Water Main (PVC).** This Item will be measured in place by the linear foot of PVC along the centerline of pipe as installed.

3.3.2. **Water Main (DIP).** This Item will be measured in place by the linear foot of DI pipe along the centerline of pipe as installed.

3.4. **Payment.**

3.4.1. **Water Main (PVC).** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Water Main (PVC)" of the type and size specified. This price is full compensation for furnishing all required materials, including all pipe, valves, fittings and accessories; mechanical joint restraints; and all appurtenances defined herein to include, but not limited to the following items: gate valves, tapping sleeves and valves, butterfly valves with manholes, air/vacuum release valves, blow-off valve assemblies, bonnet boxes, valve/access manholes, concrete collars, end plugs, bends, tees, couplings, reducers, marking tape, concrete thrust blocks, thrust restraint devices and all other items for the project not indicated as being covered under the other specific bid items shown on the proposal; furnishing all required labor, including coordination, traffic control, potholing, excavation, including hand-digging, if needed; embedment and backfilling; compaction and compaction testing; disinfection, pressure testing, dewatering of groundwater, where required; cutting, capping, and connection of new water main to existing water lines.

All fittings and appurtenances shown on the plans will not be paid for directly but will be subsidiary to the water pipe installation.

Cutting and restoring pavement will be paid for in accordance with Item 400, "Excavation and Backfill for Structures". Flowable fill will be paid for in accordance with Item 401, "Flowable Fill". Trench excavation protection will be paid for in accordance with Item 402, "Trench Excavation Protection".

3.4.2. **Water Main (DIP).** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Water Main (DIP)" of the type and size specified. This price is full compensation for furnishing all required materials, including all pipe, valves, fittings and accessories; mechanical joint restraints; and all appurtenances defined herein to include, but not limited to the following items: gate valves, tapping sleeves and valves, bonnet boxes, valve/access manholes, cathodic protection, concrete collars, end plugs, bends, tees, couplings, reducers, marking tape, polyethylene wrap, concrete thrust blocks, thrust restraint devices and all other items not indicated as being covered under the other specific bid items; furnishing all required labor, including coordination, traffic control, potholing, excavation, including hand-digging, if needed; embedment and backfilling; compaction and compaction testing;; disinfection, pressure testing, dewatering of groundwater, where required; cutting, capping, and connection of new water main to existing water lines.

All fittings and appurtenances shown on the plans will not be paid for directly but will be subsidiary to the water pipe installation.

Cutting and restoring pavement will be paid for in accordance with Item 400, "Excavation and Backfill for Structures". Flowable fill will be paid for in accordance with Item 401, "Flowable Fill". Trench excavation protection will be paid for in accordance with Item 402, "Trench Excavation Protection".

4. CONCRETE

4.1. **Description.** Furnish all labor, materials, equipment and incidentals necessary to mix and place concrete, consisting of Portland cement, fine aggregate, coarse aggregate, admixtures, and water in the proper proportions as specified herein for use in Water and Sewer Mains.

4.2. **Materials.**

4.2.1. **Quality Assurance.** Proportion cement to give the necessary workability and strength and conform to the requirements shown on Table 3.

Table 3.
Cement Requirements

CLASS	MINIMUM 28-DAY COMPRESSIVE STRENGTH	MINIMUM CEMENT	MAXIMUM SIZE COARSE AGGREGATE	SLUMP (inches)
A	3,000 psi	5.5 bag/cy	3/4"	3 1/2"
B	2,500 psi	4 bag/cy	1 1/2"	4"
C	4,000 psi	6 bag/cy	3/4"	4"

4.2.2. **Class Designations.** The class designations provided above are as defined by El Paso Water Utilities (EPWU) and are to be used as listed:

- Class A Use for curb, gutter, and sidewalk replacement, unless otherwise directed.
- Class B Use for thrust blocks, pipe encasement, ground anchors for piping and as noted in the plans.
- Class C Use for cast in place sewer manhole bases, special structures or as required by manufacturer's specifications for pre-cast structures, unless otherwise indicated.

4.2.3. **Submittals.** Submit certified test reports regarding concrete mix design and reinforcing steel as may be required by the plans or the Engineer. Submit in a timely manner so as not to delay the project. Allow sufficient time for Engineer's review and resubmission, if necessary.

4.2.4. **Standards.** Comply with the following applicable requirements for concrete and related products:

- ASTM C-33 Specification for Concrete Aggregates
- ASTM C-150 Specification for Portland Cement
- ASTM C-260 Specification for Air-Entraining Admixtures for Concrete
- ASTM C-494 Specification for Chemical Admixtures for Concrete

4.2.5. **Portland Cement.** Conform to ASTM C-150 for the appropriate required Type.

Aggregates. Conform to ASTM C-33. Use fine aggregate consisting of natural, washed, and screened sand having clean, hard, strong, durable, un-coated grains complying with ASTM C-33. Use coarse aggregates that comply with ASTM C-33 Size 467, Size 57, or Size 67. Local aggregates of proven durability may be used with prior approval

Use air-entraining admixture for concrete of 3,000 psi or greater and complies with ASTM C-260. The total average air content will be in accordance with ACI 211.1.

Use water reducing admixture when required by job conditions in conformance with ASTM C-494. Use only admixtures that have been tested and accepted in mix designs, unless otherwise acceptable. Use according to manufacturer's recommendations.

Use set retarding admixtures as approved, in conformance with ASTM C-494 and according to manufacturer's recommendations.

Use water that is clean and free from impurities. Drinking and ordinary household water is acceptable.

- 4.2.6. **Manufactured Products.** Provide forms of wood or metal of sufficient strength to support the concrete without bulging between supports and sufficiently water tight to hold the concrete mortar. Construct forms to the shape and dimensions of finished concrete shown on the plans. For exposed surfaces, provide form work material and construct to produce a smooth, even surface when the concrete is poured. Oil all forms before use. Remove wall forms after the concrete has been in place for 24 hours. Chamfer all exposed edges 3/4 inch chamfer. Repair any honeycombed sections immediately upon removal of the form as directed.

Embedded Items. Accurately set in place and maintained in position during concreting operations all bolts, pipe, pipe sleeves, inserts, or other fixtures, required by the plans or this specification to be embedded in the concrete.

Reinforcing Steel. Provide bar reinforcement that is round, deformed bars, Grade 60, conforming to either "Specification for Rail Steel Deformed and Plain Bars for Concrete Reinforcement" (ASTM A-616), or "Specifications for Axle Steel Deformed and Plain Bars for Concrete Reinforcement" (ASTM A-617).

- Rail Steel Bars will be permitted only where bending is not required.
- Permanently mark all reinforcement bars with grade identification marks or, on delivery, be accompanied by a manufacturer's guarantee of grade that will identify variation.
- Protect reinforcement stored on the site from accumulation of grease, mud or other foreign matter and from rust producing conditions.
- Ensure that bars are free from rust, scale, oil, mud, or structural defects when incorporated in the structures.
- Accurately place and securely hold in place reinforcement during concrete placement in accordance with the ACI Detailing Manual.

- 4.2.7. **Concrete Thrust Blocking.** Block with concrete all underground piping bearing solidly against undisturbed trench walls, at all changes in direction subsidiary to the installation of fittings, valves, and all other appurtenances requiring provisions for thrust restraint.

Place concrete blocking against undisturbed trench walls with a minimum 18 inches between trench wall and pipe extending a minimum of 0.75 times the pipe diameter shown on Table 4 and above the centerline of pipe. Do not extend beyond any joints. Place blockings in accordance with the recommendations of "A Guide for the Installation of Ductile Iron Pipe" published by Cast Iron Pipe Research Association. If requested, contain the ends of the thrust blocks in wood or metal forms. Reinforce concrete anchor where upward thrusts are to be resisted.

Use Class B concrete for Blocking. The minimum area of concrete bearing against undisturbed trench bank is shown on Table 4.

Table 4.
Bearing Surface Per Bend

PIPE SIZE	TEE, DEAD END, 90 DEGREE BEND	45 AND 22-1/2 DEGREE BEND
6"	4 sq. ft.	3 sq. ft.
8"	6 sq. ft.	3 sq. ft.
12"	13 sq. ft.	7 sq. ft.
16"	23 sq. ft.	12 sq. ft.
20"	37.02 sq. ft.	20.04 sq. ft.

- 4.3. **Measurement and Payment.** The work performed and the materials furnished in accordance with this Article will not be measured or paid for individually as it is considered subsidiary to the various water main bid items and related appurtenances items. This includes furnishing all required materials including concrete used for thrust blocking or anchoring fitting (bends, plugs, reducers, etc.), valves, fire hydrants, manholes, water services or water fire lines, and all other concrete items damaged by Contractor due to negligence during the course of the project; and all hauling, mixing, manipulation, tools, labor, equipment, forming and incidentals necessary to complete the work.

5. GROUT

- 5.1. **Description.** Provide all labor, materials, equipment, and incidentals for grout uses other than masonry.
- 5.2. **Materials.**
- 5.2.1. Non-shrink, Epoxy Type. Provide a non-metallic, 100% solids, high strength epoxy grout such as Epoxite as manufactured by A.C. Horn Company, or Five Star Epoxy Grout by U.S. Grout Corporation, or approved equal.
- 5.2.2. Non-shrink, Non-metallic Type. Provide a premixed non-staining cementitious grout requiring only the addition of water at the job site. Provide Darex In-Pakt Grout Pre-mix by A.C. Horn Company, or Masterflow 713 by Master Builders Company, or approved equal.
- 5.2.3. Ordinary Cement-Sand Grout. Consisting of one part by weight of Portland cement complying with ASTM C-150, Type V, to three parts by weight of clean sand of suitable gradation and complying with ASTM C-33. Ordinary grout may be of masonry cement, 4 sacks per cu. yd. of clean sand, together with approved air-entraining agent and a minimum of clean water for placing. Where water repelling and shrinkage reducing requirements are shown or specified, use approved admixtures.
- 5.2.4. Water. Use clean, fresh, potable water free from injurious amounts of oils, acids, alkalies, or organic matter.
- 5.3. **Standards.** Comply with the following applicable requirements:
- ASTM C-33 "Specification for Concrete Aggregates"
 - ASTM C-150 "Specification for Portland Cement"
- 5.4. **Measurement and Payment.** The work performed and the materials furnished in accordance with this Article will not be measured or paid for individually as it is considered subsidiary to the various water main bid items.

6. EXCAVATION, INSTALLATION, AND BACKFILL

- 6.1. **Description.** Excavation classification is defined as “unclassified” and involves removing unnecessary materials and excavating trenches to the alignment, width, and depth as indicated in the plans or as required for the proper installation of the pipe and appurtenances. Protect adjacent structures from damage by construction equipment. Pile all excavated material along the trench in a manner that will not endanger the work.
- 6.2. **Materials.**
- 6.2.1. Standards. Comply with the following applicable requirements for embedment materials:
- ASTM D-75 “Methods for Sampling Aggregates”
 - ASTM D-448 “Specification for Standard Sizes of Coarse Aggregate for Highway Construction”
 - ASTM D-2321 “Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe”
 - ASTM D-2487 “Classification of Soils for Engineering Purposes”
- 6.2.2. Definitions. For the purpose of this specification, “pipe zone” defines the area extending from the bottom of the trench bedding to 12 inches above the top of the pipe and to the undisturbed trench walls on either side of the pipe. “Embedment” is defined as those vertical stratas of backfill material in the pipe zone consisting of bedding, haunching, and initial backfill, as defined in ASTM D-2321.
- 6.2.3. Submittals. Include certified test reports for embedment material from an independent laboratory. Include sieve analysis and Atterberg’s limits on test reports. Submit a gradation of Class I material for approval prior to installation.
- 6.2.4. Pipe Zone and Backfill. Classify materials according to The Unified Soil Classification System as defined in ASTM D-2487.
- Class I Material. Provide manufactured angular, well-graded, crushed stone per ASTM D-2321, 1/4 inch to 3/4 inch size material. Acceptable materials under this class designation are: ASTM D-448 - Stone Sizes 4, 67, 5, 56, 57, and 6. Pea Gravel and other uniformly graded material are not acceptable under this class.
- Class II Material. Provide coarse sands and gravels per ASTM D-2487 with maximum particle size of 3/4 inch, including variously graded sands and gravels, containing less than 5 percent fines (material passing the #200 sieve) generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW and SP are included in this class.
- Class III Material. Provide fine sand and clayey (clay filled) gravels, per ASTM D-2487, including fine sands, sand-clay mixtures, and gravel-clay mixtures. Class III includes soil Types GM, GC, SM and SC.
- Do not use Class IV or V material, as defined in ASTM D-2487, for embedment of flexible pipe.
- 6.2.5. Final Backfill. Unless otherwise shown, material for backfilling above the pipe zone is defined as follows:
- Native. The most granular material excavated from the trench comprising the spoil bank may be used, provided it is devoid of rocks larger than three inches in greatest dimension, organic material, and other unsuitable material. If initially saturated during the excavation, allow backfill to dry sufficiently, being manipulated if necessary, prior to placing back into trench, to achieve the specified compaction at plus or minus 2 percent of optimum moisture content.
- Select. Select material is designated as Class II as described in 6.2.4.2. If material excavated from the trench is unsuitable as backfill material, or the required compaction is unattainable for the particular spoil backfill material, import select material to be mixed with or used in place of the spoil material.

Soil Cement. When shown on the plans, cement stabilized backfill will consist of a mixture of soil or sand and 2 sacks of Portland cement per cubic yard. Use a sandy material, free from lumps, clods or organic material. If excavated material is not suitable, use pit-run sand. Mix cement stabilized backfill in a concrete mixer or transit mixer.

6.3. **Construction.**

6.3.1. Sources and Evaluation Testing. Obtain materials to be used for embedment and for backfill in accordance with a sampling plan and ASTM D-75. Perform testing of materials to certify conformance with specification requirements by an approved independent testing laboratory. Perform tests and provide results upon change of source and at sufficient intervals to certify conformance of all material furnished.

6.3.2. Trench Excavation and Preparation. Construct trench walls in the "pipe zone" vertically.

Trench Width. See Tables 5 and 6 below for trench widths for flexible and rigid pipes.

**Table 5.
Flexible Pipe Trench Width**

PIPE DIAMETER	TRENCH WIDTH = BARREL OUTER DIAMETER PLUS	
	Minimum	Maximum
Less than 24 inch	15 inches	18 inches
24 inch – 48 inch	18 inches	24 inches
Greater than 48 inch	24 inches	1/2" Pipe O.D.

**Table 6.
Rigid Pipe Trench Width**

Do not exceed the outside diameter of the pipe barrel plus the following allowance for RIGID PIPE trench width:	
PIPE DIAMETER	TRENCH WIDTH = BARREL OUTER DIAMETER PLUS
Less than 18-inch	16 inch
18 inch - 24 inch	19 inch
27 inch – 39 inch	22 inch
42-inch & Larger	½ Pipe O.D.

If maximum trench width specified above is exceeded at the top of the pipe, provide additional load-bearing capacity by means of improved bedding, concrete cradle, cap, or encasement, or other approved means

Lay back or bench the trench walls above the pipe zone, where space permits, as necessary to satisfy the requirements of OSHA and additional requirements for Trench Support as specified herein.

Wherever the prescribed maximum trench width is exceeded, remove all loose and sloughed-in material from the trench and replace with compacted granular material such that haunching and initial backfill is compacted to at least 2.5 pipe diameters from either side of the pipe or to the trench walls.

Unless otherwise agreed upon, no additional payment will be made for extra material and labor required to fill excessive trench widths caused by Contractor's equipment or natural collapse of trench walls.

- 6.3.3. Trench Bottom. Excavate the trench to an even grade so that the full length of the pipe barrel is supported and joints may be properly assembled.

For 30 inch diameter and smaller pipe, "rough cut the trench a minimum of 4 inches below the bottom of the pipe. For 33 inches and larger pipe, "rough cut the trench a minimum of 6 inches below the bottom of the pipe. Increase the "rough cut" dimension as necessary to provide a minimum clearance of 2 inches from the bottom of the trench to the bottom of the bells, flanges, valves, fittings, etc.

The entire foundation area at the bottom of all excavations will be firm, stable material. Remove loose material leaving a clean, flat trench bottom. Do not disturb material below required subgrade except as described elsewhere in this specification.

If the subgrade is soft, spongy, disintegrated, or where the character of the foundation materials is such that a proper foundation cannot be achieved at the elevation specified, deepen the excavation, not less than 6 inches to a depth where a satisfactory foundation may be obtained. Bring back subgrade to the required grade with Class I coarse gravel compacted to 70% relative density per ASTM D-4254.

- 6.3.4. Over Excavation. If the trench is excavated to a faulty grade (at a lower elevation than indicated), correct the faulty grade at no additional cost as follows:

- In uniform, stable dry soils, correct the faulty grade with Class II granular embedment material thoroughly compacted to 90% Modified Proctor Density per ASTM D-1557.
- In soft spongy disintegrated soils, or where necessary to allow proper drainage, correct the faulty grade with Class I coarse gravel compacted to 70% of relative density.

- 6.3.5. Rock Excavation. When pipe is to be laid in rock cut, provide a clearance of at least 6 inches below parts of the pipe, valves or fittings. Provide adequate clearance at bell holes to permit proper jointing of pipe laid in rock trenches. Refill excavation to pipe grade with Class II granular embedment material compacted to 90% Modified Proctor Density. Blasting is not be permitted unless specifically required and called for in the plans and with a permit issued by governing authorities.

- 6.3.6. Bell Holes. Dig, in trenches, bell holes of ample dimension at each joint of pipe to permit the jointing to be made properly, visually inspected, and so that the pipe will rest on the full length of the barrel.

- 6.3.7. Trench Support. Brace and sheet excavations to provide complete safety to persons working therein in conformance with applicable federal (OSHA), state and local laws and ordinances. Meet the requirements specified in the current OSHA Standard for all trenches exceeding 5 feet in depth as measured from the ground surface at the highest side of the trench to the trench bottom.

Provide sufficient and adequate bracing for excavations with respect to work under construction and to adjacent utility lines and private property. Where soil conditions within trench area require support, use tight sheeting, skeleton sheeting, stay bracing, trench jacks, movable trench shield, or other approved methods to support the trench during pipe installation operations such as bedding preparation, pipe laying, and backfilling of haunches and initial zone.

Do not extend trench support below the pipe crown whenever possible. Where trench support must extend below the crown, such support should either be left in place or consist of approved steel sheets that can be retracted with minimal disturbance. Treat remaining voids with grout or granular embedment material.

When a movable trench shield is used, the trailing half of the shield should be notched to the height of the top of the pipe. This will allow the haunch area of the pipe to be compacted properly to the wall of the trench. Dragging of a trench shield at pipe grade may be done provided such practice does not disturb the bedding. Fill and compacted voids created by the shield properly.

- 6.3.8. Trenching in Public Right-of-Way. Except where otherwise specified, indicated on the plans, or approved in writing, do not exceed the maximum length of open trench shown on Table 8, where the construction is in any stage of completion. The definition of “open trench” for the purposes of this description includes excavation, pipe laying, backfilling, and pavement replacement. The descriptions under the area designations are general in nature and may be amended in writing by the Engineer due to particular or peculiar field conditions.

Table 8.
Maximum Open Trench Lengths

TYPE OF AREA	MAX LENGTH (LF)	DESCRIPTION
Business District	300	Store front areas
Commercial	300	Industrial, shopping centers, churches, schools, hotels, motels, markets, gas stations, government and private office buildings, hospitals, fire and police stations, and nursing homes
Residential	One (1) block or 300 linear feet, whichever is the least:	Single and multi-family residences, apartments, and condominiums
Undeveloped	1,500	Parks, golf courses, farms, undeveloped subdivided land

Any excavated areas is considered “open trench” until all pavement replacement has been made, or until all trenches outside of pavement replacement areas have been backfilled and compacted in accordance with the plans. Completely backfill trenches across streets with temporary or permanent pavement in place within 72 hours after pipe laying. An open trench is not permitted overnight, unless approved and adequately barricaded.

Provide steel plates with adequate trench shoring and bracing, designed to support traffic loads where required to bridge across trenches at street and alley crossings, commercial driveways, and residential driveways where trench backfill and temporary patch have not been completed during regular working hours. Provide safe and convenient passage for pedestrians. Maintain access to fire stations, fire hydrants, and hospitals at all times.

- 6.3.9. **Pipe Installation.** Install pipes true to lines and grades as indicated on the plans. Inspect all pipe and fittings before placing in the trench. Clean all joint surfaces and soiled materials prior to connecting one another. As work progresses, maintain interior of pipes clean.

- 6.3.9.1. Standard Cover. Standard cover depends on the water main size and installation conditions and is generally
- 6 and 8 inch diameter Main: Minimum of 4-foot cover from top of pipe to finished grade
 - 12 inch & larger diameter Main: Minimum of 5-foot cover from top of pipe to finished grade

- 6.3.9.2. Potholing. Existing utilities shown on plans are for informational purposes only. Prior to new pipe installation, pothole all existing utilities and structures to confirm their location, depth, and size. In the event of conflict or discrepancy that affects the project design, notify Engineer before proceeding with pipe installation in order to formulate a solution

- 6.3.9.3. Pipe Zone Embedment. Unless otherwise specified or shown on the plans, embed pipelines either Class I, II, or III material defined in this Article 6.2.4 and installed as described. Native or imported material for embedment may be used provided material conforms to this Specification.

Place embedment materials in lifts not exceeding 8 inches loose depth. Unless otherwise specified or directed in writing, provide homogenous material in the embedment zone

Place bedding to provide uniform and adequate longitudinal support under the pipe. Place the first lift of bedding material from the bottom of the trench to slightly above the bottom of the pipe grade. Unless otherwise shown on the plans, provide a minimum bedding of 4 inches in depth for pipe sizes 30 inches and smaller, and 6 inches for pipe sizes greater than 30 inches.

Install material true to line and grade with bell holes of ample dimension to permit pipe to rest on the full length of the barrel and to permit joint make-up and coating application at joints. Consolidate and compact the bedding material as described in Article 6, and lay pipe to indicated grade.

Place a second lift, and if required, subsequent lifts, of embedment material to the springline of pipe. This process is defined as Haunching. Slice material under the haunches of the pipe, carefully filling all voids, and using care to prevent movement of the pipe.

Place Initial Backfill using a third lift from the springline of the pipe to the pipe crown, and a fourth lift from the pipe crown to a point 12 inches above the pipe.

6.3.9.4. Embedment Class Schedule. Unless otherwise shown on the plans, use the Utility Standard Embedment Class designations for the pipe material types listed in this Article to define each particular pipe's Embedment Condition allowed. Examine the detail drawings for additional information or other special bedding requirements.

6.3.9.5. Consolidation Methods in Embedment Zone. Compact embedment backfill by equipment that is suitable for the type of soil encountered, and is capable of producing the degree of compaction specified. Where applicable, provide backfill materials that is moisture conditioned to produce the required degree of compaction.

Do not use flooding or jetting methods for compaction of embedment material.

Use hand or mechanical tamping to compact Class II or III material used in bedding, haunching, and initial backfill, except that the use of mechanical tampers or vibratory compactors directly over the pipe in the embedment area is prohibited. Exercise caution in the use of mechanical compactors in the haunch and initial backfill to 12 inches above the pipe to avoid damaging or misaligning the pipe.

6.3.9.6. Compaction and Testing of Pipe Embedment Zone. Class I material used in the embedment zone may be placed by loose dumping with a minimum of compactive effort, exercising care to assure proper placement of material under the pipe haunches.

Class I material does not specifically require testing unless directed by the ENGINEER, in which case, such test will be measured by ASTM D-4254 by percent of relative density.

Compact Class II material used in the embedment zone to a density of not less than 90% of Standard Proctor Density defined by ASTM D-698.

Compact Class III material used in the embedment zone to a density of not less than 90% of Standard Proctor Density defined by ASTM D-698.

Do not exceed a moisture content of 3% over the optimum in Class II or III material to assure proper compaction.

Unless otherwise directed, one compaction test in the embedment zone for Class II or III material will be taken at 200 feet intervals along the trench on either side of the pipe, or at any other intervals as may be judged warranted by questionable installation conditions. For pipe sizes 8 inches to 12 inches diameter, perform the first test on the side level with the top of pipe. For sizes 15 inches and larger, perform the first test at the springline of the pipe. For all sizes, perform the second test at the top of the embedment zone.

6.3.9.7. Density Control and Laboratory Testing. Unless otherwise specified, reference to "maximum dry density" means maximum density defined by ASTM D-1557 or D-698. Determination of density of backfill in-place, will be in accordance with the requirements of ASTM D-2922.

Unless otherwise specified, the Engineer selects a soils testing laboratory to perform initial density testing of in-place backfill and Contractor is responsible for all density testing of backfills, including tests found not to be within the minimum requirements of the specifications.

Provide laboratory materials testing, including but not limited to determination of Atterberg Limits, Proctor Curves, Grain Size Analysis, as well as laboratory certification of manufactured materials and as required by this Article

Notify the soils testing laboratory and Engineer 24 hours in advance to obtain soil density tests to fulfill the compaction requirements.

6.3.10. **Final Backfill.**

6.3.10.1. General. Backfill trench, as soon as practicable after laying and jointing of the pipe, the completion of embedment and the completion of structures. Take the necessary precautions to protect the pipe during backfilling operations.

Remove sheeting and shoring as backfilling operations progress. Incorporate methods so that a good bond is achieved between the backfill material and the undisturbed trench walls. Where sheeting or trench protection is intact below the top of pipe and their removal cause obvious damage to the bedding and haunching, it may be necessary to leave portions of sheeting or bracing in place.

Exercise caution in the use of mechanical compactors in the haunch and initial backfill to 12 inches above the pipe avoid damaging or misaligning the pipe. Provide at least 3 feet of compacted cover over the top of the pipe before the trench is wheel-loaded, and 4 feet of cover before using pneumatic hammers during compaction. Avoid contact between pipe and compaction equipment at all times.

6.3.10.2. Consolidation Methods. Backfill above the pipe zone to surface subgrade with backfill material as indicated on the plans and described in this Article. Compact backfill above the pipe zone by mechanical means. Water consolidation (flooding) may be used if approved.

Mechanical Compaction. Place backfill material above the pipe zone in lifts not exceeding 8 inches loose depth, moisten or aerate to obtain optimum moisture, and compact to the required density as described in this Article.

Ponding Method. When permitted, place backfill material above the pipe zone in the trench not exceeding 3 feet loose depth, and flood until free water is evident on the surface for at least two hours. Place approximately 1 foot of water in the trench and start subsequent lifts by depositing backfill material in the water until a maximum 3 foot lift is placed. Add additional water to the backfill material until free water is again evident as before. Repeat procedure until the entire trench is filled and thoroughly settled

Jetting Method of water tamping is not allowed.

6.3.10.3. Cement Stabilized Backfill. Stabilize backfill material with a minimum of 2 sacks per cubic yard of Portland cement of material placed. Place stabilized soil as shown on the plans under roads, driveways, concrete slabs, and in the excavation zone for structures. Cement stabilized soil placed around all adjusted manholes is subsidiary to the various manhole installation items. No compensation will be made for use of soil cement backfill at the Contractor's discretion, without prior approval, or for over-excavated trenches.

6.3.10.4. Compaction and Testing Final Backfill. This subsection may be superseded by the Department requirements, if stricter. Under existing or proposed paved streets, compact final backfill to the Modified Proctor Densities shown on Table 9 and as per ASTM D-1557 and to standard plan detail layouts, "Typical Trench Backfill Detail under Existing or Proposed Paved Streets".

Table 9.
Paved Street Compaction Densities

ZONE	SOIL CONDITION	% OF PROCTOR
Top of Pipe Embedment to 18 inches Below Finished Subgrade	Native Material As Specified	90%
Top of Finished Subgrade to 18 inches Below Top of Subgrade	Cohesive Non-cohesive	90% 95%

Compaction tests are required on backfill under proposed or existing streets and easements as follows, unless otherwise directed and deemed necessary.

- Tests at 8 inches below subgrade at 200 feet intervals and not less than two per street at this level
- One test for every 2 feet of vertical trench backfill between top of pipe bedding and 18 inches below subgrade at 200 feet horizontal intervals and not less than two per street at each level

Obtain density of not less than 85% ASTM D-1557 from top of pipe bedding to ground surface for all other areas not in existing or proposed paved streets.

Provisions for selection of the testing laboratory and responsibilities for density control as described in this Article also apply to this backfilling section.

6.4. Measurement

6.4.1. Excavation and Backfill. This Item will not be measured individually and is subsidiary to the installation of the various water mains, sanitary sewer mains, and related appurtenances.

6.4.2. Cement Stablized Backfill . Unless shown on the plans as a pay item, quantities shown are for informational purposes. When specified as a pay item, this Item will be measured by the cubic yard as shown under Item 401, "Flowable Backfill".

6.5. Payment. The work performed and the materials furnished in accordance with this Article will not be measured or paid for individually as it is considered subsidiary to the various bid items for water main, sanitary sewer mains and manhole installations, including related appurtenances, such as all excavation, bedding, backfill for pipe zone (embedment), final backfill, compaction and compaction testing. Associated dewatering is subsidiary to the different materials and sizes of water mains, sanitary sewer mains, steel casings, valves, fittings and appurtenances, and service installation, including but not limited to excavation, embedment and final backfill for "Additional Fittings" as described in Article 7.

When Flowable Backfill is specified as a pay item, flowable backfill will be paid as provided in Item 401, "Flowable Backfill."

7. VALVES AND FITTINGS

7.1. Description. Furnish all valves and fittings as shown on the plans and as called for in this specification or as required for proper operation of the equipment in general. Unless otherwise indicated, conform to requirements as specified herein. Upon acceptance, provide and install valves similar and comparable to valves specified for similar and comparable duty in other parts of the project where proper operation and utilization of equipment and facilities require installation of valves not indicated or specified.

7.2. Materials. Conform to the pertinent material requirements of the items listed. Furnish complete shop drawings and specifications. If requested, submit a list of similar installations that have been in satisfactory operation for at least three years.

Furnish a complete set of installation, operation, and maintenance instructions, bound in a cover, for each type of valve furnished.

Quality Assurance. Conform to American National Standards Institute / National Sanitation Foundation (ANSI/NSF) Standard 61 "Drinking Water system Components - Health Effects" and be certified by an organization accredited by ANSI. Provide an affidavit from the manufacturer or vendor. If the pipe does not presently conform to this standard, submit information from the manufacturer regarding action being taken to comply with this standard. Include manufacturer's name or trademark permanently stamped or cast on all valves and fittings along with "No Lead" brass alloy, e.g. "NL". Design all valves installed in a given line to withstand the test pressure for that particular line and fabricate with ends to fit the piping.

7.2.1.

Valves.

7.2.1.1.

Outside Screw and Yoke (OS&Y) Gate Valves. Provide iron-body, bronze mounted, parallel seat internal wedging type with outside screw and yoke in conformance with AWWA C-500 "Gate Valves for Water and Sewage Systems". Provide OS&Y gate valves for the size specified. Acceptable manufacturers and models are listed:

■ American Darling	52 OS&Y
■ Clow	F5072
■ Kennedy	566
■ M&H	STYLE 68
■ Mueller	A-2483-6

Submittals. Provide submittals for approval. Provide manufacturer's Affidavit of Compliance in accordance with Section 6.3 of AWWA Standard C-500. Provide records of all tests performed in accordance with Section 5.1 of AWWA Standard C-500 that are representative test results per Section 5.1 of AWWA Standard C-500 along with an affidavit of testing for the valve assembly as outlined in Section 6.3 of AWWA Standard C-500 (300 ft-lbs.). Provide records of all tests performed in accordance with Section 5.2 and 6.3 of AWWA Standard C-504.

Markings. Cast markings on the bonnet or body of each valve. Include the manufacturer's name or mark, the year the valve casting was made, the size of the valves, and the designated working pressure.

Valve Ends. Provide flanged ends with drilling in compliance with ANSI B16.1 or otherwise specified.

Valve Body and Bonnet. Provide in cast iron conforming to ASTM A-126 Class B, or ductile iron conforming to ASTM A-395 or ASTM A-536.

Gate. Manufacture in cast iron or Grade A bronze. Grade A gate rings must be rolled, peened, or pressed into grooves machined in the discs, or may be fastened by some other accepted method.

Body-Seat Ring. Construct of Grade A bronze, back-face threaded and machined screwed into the valve body.

Wedges. Equip double-disc gate valves with a free and positive-operating internal device that presses the disc seats firmly against the body seats when the valve is closed and releases the load before the discs begin to move when the valve is opened. Provide a simple and rugged design with materials as specified in AWWA C-500. Iron to iron contact surface is not allowed.

Valve Stem. Construct of low zinc bronze CDA Copper Alloy No. C99500 with a minimum yield strength of 40,000 psi and minimum elongation in 2 inches of 10%. Brush the opening through the bonnet for the stem with grade A, B, C, D, or E bronze as defined in AWWA C-500.

Yoke. The yoke may be either integral or bolted on to bonnet such that a hand may not be jammed between the yoke and handwheel.

Valve Operator. Provide a cast iron, ASTM A-126 Class B, wrench nut that has a 2 inch square base, a 1 15/16 inch square top and 1 3/4 inch high, opening counterclockwise (left). Paint wrench nut black with and cast an arrow indicating direction of opening in accordance with AWWA C-509.

Protective Coating. Apply an epoxy coating to all exterior and all stationary interior ferrous surfaces including all interior openings in the valves body in accordance with AWWA C-550 and the manufacturer's instructions. After the coating is completely cured, test coated surface for porosity, holidays, and pinholes using a holiday detector. Repair all holidays or irregularities and test the coating again. Do not apply coating to the gasket surfaces of the end flanges.

7.2.1.2.

Tapping Valves. Provide iron-body, bronze mounted, parallel seat internal wedging type with non-rising stem tapping valves that conform to AWWA C-500 "Gate Valves for Water and Sewage Systems" except that tapping valves will have over-sized seat rings to accommodate full size cutters. Provide for the size specified. Acceptable manufacturers and models are listed:

■ American Darling	565
■ Clow	2640 (Figure F-6114)
■ Kennedy	8950 KEN-SEAL II
■ M&H	STYLE 751
■ Mueller	H-667

Minimum number of turns to open is three times the valve diameter.

Submittals. Provide submittals for approval. Provide manufacturer's Affidavit of Compliance in accordance with Section 6.3 of AWWA Standard C-500. Provide records of all tests performed in accordance with Section 5.1 of AWWA Standard C-500 that are representative test results per Section 5.1 of AWWA Standard C-500 along with an affidavit and certificate of testing for the valve assembly as outlined in Section 6.3 of AWWA Standard C-500.

Markings. Cast markings on the bonnet or body of each valve. Include the manufacturer's name or mark, the year the valve casting was made, the size of the valves, and the designated working pressure.

Valve Ends. Provide mechanical joint outlet ends unless otherwise specified.

Valve Body and Bonnet. Provide in cast iron conforming to ASTM A-126 Class B, or ductile iron conforming to ASTM A-395 or ASTM A-536.

Gate. Manufacture in cast iron or Grade A bronze. Grade A gate rings must be rolled, peened, or pressed into grooves machined in the discs, or may be fastened by some other accepted method.

Body-Seat Ring. Construct of Grade A bronze, back-face threaded and machined screwed into the valve body.

Wedges. Equip double-disc gate valves with a free and positive-operating internal device that presses the disc seats firmly against the body seats when the valve is closed and releases the load before the discs begin to move when the valve is opened. Provide a simple and rugged design with materials as specified in AWWA C-500. Iron to iron contact surface is not allowed.

Valve Stem. Construct of low zinc bronze CDA Copper Alloy No. C99500 with a minimum yield strength of 40,000 psi and minimum elongation in 2 inches of 10%.

Stem Seals. Provide two O-rings such that the seal above the stem collar can be replaced with the valve under pressure in the fully open position meeting the requirements of ASTM D-2000 and have physical properties suitable for the application.

Valve Operator. Provide a cast iron, ASTM A-126 Class B, wrench nut that has a 2 inch square base, a 1 15/16 inch square top and 1 3/4 inch high, opening counterclockwise (left). Paint wrench nut black with and cast an arrow indicating direction of opening in accordance with AWWA C-509.

Protective Coating. Apply an epoxy coating to all exterior and all stationary interior ferrous surfaces including all interior openings in the valves body in accordance with AWWA C-550 and the manufacturer's instructions. After the coating is completely cured, test coated surface for porosity, holidays, and pinholes using a holiday detector. Repair all holidays or irregularities and test the coating again. Do not apply coating to the gasket surfaces of the end flanges.

7.2.1.3.

Non-Rising Stem (NRS) Resilient-Seated Gate Valves. Provide NRS gate valves that are resilient seat, non-rising stem and have a minimum rated gauge working pressure of 200 psig that comply with AWWA C-509 "Resilient-Seated Gate Valves for Water and Sewage Systems" and AWWA C-550 "Standard for Protective Coatings for Valves and Hydrants". Valve designed with recesses, insets in the bottom of the waterway that would promote build-up or collection of residue and debris are not acceptable. Provide NRS Gate Valves the size specified. Acceptable manufacturers and models are listed:

- American Flow Control Series 500, Series 2500
- Clow 2640 (Figure F-6100)
- Kennedy 8571 KS – FW
- M&H 3067
- US Pipe METROSEAL 250
- Mueller A-2360
- J&S Series 6800, Series 6900

Submittals. Provide submittals for approval. Provide manufacturer's approved certified test data or an affidavit stating that the valve complies with AWWA C-509 Section 5.1 and the following, in accordance with AWWA C-509 Section 6.3:

- Hydrostatic Test. Provide results of manufacturer's pressure test for one valve of each size and class with 400 psi applied to one side and zero to the other made in each direction across the closed gate.
- Torque Test. Provide results of manufacturer over-torque test on one valve of each size to demonstrate that no distortion of the valve stem occurs. Applied torque for a 4-inch valve is 250 ft-lb and 350 ft-lb for the larger valves in both the open and closed position.
- Leakage Test. Provide results of manufacturer's leakage test where manufacturer selects two valves of each size to be fully opened and closed for 500 complete cycles with a 200 psi differential pressure across the gate and the valve is drip tight upon completion of the test.
- Pressure Test. Test one valve of each size with the gate fully open to a pressure of 500 psi. No evidence of rupture or cracking of valve body, bonnet or seal plated should be detected

Markings. Cast markings on the bonnet or body of each valve. Include the manufacturer's name or mark, the year the valve casting was made, the size of the valves, and the designated working pressure.

Valve Ends. Provide mechanical joint or flanged ends as specified.

Valve Body and Bonnet. Provide in cast iron conforming to ASTM A-126 Class B, or ductile iron conforming to ASTM A-395 or ASTM A-536.

Bolts. Provide all bonnet and seal plate bolts that are factory installed and made from stainless steel ASTM A-276 with either regular-square or hexagonal heads with dimensions conforming to ANSI B18.2.1.

Wedge. Provide cast iron or ductile iron fully encapsulated wedge with resilient rubber material bonded to the disc in conformance with ASTM D-429 as required by AWWA C-509.

Valve Stem. Construct of low zinc bronze CDA Copper Alloy No. C99500 with a minimum yield strength of 40,000 psi and minimum elongation in 2 inches of 10%.

Stem Seals. Provide two O-rings such that the seal above the stem collar can be replaced with the valve under pressure in the fully open position meeting the requirements of ASTM D-2000 and have physical properties suitable for the application.

Valve Operator. Provide a cast iron, ASTM A-126 Class B, wrench nut that has a 2 inch square base, a 1 15/16 inch square top and 1 3/4 inch high, opening counterclockwise (left). Paint wrench nut black with and cast an arrow indicating direction of opening in accordance with AWWA C-509.

Protective Coating. Apply an epoxy coating to all exterior and all stationary interior ferrous surfaces including all interior openings in the valves body in accordance with AWWA C-550 and having a minimum dry film thickness of 8 mils. After the coating is completely cured, test coated surface for porosity, holidays, and pinholes using a holiday detector. Repair all holidays or irregularities and test the coating again. Do not apply coating to the gasket surfaces of the end flanges.

7.2.1.4.

Butterfly Valves. Provide butterfly valves that are tight-closing, rubber-seated type for Class 150B service and comply with the requirements of AWWA C-504, "Standard for Rubber-Seated Butterfly Valves". Provide valves for the size specified. Acceptable manufacturers and models are listed:

■ Val-Matic	Class 150B Flanged or Mechanical Joint
■ M&H	450, 4500, 1450
■ Kennedy	30A, 30C
■ Mueller	Lineseal III
■ Pratt	Groundhog Flanged or Mechanical

Submittals. Provide submittals for approval. Provide manufacturer's approved certified test data or an affidavit stating that the valve complies with the performance tests, leakage tests, hydrostatic test and proof-of-design tests as described in Sections 5.2 and 6.3 of AWWA C-504.

Valve Ends. Provide short body flanged, mechanical joint valve ends or as otherwise specified.

Valve Bodies. Construct valve bodies of cast iron ASTM A-126, Class B, or ASTM A-48, Class 40 or Ductile Iron, ASTM A-536, Grade 65/45/12.

Valve Discs. Construct valve discs of cast iron conforming to ASTM A-126, Class B or Ductile Iron conforming to ASTM A-536, Grade 65/45/12, seat in a position of 90 degrees to the pipe axis and rotates 90 degrees between full open and tight closed position. Dimensions of clearance for valve discs are required.

Valve Shafts. Provide Type 304 or 316 Stainless Steel valve shafts, keys, dowel pins, or taper pins used for attaching valve shaft to the valve disc in conformance with ASTM A-276, or equivalent corrosion resistant material. All portions of shaft bearings must be stainless steel or bronze. Valve shafts may consist of a one-piece unit extending completely through the valve disc, or may be of the "stub shaft" type as defined in AWWA C-504. Provide butterfly valves with an extended bonnet, unless otherwise specified.

Shaft Seals. Provide a Split-V or O-ring type shaft seal that allows replacement without removing the valve shaft.

Valve Seats. Provide new natural or synthetic rubber resilient seats attached to either the disc or the body that provide tight shut off at the specified pressure. Seats must be clamped, mechanically secured, bonded or vulcanized to either the disc or body, be stainless steel and fastened by stainless steel cap screws.

Mating Seat Surface. Conform to ASTM A-276, stainless steel 18-8, Type 304, or have a 95% pure nickel overlay.

Valve Bearings. Manufacture bearings from corrosion resistant, and "self-lubricated" materials that will not damage natural or synthetic rubber and are sleeve type.

Valve Operators. Provide manual valve operations with a 2-inch square operating-nut and turn left (counterclockwise) to open. Totally enclose, pre-lubricate or grease pack all gearing. Provide operators of the worm gear or traveling nut and link type with field adjustable stops capable of withstanding 300 ft. lbs. input torque, as required by AWWA C-504.

Protective Coating. Except as otherwise specified, shop coat all interior steel or cast iron surfaces in accordance with the requirements of AWWA Standard C-504. Shop coat all external surfaces for buried valves with two coats of asphalt varnish according to AWWA C-504. When specified, apply a standard epoxy interior coating in accordance with AWWA Standard C-550, "Standard for Protective Interior Coatings for Valves and Hydrants".

- 7.2.1.5. **Air Release, Air/Vacuum, and Combination Air Valves.** Conform to AWWA C-512 requirements, testing requirements found in Section 5.1 of AWWA C-512 and the following specifications that apply to valve sizes 6" and smaller.

Air Release Valves (AR). Design to automatically release accumulated air pockets within the pipeline while in operation and under pressure. Provide air release valves APCO Model 200, Val-Matic Model 38, or Crispin Model P.

Air/Vacuum Valves (AV). Design to allow large volumes of air to escape through the valve orifice when filling a pipeline and to close watertight once the air has been expelled. Permit large volumes of air to enter through the valve orifice when the pipeline is being drained to break the vacuum. Provide AV valves that are APCO Series 140, Val-Matic Series 100, or Crispin Model AL.

Combination Air Valves (CAV). Provide heavy-duty air and vacuum valves with air release designed to release accumulations of air at high points within a pipeline by exhausting large volumes of air as the pipeline is being filled and by releasing accumulated pockets of air while the pipeline is in operation and under pressure. Also design CAV to permit large volumes of air to enter the pipeline during pipeline drainage. Provide CAV that are APCO, Val-matic Series 200, or Crispin Model C.

Submittals. Provide submittals for approval. Provide manufacturer's affidavit stating that the valve and all materials used in its construction conform to the applicable requirements of AWWA C-512 and these specifications. When required, the manufacturer shall provide an affidavit stating that the valve has been tested and is in compliance with the requirements specified in Section 5.1 of AWWA C-512.

Markings. Cast markings on the bonnet or body of each valve. Include the manufacturer's name or mark, the year the valve casting was made, the size of the valves, and the designated working pressure.

Body and Cover. Provide each air valve with a cast or ductile iron body and cover that complies with ASTM A-126 Class B, or ASTM A-48 Class 35. Ductile iron requirements in conformance with ASTM A-536, Grade 65-45-12. Meet or exceed the strength requirements of ASTM A-307 for bolting material. Provide all internal trim of stainless steel.

Float. Provide stainless steel float that is baffled to prevent air from blowing valve closed until air is exhausted. Design valve body, float, etc., for a working pressure equal to that of the system in which it is installed. Floats for valves with inlet sizes less than 4 inches must be capable of withstanding a collapse pressure of 1000 psig. For larger inlet sizes, floats must be capable of withstanding a collapse pressure of 750 psig.

Valve Outlet. Fit outlet to attach discharge pipe as indicated. Provide N.P.T valve inlet for 2 inch and smaller valves and ANSI flange for 3 inch and larger valves. Flange rating must equal or exceed the maximum working pressure of the system in which it is installed.

Installation. Install AR and AV valves within valve vaults, or manhole, in accordance with Utility Standard Details 263-1, 263-2, 263-3, 263-4 and plans.

Protective Coatings. Interior surface coatings are not required unless otherwise specified. Coat external surfaces with the manufacturer's standard primer.

- 7.2.1.6. **Swing Check Valves.** Provide swing check valves 2 1/2 inches to 12 inches in diameter that withstand a working pressure of 175 psig, comply with the requirements of AWWA C-508 and are tight seating to prevent the backflow of the media during pump shut-off or power failure. Design the closure assembly to assume the

closed position by gravity under no flow conditions in a horizontal position. Provide fully open swing check valves with a net flow area not less than the area of a circle with a diameter equal to the nominal pipe size. Check valves can be either Swing Type Spring and Lever or Swing Type Lever and Weight. Acceptable manufacturers are Kennedy Company, Mueller, or equal.

Provide internals that are replaceable in the field without removing the main valve from the pipeline.

Submittals. Comply with the requirements of Article 7.2.1.2 in accordance to the applicable requirements of AWWA C-508. When required, the manufacturer must provide an affidavit stating that the valve has been tested and is in compliance with the requirements specified in Section 5.2 of AWWA C-508.

Markings. Cast markings on the bonnet or body of each valve. Include the manufacturer's name or mark, the year the valve casting was made, the size of the valves, and the designated working pressure.

Valve Ends. Provide flanged valve ends unless otherwise specified.

Body. Provide heavy cast-iron body conforming to ASTM Standard A-126, Class B.

Disc. Provide cast-iron disc conforming to ASTM Standard A-126, Class B that is either Rubber-Faced, or Bronze-Faced conforming to ASTM B-584 "Specification for Copper Alloy Sand Castings for General Applications".

Disc Seat or Plate. Provide resilient Buna-N material or Bronze disc seat or plate conforming to ASTM Standard B-62 for drip tight shut-off and easily replaced in the field without the use of special tools.

Seat Ring. Provide Bronze seat ring conforming to ASTM Standard B-584 and is mechanically attached to machined surfaces in the body.

Hinge or Clapper Arm. Provide Bronze hinge or clapper arm conforming to ASTM Standard B-584.

Hinge Pins. Provide stainless steel hinge pins conforming to ASTM A-276 "Specification for Stainless and Heat Resisting Steel Bars and Shapes" in accordance with AWWA C-508.

Lever. For Swing-Type Lever and Weight, provide the lever with an adjustable counterweight to control opening and closing of clapper arm. For Swing-Type Spring and Lever, provide lever with an adjustable spring tension to control opening and closing of clapper. Install lever on either side of valve.

Protective Coating. Apply epoxy coating to all stationary interior ferrous surfaces including all interior openings in the valves body in accordance with AWWA C-550 and the manufacturer's instructions. Do not apply coating to the gasket surfaces of the end flanges. Paint valve exterior with Red Oxide Phenolic Primer Paint as accepted by the FDA for use on materials in contact with potable water.

7.2.1.7.

Pressure Reducing Valves. Provide pressure reducing valves that maintain a constant downstream pressure regardless of varying inlet pressure and, unless otherwise specified, will be a direct acting, spring loaded, normally open globe pattern valve designed to permit flow when controlled pressure is less than the spring setting. Acceptable manufacturers and models are listed:

- | | |
|-----------------------|-----------|
| ■ Cla-Val Co. | Model 90 |
| ■ Fisher Governor Co. | Type 616 |
| ■ Bailey | Model 30A |

2 inches or smaller. Provide valves with a bronze body, nylon reinforced diaphragm, single seat, composition disc, Watt No. 223 or Masoneilan No. 227, or approved equal.

Larger than 2 inches. Provide valves with a cast iron body conforming to ASTM B-61, bronze main valve trim conforming to ASTM B-61, a reinforce neoprene diaphragm, stainless steel stem and flanged ends.

Pressure Rating. Provide a pressure rating of 125 psi with an adjustment range of 30-300 psi.

Valve Components. Provide removable and repairable components while the valve body remains in the line.

Diaphragm Assembly. Provide a synthetic rubber assembly a stem fully guided at both ends by a bearing in the valve cover and an integral bearing in the valve seat. Do not use diaphragm as a seating surface.

Resilient Disc. Provide discs that form a sealed chamber against the disc seat when the valve is closed. Provide seat that is removable and has a smooth surface that will not induce seal cutting or wear.

Strainer: For valves 3 inches and smaller, provide a standard flow clean strainer mounted in the inlet supply port of the main valve. For valves 4 inches and larger, provide a standard y-strainer externally mounted for the protection of the control circuit.

Protective Coating: Apply an epoxy coating to all exterior and all stationary interior ferrous surfaces including all interior openings in the valves body in accordance with AWWA C-550 and the manufacturer's instructions. After the coating is completely cured, test coated surface for porosity, holidays, and pinholes using a holiday detector. Repair all holidays or irregularities and test the coating again. Do not apply coating to the gasket surfaces of the end flanges.

7.2.2. **Fittings.** Provide ductile iron (DIP) fittings for use with ductile iron and polyvinyl chloride (PVC) for water pressure or transmission pipe that are smooth cement lined in accordance with AWWA C-104 and outside asphaltic coated per AWWA C-110. The size, body type, type of joint ends, and applicable reference standard are shown on plans or are specified.

Standards. Comply with the following applicable requirements:

ANSI B16.1 "Cast Iron Pipe Flanges and Fittings"

AWWA C-104 "American National Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water"

AWWA C-105 "Standard for Polyethylene Encasement for Ductile Iron Pipe and Fittings"

AWWA C-110 "American National Standard for Ductile-Iron and Gray-Iron Fittings, 3 inches through 48 inches, for Water and Other Liquids"

AWWA C-111 "Rubber-Gasket Joints"

AWWA C-153 "American National Standard for Ductile-Iron Compact Fittings, 3 inches through 16 inches, for Water and Other Liquids"

Minimum Requirements. Apply minimum requirements of shown Table 10 and Table 11 to the specified fittings.

Table 10.
Standard Short-Body Fittings per AWWA C-110

TYPE OF JOINT	DIAMETER	RATE WORKING PRESSURE	MATERIAL
Mechanical (Rubber Gasket/C-111)	4-24 inches	350 psi	DI
Flanged	4-24 inches	250 psi	DI
All Types	30-80 inches	250 psi	DI
Push-On (Rubber-Gasket/C-111)	4-24 inches	250 psi	DI

Table 11.
Compact Short-Body Fittings per AWWA C-153

TYPE OF JOINT	DIAMETER	RATE WORKING PRESSURE	MATERIAL
Mechanical or Push-On (Rubber Gasket/C-111)	4-24 inches	350 psi	DI

Provide all joint accessories such as gaskets, glands, bolts, and nuts with mechanical joints, and gaskets and lubricant furnished with push-on joints in sufficient quantity for assembly of each joint.

Mark push-on joint fittings with the proprietary name or trademark of the joint marked on the outside with their applicable AWWA Standard and information specified in the standard.

Provide polyethylene wrapped fittings in accordance with AWWAC-105.:

7.2.3. **Valve Vaults.** Provide pre-cast vaults with pre-cast or cast-in-place bases as shown on the plans.

Quality Assurance. Provide vaults that meet the requirements of ACI 318 and are designed for a minimum H-20 loading per AASHTO Specifications, plus a 30% impact factor, or greater if shown on the plans or specified. Mark date of manufacture and name or trademark of manufacturer on inside of each pre-cast vault section.

Submittals. Submit structural calculations sealed by a Structural Engineer registered in the State of Texas for approval along with shop drawings.

Materials. Provide concrete with a minimum 28 days compressive strength of 4,000 psi and reinforcing steel that meets the requirements of Article 4. Provide metal frames, covers, steps, toe pockets and similar required items as shown. Each pipe entering and exiting the vault required an approved flexible joint the provides a watertight installation. Submit jointing system or material for approval..

Installation. Cast-In-Place. Place cast-in-place bases on suitable foundations after the pipes are laid. Exercise special care when placing the concrete around the bottom of the pipes to obtain a waterproof structure. Cast an approved bell in the base to receive the pipe sections forming the barrel.

Pre-Cast. Set pre-cast bases on a concrete or crushed stone foundation as shown at the proper grade and carefully aligned. Set pre-cast vault sections vertical in true alignment. Install sections, joints, and gaskets in accordance with manufacturer's recommendations.

Seal lifting holes tight with a solid rubber plug driven into hole and the remaining void filled with cement-sand mortar.

7.3. **Provisions for Thrust.** Block all underground piping with concrete, bearing solidly against undisturbed trench walls, at all changes in direction, fittings, and valves subsidiary to the installation of fittings, valves, and all other appurtenances requiring provisions for thrust restraint.

Place concrete blocking against undisturbed trench walls with a minimum 18 inches between trench wall and pipe. Extend blocking a minimum of 0.75 times pipe diameter below and above the centerline of pipe and do not extend beyond any joints. Place blockings in accordance with the recommendations of "A Guide for the Installation of Ductile Iron Pipe" published by Cast Iron Pipe Research Association and according to details shown on the plans.

If directed, contain the ends of the thrust blocks in wood or metal forms as provided for under Item 420, "Concrete Structures". Where upward thrusts are to be resisted, reinforce concrete anchor with reinforcing conforming to the provisions of Item 440, "Reinforcing Steel".

Use Class B concrete used for Blocking in accordance Item 421, "Portland Cement Concrete" and Table 12 depicting the minimum area of concrete bearing against undisturbed trench bank.

Table 12.
Bearing Surface Per Bend

PIPE SIZE	TEE, DEAD END, 90 DEGREE BEND	45 AND 22-1/2 DEGREE BEND
6 Inch	4 sq. ft.	3 sq. ft.
8 Inch	6 sq. ft.	3 sq. ft.
12 Inch	13 sq. ft.	7 sq. ft.
16 Inch	23 sq. ft.	12 sq. ft.
20 Inch	37.02 sq. ft.	20.04 sq. ft.

Install mechanical joint restrainers as specified that are manufactured by EBAA Iron, Uni-Flange or approved equal.

7.4. **Construction.**

Valve Installation. Polyethylene-wrap valves in accordance with AWWA C-105, unless otherwise specified. Provide thrust blocking as specified. Carefully handle and install valves horizontally in such a manner as to prevent damage to any parts of the valves in accordance with manufacturer's instruction. Valves delivered closed to the site will be opened by Contractor prior to installation. Record number of turns required to open the valve and submit information on the standard valve report to EPWU through Engineer.

Valve Testing. Upon completion of installation of the valves, conduct an acceptance test to verify the satisfactory operation of the valves. Check unit for operation and leakage. The valves must perform in a manner acceptable to the Engineer.

7.5. **Measurement.**

7.5.1. **Valves.** This Item will not be measured individually and is subsidiary to the installation of the various water mains and related appurtenances.

7.5.2. **Butterfly Valve with Manhole.** This Item will be measured in place by each new butterfly valve with manhole and related appurtenances installed for the size and type indicated.

7.5.3. **Blow-Off Valve with Manhole.** This Item will be measured in place by each new blow-off valve with manhole and related appurtenances installed for the size and type indicated.

7.5.4. **Combination Air Release and Vacuum Valve with Manhole.** This Item will be measured in place by each new combination air release and vacuum valve with manhole and related appurtenances installed for the size and type indicated.

7.5.5. **Fittings.** This Item will not be measured individually and is subsidiary to the installation of the various water mains and related appurtenances.

7.5.6. **Additional Fittings.** This Item will be measured in place by the pound of additional fittings installed.

7.6. **Payment.**

- 7.6.1. **Valves.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be not paid for individually as it is considered subsidiary to the various water mains Items. All valves shown on the plans are subsidiary to the various water mains and services pay items and include all costs associated with coordination; excavation; disposal of excess material; backfill, compaction, compaction testing for utilities, all labor, equipment and materials required for furnishing and installing all valves shown on the plans to include those required as part of the different pay items, complete in place, including but not limited to: thrust blocking, mechanical joint restrainers, concrete anchoring, polyethylene wrapping, and provisions for corrosion protection. Use of mechanical joint restrainers in lieu of or in conjunction with concrete thrust blocking is not be considered for additional compensation.
- 7.6.2. **Butterfly Valve with Manhole.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Butterfly Valve with Manhole" of the size and type specified. This price is full compensation for furnishing all required materials, including all costs associated with: furnishing labor, new materials, equipment, additional removal and replacement of asphaltic pavement structure, restoration of concrete sidewalk and curb and gutter, and incidentals to install butterfly valves, manholes and associated appurtenances. Manholes of standard precast or cast-in-place bases shall be measured for each type installed to a depth as shown in plans for 48-inch and/or 72-inch diameter manholes, including bases, pipe penetrations, grout, concrete, sealant, protective coatings, frames, covers, concrete collars, testing and other appurtenances as shown on the drawings and in accordance with EPWU requirements and as indicated on the plans and/or details. The additional depth of manhole risers will not be paid for separately as it is considered subsidiary to this item.
- 7.6.3. **Blow-Off Valve with Manhole.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Blow-Off Valve with Manhole" of the size and type specified. This price is full compensation for furnishing all required materials, including all costs associated with: furnishing labor, new materials, equipment, additional removal and replacement of asphaltic pavement structure, restoration of concrete sidewalk and curb and gutter, and incidentals to install blow-off valves, manholes and associated appurtenances. Manholes of standard precast or cast-in-place bases shall be measured for each type installed to a depth as shown in plans for 48-inch and/or 72-inch diameter manholes, including bases, pipe penetrations, grout, concrete, sealant, protective coatings, frames, covers, concrete collars, testing and other appurtenances as shown on the drawings and in accordance with EPWU requirements and as indicated on the plans and/or details. The additional depth of manhole risers will not be paid for separately as it is considered subsidiary to this item.
- 7.6.4. **Combination Air Release and Vacuum Valve with Manhole.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Combination Air Release and Vacuum Valve with Manhole" of the size and type specified. This price is full compensation for furnishing all required materials, including all costs associated with: furnishing labor, new materials, equipment, additional removal and replacement of asphaltic pavement structure, restoration of concrete sidewalk and curb and gutter, and incidentals to install combination air release and vacuum valves, manholes and associated appurtenances. Manholes of standard precast or cast-in-place bases shall be measured for each type installed to a depth as shown in plans for 48-inch and/or 72-inch diameter manholes, including bases, pipe penetrations, grout, concrete, sealant, protective coatings, frames, covers, concrete collars, testing and other appurtenances as shown on the drawings and in accordance with EPWU requirements and as indicated on the plans and/or details. The additional depth of manhole risers will not be paid for separately as it is considered subsidiary to this item.

- 7.6.5. **Fittings.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be not paid for individually as it is considered subsidiary to the various water mains pay items. All fittings shown on the plans are subsidiary to the different pay items for water mains and services and include all costs associated with coordination; excavation; disposal of excess material; backfill, compaction, compaction testing for utilities, all labor, equipment and materials required for furnishing and installing all fittings shown on the plans to include those required as part of the different pay items, complete in place, including but not limited to: thrust blocking, mechanical joint restrainers, concrete anchoring, polyethylene wrapping, and provisions for corrosion protection. Use of mechanical joint restrainers in lieu of or in conjunction with concrete thrust blocking will not be considered for additional compensation.
- 7.6.6. **Additional Fittings.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Additional Fittings". This price is full compensation for furnishing all required materials based on the cost of material only. Include labor costs, all costs associated with coordination; excavation; backfill, compaction, compaction testing for utilities; disposal of excess material; equipment and materials required for cutting and removal of water mains, furnishing and installing additional valves, bends, tees, crosses, couplings, reducers, adaptors, flexible fittings, not originally shown on the plans or details, as deemed necessary, complete in place, including but not limited to: thrust blocking, mechanical joint restrainers, concrete anchoring, polyethylene wrapping, and provisions for corrosion protection in the unit price for Water Main (PVC), Water Main (DIP) and/or Water Main (STEEL). Mechanical joint restrainers in lieu of or in conjunction with concrete thrust blocking are not considered for individual payment through the "Additional Fittings" provisions. The actual amount of additional fittings may be less than, but may not exceed the total quantities on the plans without approval.

8. WATER SERVICE CONNECTIONS

- 8.1. **Description.** Furnish labor, materials, equipment and incidentals necessary to construct and install pre-cast concrete meter boxes and vaults, water service connections and fire lines, complete for potable water supply including .
- 8.2. **Materials.**
- General. Provide fittings and valves in contact with potable water in conformance to the latest revision of NSF/ANSI Standard 61 (Annex F) and the requirements of Article 7. Include certifications from manufacturers that the products comply with appropriate ASTM, AWWA and Utility Standards with required submittals. New water meters will be furnished by EPWU when required unless otherwise specified.
- Quality Assurance. Fittings and valves in contact with potable water must conform to the latest revision of NSF/ANSI Standard 61 (Annex F). Such compliance must be evidenced by an affidavit from the manufacturer or vendor.
- All fittings and valves must have the manufacturer's name or trademark permanently stamped or cast on it and "No Lead" brass allow, e.g. "NL" shall be cast or stamped on the valves and fittings.
- 8.2.1.1. **Water Service Connections.**
- Castings and Washer Nuts. Provide certified cast bronze composition castings and washer nuts, 85-5-5-5 percent per ASTM B-62, fully formed, tapped threads meeting requirements of AWWA C-800 for underground service.
- Gaskets. Provide gaskets that are self-sealing, 100 percent neoprene or Buna-N rubber, formulated for water service.
- Service Saddles. Provide two or three piece all-bronze, double strap with National Coarse Class 2 thread saddles suitable for Class 200 asbestos cement pipe, cast iron pipe and ductile iron pipe with double straps.

Provide single strap saddles for C-900 or C-905 PVC pipe. Extend saddle body 180 degrees around pipe. Acceptable manufacturers and models are listed:

■ Ford Meter Box Co.	Model S90
■ James Jones Co.	J-996
■ A.Y. McDonald Mfg. Co.	3805
■ Mueller	H-1344X

Straps. Provide silicon bronze straps, approximate tensile strength of 70,000 psi chamfered for easy nut starting and flattened to provide wide bearing surface.

Valves. Provide valves in accordance with Utility acceptable standards and requirements for Article 7.2.1.11, "Gate Valves".

Use bronze valves for copper pipes with minimum 85% copper content casting and cast iron valves for PVC pipe that conform to requirements for Article 7.2.1.11, "Gate Valves".

Provide corporation stops manufactured by Ford Meter Box Co., Mueller, or approved equal and conform to the requirements of AWWA C800.

Provide angle ball valves with padlock wings that are copper flared inlet and female iron pipe thread outlet such as James Jones Company Model J-1965W, McDonald MFG Model 74606B, or approved equal. Use outlet meter coupling nut for 3/4 inch and 1 inch meters. Use inlet female iron pipe by outlet oval flange ends valves for 1 1/2 inch and 2 inch meters.

Service Pipe. Provide copper Type "K" for service pipe sizes up to and including 2 inch, meeting ASTM B-88 requirements with bronze fittings. For 3-inch services, provide 4 inch PVC per AWWA C-900 with reducers at meters. For 4 inch services and larger, provide PVC pipe per AWWA C-900. Provide ductile iron fittings for PVC pipe.

8.2.1.2.

Meter Boxes. Meet the standards listed:

■ ASTM A-27	Specifications for Steel Castings, Carbon, for General Application
■ ASTM A-36	Specification for Structural Steel
■ ASTM A-48	Specification for Gray Iron Castings
■ ASTM C-33	Specification for Concrete Aggregates
■ ASTM C-150	Specification for Portland Cement
■ ASTM C-309	Specification for Liquid Membrane-Forming Compounds for Curing Concrete
■ ASTM C-615	Specification for Granite Building Stone

Shop Drawings. Submit shop drawings on molds, meter boxes, and associated hardware for approval prior to fabrication. Provide manufacturer's certification that products comply with appropriate ASTM, AWWA, and Utility standard details

Testing. When requested, provide compressive tests results and allow Engineer to inspect of the manufacturing process at any time, perform tests on materials used and to extract cores from completed meter boxes for compressive strength testing and placement of reinforcement.

Cement. Use Portland cement conforming to ASTM C-150, Type I or Type III. Provide concrete with a minimum 28 day compressive strength of 4,500 psi, a water cement ratio of 0.5 or less by weight, and a maximum 5.5 gallons water per sack cement. Handle concrete from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the operation is completed. Place concrete in layers not exceeding 2 feet deep. Compact each layer by mechanical internal or external vibrating equipment. Limit duration of the vibration cycle to the time necessary to produce satisfactory consolidation without causing objectionable segregation.

Aggregates. Conform to specifications outlined by ASTM C-33 for aggregates other than lightweight aggregates. Provide aggregate that is free of deleterious substances and graded in a manner as to produce a homogeneous concrete mix. Accurately weigh all materials at a central batching facility for mixture.

Curing. For the purposes of early re-use of forms, concrete may be heated in the mold, after initial set has taken place. Do not exceed a temperature of 71.11°C (160°F) and raise temperature from normal ambient temperatures at a rate not to exceed 4.44°C (40°F) per hour. Do not remove the cured unit from the forms until sufficient strength is obtained for the unit to withstand any structural strain that may be subjected during the form stripping operation. After the stripping of forms further curing by means of water spraying or a membrane curing compound of a clear or white type, conforming to ASTM C-309 may be used.

Steel Reinforcing. Comply with ASTM A-615 Grade 60 steel, $F_y = 60,000$ psi. Minimum concrete cover on re-bar top slab is 1 1/4 inch and 1 1/2 inch on re-bar for walls. Comply latest ACI Standards for bar bending and placement. Provide all reinforcing steel, including welded wire mesh, of the size and place in location shown on the plans. Tie all reinforcing sufficiently to withstand displacement during the pouring operation. Design lifters to handle the imposed weights, and place as shown on the plans or manufacturer's requirements.

Steel Frames and Covers. Conform to ASTM A-27, Grade 70-36. For structural welded steel, conform to the requirements of ASTM A-36 with dimensions as specified on the plans.

Cast Iron Ring and Covers. Conform to the requirements of ASTM 48, Class 30. Provide all castings of uniform quality, free from blowholes, shrinkage, distortion or other defects, smoothed and well cleaned by shot-blasting. Manufacture true to pattern. Provide component parts that fit together in a satisfactory manner. Provide round frames and covers with continuously machined bearing surfaces to prevent rocking and rattling. Do not exceed tolerances of 1/16 inch per foot and deviation in weight of 5%.

8.2.1.3. **Tapping Sleeves and Pipe Couplings.** Furnish labor, materials, equipment and incidentals necessary to install tapping sleeves and pipe couplings as specified suitable for operation at pressures as specified for the pipelines in which they will be installed, including test pressures and surge allowances. Furnish shop drawings as required.

8.2.1.3.1. **Cast Tapping Sleeves.** Provide tapping sleeves of suitable construction and reinforced to provide resistance to line pressures that are designed for the pipe size and material on which they will be used. Build tapping sleeves in halves for assembly around the main to be tapped. The branch outlet will have a flanged face for bolting to the tapping valve with the inside diameter of outlet branch larger than the nominal size to provide clearance for the full size cutters of the tapping machine. Acceptable manufactures are Mueller Company, Kennedy Valve Squareseal and M&H.

Type 1_ Cast tapping sleeve allows water to circulate between the sleeve and the outside surface of the pipe. Gaskets of suitable material, designed for use on potable water must form watertight joints along the entire length of the sleeve. Seal circumferential joints at the ends of the run of the sleeves by mechanical joints, conforming to AWWA C-111 as to dimensions, clearances, and materials, except that gaskets and glands from mechanical joints must be totally confined or compressed between ridges or grooves extending continuously for the full length of both halves of the sleeve casting. Locate bolts close to the outside of the gaskets and spaced so as to exert sufficient pressure to form a watertight joint and withstand stresses imposed by the intended use.

Type 2_ Water is confined to the immediate area of the tap opening. Fit the outlet half of each sleeve with a continuous gasket of approximately circular cross section, permanently cemented into a groove surrounding the outlet opening and the back half of each sleeve fitted with elastomeric pads, a metal shoe, or other device for developing adequate pressure on the gasket to prevent leakage at any pressure within the design capacity of the pipe.

Protective Coating: Coat all surfaces exposed to flow in accordance with AWWA C-550.

8.2.1.3.2. Fabricated Tapping Sleeves. Fabricated tapping sleeves must be rated for a working pressure of 150 psi and meet the following requirements. Acceptable manufacturers and models are listed:

- Ford FTSC
- JCM 412
- Romac FTS 420
- Powerseal 3490

Markings: Permanently mark each tapping sleeve to identify the outer diameter size range.

Test Plug: Provide a 3/4" NPT with standard square head.

Nuts and Bolts: Provide high strength, corrosion resistant 18-8 Type 304 Stainless Steel.

4 inch to 12 inch. Provide tapping sleeve body and flange 18-8 Type 304 Stainless Steel or AWWA C111 Carbon Steel with fusion epoxy coating. Provide body, lug, and gasket armor plate in compliance with ASTM A-240 having all metal surfaces passivated, in accordance with ASTM A-380, after fabrication.

- Provide gasket with a watertight sealing surface around the full circumference of the pipe formed of natural or synthetic rubber.
- Weld lugs to the shell and prevent alignment problems by allowing the bolts to pass through. Do not weld bolts to the sleeve.

16 inch and Larger: Provide tapping sleeves that have a heavy welded steel body in compliance with ASTM A-36 or ASTM A-285, Grade C.

- Provide natural or synthetic rubber compounded gaskets for water use providing a watertight sealing surface.
- Construct flanges in accordance with AWWA C-207 Class D and properly recess for aligning the sleeve and tapping valves.
- Coat steel tapping sleeves with 8 mils minimum thickness epoxy

8.2.1.3.3. Flexible Couplings. Furnish and install couplings where shown on the plans, specified, or in locations as approved. Use ductile iron flexible couplings and Type 316 Stainless Steel nuts and bolts when installed underground. When flexible couplings are used as expansion joints, separate the pipe ends to allow for expansion. Where indicated on the plans or required by field conditions, flexible couplings must be suitable for connecting pipes having different outside diameters. Restrain flanged coupling adapters with tie rods.

Protective Coating: Coat entire coupling assembly with a 20 mil coating of T.C. Mastic as manufactured by Tape Coat Company, Bitumastic No. 50 as manufactured by Koppers Company, or approved equal.

Ductile Iron Pipe. Flexible Joint Couplings will be Dresser Style 38, Rockwell Style 411, or equal. Flanged coupling adapters for ductile iron pipe will be Dresser Type 127, Rockwell International 112, Baker Series 600, or equal.

Steel Pipe. Flexible couplings will be Dresser Style 38, Rockwell International 411, or equal, except where other styles are required for special conditions.

Provide neoprene rubber or equal gaskets.

8.2.1.3.4. Installation. Install tapping sleeves in accordance with the manufacturer's recommendations. Construct disc and seat ring in a manner that the inside diameter of the ring is at least 3/16 inch larger than nominal size of valve. Block tapping sleeve and valve assembly blocked as indicated.

8.3. Construction.

- 8.3.1. General. Furnish and install service taps for 3/4 inch to 2 inch services with service saddle. Direct taps, i.e. without the saddle, are not allowed. For 3 inch and 4 inch services, construct taps using 4 inch tapping sleeve and valve. Insulate copper service pipe attached to metallic water mains at the corporation stop with a dielectric insulator in accordance with Utility Standards for Excavating, Backfilling, and Compacting.

Do not install multiple tapping, two or more taps on a length of pipe, on a common line parallel to the longitudinal axis of the pipe and no closer than 18 inches on the longitudinal axis of the pipe.

Splices are not allowed in any portion of the service pipe run between the main line connection and the meter assembly. Connect all services to new main by means of wet-tapping. Dry or direct taps are not allowed.

Perform meter installations larger than 1-inch with a bypass meter connection as listed:

- 1 1/2 inch and 2 inch meters 1-inch bypass
- 3 inch and 4 inch meters 2-inch bypass
- 6 inch and 8 inch meters 3-inch bypass

- 8.3.2. Existing Services. Where existing water services are indicated on the plans to be replaced, relocated, or reconnected to new water lines, make prior arrangements with each water customer as to the time and length of shutdown necessary. Notify the customer 24 hours before any connections are made. A maximum shut-off time of four (4) hours will be allowed for making connections, after which time supply the customer with potable water from an approved source at no additional cost to Department.

- 8.3.3. Metallic Tracer Tape. For 3-inch services and larger (i.e. PVC), provide a minimum width of 6 inches or twice the line diameter. Do not exceed a burial depth of 36 inches below final grade or be at an elevation of less than 12 inches above the utility line. Follow tape manufacturer's recommended burial depths.

- 8.3.4. Meter Box Installation. Install in accordance with these specifications and Utility Standard Details to grade matching top of curb.

Do not install under sidewalks, driveways, or proposed above-ground structures. Where no curbing exists, install boxes in accessible locations beyond limits of street surfacing, walks, and driveways.

Install standard meter boxes for their respective meter size according to Table 13.

Table 13.
Standard Meter Boxes

METER SIZE	BOX TYPE	CONSTRUCTION	DIMENSIONS W x H
3/4 inch	Type A	Single Unit	19.25 inch O.D. x 17 inch
1 inch	Type B	Single Unit	26 inch O.D. x 17 inch
1 1/2 inch to 2 inch	Type C	Single Unit	50 inch sq. x 24 inch
3 inch and larger	Type D	Modular	7 ft.-8 inch sq. x 4 ft.-6 inch

Where it is necessary to install Type A or B boxes for 3/4 inch or 1 inch meters under roadways or traffic bearing surfaces, encase boxes in 12 inches concrete 3,000 psi minimum.

- 8.3.5. Testing and Flushing Procedures. Pressure test all services for leakage by opening the corporation or service valve at the main service connection point, maintaining the meter angle valve closed, and visually observing all connections and piping for leaks. If no leaks are observed, then flush service line as follows. The angle valve is opened to "full" and then the corporation valve is slowly opened to full capacity. Water is allowed to flow until piping has been thoroughly flushed. Then the angle valve is slowly closed to prevent water hammer or shock pressure, which might rupture the main or adjacent water service connections. If no customer piping is currently connected to the meter outlet connection, use a fitted plug at the end of this connection to prevent the entrance of dirt or muddy water.

- 8.4. **Measurement.**
- 8.4.1. **Water Service Replace and Reconnect.** This Item will be measured in place by each water service replaced and reconnected for the size and type indicated.
- 8.4.2. **New Water Service Installation.** This Item will be measured in place by each new service installed for the size and type indicated.
- 8.4.3. **Meter Boxes.** This Item will not be measured for individual payment and is subsidiary to the water connection items.
- 8.5. **Payment.**
- 8.5.1. **Water Service Replace and Re-connect.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Water Service Replace & Reconnect" of the size and type specified. This price is full compensation for furnishing all required materials, including all costs associated with: furnishing labor, new materials, equipment, and incidentals to replace and reconnect existing water services of the specific size and type (water service or fire line); complete restoration to its original condition, any disturbed areas associated with the replacement and reconnection of existing water services; coordination; and all appurtenances defined herein to include, but not limited to the following items: concrete meter boxes, all fittings and valves in accordance with EPWU requirements and as indicated on the plans.
- 8.5.2. **New Water Service Installation.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "New Water Service Installation" of the size and type specified. This price is full compensation for furnishing all required materials, including all costs associated with: furnishing labor, new materials, equipment, and incidentals to install new water services of the specific size and type (water service or fire line); complete restoration to its original condition, any disturbed area associated with the installation of new water services; coordination; and all appurtenances defined herein to include, but not limited to the following items: concrete meter boxes and vaults, all fittings and valves in accordance with EPWU requirements and as indicated on the plans.
- 8.5.3. **Meter Boxes.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" are subsidiary to the "Water Service Replace & Reconnect" or "New Water Service Installation" bid items.

9. FIRE HYDRANTS

- 9.1. **Description.** Furnish labor, materials, equipment and incidentals to install fire hydrants as shown on the plans in accordance with Utility requirements and typical fire hydrant installation.
- 9.2. **Materials.**
- Submittals. Submittals include certified drawing showing dimensions and construction details and certification from manufacturers that the products comply with appropriate AWWA Standards and this Specification. Submit catalog data illustrating equipment to be furnished and a schedule of parts and materials. Provide manufacturer guarantee that friction loss meet the requirements of AWWA C-502.
- Standards. Comply with requirements of AWWA C-502, Dry-Barrel Fire Hydrants, and AWWA C-550, Protective Epoxy Interior Coatings for Valves and Hydrants.
- 9.2.1. **Manufactured Products.**
- General. Provide dry-barrel compression type fire hydrants, with the main valve opening against the pressure, in accordance with AWWA C-502. Design hydrant for a minimum working pressure of 150 psi and tested at 300 psi hydrostatic pressure.

Provide hydrant with permanent markings identifying name of manufacturer, size of main valve opening and year of manufacture that are easily located and legible after the hydrant has been installed.

Construct hydrant so that the standpipe may be rotated to eight (8) different positions.

Provide center of the lowest nozzle a minimum ground clearance of 15 inches. Supply with extension sections in multiples of 6 inches with rod and coupling as required to increase barrel length.

The fire hydrant manufacturer must provide local representation and support services, through an established vendor, within the County of El Paso. Acceptable manufacturers and models are listed.

- | | |
|-------------------------|-----------|
| ■ American Flow Control | B84B |
| ■ Clow | Medallion |
| ■ M&H | Model 129 |
| ■ Mueller | Centurion |

Size. Provide a minimum inside barrel diameter of 7 inches with a minimum diameter of the main valve opening of 5 inches.

- 9.2.2. **Traffic Type.** Design the barrel and operating mechanism that the main valve will remain closed and reasonably tight against leakage in the event of an accident, damage, or breaking of the hydrant above or near the grade level.

Provide manufacturer guarantee that the hydrant valve stem will not be bent when the hydrant is damaged or broken at or near ground level. Provide a safety breaking flange or thimble. Make provisions in the design of the stem to disconnect the stem from the hydrant parts above the standpipe break point in the event of a traffic accident.

If breakable couplings are used, design the barrel safety flange and stem safety collar to break before any other hydrant part in the event of an accident. Design coupling so that no part of the coupling will drop into the hydrant barrel in the event of an accident.

Corrosion Resistant Valve: Include a Davidson Anti-Terrorism Corrosion Resistant Valve Kit (DATV) designed to protect against accidental backflow and intentional contamination of drinking water via the hydrant. The DATV must be a stealth check valve located internal to the upper barrel of the hydrant and consisting of four main parts.

- A sleeve-insert valve seat, made of E-coated or fusion-bonded epoxy steel. Provide a machined slot to the top of the valve seat to accommodate an EPDM quad ring that will provide an impenetrable seal between the seat and the valve and separates the valve from the insert to prevent the chance of galvanic corrosion. The sleeve will have a plug in the drain hole located at the bottom of the sleeve.
- A valve made of brass with machined slots to accommodate a Viton O-ring between the valve and the upper stem.
- A 304 stainless steel machined upper stem to replace the original upper stem. Attach the brass valve to the upper stem in such a manner as to provide free vertical movement along the shaft and be sealed and separated from the stem by a Viton o-ring that prevents contact between dissimilar metals to eliminate the chance of galvanic corrosion.
- A 302 stainless steel spring that fits around the upper stem and is of adequate compression strength and length such that sufficient pressure is placed on the valve to provide an impenetrable seal when the hydrant is not in use and yet allows water to flow freely when the hydrant is flowed.

Provide a technician certified by the DATV manufacturer to install the DATV. The DATV manufacturer or authorized representative must provide both initial and ongoing refresher training, free of charge to governmental entities utilizing their product. Install DATV in a manner that does not alter the standard warranty offered by the hydrant manufacturer, except that such warranty will not cover the DATV itself.

The DATV must be shop-installed by the hydrant distributor and be delivered to the project site ready for installation. The hydrant distributor will order the hydrants without the hydrant parts that are to be replaced by the DATV. Provide DATV with a minimum 10 year warranty against defects in workmanship and materials that also guarantees that its installation inside the hydrant will not cause failure of any of the original fire hydrant parts while the hydrant is under warranty, provided that: (a) the hydrant and DATV are installed and maintained in accordance with the corresponding manufacturers' recommendations; (b) the installer of the DATV was certified for such installation by the DATV manufacturer; and (c) that analysis of the failure clearly establishes that installation of the DATV as the primary cause of the failure.

Ensure that the DATV does not interfere with the breakaway functionality of the fire hydrant.

Drain Outlet. Provide upper valve plate, seat ring and drain ring or shoe bushing in bronze, to form an all bronze drain way and drains the hydrant properly by opening as soon as the main valve is closed.

Inlet Connections. Provide mechanical joint, with accessories, gland, bolts, gaskets, and a 6 inch diameter inlet connection. Provide synthetic rubber main valve facing against seats. Equip top of the stem or bonnet with O-ring seal. Provide oil or grease lubricated hydrant.

Outlet and Pumper Nozzles. Provide two hose outlets with two 1/2 inch nozzles with National Standard hose coupling screw threads. Provide outlet nozzles of the caulked type or mechanically connected into the barrel with an O-ring seal and a non-corrosive locking pin to lock the nozzle to the barrel.

Provide pumper Nozzle with an inner diameter of 4 inches with threads conforming to the City of El Paso Standards.

Provide nozzle caps with one, 1 inch square nut, gaskets and non-kinking chains. Provide operating nut and nozzle cap nuts that have one, 1 inch square at the base and tapered to 7/8 inch square at the end and not less than 1 inch deep. Provide nozzle caps with rubber gaskets.

Hydrant Operator. Provide operator that is 1 inch square at the base and tapered to 7/8 inch at the end and not less than 1 inch deep. Attachment of the operator nut must not, in any way, hinder operating the hydrant with the wrench and must open by turning left (counterclockwise). Design hydrants with O-ring seals to prevent water from damaging the operating threads.

Tamper Proof Cover. Equip hydrant with a tamper proof cover, minimum inside diameter of 2 1/4 inches, with drainage holes, that deters unauthorized operation of the hydrant and provides adequate wrench clearance. The height of the cover ranges from 2 1/4 inches to 2 1/2 inches, measured from the base at the bonnet to the top of the collar.

Painting. Prime coat barrels above ground with two coats of aluminum colored paint as approved by EPWU.

Protective Coating. Epoxy coat all interior ferrous surfaces of shoe exposed to flow to a minimum dry thickness of 4 mils. Factory- apply epoxy coating by an electrostatic or thermosetting process in accordance with manufacturer's printed instructions. Epoxy materials must be 100 percent powder epoxy or liquid epoxy conforming to AWWA C-550 and to the current requirements of the Food and Drug Administration and the EPA for potable water.

- 9.3. **Construction.** Install hydrants at locations shown on the plans or in approved standard locations. Touch up paint damaged during installation. Disinfect hydrants with the connecting pipe in accordance with Article 10, "Cleaning, Disinfection and Testing of Water System" in this Specification. Ensure installed hydrants are left in good working order with control valve open.

- 9.4. **Measurement.**
- 9.4.1. **Fire Hydrant (Relocate & Reconnect).** This Item will be measured in place by each fire hydrant reconnected to the new or existing water main.
- 9.4.2. **Fire Hydrant (New).** This Item will be measured in place by each new fire hydrant connected to the new water main.
- 9.4.3. **Fire Hydrant (Remove and Salvage).** This Item will be measured in place by each fire hydrant removed and salvaged.
- 9.5. **Payment.**
- 9.5.1. **Fire Hydrant (Relocate & Reconnect).** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Fire Hydrant (Reconnect Only)" as specified. This price is full compensation for furnishing all required materials, including new piping from the new or existing water main to the fire hydrant, new gate valve with bonnet box, concrete thrust blocking or mechanical joint restraints, Davidson Anti-Terrorism Corrosion Resistant Valve Kit (DATV), new spool extensions as needed, new fittings and appurtenances for a complete installation as shown in plans.
- 9.5.2. **Fire Hydrant (New).** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Fire Hydrant (New)" as specified. This price is full compensation for furnishing all required materials, installation of new fire hydrant, Davidson Anti-Terrorism Corrosion Resistant Valve Kit (DATV), spool extensions as needed, mechanical joint tee at the main, gate valve with bonnet box and lid, all PVC C900 pipe from the main to the fire hydrant, thrust blocking or mechanical joint restrainers and all fittings and appurtenances for a complete installation as shown in the plans.
- 9.5.3. **Fire Hydrant (Remove and Salvage).** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Fire Hydrant (Remove and Salvage)" as specified. This price is full compensation for furnishing all required labor, materials, equipment, and incidentals to remove and salvage existing fire hydrants as indicated on the plans in accordance with EPWU's requirements.

10. **CLEANING, DISINFECTION, AND TESTING OF WATER SYSTEM**

10.1. **Description.** Perform disinfection and testing of all water mains and related appurtenances.

10.2. **Materials.**

Standards. Comply with applicable requirements of AWWA B-300 "Standard for Hypochlorites", AWWA B-301, "Standard for Liquid Chlorine" and AWWA C-651, "Standard for Disinfecting Water Mains".

Water. Provide water required for filling, flushing and testing the line at such points along the pipeline as water is available from the existing distribution or supply systems (See "Water for Construction" in Project General Notes). Do not waste water. Such action may require appropriate charges. Provide water, by tank truck or other means, to the points necessary to produce specified test pressure. Coordinate disposal of water with Engineer and El Paso Water Utilities Operations Division. Do not dispose water onto the streets as that will be considered "wasting of water", unless otherwise approved.

Chlorinating Material. Provide either liquid chlorine conforming to AWWA B-301 or hypochlorite conforming to AWWA B-300.

10.3.

Construction.

General. After completion of all pipe line section, use the following procedure to clean, sterilize and pressure test the pipeline. Fill the pipeline and flush until all evidence of dirt or debris has been washed from the pipeline, then refill line, if necessary, introducing the chlorinating material. Perform pressure and leakage test at each valved section. After all sections have been approved, clean all valves and leave line full of sterilizing water.

Quality Assurance. Exercise special care to keep the interior of the pipe clean during storing, handling, and laying operations in order to reduce the need for flushing to an absolute minimum. In addition, tightly cover all open ends whenever unattended to prevent small animals and dirt from entering the pipeline after it is in place.

10.3.1.1.

Sterilization. Before acceptance for operation, sterilize each unit of completed water system as specified below or as prescribed by AWWA Standard C-651. (As per C-651, collect two consecutive sets of acceptable samples taken at least 24 hours apart from the new main.)

- Thoroughly flush with water the unit to be sterilized until all entrained dirt and mud have been removed before introducing the chlorinating material.
- Provide all chlorination material for sterilization and introduce the chlorinating material into the water line in an approved manner at a dosage of not less than 50 parts per million.
- Retain treated water in the pipe at least 25 hours to destroy all nonspore-forming bacteria except where a shorter period is approved. Retention time should produce not less than 10 ppm of chlorine at the extreme end of the line at the end of the retention period.
- Open and close all valves on the lines being sterilized several times during the contact period.

10.3.1.2.

Hydrostatic Pressure and Leakage Testing. Furnish meter, pressure gauges, pump, small piping and hose connections, and all labor necessary for conducting hydrostatic pressure and leakage tests. Check all valves and hydrants for proper operation and pressure. Subject the pipe system to a hydrostatic pressure and leakage test after completion of each valved section and following the filling and disinfection of the section.

After the section of pipeline has been filled, pump water into the section and raise the pressure to 150 psi. Maintain this test pressure for a period of at least two (2) hours. Deliver water required to maintain this pressure through the meter. The amount of water through the meter during the two-hour test period will be the total leakage. Should this leakage exceed the allowable amount, make repairs as may be required until the actual leakage, as determined by succeeding tests, is no greater than the allowable as determined by the following formula:

$$L = S \times D \times (P^{1/2}) / 133,200 \quad \text{except that } L = 0 \text{ in above ground systems and otherwise}$$

L = Allowable Leakage in gallons/hour

S = Length of pipe tested in feet

D = Nominal diameter of pipe in inches

P = Average test pressure during the test, in pounds per square inch, gage; determined by computing the weighted average of actual pressures on various portions of the section

After all sections of the pipeline have been tested, as described above, close all valves and leave line filled with the water used for disinfection and testing.

10.4.

Measurement and Payment. The work performed and the materials furnished in accordance with this Article will not be measured or paid for individually as it is considered subsidiary to the various water main and related appurtenances bid items.

11. SANITARY SEWER FACILITIES

- 11.1. **Description.** Furnish all labor, materials, equipment and incidentals required and install sanitary sewer systems and adjustments as shown on the plans and as specified.

Verification of Utilities. The data furnished in the plans regarding the size and location of utility lines has been obtained from field surveys and the various utility companies. Verify the location of all utilities prior to commencing sewer construction. Perform all work within public right-of-way. Do not extend into or encroach upon private property including basements, residences, and places of business.

Coordination with El Paso Water Utilities (EPWU). Coordination with EPWU is required for sewer line tie-ins and bypassing, where indicated in the specifications and on the plans, and for CCTV video-inspection of new sewer lines. EPWU will perform video-inspection of all new sewer lines to determine acceptance. Notify EPWU through Engineer, a minimum of 48 hours in advance of any scheduled inspection; and provide a staging area that is free and accessible for TV camera activities.

Water Main Crossing. Where gravity or force main sewers are constructed in the vicinity of water mains, ensure that the most current requirements of the Texas Commission on Environmental Quality (TCEQ) are met.

- 11.2. **Materials.**

- 11.2.1. **Polyvinyl Chloride (PVC) Flexible Pipe.** These standard specifications designate the requirements for furnishing and installing PVC gravity pipe for sanitary sewage, with a standard dimension ratio (SDR) as shown in the plans and/or specified herein. Furnish all materials, equipment, tools, labor, superintendence, and incidentals required for the complete construction of the work designated.

Quality Assurance. Code all PVC pipe to provide positive identification and prevent accidental damage to or interruption of the sanitary sewer facilities. Only provide pipe manufactured in the United States of America. Provide new materials including all pipe, fittings, and accessories. Perform manufacturer's physical and chemical tests according to the ASTM standard applicable to the respective PVC pipe type and diameter herein specified, in order to demonstrate pipe quality.

Submittals. Submit documentation on pipe products, fittings, and related materials as may be required by the contract documents or the Engineer. Review all submittals prior to submission. Submit in a timely manner so as not to delay the project. Allow sufficient time for Engineer's review and resubmission, if necessary. Include certifications from manufacturer that the product complies with appropriate ASTM standards.

Standards. Comply with applicable following requirements:

- ASTM D-1784 Specification for Rigid Poly (Vinyl Chloride) (PVC) Compounds and Chlorinated Poly (Vinyl Chloride) (CPVC) Compounds
- ASTM D-2321 Specification for Underground Installation of Flexible Thermoplastic Sewer Pipe
- ASTM D-3034 Specification for Type PSM Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
- ASTM D-3212 Joints for Drain and Sewer Pipes Using Flexible Elastomeric Seals
- ASTM F-477 Specification for Elastomeric Seals (Gaskets) for Joining Plastic Pipe
- ASTM F-679 Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Plastic Gravity Sewer Pipe and Fittings
- ASTM F-789 Specification for Type PS-46 Poly (Vinyl Chloride) (PVC) Plastic Gravity Flow Sewer Pipe and Fittings
- ASTM F-794 Specification for Poly (Vinyl Chloride) (PVC) Large Diameter Ribbed Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter

Delivery and Storage. Inspect pipe, fittings, and accessories upon delivery and during progress of the work. Any material found defective will be rejected. Remove rejected material promptly from site.

Replace, at no additional cost to Department, any material found to be defective in manufacture or damaged.

Unload at point of delivery all pipe, fittings, and other accessories, haul to and distribute at the work site. In loading and unloading, lift materials by hoists or rolled on skidways so as to avoid shock or damage. Do not incorporate materials that have been dropped into the work. Do not skid or roll pipe handled on skidways against pipe already on the ground.

Do not store PVC pipe outside exposed to prolonged periods of sunlight. Any discoloration of pipe due to such exposure is an indication of reduced pipe impact strength, and will be sufficient cause for rejection of the pipe. Remove rejected all pipe from the job site.

Pipe Schedule. PVC pipe will be designated as gravity sewer conduit and must meet the requirements shown on Table 14.

Table 14.
Gravity Sewer Conduit Dimensions

Pipe Size	ASTM Standard	Material	Wall Type	Minimum Stiffness	Standard Length
8"	D-3034	PVC	Solid SDR-35	46 psi	20'
12"	F-789	PVC	Solid T1-Wall	46 psi	20'
15"					
18"	F-679	PVC	Solid T1-Wall	46 psi	20'
	F-789	PVC	Solid T1-Wall	46 psi	20'
	F-794	Large Dia PVC	Profile Open	46 psi	13'
21"- 27"	F-679	PVC	Solid T1-Wall	46 psi	20'
	F-794	Large Dia PVC	Profile Open or Closed	46 psi	13'
30"- 36"	F-794	Large Dia PVC	Profile Open or Closed	46 psi	13'
39" - 60"	F-794	Large Dia PVC	Profile Closed	46 psi	13'

Joints. Provide push-on, bell and spigot type joints with elastomeric seals that conform to the requirements of ASTM D-3212. Provide factory installed gaskets that are chemically bonded to the bell end of the pipe with gasket material that conforms to the requirements of ASTM F-477.

Pipe Materials. Provide pipe and fittings made from polyvinyl chloride compounds that comply with the requirements for minimum cell classification defined by ASTM D-1784. Provide PVC fittings, service risers, and laterals with a SDR 35 rating.

Pipe Trenching, Installation and Backfill. Except as noted, Pipe Trenching, Installation and Backfill of PVC gravity sewer pipe will be in accordance with ASTM D-2321 and Article 6 of this specification.

- Trench Width: Refer to Article 6.3.2.1 for FLEXIBLE PIPE
- Pipe Installation: Following the preparation of the trench bottom and trench bracing installed where required, proceed up grade with spigot ends pointing down grade. Lay pipe true to lines and grades as shown on plans. Grade may be established by laser beam, or batter boards (not exceeding 50 foot intervals), and string line may be used with each pipe set to grade, from the string line, with a grade rod equipped with a "shoe" designed to fit into the flow line of the pipe

Testing. Inspect PVC and test for leakage and deflection in accordance with Article 11.3.3.

Ductile Iron Pipe (DIP). These standard specifications designate the requirements for furnishing and installing DIP for sanitary sewage. Furnish all materials, equipment, tools, labor, superintendence, and incidentals required for the complete construction of the work designated.

Quality Assurance. Manufacturer must have a minimum of ten years successful experience in designing and manufacturing DIP, pipe joints of similar design, pipe diameter, and pressure class of the type specified. The entire pipeline will be the product of one manufacturer. Pipe must conform to American National Standards Institute/National Sanitation Foundation (ANSI/NSF) Standard 61 "Drinking Water System Components - Health Effects" and be certified by an organization accredited by ANSI. Such compliance will be evidenced by an affidavit from the manufacturer or vendor. If the pipe does not presently conform to this standard, information from the manufacturer regarding action being taken to comply with this standard must be submitted.

Submittal. Submit documentation on pipe products, fittings, and related materials as required by the plans or Engineer. Review all submittals prior to submission. Submit in a timely manner so as not to delay the project. Allow sufficient time for Engineer's review and resubmission, if necessary. Include certifications from manufacturer that the DIP complies with appropriate AWWA Standards and ANSI/NSF Standard 61. Provide by an affidavit from the manufacturer or vendor as evidence of compliance. If the pipe does not presently conform to this standard, information from the manufacturer regarding action being taken to comply with this standard must be submitted. If requested, provide copies of results of factory hydrostatic tests.

Standards. Comply with applicable requirements of the following items listed below:

- ASTM A-746 Specification for Ductile Iron Gravity Sewer Pipe
- AWWA C-104 Standard for Cement Mortar Lining for Ductile Iron Pipe and Fittings
- AWWA C-105 Standard for Polyethylene Encasement for Ductile Iron Piping
- AWWA C-110 Standard for Ductile Iron and Gray Iron Fittings
- AWWA C-111 Standard for Rubber Gasket Joints for Ductile Iron Pipe and Fittings
- AWWA C-150 Standard for Thickness Design of Ductile Iron Pipe
- AWWA C-151 Standard for Ductile Iron Pipe

Pipe Materials. Manufacture DIP in accordance with AWWA C-151 and conform to ASTM Specification A-746 with physical properties of Grade 60-40-18 with a minimum pressure class rating of 150 psi, unless otherwise specified. Design pipe for five (5) feet of cover or for the depths shown on the plans, whichever is greater. Provide a standard joint length of 18 or 20 feet and the inside diameter will be industry standard. Replace any material found to be damaged or defective in manufacture at Contractor's expense.

Joints. Provide push-on standard joints for DIP manufactured in accordance with AWWA C-111, AWWA C-151. Where indicated on the plans, joints will be mechanical or flanged. Flanged joints will have pressure ratings equal to or greater than adjacent pipe. Flange pattern will match pattern of valve, fitting, or appurtenance to be attached.

Fittings. Provide DIP in accordance with AWWA C-110 and Article 7 of this Specification. Fittings will be rated for a minimum working pressure of 250 psi, unless otherwise specified. Factory welded outlets, minimum pressure rating 250 psi, may be used in lieu of tee fittings for 18 inch and larger tee fittings. Do not use factory welded outlets near sources of vibration, such as pump stations or roads, unless specifically noted on the plans.

Exterior Coating. Provide a standard asphaltic coating in accordance with AWWA C-151, unless otherwise specified. The finished coating will be continuous, and smooth and strongly adherent to the pipe.

For DIP sizes 30 inches and smaller, use a 30 mils minimum thickness polyethylene wrap applied wrap in accordance with AWWA C-105/A21.5.

Tape coat DIP 36 inches and larger. The exterior of the pipe must have a prefabricated cold-applied tape coating system conforming to the requirements of ANSI/AWWA C-214, except as noted herein. Blast clean the surface to achieve a surface preparation at least equal to that specified in SSPC SP6. The blast profile must have an anchor pattern as specified by the tape manufacturer. Hold the coating back from the end of the pipe the minimum distance recommended by the pipe manufacturer for the type of joint used. Taper the tape wrap cut back. Provide a nominal thickness of 80 mils.

Interior Lining. DIP Pipe and fittings will have an epoxy lining in accordance with ASTM D714. Provide epoxy lining appropriate for wastewater pipe application with a minimum lining thickness of 40 mils.

Provisions for Thrust. Where indicated and where required for thrust restraint, joints must be restrained. Restrained joints will be mechanically interlocking joints. Provide restrained joints such as U.S. Pipe "TR Flex", American Cast Iron Pipe "Flex Ring", or Clow Corporation "Super-Lock" that are capable of sustaining the specified design pressure. If thrust cannot be accommodated using restrained joints, such as bends adjacent to casing pipe, use approved thrust restraint devices.

Use thrust restraint devices to resist thrust at bends, tees, plugs, or other fittings. Do not use concrete thrust blocks unless approved by the Engineer. Acceptable thrust restraint devices are those as manufactured by EBAA Iron, Ford Uni-Flange, or approved equal.

NOTE: At connection of new sewer force main to existing main, use both concrete thrust blocking and thrust restraint devices as per Article 4.2.5 of this specification.

Use restrained joints for a sufficient distance from each bend, tee, plug, or other fitting to resist thrust which will be developed at the design pressure of the pipe. For the purposes of thrust restraint, design pressure will be 1.5 times the design working pressure class indicated. Pipe manufacturer will determine length of pipe with restrained joints to resist thrust forces in accordance with the Handbook of Ductile Iron Pipe. Use the following parameters:

- Laying condition equal to AWWA C-600 Type 5 soil
- Safety factor of 1.8
- Unit bearing resistance equal to zero
- Factor for polyethylene encasement as recommended by DIPRA, if required.

Pipe Trenching, Installation, and Backfill. Except as noted, perform pipe trenching, installation, and backfill for DIP in accordance with AWWA C-600 and Article 6 of this Specification.

General. Repair any damage to polyethylene wrap according to AWWA C-105. Keep pipe clean during installation. Provide two coats of Koppers Bitumastic No. 50, or approved equal to exposed ferrous metal that cannot be protected with field-applied tape coating. Install pipe and fittings to line and grade indicated. In areas where the line and grades indicated cannot be achieved using standard manufactured bends and fittings, make slight adjustments by deflecting joints according to the limitations of AWWA C-600.

Pipe Zone Embedment. Unless otherwise specified, embed DIP in Class II material as defined in Article 6. Native material or imported material meeting or exceeding Class II requirements may be used. Class I material may be acceptable only in groundwater conditions if approved.

Pipe Cutting: When required, machine cut DIP leaving a smooth cut at right angles to the axis of the pipe. Bevel ends of cut pipe to be used with a push-on joint bell to comply with manufactured spigot end. Do not damage cement lining.

Corrosion Protection: As a precaution against corrosion, coat all flanges, bolts, nuts and other exposed metal surfaces underground with Texaco, Koppers, or equal rustproof compound.

Testing. Inspect DIP and test for leakage and deflection in accordance with Section 11.3.3.

11.3. **Sanitary Sewer System.** Furnish labor, materials, equipment and incidentals to install sewer service lines as indicated on the plans in accordance with EPWU Standards.

11.3.1. Sewer Service Connections.

Materials. Conform to the material requirements of the City of El Paso's Plumbing Code and all amendments thereto. Fittings, service risers, and laterals are as specified for the material type utilized. Where additional service connections are required on an existing main line, install an approved service saddle compatible to the size and type of both the collection line and service lateral. Encase saddles with Class B (2500 psi) concrete where PVC saddles with rubber seals and stainless steel bands are used in accordance with EPWU Standards to protect the steel bands from corrosion and to add stability.

Tees and Riser. Install tee or wye fittings for future house service connections. Use bell-type fittings and seal on the branch outlet with an approved plug that can be easily removed for service riser or lateral line installation.

Where ground water is encountered, install the tee and a sufficient service line RISER, thereby raising the final bell above the ground water level. In deep trenches, extend the RISER to the depth of the intersecting service line, or to within 6 feet of the surface, whichever is designated in the plans or appropriate for field conditions.

Install a maximum of four service connections at manholes located at the ends of street cul-de-sacs. Connect additional services to the main line at a minimum 24 inch spacing.

Service Connections and Laterals. Provide new sewer service laterals and re-connections of all existing sewer service laterals to new lines installed to replace lines to be abandoned where required on the plans. Verify location of laterals indicated on the plans and ensure service is not interrupted to homes or other establishments.

Install wyes, bends, tees, stacks, and other hardware, where required, for service laterals as shown in the plans or as directed. Unless otherwise specified, provide minimum 4 inch diameter lateral service lines. Although the maintenance of service laterals is the responsibility of private property owners, including the portion within public right-of-way, as established by Public Service Board Rules and Regulations, the Contractor is responsible for the integrity of the installation or re-connection of all such service lines during the warranty period.

Use proper specials and fittings to suit the actual conditions for connections between new work and existing work, where required. When it is necessary to interrupt service to existing facilities in order to make connection to an existing line, connections may need to be made at some time other than during normal working hours at no additional cost to Department.

Prior to service line installation, coordinate with EPWU through Engineer to have EPWU personnel curb mark the locations of proposed service tees. Lay service lines and/or tees that the branch makes an angle of 45° with the vertical on the side of the main facing the lot to be served.

Install and extend new service lines 6 inches beyond existing or proposed improvements such as pavement, curb and gutter, sidewalk, etc. unless otherwise specified or shown in the plans. For standard subdivisions having curb and gutter for drainage, install new services lines at a minimum slope of 2 percent with a minimum cover at the terminus of 18 inches. For subdivisions with flat terrain and on-site ponding (no curb and gutter), provide a minimum cover of 3 1/2 feet, unless otherwise directed.

Uniformly support service pipe on bedding having a density of not less than 90% of maximum density per ASTM D-1557. Carefully place and compact backfill on service lines in accordance with the requirements of Article 6.3.4. Plug the terminus of the service line with an approved universal end cap compatible with the pipe size and material.

Utilize a qualified licensed plumber who is bonded and approved by the El Paso City Public Inspection Department to install service risers and lateral extensions. Provide evidence that plumber is licensed and insured in accordance with City of El Paso requirements.

Location Marking and Recording. Maintain as-built records of the horizontal and vertical location of installed sewer service lines. In unpaved areas without curb, mark the plugged ends of risers or laterals using a 1" by 2" by 24" wooden stake set vertically at the plugged terminus, and a sufficient length of plastic metallic marking tape extended vertically from the terminus to within 6 inches of ground surface. An electronic marker disk may be used in lieu of metallic tape. EPWU personnel will mark locations of the installed service line or riser ends by chipping an arrowhead mark on top of the curb directly over the service plug.

11.3.2.

Manhole Structures. Furnish all labor, materials, equipment and incidentals necessary to provide all manholes as required. Provide manholes for the various sized lines as listed.

- Standard Type "A" 48 inch inside diameter
- Standard Type "B" 72inch inside diameter
- Drop Manhole constructed at the designated locations and in accordance with Utility Standard Details, and as otherwise indicated in the project plans.
- Construct pre-cast concrete sections as specified herein

Quality Assurance. Provide manholes free of visible leakage and test each structure for leaks. Repair all leaks in a manner subject to Engineer's approval.

Submittals. Provide complete manufacturer's shop drawings on the manhole section(s), to include the joints, for approval. Revise shop drawings that do not meet specifications and re-submit approval. Include manufacturer's specification data and recommendations on the lifters and joint material. Submit documentation of compliance with ASTM C-478. Failure to provide either the detailed shop drawings, specification data and recommendation on lifters and joint material, or the letter certifying that all material provided meets specification is sufficient grounds to reject material.

Standards. Comply with the following applicable requirements:

- ASTM A-48 Specification for Gray Iron Castings
- ASTM A-82 Specification for Steel Wire, Plain, for Concrete Reinforcement
- ASTM A-185 Specification for Steel Welded Wire, Fabric, Plain, for Concrete Reinforcement
- ASTM A-615 Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement
- ASTM C-32 Specification for Sewer and Manhole Brick (Made from Clay or Shale)
- ASTM C-33 Specification for Concrete Aggregates
- ASTM C-144 Specification for Aggregate for Masonry Mortar
- ASTM C-150 Specification for Portland Cement
- ASTM C-309 Specification for Liquid Membrane-Forming Compounds for Curing Concrete
- ASTM C-478 Specification for Pre-cast Reinforced Concrete Manhole Sections
- ASTM C-923 Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures and Pipe
- ASTM D-1557 Test Methods for Moisture-Density Relations of Soils and Soil Aggregate Mixtures Using 10-lb (4.54-kg) Rammer and 18-in (457-mm) Drop

11.3.2.1.

Manhole Structure Materials.

Frame and Cover: Provide manhole frame and cover of cast iron of the weight, dimensions, and pattern indicated by the EPWU Standard Details. Provide casting made from superior quality, gray cast iron conforming to the requirements of ASTM A-48 with no holes in the cover, but edge notches for embedded rings used for lifting. Imprint "SEWER" or a suitable designation on the cover. Machine mating surfaces to assure a snug fit of the cover and frame.

Manhole Rings. Provide manhole rings used for a maximum 2 foot final grade in conformance to the applicable requirements of ASTM Specifications C-32, Grade MS.

Cement. Provide Portland Cement conforming to ASTM Specifications C-150, Type V.

Mortar Sand. Provide mortar sand conforming to ASTM Specifications C-144.

Concrete Aggregates. Provide concrete aggregates conforming to ASTM Specifications C-33 except that the requirement for gradation will not apply to concrete manhole conical and riser sections.

Steel Reinforcement. Provide billet-steel bars conforming to ASTM Specifications A-615 and welded steel wire fabric conforming to ASTM Specifications A-82 or to ASTM Specifications A-185.

Water. Provide water that is clean, clear, free from oil, acid or organic matter and injurious amounts of alkali, salts or other chemicals or deleterious materials.

Mortar. Provide mortar that is composed of 1 part Portland Cement Type V and 3 parts mortar sand mixed in an approved manner with water to form a workable mixture.

11.3.2.2.

Pre-Cast Concrete Manholes. Design manhole riser and conical section for sewer and water installations in the diameters specified or shown. Provide all manhole sections with 5 inch wall thickness and tongue and groove, unless otherwise specified. Rings will be available in various lengths from one foot to four feet. Design the conical sections to be concentric and adapted to the ring at one end and to El Paso Water Utilities standard cast iron frame at the other. Provide the base ring with a flat bottom joint. Steps or rungs are not required. Manufacture manhole section(s) in conformance with ASTM C-478 and any additional specifications listed here forth.

Concrete. Concrete to have a minimum 28 days compressive strength of 4000 psi. Water cement ratio to be 0.5 or less by weight or not more than 5.5 gallons per sack.

Aggregates. Conform to specifications outlined by ASTM C-33 except for lightweight aggregate. Aggregates will be free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Grade both types of aggregates in order to produce a homogeneous concrete mix. Accurately weight all materials at a central batching facility for mixing.

Cement. Provide Portland Cement conforming to ASTM C-150, Type V (sulfate resistant) for sewer applications and sufficient to produce a minimum strength of 4,000 PSI, or other design strengths required.

Placing. Handle all concrete from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until (the approved unit operation) is completed. Place concrete in layers not to exceed two feet deep. Compact each layer by mechanical internal or external vibrating equipment. Limit duration of the vibration cycle to the time necessary to produce satisfactory consolidation without causing objectionable segregation.

Quality Assurance. The Engineer reserves the right to inspect the manufacturing process at any time to make tests on materials used, and to have cores cut out of the completed manholes for compressive strength testing and placement of reinforcement.

Curing. For purposes of early re-use of forms, the concrete may be heated in the mold after the initial set has taken place. Do not exceed a temperature of 160° and raise from normal ambient temperature at a rate not to exceed 40° per hour. Do not remove the cured unit from forms until sufficient strength is obtained for the unit to withstand any structural strain that may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound of a clear or white type, conforming to ASTM C-309-58 may be used.

Steel Reinforcement. Use reinforcing steel as outlined in ASTM C-478 and any additional specifications herein. Apply the minimum steel area of 0.12 square inches to both risers and cone sections and the maximum center to center spacing of 6 inches as well. Place reinforcing steel for one line circumferential reinforcement on the tension side of the wall (the inner half part of the wall with a minimum 1-inch cover) for two lines circular reinforcement, refer to ASTM C-478. Sufficiently tie all reinforcing to withstand any displacement during the pouring operation.

Joint Reinforcement. Both tongue and groove will contain a #4 rebar.

Lifters. Design lifters to handle the imposed weights placed per manufacturer's requirements.

Joint Material. Seal all joints using Ram-Nek joint sealer in sufficient quantities by the vendor as part of the manhole section(s) in sizes per manufacturer's recommendations.

11.3.2.3. Cast-In-Place Concrete Manholes. In special circumstances, construct cast-in-place concrete manholes as shown in the plans, and provide the wall thickness not less than 6 inches. Ensure that the concrete is of good quality and well vibrated and the method of construction materials and type of forms used are approved by the EPWU.

11.3.2.4. Manhole Connectors. At manholes, a water-tight resilient connection will be made between the wall and the pipe by use of an engineering approved manhole waterstop adaptor such as Indiana Seal Manhole Adaptor, Kor-N-Seal, or approved equal, meeting the requirements of ASTM C-923. The connector must be compatible to both the type of pipe wall and manhole wall, and be installed in strict accordance with the recommendations of the connector manufacturer.

11.3.2.5. Installation. Construct manholes at the location and details shown on the plans or as. After the excavation has been completed, pour the concrete base or bottom.

The riser work may proceed when the concrete has sufficiently set. Neatly form the invert in the bottom of the manhole with concrete after the manhole rise has been completed. Construct invert with a true curve of as large a radius as the size of the manhole will permit and with a smooth trowel finish.

11.3.3. **Inspection and Testing.** Test all piping as specified herein unless otherwise directed.

Standards. Adhere to the following requirements when inspecting and testing sewer lines and manholes.

- ASTM C-828 Recommended Practice for Low-Pressure Air Test of Vitrified Clay Pipe Lines (4-12 Inches)
- ASTM C-1103 Standard Practice for Joint Testing of Installed Pre-Cast Concrete Pipe Sewer Line
- ASTM D-3034 Specification for Type PSM Poly(Vinyl Chloride)(PVC) Sewer Pipe and Fittings
- ASTM F-679 Specification for Poly(Vinyl Chloride)(PVC) Large-Diameter Plastic Gravity Sewer Pipe and Fittings
- UNI-BELL-6 Standards and Practices for Low-Pressure Air Testing of Installed Sewer Pipe
- UNI-BELL-9 Polyvinyl Chloride (PVC) Large Diameter Gravity Sewer Pipe and Fittings Based on Controlled Inside Diameter (Nominal Pipe Sizes 18-48 Inch)

Manufactured Products. Provide all testing apparatus including pumps, compressors, hoses, gauges and fittings, mandrels, and other equipment necessary to perform the required tests.

11.3.3.1. **Television Inspection.** Prior to placing lines into operation, completed sewer lines will be inspected by EPWU personnel with a television camera as a condition of final approval of the installation. Thoroughly clean and flush all lines and notify Engineer that the line is ready for television inspection. Correct any defects discovered in the pipe or construction methods at no additional cost. EPWU will bear cost of the initial TV inspection. Any additional inspection(s) required due to failure of the initial inspection is/are the Contractor's responsibility.

11.3.3.2. **Leakage Testing.** To ensure the integrity of the pipe and joints, test all sewer lines installed under these specifications for leakage using the guidelines established by ASTM C-828 and UNI-BELL B6, and the methods and procedures here forth described.

General. Provide all testing apparatus including pumps, compressors, hoses, gauges and fittings and other equipment necessary to perform the required tests. Acceptable equipment can be as manufactured by Cherne Industries Incorporated or approved equal.

Conduct tests in the presence of the Engineer unless otherwise approved. Notify Engineer 48 hours in advance of testing. Record test results on standard utility forms provided by EPWU.

Low pressure air testing may be conducted by Contractor or an approved independent testing firm with the full understanding to all persons conducting an Air Test that an Air Test may be dangerous if conducted improperly.

Test sewer lines after the "pipe zone" backfilling is completed and prior to construction of finished surfacing.

Where house laterals are included as integral part of the project, perform testing on the main and laterals after the risers or laterals have been completed and backfilled.

Thoroughly clean pipes prior to conducting leakage tests. Repair pipelines that exceed the allowable leakage rate and retest at no additional cost to the Department.

11.3.3.2.1. **Exfiltration Air Testing.** A Low Pressure Air Test is the standard method for testing sewer lines. Seal test pneumatic plugs above ground using a random pipe section pressurized to 5 psig. Plugs should remain intact without bracing or movement out of the section. Test procedure is as follows:

- Seal off each end of the section of pipe to be tested at a manhole connection. Securely brace test plugs.
- Introduce air slowly into the test section through the test plug until an internal pressure of 4.0 psi is reached. Allow internal air temperature to stabilize. Adjust the internal air pressure to 3.5 psi, disconnect the air supply and begin the test.
- Maintain the test pressure through section without losing more than 1.0 psi for a length of time as determined by Table 15. Sections losing more than 1.0 psi fail test and must be repaired and re-tested for acceptance. If the section being tested includes more than one size of pipe, calculate the test time for each size and add to determine the total test time for the section. .

Table 15.
Total Test Time

Nominal Pipe Size (d)	Time (t).
Inches	Minutes/100 ft.
4	0.3
6	0.7
8	1.2
10	1.5
12	1.8
15	2.1
18	2.4
21	3.0
24	3.6
30	4.8
36	6.0
42	7.3

- 11.3.3.2.2. Infiltration Test. Infiltration testing of sewer lines under groundwater is mandatory. Perform this test prior to initiating any service connections and after backfilling. At testing time, maintain the level of the groundwater over the entire section of the pipe or near its maximum level.

Measure the allowable infiltration for any portion of the sewer system by a weir or current meter placed in the appropriate manhole and do not exceed 50 gallons per inch of internal pipe diameter per mile per day, including manholes.

Provide suitable plugs or other facilities in order to measure the amount of infiltration. If infiltration is excessive, immediately proceed to locate the source of leakage. Once located, seal the source of leakage by grouting, cementing and rebuilding as required, or by approved methods.

- 11.3.3.2.3. Joint Testing. At Engineer's direction, perform individual joint testing of pipe larger than 24 inches in diameter in accordance with ASTM C-1103 for special conditions not covered by other test methods.

- 11.3.3.2.4. Inspection of Sewer Manholes. Visually inspect manholes installed under groundwater for infiltration leakage through all joints and the manhole base. Repair all leaks or cracks with an approved hydro-cement grout.

- 11.3.3.3. **Deflection Testing.** As a condition for acceptance of the pipeline, perform a mandrel test (deflection test) to verify the roundness and proper installation of the flexible pipeline. Within 30 days, but not less than 7 days after the installation and backfilling of the flexible sewer line, including any service connections, in the presence of the ENGINEER, test deflection of the pipe with a mandrel (GO-NOGO device).

Mandrel Fabrication. Provide mandrels of high quality fabrication and precision as commercially available by Cherne Industries Incorporated, or approved equal. Mandrels require Engineer's approval and must be equipped with proven rings and meet the following requirements:

- Fabricate mandrel outside diameter (gauge dimension):

$\text{Mandrel O.D.} = \text{Pipeline Base I.D.} - (\% \text{ deflection limit} \times \text{Pipeline Base I.D.})$ in accordance with ASTM D-3034, F-679, or UNI-BELL-9

- Design mandrel open preventing debris buildup between channels of adjacent fins. Include a minimum of nine fin sets that are removable from the mandrel core. Assemble gauges of various diameters by substituting fin sets of appropriate dimension. Provide a length of the minimum radius portion of the mandrel not less than one-third of the nominal diameter of the pipe being tested.

Execution. Prior to testing, flush pipe and clean. Flow is not permitted in the pipeline throughout the duration of the deflection test. Manually pull mandrel through the pipeline with a suitable rope or cable that is connected to an eyebolt at one end of the gauge. Attach a similar rope or cable to the eyebolt at the opposite end of the mandrel and apply tension to it. This will ensure that the mandrel maintains its correct position during testing, while providing easy removal of the mandrel should it become lodged in an excessively deflected pipeline. Winching or other methods of forcing the mandrel through the pipeline is unacceptable.

For pipeline tested within 30 days of installation, do not exceed a deflection of 5% of the base inside pipe diameter as established by ASTM Standards D-3034 and F-679 listed in Table 16.

Table 16.
Deflection Gauge Dimensions: SDR35 OR RSC 160

Nominal Size	Average I.D.	Base I.D.	5% Deflection Gauge
6"	5.893	5.742	5.46
8"	7.891	7.665	7.28
10"	9.864	9.563	9.08
12"	11.737	11.361	10.79
15"	14.374	13.898	13.20
18"	17.564	16.976	16.13
21"	20.707	20.004	19.00
24"	23.296	22.480	21.36
27"	26.258	25.327	24.06

For pipeline tested beyond 30 days of installation, do not exceed a deflection of 7.5% of the nominal inside diameter or as established otherwise by the applicable governing body. Adjust mandrel gauge for 7.5% and seek Engineer approval. Make every effort to test for deflection prior to the 30 day expiration.

Maintain a permanent record of all testing with locations where excessive pipeline deflections occur and forward to Engineer after completion of testing on each line.

Replace all sections of pipe that deflect more than 5% (or 7.5%). Lay pipelines with acceptable ovality such that the larger diameter is situated in the vertical direction. All expenses for re-trenching, backfill, compaction, paving, and related work necessary due to failure to satisfy deflection test requirements are Contractor's responsibility.

11.4. **Sewer Line Bypassing and Draining.** This section specifies the requirements for temporary bypassing, draining, flushing and abandonment of sewer lines. Keep excavations free from water during construction. Do not damage property or create a public nuisance when disposing water. Provide hand pumping equipment and machinery in good working condition for emergencies and have workers available for its operation.

11.4.1. Requirements. Provide labor, equipment, materials and supervision to temporarily bypass flow around work during sewer construction and/or during work associated with sewer construction when necessary. Drain and flush all sewers to be abandoned with a minimum of twice the sewer's volumes of water. Drain all sewers lines to be abandoned. Coordinate all work with the Engineer.

11.4.2. Submittals. Twenty-one (21) calendar days prior to commencement of construction activities, the submit for review and approval drawings and complete design data showing methods and equipment proposed to utilize in sewer bypassing and draining. Include the following information:

- Drawings indicating the location of temporary sewer plugs and bypass discharge lines
- Schedule times for bypasses
- Capacities of pumps, prime movers, and standby equipment
- Design calculations proving adequacy of the system and selected equipment

11.4.3. Job Conditions. Existing sewer system map of the project area can be obtained from EPWU and are available for review at their office – 1154 Hawkins Blvd., El Paso, TX. 79925, during regular business hours.

Protection. Where bypassing or draining of the contents of a line is required, ensure that service for connecting sewer laterals are not disrupted. Discharge all flow into the nearest downstream manhole and only after consultation with EPWU operations to coordinate the discharge. Do not surcharge sewers or interfere with normal operation of related sewer facilities when bypassing and draining of the contents of a line. Discharging to the ground surface, receiving streams, storm drains, or discharging that result in groundwater contamination or potential health hazards is not permitted. In the event accidental discharging is caused by the Contractor's operations, EPWU is immediately entitled to employ others to stop the discharging without giving written notice to the Contractor.

Contractor is responsible for penalties imposed on the EPWU as a result of any discharge by the actions of Contractor's employees or subcontractors including legal fees and other expenses to the EPWU resulting directly or indirectly from the discharge.

Scheduling. Do not shut down the bypassing systems between shifts, on holidays or weekends, or during work stoppages without written permission from the ENGINEER. Submit a detailed outage plan and time schedule for operations when necessary to remove a sewer line or structure from service. Coordinate schedule with the Engineer and meet the restrictions and conditions specified in this section. In the detailed plan, describe the method for preventing accidental discharges, the length of time required to complete said operation, the necessary plan and equipment to be used in order to prevent accidental discharges. Observe the following restrictions:

- Systems or individual equipment items will be isolated, drained, decommissioned, de-energized, or depressurized in accordance with the detailed outage plan and schedule.
- Notify Engineer, in writing, at least one week in advance of the planned operation.

11.4.4. **Sewer Line Draining.** Flush sewers to be abandoned with two pipeline volumes of water and allow to drain fully prior to abandoning.

11.4.5. **Sewer Bypassing.** Accomplish sewer bypassing by pumping or diverting the upstream flow around the proposed work and as directed. Provide temporary pumps, conduits, and other equipment to bypass the sewer flow.

Furnish the necessary labor, equipment and material, and supervision to set up and operate the pumping and bypass system. Equip engines with mufflers and/or enclosed to keep the noise level within local ordinance requirements. Provide pumps and bypass lines of adequate capacity and size to handle the flows.

Unless otherwise directed, bypass flow around proposed work whenever the depth of flow, as measured at the inlet pipe to the upstream manhole adjacent to proposed work, exceeds the crown elevation of the pipe; or whenever the equipment operating in the sewer provides an obstruction that restricts flow and causes the depth of flow to exceed the crown elevation.

11.4.6. **Standby Equipment.** Maintain on site sufficient equipment and materials to ensure continuous and successful operation of the bypass and dewatering systems. Maintain standby pumps fueled and operational at all times. Maintain on site a sufficient number of valves, tees, elbows, connections, tools, sewer plugs, piping and other parts or system hardware to ensure immediate repair or modification of any part of the system as necessary.

11.4.7. **Damages.** Repair, without additional cost to the Department, any damage that may result from negligence, inadequate or improper installation, maintenance, and operation of bypassing and draining equipment, including mechanical or electrical failures.

11.5. **Flowable Backfill.** When indicated on the plans, backfill trenches to the elevations shown with stabilized backfill meeting requirements of Item 401.

11.6. **Cutting and Restoring Pavement.** Where sewers must be installed in streets or other paved areas, the work includes saw cutting of the pavement and base to neat lines and prompt replacement of these materials after sewer excavation and backfill are completed. The replacement materials, as to type and thickness, are shown on the plans. Any work done or damage to base and/or pavement outside the limits shown on the plans will not be measured for payment and must be restored at no additional cost to the Department.

- 11.7. **Measurement.**
- 11.7.1. **Sanitary Sewer Mains (PVC).** Longitudinal measurement of sanitary sewers will be made along the centerline of the sewer by the linear foot of the various sizes of sewers in place, in accordance with these specifications, complete and approved. The lengths of sewer mains will be measured center of manholes where the installation involves connection of the sewer into a manhole at each end of the line being measured. Where the installation involves a connection to an existing sewer line, the measurement will be made from the end of the existing sewer line to the center of the manhole on the work being measured.
- 11.7.2. **Sanitary Sewer Mains (DIP).** Longitudinal measurement of sanitary sewers will be made along the centerline of the sewer by the linear foot of the various sizes of sewers in place, in accordance with these specifications, complete and approved. The lengths of sewer mains will be measured center of manholes where the installation involves connection of the sewer into a manhole at each end of the line being measured. Where the installation involves a connection to an existing sewer line, the measurement will be made from the end of the existing sewer line to the center of the manhole on the work being measured.
- 11.7.3. **Sanitary Sewer Manhole.** All sanitary sewer manholes satisfactorily completed in accordance with the plans and specifications will be measured by each of the various manhole types based on a standard 6 foot depth.
- 11.7.4. **Sanitary Sewer Manhole (Extra Depth).** This measurement will be measured by the linear foot and is the distance from the top of the frame to the invert of the manhole minus 6 feet.
- 11.7.5. **Adjusting Manhole.** Existing manholes remaining in service and required to be adjusted to proposed grade will be measured by each manhole adjusted.
- 11.7.6. **Remove Existing Manholes.** Existing manhole structures to be completely abandoned and removed as identified in the plans will be measured for each manhole removed.
- 11.7.7. **Sewer Service Re-Connections (Service Laterals).** Sewer Service Re-Connections (Service Laterals) will be measured by each sewer service re-connection of a particular size installed and accepted.
- 11.7.8. **New Sewer Service (Service Laterals).** New Sewer Service (Service Laterals) will be measured by each new sewer service connection of a particular size installed and accepted.
- 11.7.9. **Abandon and Fill Existing Sanitary Sewer Pipe.** This Item will be measured by the linear foot of existing sanitary sewer main that is abandoned in place.
- 11.7.10. **Remove Existing Sanitary Sewer Pipe.** This Item will be measured by the linear foot of existing sanitary sewer main pipe that is removed as identified in the plans.
- 11.7.11. **Flowable Backfill.** This Item will be measured by cubic yard as shown under Item 401, "Flowable Backfill".
- 11.7.12. **Cutting and Restoring Pavement.** This will be measured by the square yard as shown under Item 400, "Excavation and Backfill for Structures".
- 11.8. **Payment.**
- 11.8.1. **Sanitary Sewer Mains (PVC).** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid for at the unit price bid for "Sanitary Sewer Pipe (PVC)" of the type and size specified, complete in place.
- This price is full compensation for furnishing all required materials and labor; potholing; excavation, including hand-digging, if needed, embedment and backfill; compaction and compaction testing for utilities, all fittings; removal and disposal of existing manholes, except where indicated as being covered under a specific bid item; pipe connections to existing manholes; relocation or replacement of existing water and sewer lines

required for placement of new sewer line; pipe concrete caps; plugs (temporary and/or permanent); testing; dewatering of groundwater, if needed; bypassing and any work related to the bypass including traffic control related to bypasses; removal and replacement of storm drains; removal and replacement of drainage structures; placing and joining of pipes and fittings; traffic control required for sewer work outside Project limits; coordination with utility companies, EPWU, and Engineer; locating and protecting of existing utilities; and for all other items of material, labor, equipment, tools and incidentals necessary to complete the work in accordance with the plans and specifications

- 11.8.2. **Sanitary Sewer Mains (DIP).** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid for at the unit price bid for "Sanitary Sewer Pipe (DIP)" of the size specified, complete in place.

This price is full compensation for furnishing all required materials and labor; potholing; excavation, including hand-digging, if needed, embedment and backfill; compaction and compaction testing for utilities, all fittings; removal and disposal of existing manholes, except where indicated as being covered under a specific bid item; pipe connections to existing manholes; relocation or replacement of existing water and sewer lines required for placement of new sewer line; pipe concrete caps; plugs (temporary and/or permanent); polyethylene wrap; testing; dewatering of groundwater, if needed; bypassing and any work related to the bypass including traffic control related to bypasses; removal and replacement of storm drains; removal and replacement of drainage structures; placing and joining of pipes and fittings; traffic control required for sewer work outside Project limits; coordination with utility companies, EPWU, and ENGINEER; locating and protecting of existing utilities; and for all other items of material, labor, equipment, tools and incidentals necessary to complete the work in accordance with the plans and specifications.

- 11.8.3. **Sanitary Sewer Manhole.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid for at the unit price bid for "Sanitary Sewer Manhole (6 foot Depth)" of the size and type specified or indicated on the plans". This price is full compensation for furnishing all required materials, labor, gaskets, rings, covers, concrete collars, pipe penetrations, drop connections, grout, groundwater dewatering, testing, concrete, excavation and backfill, grouting of inverts, coating interior and exterior where required, adjustment of new manhole to both temporary and finished grades, and tools and incidentals necessary to complete the work in accordance with the plans and specifications.

- 11.8.4. **Sanitary Sewer Manhole (Extra Depth).** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid for at the unit price bid for "Sanitary Sewer Manhole (Extra Depth)". This price is full compensation for furnishing all required materials, labor, equipment and performing all operations necessary to construct the depth of sanitary sewer manhole in excess of 6 feet; including but not limited to providing an external protective bituminous coating, such as coal-tar epoxy.

- 11.8.5. **Adjusting Manholes.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid for at the unit price bid for "Adjusting Manhole". This price is full compensation for furnishing all required materials and labor, plugs (temporary and permanent), excavation and backfill, cement stabilized backfill, groundwater dewatering, removal, disposal of materials, and all other incidentals necessary to complete the work in accordance with the plans and specifications.

- 11.8.6. **Remove Existing Manholes.** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid for at the unit price bid for "Remove Existing Manhole". This payment will be for all labor, materials, plugs (temporary and permanent), excavation and backfill, cement stabilized backfill, groundwater dewatering, removal, disposal of materials, and all other incidentals necessary to complete the work in accordance with the plans and specifications.

- 11.8.7. **Sewer Service Re-Connections (Service Laterals).** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid for at the unit price bid for "Sewer Service Re-Connection" of the particular size installed. This price is full compensation for furnishing all required materials, labor and materials for the pipe; excavation and backfill; fittings; cutting;

bypassing; coordination; testing; and plugging/capping of abandoned utilities; draining of lines; vertical and horizontal adjustments; connections to existing sewers; and all other incidentals necessary to complete the work in accordance with the plans and specifications.

- 11.8.8. **New Sewer Service (Service Laterals).** The work performed and materials furnished in accordance with this Item and measured as provided under "Measurement" herein will be paid at the unit price bid for each "New Sewer Service Lateral" of the particular size installed. This price is full compensation for furnishing all required materials and labor; excavation and backfill; fittings; cutting; bypassing; coordination; testing; and plugging/capping of abandoned utilities; draining of lines; vertical and horizontal adjustments; connections to existing sewers; and all other incidentals necessary to complete the work in accordance with the plans and specifications.
- 11.8.9. **Abandon and Fill Existing Sanitary Sewer Pipe.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Abandon and Fill Existing Sanitary Sewer Pipe" of the size specified. This price is full compensation for furnishing all required materials, labor, and equipment, including but not limited to the following items: coordination, traffic control, potholing, excavation, complete flushing and draining (dewatering) of pipe, flowable backfill, cutting, capping/plugging, complete filling with approved flowable backfill of sanitary sewer mains to be abandoned, proper abandonment of all manhole structures with flowable backfill as indicated on the plans, and all other items for the project not indicated as being covered under the other specific bid items.
- 11.8.10. **Remove Existing Sanitary Sewer Pipe.** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Remove Existing Sanitary Sewer Pipe" of the size specified. This price is full compensation for furnishing all required materials, labor, and equipment, including but not limited to the following items: coordination, traffic control, potholing, excavation and backfill, complete draining (dewatering) of pipe, groundwater dewatering, flowable backfill, cutting, capping, removal of pipe, disposal of materials, and all other items for the project not indicated as being covered under the other specific bid items.
- 11.8.11. **Flowable Backfill.** Flowable Backfill will be paid for in accordance with Item 401, "Flowable Backfill".
- 11.8.12. **Cutting and Restoring Pavement.** Cutting and Restoring Pavement will be paid for in accordance with Item 400, "Excavation and Backfill for Structures".

12. CASINGS

- 12.1. **Description.** Furnish all labor, materials, equipment and incidentals required to construct steel casings and install approved carrier pipes within the casing of various sizes including all necessary field welding, carrier pipes and accessories as shown on the plans and as specified herein.
- 12.2. **Materials.** Furnish new, unused steel casing pipe suitable for the purpose intended with a minimum yield strength of 36,000 psi. Provide casing that meets ASTM A-53 or approved equal requirements. Coat and line pipe with coal tar epoxy (15 mils min.) in accordance with AWWA C-210. Weld pipe joints in accordance with AWWA C-206. After pipe is welded, repair coating and lining. Unless specified otherwise, provide the steel casing pipe with a minimum wall thickness of 5/16 inches. Provide required vent piping, casing insulators (casing insulated spacers), end seals, pipe supports and skids, and other incidental features required to complete work described in this section and as shown on the plans.
- Construct tunnel liner of cold-formed steel plates of the sizes, thickness, and dimensions required, as indicated on the plans, and as manufactured by Commercial Shearing, Contech, or equal.
- Provide reinforced concrete pipe for casing where specified or shown that is straight-wall RCP pipe casing conforming to ASTM C-76 Class IV of the size and length specified.
- Provide welded half coupling grout holes. Provide tapped holes with a pipe plug screwed in place.

Provide bolts and nuts with liner plates that are not less than 1/2 inch diameter and conform to ASTM A-307 Grade A.

- 12.2.1. Submittals. Submit complete working drawings that show details of the proposed method of construction and the sequence of operations to be performed during construction. The plan will show the method of jacking, boring, or tunneling, muck removal and disposal, type and method of installation of the primary casing or tunnel liner, access pit size and construction shoring and bracing, and dewatering methods proposed. Drawings should be sufficiently detailed to allow the ENGINEER to judge whether or not proposed materials and procedures will meet the contract requirements.

Include the design criteria used and a certification that the structural design of the casing or tunnel liner meets these design criteria and that the material meets the required ASTM Standards. The tunnel liner must be capable of carrying H-20 vehicle load distributions in accordance with AASHTO as well as the anticipated dead loads and include an appropriate design factor of safety.

Include the layout and design of the access shafts. Provide a certification that the structural design of the shoring and bracing meets the design criteria as submitted. All structural designs must be sealed by a Professional Engineer licensed in the State of Texas and qualified to perform such work.

- 12.2.2. Standards. Apply all OSHA regulations and all requirements of the specific private and governmental agencies under whose facilities the casings and pipe area to be installed.

Protect the facilities under which the casings and pipe are installed, provide protection at the excavations, and carry out the trench safety procedures in accordance with all required OSHA regulations.

Referenced within this section is the "Standard Specification for Construction of Highways, Streets and Bridges," most current edition of the Texas Department of Transportation (TxDOT).

12.3. **Construction.**

- 12.3.1. General. Install casings at the locations and to the lines and grades indicated on the plans, of the sizes indicated, using either jacking, boring, tunneling, or approved open-cut methods.

Provide adequate lights, ventilation, signal systems, fire extinguisher, safety equipment, and other equipment required and maintain such equipment in good repair.

Determining soil conditions at the various locations where casings are to be installed, and make such other investigations to obtain that information as deemed necessary subsidiary to this Item.

The methods of construction, whether by tunnel boring machine or by hand digging, is Contractor's option subject to the approval of the governing agencies and Engineer.

Execute work of excavating, lining, grouting and construction of the casing or tunnel so that ground settlement is minimized.

Where casings are installed by open-cut method, all requirements for trenching and backfilling as described in these specifications apply, except as otherwise required by the plans or supplemental specifications.

Locate access shafts or pits at the beginning and end of each casing or tunnel segment to be constructed.

Unless superseded by the requirements of other governing authorities under whose facilities or right-of-way the casing is to be installed, install the face of any shaft at least 20 feet from existing adjacent roadways or structures. Ensure that the size of shafts or pits provide adequate room to meet operational requirements for tunnel construction.

- 12.3.2. Installation of Casings. Install casings using either jacking, boring, or tunneling methods. Provide equipment of such size and capacity as to allow the placement of the casings to proceed in a safe and expeditious manner.

Install casing pipe from the end which will create a minimum of access and utility relocation problems. Prior to casing installation, pothole utilities and all other permanent structures within the project area in order to identify potential conflicts. In the event a conflict exists, notify Engineer before proceeding with casing installation so a solution can be formulated.

Permissible lateral or vertical variation in the final position of the pipe casing from the established line and grade established is only to the extent of 1 inch in 10 feet, provided that such variation is regular and only in the direction that will not detrimentally affect the function of the carrier pipe. Remove or abandon casing pipe found to be considerably off-grade or alignment and re-install at no additional cost.

Repair any detectable settlement of the roadway overlying the casing or tunnel immediately. Slight settlement of the roadway, should it occur, will result in cessation of casing/tunneling operations, posting of appropriate highway safety signs, and placement of an asphaltic hot-mix overlay to return the roadway to original grade. For over-cutting in excess of 1 inch, pressure grout the entire length of the bore with 7 sack cement per cubic yard of soil mixture. Where applicable, provide hot-mix in accordance with the requirements of TxDOT Specifications. Prime the surface to receive hot-mix as directed. Submit an emergency road repair procedure plan to the Engineer, prior to beginning any casing/tunneling operations. Labor and equipment necessary for this work is the Contractor's responsibility and will be provided at no additional cost.

When installing casing by boring, install casing, excavate and remove material within the casing simultaneously. Ensure the completed casing is free of dents, bends, weld protrusions, or other obstructions to allow the smooth sliding of the carrier pipe through the casing.

- 12.3.3. Installation by Tunneling. Excavate tunnel of sufficient size to permit efficient excavation operations, to provide sufficient working space for placing the tunnel lining, and to allow for construction of the carrier pipe as shown on the plans and indicated on the specifications. Determine adequate tunnel size and section to meet these requirements. Dimensions shown on the plans represent the acceptable approximate dimensions and do not necessarily represent the size and/or section suitable for the construction methods or operational procedures as may be proposed and/or conducted by the Contractor.

Use structural steel plates assembled from the inside of the tunnel and field bolted to provide a full round casing pipe when installing casing pipe by tunneling method. Hold tunnel excavation to the minimum possible diameter required for installation of liner plate.

Minimize excavation limits as required to prevent caving. Pressure grout the annular space between the tunnel liner and the tunnel bank by providing 2 inch diameter plugs in the liner plates at spacing of 5'-0" or as directed. Remove any excess groundwater encountered in a manner to allow the tunneling operation to proceed according to schedule.

- 12.3.4. Installation of Carrier Pipe in Casing Pipe or Tunnel Liner. Install carrier pipe in the casing in accordance with the recommendations of the pipe manufacturer. After the casing or tunnel liner has been installed and approved, push or pull the carrier pipe through the casing by exerting pressure on the barrel of the pipe in such a manner that the pipe joints are always in compression.

Use insulated spacers when specified for providing cathodic protection consisting of pre-manufactured steel bands with plastic lining and plastic runners. Casing spacers must fit snug over the carrier pipe. Position the carrier pipe approximately in the center of the casing pipe, to provide adequate clearance between the carrier pipe bell and the casing pipe. Use casing spacers that are Model C12G-2, coated for the ultimate in strength, toughness and corrosion resistance, or Model A12G-2, painted for unusually heavy pipe, for long casings or whenever maximum strength and toughness are required for carrier pipes 4" - 56" in diameter and as directed. Casing spacers can be as manufactured by Pipeline Seal and Insulator, Inc. (PSI) or approved equal.

If tunnel liner is used, grout the bottom 120 degrees of the liner to the top of the tunnel liner ribs to aid in the installation of the carrier pipe.

Seal ends of pipe after installation of the carrier pipe inside the casing pipe or tunnel liner to prevent water or other material from entering the casing or liner and causing corrosion by one of the following methods:

- Brick and Mortar Method
- Bulkhead and Grout Method
- Synthetic rubber end seal - type PSI, Inc. Standard Pull-On (Model C), or approved equal, appropriate for the size and type of carrier pipe and casing.

Include a precautionary outlet and bonnet box at each end of the casing as shown on the plans when using steel casings.

- 12.3.5. Grouting. Use ordinary cement-sand grout, as described in Article 5, unless otherwise specified or directed. Fill all excavation outside the casing or tunnel liner with pressure-applied grout or other approved fill unless otherwise directed.

Exercise care in grouting operations to prevent damage to adjacent utilities or other properties. Ensure that pressure used in grouting is not great enough to distort or imperil any portion of the work.

Completely fill with grout all voids outside the limits of the casing or tunnel excavation created by caving or collapse of earth cover over the excavation, or by other cause. All grouting to eliminate voids outside the casing or tunnel limits is subsidiary to this item.

When hand-tunneling methods are used, place grout behind the tunnel liner at the end of each day or at every 10 feet of tunnel installed whichever spacing is acceptable.

Treat the annular space between the casing and carrier pipe by one of the following methods as directed or specified. Where applicable, fill the annular space according to the regulations specified by the governing agency for the area where the casing is to be installed.

- Leave annular space open for cathodically protected systems where both casing and carrier pipes are metallic material.
- Fill annular space with pneumatically placed sand as the standard method for pipes in all installations other than groundwater.
- Fill annular space with grout. Do not damage or distort pipe using pressure to install grout. Submit method for approval prior to starting work. This method is mandatory for installations in groundwater, optional on all other dry installations.

- 12.4. **Measurement.** Casings will be measured by the linear foot complete in place. Casing for temporary water and/or sanitary sewer by-pass lines will not be measured for payment and are incidental to pertinent pay items.

- 12.5. **Payment.** The work performed and the materials furnished in accordance with this item and measured as provided under "Measurement" will be paid for at the unit price bid for "Casing" of the type, size and installation method specified. This price is full compensation for coordination; excavation; disposal of excess material; grouting; backfilling; compaction; compaction testing for utilities; furnishing and installing the approved carrier pipe, precautionary outlet with bonnet box, and accessories as per specifications and standard details by means of open cut (where indicated), and bore and jacking methods (where indicated), welding, furnishing and installing steel casing insulators, and all appurtenances described herein to include, but not limited to the following items: locating, protecting, supporting, relocating if required, and repairing damage to any utilities or structures encountered in the process of the work, dewatering and disposal for water where required, paving cut, removal and repair as needed, traffic control plan, excavation for bore pits, and all other items of the project not indicated as being covered under the other specific bid items shown on the Proposal. Such payment is complete compensation for the complete performance of the work in accordance with the plans and the provisions of these specifications.

13. MASTER METER AND BACKFLOW ASSEMBLY

- 13.1 **Description.** Furnish all labor, materials, equipment and incidentals required to install master meter and backflow preventer as shown on the plans and as specified including all ductile iron pipe, meters, valves, fittings, concrete slabs, lock boxes, etc., including all appurtenances.
- 13.2 **Material.** Furnish all material in accordance with the plans.
- 13.3 **Construction.** Use construction methods in accordance with the plans.
- 13.4 **Measurement.**
- 13.4.1 **Master Meter Assembly (New).** This item will be measured in place by each new master meter and backflow assembly as installed.
- 13.4.2 **Master Meter Assembly (Remove and Salvage).** This item will be measured in place by each master meter and backflow assembly removed and salvage.
- 13.5 **Payment.**
- 13.5.1 **Master Meter Assembly (New).** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Master Meter Assembly (New)" as specified. This price is full compensation for furnishing all required labor, materials, equipment and incidentals required to install master meter and backflow preventer as shown on the plans and as specified including all ductile iron pipe, meters, valves, fittings, concrete slabs, lock boxes, etc., including all appurtenances.
- 13.5.2 **Master Meter Assembly (Remove and Salvage).** The work performed and the materials furnished in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Master Meter Assembly (Remove and Salvage)" as specified. This price is full compensation for furnishing all required labor, materials, equipment, and incidentals to remove and salvage existing master meter assemblies as indicated on the plans in accordance with EPW's requirements.

WAGE RATES



The wage rates listed are those predetermined by the Secretary of Labor and State Statute to be the minimum wages paid. To determine the applicable wage rate zone, a list entitled "TEXAS COUNTIES IDENTIFIED BY WAGE RATE ZONES" is provided in the contract. Any wage rate that is not listed must be submitted to the Engineer for approval. **IMPORTANT NOTICE FOR STATE PROJECTS;** only the controlling wage rate zone applies to the contract. Effective 01-04-2019.

CLASS. #	CLASSIFICATION DESCRIPTION	ZONE TX02 1/4/19	ZONE TX03 1/4/19	ZONE TX04 1/4/19	ZONE TX05 1/4/19	ZONE TX06 1/4/19	ZONE TX07 1/4/19	ZONE TX08 1/4/19	ZONE TX24 1/4/19	ZONE TX25 1/4/19	ZONE TX27 1/4/19	ZONE TX28 1/4/19	ZONE TX29 1/4/19	ZONE TX30 1/4/19	ZONE TX37 1/4/19	ZONE TX38 1/4/19	ZONE TX42 1/4/19
1428	Agricultural Tractor Operator						\$12.69					\$12.35			\$11.75		
1300	Asphalt Distributor Operator	\$14.87	\$13.48	\$13.88	\$15.72	\$15.58	\$15.55	\$15.72	\$13.28	\$15.32	\$15.62	\$14.36	\$14.25	\$14.03	\$13.75	\$14.06	\$14.40
1303	Asphalt Paving Machine Operator	\$13.40	\$12.25	\$12.35	\$13.87	\$14.05	\$14.36	\$14.20	\$13.26	\$13.99	\$14.68	\$12.92	\$13.44	\$12.53	\$14.00	\$14.32	\$12.99
1106	Asphalt Raker	\$12.28	\$10.61	\$12.02	\$14.21	\$11.65	\$12.12	\$11.64	\$11.44	\$12.69	\$12.05	\$11.34	\$11.67	\$11.40	\$12.59	\$12.36	\$11.78
1112	Batching Plant Operator, Asphalt																
1115	Batching Plant Operator, Concrete																
1214	Blaster																
1615	Boom Truck Operator						\$18.36										
1444	Boring Machine Operator																
1305	Broom or Sweeper Operator	\$11.21	\$10.33	\$10.08	\$11.99		\$11.04	\$11.62		\$11.74	\$11.41	\$10.30		\$10.23	\$10.60	\$12.68	\$11.05
1144	Communications Cable Installer																
1124	Concrete Finisher, Paving and Structures	\$13.55	\$12.46	\$13.16	\$12.85	\$12.64	\$12.56	\$12.77	\$12.44	\$14.12	\$13.04	\$13.38	\$12.64	\$12.80	\$12.79	\$12.98	\$13.32
1318	Concrete Pavement Finishing Machine Operator				\$16.05		\$15.48			\$16.05		\$19.31				\$13.07	
1315	Concrete Paving, Curing, Float, Texturing Machine											\$16.34				\$11.71	
1333	Concrete Saw Operator				\$14.67					\$14.48	\$17.33					\$13.99	
1399	Concrete/Gunite Pump Operator																
1344	Crane Operator, Hydraulic 80 tons or less				\$18.22		\$18.36			\$18.12	\$18.04	\$20.21			\$18.63	\$13.86	
1345	Crane Operator, Hydraulic Over 80 Tons																
1342	Crane Operator, Lattice Boom 80 Tons or Less	\$16.82	\$14.39	\$13.85	\$17.27		\$15.87			\$17.27		\$14.67			\$16.42	\$14.97	\$13.87
1343	Crane Operator, Lattice Boom Over 80 Tons				\$20.52		\$19.38			\$20.52		\$17.49			\$25.13	\$15.80	
1306	Crawler Tractor Operator	\$13.96	\$16.63	\$13.62	\$14.26		\$15.67			\$14.07	\$13.15	\$13.38			\$14.60	\$13.68	\$13.50
1351	Crusher or Screen Plant Operator																
1446	Directional Drilling Locator						\$11.67										
1445	Directional Drilling Operator				\$20.32		\$17.24										
1139	Electrician	\$20.96		\$19.87	\$19.80		\$26.35		\$20.27	\$19.80		\$20.92				\$27.11	\$19.87
1347	Excavator Operator, 50,000 pounds or less	\$13.46	\$12.56	\$13.67	\$17.19		\$12.88	\$14.38	\$13.49	\$17.19		\$13.88			\$14.09	\$12.71	\$14.42
1348	Excavator Operator, Over 50,000 pounds		\$15.23	\$13.52	\$17.04		\$17.71			\$16.99	\$18.80	\$16.22				\$14.53	\$13.52
1150	Flagger	\$9.30	\$9.10	\$8.50	\$10.28	\$8.81	\$9.45	\$8.70		\$10.06	\$9.71	\$9.03	\$8.81	\$9.08	\$9.90	\$10.33	\$8.10
1151	Form Builder/Setter, Structures	\$13.52	\$12.30	\$13.38	\$12.91	\$12.71	\$12.87	\$12.38	\$12.26	\$13.84	\$12.98	\$13.07	\$13.61	\$12.82	\$14.73	\$12.23	\$12.25
1160	Form Setter, Paving & Curb	\$12.36	\$12.16	\$13.93	\$11.83	\$10.71	\$12.94			\$13.16	\$12.54	\$11.33	\$10.69		\$13.33	\$12.34	\$13.93
1360	Foundation Drill Operator, Crawler Mounted				\$17.99					\$17.99						\$17.43	
1363	Foundation Drill Operator, Truck Mounted		\$16.86	\$22.05	\$21.51		\$16.93			\$21.07	\$20.20	\$20.76		\$17.54	\$21.39	\$15.89	\$22.05
1369	Front End Loader Operator, 3 CY or Less	\$12.28	\$13.49	\$13.40	\$13.85		\$13.04	\$13.15	\$13.29	\$13.69	\$12.64	\$12.89			\$13.51	\$13.32	\$12.17
1372	Front End Loader Operator, Over 3 CY	\$12.77	\$13.69	\$12.33	\$14.96		\$13.21	\$12.86	\$13.57	\$14.72	\$13.75	\$12.32			\$13.19	\$13.17	\$13.02
1329	Joint Sealer																
1172	Laborer, Common	\$10.30	\$9.86	\$10.08	\$10.51	\$10.71	\$10.50	\$10.24	\$10.58	\$10.72	\$10.45	\$10.30	\$10.25	\$10.03	\$10.54	\$11.02	\$10.15
1175	Laborer, Utility	\$11.80	\$11.53	\$12.70	\$12.17	\$11.81	\$12.27	\$12.11	\$11.33	\$12.32	\$11.80	\$11.53	\$11.23	\$11.50	\$11.95	\$11.73	\$12.37
1346	Loader/Backhoe Operator	\$14.18	\$12.77	\$12.97	\$15.68		\$14.12			\$15.18	\$13.58	\$12.87		\$13.21	\$14.13	\$14.29	\$12.90

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1187	Mechanic	\$20.14	\$15.47	\$17.47	\$17.74	\$17.00	\$17.10			\$17.68	\$18.94	\$18.58	\$17.00	\$16.61	\$18.46	\$16.96	\$17.47
1380	Milling Machine Operator	\$15.54	\$14.64	\$12.22	\$14.29		\$14.18			\$14.32	\$14.35	\$12.86			\$14.75	\$13.53	\$12.80
1390	Motor Grader Operator, Fine Grade	\$17.49	\$16.52	\$16.88	\$17.12	\$18.37	\$18.51	\$16.69	\$16.13	\$17.19	\$18.35	\$17.07	\$17.74	\$17.47	\$17.08	\$15.69	\$20.01
1393	Motor Grader Operator, Rough	\$16.15	\$14.62	\$15.83	\$16.20	\$17.07	\$14.63	\$18.50		\$16.02	\$16.44	\$15.12	\$16.85	\$14.47	\$17.39	\$14.23	\$15.53
1413	Off Road Hauler			\$10.08	\$12.26		\$11.88			\$12.25		\$12.23			\$13.00	\$14.60	
1196	Painter, Structures					\$21.29	\$18.34						\$21.29			\$18.62	
1396	Pavement Marking Machine Operator	\$16.42		\$13.10	\$13.55		\$19.17	\$12.01		\$13.63	\$14.60	\$13.17		\$16.65	\$10.54	\$11.18	\$13.10
1443	Percussion or Rotary Drill Operator																
1202	Piledriver															\$14.95	
1205	Pipelay		\$11.87	\$14.64	\$13.17	\$11.17	\$12.79		\$11.37	\$13.24	\$12.66	\$13.24	\$11.17	\$11.67		\$12.12	\$14.64
1384	Reclaimer/Pulverizer Operator	\$12.85			\$11.90		\$12.88			\$11.01		\$10.46					
1500	Reinforcing Steel Worker	\$13.50	\$14.07	\$17.53	\$16.17		\$14.00			\$16.18	\$12.74	\$15.83		\$17.10		\$15.15	\$17.72
1402	Roller Operator, Asphalt	\$10.95		\$11.96	\$13.29		\$12.78	\$11.61		\$13.08	\$12.36	\$11.68			\$11.71	\$11.95	\$11.50
1405	Roller Operator, Other	\$10.36		\$10.44	\$11.82		\$10.50	\$11.64		\$11.51	\$10.59	\$10.30		\$12.04	\$12.85	\$11.57	\$10.66
1411	Scraper Operator	\$10.61	\$11.07	\$10.85	\$12.88		\$12.27		\$11.12	\$12.96	\$11.88	\$12.43		\$11.22	\$13.95	\$13.47	\$10.89
1417	Self-Propelled Hammer Operator																
1194	Servicer	\$13.98	\$12.34	\$14.11	\$14.74		\$14.51	\$15.56	\$13.44	\$14.58	\$14.31	\$13.83		\$12.43	\$13.72	\$13.97	\$14.11
1513	Sign Erector																
1708	Slurry Seal or Micro-Surfacing Machine Operator																
1341	Small Slipform Machine Operator									\$15.96							
1515	Spreader Box Operator	\$12.60		\$13.12	\$14.71		\$14.04			\$14.73	\$13.84	\$13.68		\$13.45	\$11.83	\$13.58	\$14.05
1705	Structural Steel Welder															\$12.85	
1509	Structural Steel Worker						\$19.29									\$14.39	
1339	Subgrade Trimmer																
1143	Telecommunication Technician																
1145	Traffic Signal/Light Pole Worker						\$16.00										
1440	Trenching Machine Operator, Heavy						\$18.48										
1437	Trenching Machine Operator, Light																
1609	Truck Driver Lowboy-Float	\$14.46	\$13.63	\$13.41	\$15.00	\$15.93	\$15.66			\$16.24	\$16.39	\$14.30	\$16.62	\$15.63	\$14.28	\$16.03	\$13.41
1612	Truck Driver Transit-Mix				\$14.14					\$14.14							
1600	Truck Driver, Single Axle	\$12.74	\$10.82	\$10.75	\$13.04	\$11.61	\$11.79	\$13.53	\$13.16	\$12.31	\$13.40	\$10.30	\$11.61		\$11.97	\$11.46	\$10.75
1606	Truck Driver, Single or Tandem Axle Dump Truck	\$11.33	\$14.53	\$11.95	\$12.95		\$11.68		\$14.06	\$12.62	\$11.45	\$12.28		\$13.08	\$11.68	\$11.48	\$11.10
1607	Truck Driver, Tandem Axle Tractor with Semi Trailer	\$12.49	\$12.12	\$12.50	\$13.42		\$12.81	\$13.16		\$12.86	\$16.22	\$12.50			\$13.80	\$12.27	\$12.50
1441	Tunneling Machine Operator, Heavy																
1442	Tunneling Machine Operator, Light																
1706	Welder		\$14.02		\$14.86		\$15.97		\$13.74	\$14.84					\$13.78		
1520	Work Zone Barricade Servicer	\$10.30	\$12.88	\$11.46	\$11.70	\$11.57	\$11.85	\$10.77		\$11.68	\$12.20	\$11.22	\$11.51	\$12.96	\$10.54	\$11.67	\$11.76

Notes:

Any worker employed on this project shall be paid at the rate of one and one half (1-1/2) times the regular rate for every hour worked in excess of forty (40) hours per week.

The titles and descriptions for the classifications listed here are further detailed in the AGC of Texas' *Standard Job Classifications and Descriptions for Highway, Heavy, Utilities, and Industrial Construction in Texas* . AGC will make it available on its Web site for any contractor.

TEXAS COUNTIES IDENTIFIED BY

WAGE RATE ZONES: 2, 3, 4, 5, 6, 7, 8, 24, 25, 27, 28, 29, 30, 37, 38,

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County Name	Zone	County Name	Zone	County Name	Zone	County Name	Zone
Anderson	28	Donley	37	Karnes	27	Reagan	37
Andrews	37	Duval	30	Kaufman	25	Real	37
Angelina	28	Eastland	37	Kendall	7	Red River	28
Aransas	29	Ector	2	Kenedy	30	Reeves	8
Archer	25	Edwards	8	Kent	37	Refugio	27
Armstrong	2	El Paso	24	Kerr	27	Roberts	37
Atascosa	7	Ellis	25	Kimble	37	Robertson	7
Austin	38	Erath	28	King	37	Rockwall	25
Bailey	37	Falls	28	Kinney	8	Runnels	37
Bandera	7	Fannin	28	Kleberg	27	Rusk	4
Bastrop	7	Fayette	27	Knox	37	Sabine	28
Baylor	37	Fisher	37	Lamar	28	San Augustine	28
Bee	27	Floyd	37	Lamb	37	San Jacinto	38
Bell	7	Foard	37	Lampasas	7	San Patricio	29
Bexar	7	Fort Bend	38	LaSalle	30	San Saba	37
Blanco	27	Franklin	28	Lavaca	27	Schleicher	37
Borden	37	Freestone	28	Lee	27	Scurry	37
Bosque	28	Frio	27	Leon	28	Shackelford	37
Bowie	4	Gaines	37	Liberty	38	Shelby	28
Brazoria	38	Galveston	38	Limestone	28	Sherman	37
Brazos	7	Garza	37	Lipscomb	37	Smith	4
Brewster	8	Gillespie	27	Live Oak	27	Somervell	28
Briscoe	37	Glasscock	37	Llano	27	Starr	30
Brooks	30	Goliad	29	Loving	37	Stephens	37
Brown	37	Gonzales	27	Lubbock	2	Sterling	37
Burleson	7	Gray	37	Lynn	37	Stonewall	37
Burnet	27	Grayson	25	Madison	28	Sutton	8
Caldwell	7	Gregg	4	Marion	28	Swisher	37
Calhoun	29	Grimes	28	Martin	37	Tarrant	25
Callahan	25	Guadalupe	7	Mason	27	Taylor	2
Cameron	3	Hale	37	Matagorda	27	Terrell	8
Camp	28	Hall	37	Maverick	30	Terry	37
Carson	2	Hamilton	28	McCulloch	37	Throckmorton	37
Cass	28	Hansford	37	McLennan	7	Titus	28
Castro	37	Hardeman	37	McMullen	30	Tom Green	2
Chambers	38	Hardin	38	Medina	7	Travis	7
Cherokee	28	Harris	38	Menard	37	Trinity	28
Childress	37	Harrison	42	Midland	2	Tyler	28
Clay	25	Hartley	37	Milam	28	Upshur	4
Cochran	37	Haskell	37	Mills	37	Upton	37
Coke	37	Hays	7	Mitchell	37	Uvalde	30
Coleman	37	Hemphill	37	Montague	37	Val Verde	8
Collin	25	Henderson	28	Montgomery	38	Van Zandt	28
Collingsworth	37	Hidalgo	3	Moore	37	Victoria	6
Colorado	27	Hill	28	Morris	28	Walker	28
Comal	7	Hockley	37	Motley	37	Waller	38
Comanche	37	Hood	28	Nacogdoches	28	Ward	37
Concho	37	Hopkins	28	Navarro	28	Washington	28
Cooke	37	Houston	28	Newton	28	Webb	3
Coryell	7	Howard	37	Nolan	37	Wharton	27
Cottle	37	Hudspeth	8	Nueces	29	Wheeler	37
Crane	37	Hunt	25	Ochiltree	37	Wichita	5
Crockett	8	Hutchinson	37	Oldham	37	Wilbarger	37
Crosby	2	Irion	2	Orange	38	Willacy	30
Culberson	8	Jack	28	Palo Pinto	28	Williamson	7
Dallam	37	Jackson	27	Panola	28	Wilson	7
Dallas	25	Jasper	28	Parker	25	Winkler	37
Dawson	37	Jeff Davis	8	Parmer	37	Wise	25
Deaf Smith	37	Jefferson	38	Pecos	8	Wood	28

Delta	25	Jim Hogg	30	Polk	28	Yoakum	37
Denton	25	Jim Wells	27	Potter	2	Young	37
DeWitt	27	Johnson	25	Presidio	8	Zapata	30
Dickens	37	Jones	25	Rains	28	Zavala	30
Dimmit	30			Randall	2		

01-04-2019