

SECTION 02240

CARE OF WATER DURING CONSTRUCTION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Furnish labor, materials, equipment and incidentals, including pumps, piping and other facilities necessary to remove surface and groundwater as needed to perform the required project construction.
- B. Build and maintain the necessary temporary impounding works, channels, and diversions. Remove the temporary works, equipment, and materials after they have served their purpose in strict accordance with this section of the specifications and the applicable drawings.

1.2 SUBMITTALS

- A. Submittals shall be in accordance with Section 01300 – Submittals and shall include plans and procedures for handling flood flows and dewatering excavations. Submit plans and procedures to Engineer for approval.
- B. Any construction modifications to the system shall also be submitted.

1.3 JOB CONDITIONS

Approval of plans and procedures for handling flood flows and dewatering does not relieve the Contractor of full responsibility and liability for care of water during construction.

PART 2 PRODUCTS

[Not Used]

PART 3 EXECUTION

3.1 FLOOD FLOWS AND OTHER WATER

The Contractor shall be responsible for handling and diverting any flood flows, stream flows, or any other water, including groundwater encountered during the progress of the work. Build, maintain, and operate cofferdams, channels, flumes, sumps, and other temporary works needed to pass floodwater, divert stream flow, or pass other surface water through or around the construction site and away from construction in progress. Unless otherwise approved by the Engineer, a diversion must discharge into the same natural watercourse in which its headworks are located. Construct permanent work in areas free from water. The removal of protective works, after having served their purpose, shall be in a manner satisfactory to the Engineer.

3. Route runoff from the areas through the appropriate erosion and sediment control structures.
4. Protect earth spoil areas by "trackwalking" and silt fences.
5. When topsoil is called for as a component of another item, conduct erosion control practices described in this item during the topsoiling operation.
 - a. When topsoiling, maintain erosion and sediment control structures such as swales, grade stabilization structures, berms, dikes, waterways, and sediment basins.
 - b. Maintain grades that have been previously established on areas to be topsoiled.
 - c. After the areas to be topsoiled have been brought to grade, and immediately prior to dumping and spreading the topsoil, the subgrade shall be loosened by disking or by scarifying to a depth of at least two inches to permit bonding of the topsoil to the subsoil. Compact soil by passing a bulldozer up and down the slope, tracking over the entire surface area of the slope to create small "terraces".
6. Dust Control
 - a. Control dust blowing and movement on construction sites and roads to prevent exposure of soil surfaces, to reduce on-site and off-site damage, to prevent health hazards, and to improve traffic safety.
 - b. Control dust blowing by utilizing one or more of the following methods.
 - 1) Establishment of temporary vegetative cover.
 - 2) Tillage to roughen surface and bring clods to the surface.
 - 3) Irrigation by water sprinkling.
 - 4) Utilization of barriers such as solid board fences, snow fences, burlap fences, crate walls, bales of hay, or similar materials.
 - c. Dust control methods shall be implemented immediately whenever dust is observed blowing over the project site.

F. LOCATION OF EROSION AND SEDIMENT CONTROL STRUCTURES

1. Locate erosion and sediment control structures as shown on the plans and as required to prevent erosion and removal of sediment

from the project site. Silt fences shall be required for disturbed areas and soil stockpiles/spoil areas. The runoff from no more than one acre of area shall be routed through any individual silt fence installation.

2. Install diversion dikes to divert runoff to other erosion and sediment control structures.
3. Install silt traps at the inlet (upstream) end of drainage structures, including open channels, through which runoff from disturbed areas or soil stockpiles/spoil areas may drain.
4. Provide an overall erosion and sediment control system which protects disturbed areas and soil stockpiles/spoil areas. The system shall be modified by the Contractor as needed to effectively control erosion and sediment during construction.

3.2 MAINTENANCE

- A. Maintain erosion and sediment control structures and procedures in full working order at all times during construction. This shall include any necessary repair or replacement of items which have become damaged or ineffective. Remove sediment on a regular basis which accumulates in sediment control devices and place the material in approved earth spoil areas, return the material to the area from which it eroded, or dispose of it off-site.
- B. The Contractor shall prohibit all equipment and vehicles from maneuvering in areas outside the dedicated rights-of-way and easements for construction. Damage caused by construction traffic to erosion and sedimentation control systems shall be repaired immediately at the expense of the Contractor.
- C. Upon completion of construction and stabilization of disturbed areas, properly remove the temporary erosion and sediment control structures and complete the area as indicated.
- D. Soil retention blankets will not require removal if installed on a finished graded area specified to receive seeding.

3.3 FIELD QUALITY CONTROL

In the event of conflict between these requirements and storm water pollution control laws, rules, or regulations of federal, state, or local agencies, the more restrictive requirements shall apply.

END OF SECTION

SECTION 01600
MATERIAL AND EQUIPMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Transportation and handling.
- B. Storage and protection.
- C. Product options.

1.2 RELATED SECTION

Section 01300 – Submittals.

1.3 DELIVERY, STORAGE AND HANDLING

- A. Transport, handle, and store products in accordance with the manufacturers' instructions.
- B. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and that the products are undamaged.
- C. Provide equipment and personnel to handle and store products by recommended methods to prevent soiling, disfigurement, or damage.
- D. Store and protect products in accordance with the manufacturers' instructions.
- E. Store products with seals and labels intact and legible.
- F. Store sensitive products in weather-tight, climate-controlled enclosures in an environment favorable to the products.
- G. For exterior storage of fabricated products, place on sloped supports above natural ground.
- H. Provide off-site storage and protection when the site does not permit on-site storage or protection.
- I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.
- J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.
- K. Arrange storage of products to permit access for inspection. Periodically inspect to verify that the products are undamaged and are maintained in acceptable condition.

1.4 PRODUCT OPTIONS

- A. Products Specified by Reference Standards or by Description Only.
Any products meeting those standards or descriptions are acceptable.
- B. Products Specified by Naming One or More Manufacturers.
Products of manufacturers named and meeting specifications are acceptable.
Request a substitution in accordance Section 01300 – Submittals for any manufacturer not named.

1.5 SUBSTITUTIONS

- A. Engineer will consider requests for Substitutions only within thirty (30) days after date established in Notice to Proceed.
- B. Substitutions may be considered when a Product becomes unavailable through no fault of the Contractor.
- C. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- D. A request constitutes a representation that the Contractor:
 - 1. Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - 2. Will provide the same warranty for the Substitution as for the specified Product.
 - 3. Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - 4. Waives claims for additional costs or time extension which may subsequently become apparent.
 - 5. Will reimburse Owner and Engineer for review or redesign services associated with re-approval by authorities.
- E. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request or when acceptance will require revision to the Contract Documents.
- F. Substitution Submittal Procedure:
 - 1. Submit three (3) copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
 - 2. Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on the Contractor.

3. The Engineer will notify Contractor in writing of decision to accept or reject request.

PART 2 PRODUCTS

[Not Used]

PART 3 EXECUTION

[Not Used]

END OF SECTION

SECTION 01700

CONTRACT CLOSEOUT

PART 1 GENERAL

1.1 SECTION INCLUDES

Requirements of the General Conditions and specified administrative procedures in closing out the construction contract.

1.2 RELATED SECTIONS

A. Section 01040 – Project Administration.

1.3 SUBMITTALS

Submit warranties, bonds, service agreements, affidavits, and releases at the completion of the project. Submit record documents in accordance with Section 01040 – Project Administration.

1.4 CLOSEOUT PROCEDURES

A. Submit written certification that Contract Documents have been reviewed, Work has been inspected, and that Work is complete in accordance with Contract Documents and ready for Engineer's review.

B. Provide submittals to Engineer that are required by governing or other authorities.

C. Submit final Application for Payment identifying total adjusted Contract Sum, previous payments, and sum remaining due.

1.5 FINAL CLEANING

A. Execute final cleaning prior to final project assessment.

B. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

C. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

D. Clean filters of operating equipment.

E. Clean debris from roofs, gutters, downspouts, and drainage systems.

F. Clean site; sweep paved areas, rake clean landscaped surfaces.

- G. Remove waste and surplus materials, rubbish, and construction facilities from the site.

1.6 ADJUSTING

- A. Adjust operating Products and equipment to ensure smooth and unhindered operation.

1.7 PROJECT RECORD DOCUMENTS

- A. Maintain on site one set of the following record documents; record actual revisions to the Work:
 1. Drawings
 2. Specifications
 3. Addenda
 4. Change Orders and other modifications to the Contract
 5. Reviewed Shop Drawings, Product Data, and Samples
 6. Manufacturer's instruction for assembly, installation, and adjusting
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress.
- E. Specifications: Legibly mark and record at each Product section description of actual Products installed, including the following:
 1. Manufacturer's name and product model and number.
 2. Product substitutions or alternates utilized.
 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction including:
 1. Measured depths of foundations in relation to finish floor datum.
 2. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 3. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.

- 4. Field changes of dimension and detail.
- 5. Details not on original Contract drawings.
- G. Submit documents to Engineer prior to final Application for Payment.

1.8 OPERATION AND MAINTENANCE DATA

- A. Submit data bound in 8½ x 11 inch text pages, three D side ring binders with durable plastic covers. Refer to Section 01730.

1.9 SPARE PARTS AND MAINTENANCE PRODUCTS

- A. Provide spare parts, maintenance, and extra products in quantities specified in individual specification sections.
- B. Deliver to Project site and place in location as directed; obtain receipt prior to final payment.

1.10 WARRANTIES

- A. Provide duplicate notarized copies.
- B. Execute and assemble transferable warranty documents from Subcontractors, suppliers and manufacturers.
- C. Provide Table of Contents and assemble in three D side ring binder with durable plastic cover.
- D. Submit prior to final Application for Payment.
- E. For items of Work delayed beyond date of Substantial Completion, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.

1.11 MAINTENANCE SERVICE

- A. Furnish service and maintenance of components indicated in specification sections for one (1) year from date of Substantial Completion during the warranty period.
- B. Examine system components at a frequency consistent with reliable operation. Clean, adjust and lubricate as required.
- C. Include systematic examination, adjustment and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.
- D. Maintenance service shall not be assigned or transferred to any agent or Subcontractor without prior written consent of the Owner.

1.12 SUBSTANTIAL COMPLETION

- A. Submit written notification to the Engineer that the work or designated portion of the work is substantially complete when the work is considered to be substantially complete per the General Conditions. Include a list of the items remaining to be completed or corrected before the project will be considered to be complete.
- B. The Engineer shall visit the project site to observe the work within a reasonable time after notification is received to determine the status of completion.
- C. The Engineer shall issue notification to the Contractor that the work is either substantially complete or that additional work must be performed before the project may be considered substantially complete.
 - 1. The Engineer shall notify the Contractor in writing of items that must be completed before the project can be considered substantially complete.
 - a. Correct the noted deficiencies in the work.
 - b. Issue a second written notice with a revised list of deficiencies when work has been completed.
 - c. The Engineer shall revisit the site and the procedure shall begin again.
 - 2. The Engineer shall issue a tentative Certificate of Substantial Completion to the Owner when the project is considered to be substantially complete. The certificate shall include a tentative list of items to be corrected before final payment.
 - a. The Owner will review and revise the list of items and notify the Engineer of any objections or other items that are to be included in the list.
 - b. The Engineer shall prepare and send to the Contractor a definite Certificate of Substantial Completion with a revised list of items to be corrected or completed.
 - c. Review the list and notify the Engineer in writing of any objections within 10 days of receipt of Certificate of Substantial Completion.

1.13 FINAL INSPECTION

- A. Submit written certification when the project is complete and:
 - 1. Contract documents have been reviewed.
 - 2. Work has been completed in compliance with the Contract Documents.

3. Equipment and systems have been tested per Contract Documents and are fully operational.
 4. Final operations and maintenance manuals have been provided to the Owner.
 5. [Specified spare parts and special tools have been provided.
 6. Work is ready for final inspection.
- B. The Engineer shall make an inspection with the Owner and appropriate regulatory agencies to determine the status of completeness within a reasonable time after the receipt of the certification.
- C. The Engineer shall issue notice that the project is complete or notify the Contractor that work is not complete or is defective.
1. Submit the request for final payment with closeout submittals described in paragraph 1.7 if notified that the project is complete and the work is acceptable.
 2. Upon receipt of notification from the Engineer that work is incomplete or defective, take immediate steps to remedy the stated deficiencies. Send a second certification to the Engineer when work has been completed or corrected.
 3. The Engineer shall re-visit the site and the procedure will begin again.

1.14 REINSPECTION FEES

- A. Pay fees to the Owner to compensate the Engineer for reinspection of the work required by the failure of the work to comply with the claims of status of completion made by the Contractor.
- B. Owner may withhold the amount of these fees from the Contractor's final payment.
- C. Cost for additional inspections will be billed to the Owner by the Engineer for the actual hours required for the inspection and preparation of related reports in accordance with the following hourly rates.

Principal	\$90.00
Professional Engineer	\$85.00
Graduate Engineer	\$65.00
Engineering Technician	\$50.00
Administrative Assistant	\$30.00

1.15 CLOSEOUT SUBMITTALS TO THE ENGINEER

- A. Record drawings per Section 01040 - Project Administration.

- B. Shop drawings/product data , operations and maintenance manuals, and other submittals as required by the Contract Documents.
- C. Warranties, bonds, and service agreements.
- D. Affidavit of all bills paid.
- E. Evidence of final, continuing insurance and bond coverage as required by the Contract Documents.
- F. Certificates of Occupancy, operating certificates, or other similar releases required to allow the Owner unrestricted use of the work and access to services and utilities.
- G. Equipment installation reports on equipment.
- H. Keys

1.16 FINAL PAYMENT REQUEST

- A. Submit a preliminary final payment request. This request is to include adjustments to the contract amount for:
 - 1. Approved Change Orders.
 - 2. Deductions for defective work that has been accepted by the Owner.
 - 3. Penalties and bonuses.
 - 4. Deductions for liquidated damages.
 - 5. Deductions for reinspection payments per paragraph 1.14.
 - 6. Deduction for any unused portions of allowances.
 - 7. Other adjustments.
- B. The Engineer shall prepare a final Change Order reflecting the approved adjustments to the contract amount which have not been covered by previously approved Change Orders.
- C. Submit the final payment request including the final Change Order per the General Conditions.

1.17 TRANSFER OF UTILITIES

- A. Transfer utilities to the Owner when the Certificate of Substantial Completion has been issued, final cleaning has been completed per Section 01710 – Final Cleaning, and the work has been occupied by the Owner.

- B. Submit final meter readings for utilities and similar data as of the date the Owner occupied the work.

1.18 WARRANTIES, BONDS, AND SERVICE AGREEMENTS

- A. Provide warranties, bonds, and service agreements required by the Contract Documents.
- B. The date for the start of warranties, bonds, and service agreements is established per the General Conditions.
- C. Compile warranties, bonds, and service agreements and review these documents for compliance with the Contract Documents.
 - 1. Each document is to be signed by the respective manufacturer, supplier, and subcontractor.
 - 2. Each document is to include:
 - a. The product or work item description.
 - b. The firm, with the name of the principal, address, and telephone number.
 - c. Scope of the warranty, bond, or service agreement.
 - d. Date, duration, and expiration date for each warranty bond and service agreement.
 - e. Procedures to be followed in the event of a failure.
 - f. Specific instances that might invalidate the warranty or bond.
- D. Submit two copies of each document to the Engineer for review and transmittal to the Owner.
- E. Submit warranties, bonds, and service agreements:
 - 1. At the time of final completion and before final payment.
 - 2. Within 10 days after inspection and acceptance for equipment or components placed in service during the progress of construction.

1.19 CLAIMS AND DISPUTES

Claims and disputes must be resolved prior to recommendation of final payment. Final payment and acceptance by the Contractor will indicate that any outstanding claims or disputed issues have been resolved to the full satisfaction of the Contractor.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 02220

TRENCH AND EXCAVATION SAFETY SYSTEM

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. Requirements for Trench and Excavation Safety System(s) to be designed and furnished by the Contractor for the safety and health of personnel.

1.2 REFERENCES:

- A. 29CFR1926 - Occupational Safety and Health Standards - Excavations, United States Department of Labor, latest edition.
- B. Others - Other applicable Federal, State, and local rules for Trench Construction or excavations.

1.3 REQUIREMENTS:

- A. The Contractor shall develop, design, and implement a Trench and Excavation Safety System. The Contractor shall bear the sole responsibility for the adequacy of the System.
- B. The requirements of 29CFR1926 shall be the minimum requirements for this specification and are adopted as a part of this specification. Other regulations relating to trench and excavation safety shall also be considered a part of this specification as if referenced directly.
- C. Should the System require wider trenches than shown, the Contractor shall be responsible for the costs associated with determining adequacy of pipe bedding and class, as well as, purchase and installation of alternate and/or additional materials.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION

3.1 GENERAL:

- A. Implement the system in accordance with the written System Plan and conduct affected work in accordance with the same.
- B. The system shall be in use during all phases of construction.
- C. Neither the Engineer nor the Owner will be responsible for ensuring the trench safety system is constructed and utilized in accordance with the safety plan. This shall be the sole responsibility of the contractor.

PART 4 MEASUREMENT & PAYMENT

4.1 MEASUREMENT:

- A. Trench safety shall be measured on a linear foot basis. No evaluation of the adequacy of the trench safety precautions will be made by the Engineer since the means, methods & responsibility for safety rest solely with the Contractor.

4.2 PAYMENT

- A. Payment for trench safety will be subsidiary to other involved items. No direct pay. No evaluation of the adequacy of the trench safety systems used by the Contractor will be made by the Engineer since the means, methods and responsibility for trench safety rest solely with the Contractor. By approving the Contractor's request for payment of trench safety, the Engineer makes no representation that the Contractor's work for this pay item has been performed in a manner consistent with the Contract documents.

END OF SECTION

2.3 SOIL RETENTION BLANKET

Soil retention blankets shall consist of a geocomposite of excelsior or fiber blanket with an extruded plastic net. The plastic net shall be photodegradable and the excelsior or fiber blanket shall be made smolder resistant without the use of chemicals. Soil retention blankets shall be high velocity type to resist severe runoff. Soil retention blankets shall be American Excelsior Company Curlex Blanket or Engineer approved equal.

2.4 STABILIZED CONSTRUCTION EXIT

Aggregate used in stabilized construction exits shall be hard, durable, clean, open-graded, angular, and have a nominal diameter of four inches.

PART 3 EXECUTION

3.1 INSTALLATION

A. SILT FENCE

1. Provide silt fence systems at locations specified in accordance with the drawings and as necessary to prevent sediment from leaving the site. Silt fence shall be installed in such a manner that surface runoff will percolate through the system in sheet flow fashion and allow sediment to be retained and accumulated.
2. Silt fence should not be used where there is a concentration of water in a channel or drainage way or where soil conditions prevent a minimum toe-in depth of six inches or installation of support posts to a depth of 12 inches. If concentrated flow occurs after installation, corrective action must be taken such as placing a rock filter dam in the areas of concentrated flow.
3. Attach the fabric and wire backing to steel posts spaced no more than six feet apart and embedded at least 18 inches deep. Steel posts shall have projections for fastening wire and/or fabric.
4. Trench in the toe of the filter fabric fence with a spade or mechanical trencher so that the downstream face of the trench is vertical. The trench shall be a minimum of six inches wide and six inches deep. Lay filter fabric and wire along the bottom and downstream wall of the trench. Backfill and compact the trench.
5. The filter fabric and wire backing should be provided in continuous rolls and cut to the length of the silt fence to minimize the use of joints. When joints are necessary, the fabric and wire should only be spliced together at a support post and have at least six inches of overlap. The joint shall be securely sealed.

SECTION 01568

EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

PART 1 GENERAL

1.1 SECTION INCLUDES

Furnish labor, materials, equipment, and incidentals necessary to provide erosion and sediment control for the duration of the construction period including furnishing, installing, and maintaining erosion and sediment control structures and procedures and the proper removal when no longer required.

The intent of this specification is to provide guidelines for the Contractor to adhere to all state, federal, and local environmental regulations. It is also the intent to provide preventive measures to keep sediment from entering any storm water system including open channels. It is the Contractor's responsibility to adhere to all federal, state, and local requirements. While the Engineer may require the Contractor to install erosion control devices during construction, this will in no way relieve the Contractor of his responsibility.

1.2 RELATED SECTIONS

- A. Section 01300 – Submittals.

SUBMITTALS

Submittals shall be in accordance with Section 01300 – Submittals. Data describing all materials incorporated into the project is required for all of the various erosion and sediment control devices. Manufacturers' product data sheets shall be provided for manufactured products.

1.3 QUALITY ASSURANCE

- A. Comply with applicable requirements of all governing authorities having jurisdiction. The specifications and the plans are not represented as being comprehensive, but rather convey the intent to provide complete slope protection and erosion control for both the Owner's and adjacent property.
- B. Erosion control measures shall be established at the beginning of construction and maintained during the entire length of construction. On-site areas which are subject to severe erosion and off-site areas which are especially vulnerable to damage from erosion and/or sedimentation are to be identified and receive additional erosion control measures as directed by the Owner, Engineer, or Project Representative.
- C. All land-disturbing activities shall be planned and conducted to minimize the size of the area to be exposed at any one time, to minimize the time of exposure, and to minimize off-site sedimentation damage.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

1.4 TEMPORARY WATER SERVICE

- A. Provide, maintain, and pay for suitable quality water service required for construction operations at time of project mobilization.
- B. Extend branch piping with outlets located so water is available by hoses with threaded connections.

1.5 TEMPORARY SANITARY FACILITIES

- A. Provide and maintain required facilities and enclosures at time of project mobilization.

1.6 FENCING

- A. Construction: Commercial grade chain link fence.
- B. Provide six (6) foot high fence around construction site; equip with vehicular and pedestrian gates with locks.

1.7 WATER CONTROL

- A. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- B. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

1.8 EXTERIOR ENCLOSURES

- A. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for Products, to allow for temporary heating and maintenance of required ambient temperatures identified in individual specification sections, and to prevent entry of unauthorized persons. Provide access doors with self-closing hardware and locks.

1.9 PROTECTION OF INSTALLED WORK

- A. Protect installed Work and provide special protection where specified in individual specification sections.
- B. Provide temporary and removable protection for installed Products. Control activity in immediate work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

- B. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
- C. Provide incidental labor and facilities:
 - 1. To provide access to Work to be tested.
 - 2. To obtain and handle samples at the site or at source of Products to be tested.
 - 3. To facilitate tests.
 - 4. To provide storage and curing of test samples.
- D. Notify Engineer and laboratory 24 hours prior to expected time for operations requiring testing services.

1.10 SCHEDULE OF TESTS

- A. Individual Specification Sections: Tests required and standards for testing.

2 PART 2 PRODUCTS

Not Used.

3 PART 3 EXECUTION

Not Used.

END OF SECTION

- H. ASTM E329 - Practice for Use in the Evaluation of Inspection and Testing Agencies as Used in Construction.
- I. ASTM E543 - Practice for Determining the Qualification of Nondestructive Testing Agencies.
- J. ASTM E548 - Practice for Preparation of Criteria for Use in the Evaluation of Testing Laboratories and Inspection Bodies.
- K. ASTM E699 - Practice for Criteria for Evaluation of Agencies Involved in Testing, Quality Assurance, and Evaluating Building Components in Accordance with Test Methods Promulgated by ASTM Committee E6.

1.4 SELECTION AND PAYMENT

- A. Owner will employ and pay for services of an independent testing agency or laboratory to perform specified testing.
- B. Employment of testing agency or laboratory in no way relieves Contractor of obligation to perform Work in accordance with requirements of Contract Documents.

1.5 QUALITY ASSURANCE

- A. Laboratory: Authorized to operate in State in which Project is located.
- B. Laboratory Staff: Maintain a full time registered Engineer on staff to review services.
- C. Testing Equipment: Calibrated at reasonable intervals with devices of an accuracy traceable to either National Bureau of Standards or accepted values of natural physical constants.

1.6 AGENCY RESPONSIBILITIES

- A. Test samples of mixes submitted by Contractor.
- B. Provide qualified personnel at site. Cooperate with Engineer and Contractor in performance of services.
- C. Perform specified sampling and testing of Products in accordance with specified standards.
- D. Ascertain compliance of materials and mixes with requirements of Contract Documents.
- E. Promptly notify Engineer and Contractor of observed irregularities or non-conformance of Work or Products.

During the testing of mechanical, electrical, and instrumentation equipment, the Contractor shall make available experienced factory trained representatives of the manufacturers of all the various pieces of equipment, or other qualified persons who shall instruct the Owner's personnel in the operation and care thereof. Instruction shall include step-by-step troubleshooting procedures with all necessary test equipment and a presentation in accordance with "General Outline for Manufacturer Presentations" included at the end of this section.

If under test, any portion of the work shall fail to fulfill the contract requirements and is altered, renewed or replaced, tests on that portion when so altered, removed or replaced, together with all other portions of the work as are affected thereby, shall if so required by the Engineer, be repeated within reasonable time and in accordance with the specified conditions and the Contractor shall pay to the Owner all reasonable expenses incurred by the Owner as a result of the carrying out of such tests.

Where, in the case of an otherwise satisfactory installed test, any doubt, dispute or difference should arise between the Engineer and the Contractor regarding the test results or the methods or equipment used in the carrying out by the Contractor of such test, then the Engineer may order the test to be repeated. If the repeat test using such modified methods or equipment as the Engineer may require substantially confirms the previous test, then all costs in connection with the repeat test will be paid by the Owner, otherwise the costs shall be borne by the Contractor.

Where the results of any installed test fail to comply with the contract requirements for such test, then such repeat tests as may be necessary to achieve the contract requirements shall be made by the Contractor at his own expense.

END OF SECTION

the storage box for the first 24 hours. The three cylinders shall be laboratory cured and tested for adequacy of the design for strength of the concrete in accordance with ASTM Specification C31. One cylinder shall be tested at seven days and two at twenty-eight days.

- B. Failure of Concrete to Meet Strength Requirements: The concrete shall be considered acceptable if, for any one class of concrete, the average of all tests or any five consecutive tests is equal to or greater than the specified strength, provided that no more than one test of the five falls between 90 percent and 100 percent of the specified strength. The only cylinders to be used for determination of concrete acceptability will be those laboratory cured and tested at twenty-eight days. When it appears the tests of laboratory-cured cylinders will fail to meet these requirements, the Engineer may require changes in the proportions of concrete for the remainder of the work in order to meet the strength requirements. In addition, the Engineer may also require additional curing not to exceed a total of twenty-one days on portions of the concrete already poured.

The Engineer may also require tests in accordance with Methods of Securing, Preparing and Testing Specimen from Hardened Concrete for Compressive and Flexural Strengths (ASTM Specifications C42) when the concrete cylinder tests fail to meet strength requirements. In the event there still is question as the quality of the concrete in the structure, the Engineer may require load tests for that portion where the questionable concrete has been placed. Such load tests will be made as outlined in Chapter 20 of American Concrete Institute Building Code. (ACI 318-71), and shall be at the expense of the Contractor.

- C. Removal of Under Strength Concrete: If the above tests indicate that a particular batch of previously placed concrete is under strength, the Engineer may direct that the under strength batch be removed and replaced. The removal of the under strength concrete shall also include the removal of concrete that has obtained the required strength if the Engineer deems this necessary to obtain structural or visible continuity when the concrete is replaced.

The removal, and replacement of any under strength concrete, shall be made at no additional cost to the Owner. This shall include any new formwork required or any reinforcing steel that may be required. The Owner shall not be charged any additional costs for any extra work that is required because of the failure of any concrete to meet the minimum test requirements.

3.6 Compaction Under Tanks, Structures, and Concrete

- A. Owner to conduct in-place field density tests at the minimum rate of one 1 test per 2,000 square feet for every other lift. Failed tests shall be retested at Contractor's expense. Engineer will designate locations for additional testing if in his opinion such tests are needed to verify compliance with the specifications

3.7 Mechanical, Electrical, and Instrumentation

All materials, equipment, installation and workmanship included in this contract shall be tested and inspected to prove compliance with the contract requirements. No tests specified herein shall be applied until the item to be tested has been inspected and

**MODIFICATIONS TO
TxDOT STANDARD SPECIFICATIONS**

MODIFICATIONS TO ITEM Tx100

PREPARING RIGHT OF WAY

This modification page modifies, amplifies, or amends the technical specifications and plans. In the event of discrepancy, this modification shall take precedence over the plans and the technical specifications.

Paragraph 100.1 Description

This item shall govern for the preparation of the work area for construction operations by the removal and disposal of trees, shrubs, and other items as identified in the Plans and as required for construction to begin. Preparing right of way includes the removal or trimming of all vegetation to achieve the minimum clear width and height above the proposed sidewalk per ADA requirements. Clear space requirements are generally as follows: minimum 80 inches clear height above accessible route.

Paragraph 100.2 Construction

Burning will not be permitted for the disposal of material.

Paragraph 100.3 Measurement

Preparing right of way shall be measured and paid for by the linear foot of sidewalk construction. All tree removal required for trees with a diameter less than 12" shall be subsidiary to the preparing right of way item – no separate pay.

ITEM 100
PREPARING RIGHT OF WAY

100.1. Description. Prepare the right of way and designated easements for construction operations by removing and disposing of all obstructions when removal of such obstructions is not specifically shown on the plans to be paid by other Items.

100.2. Construction. Protect designated features on the right of way and prune trees and shrubs as directed. Do not park equipment, service equipment, store materials, or disturb the root area under the branches of trees designated for preservation. When shown on the plans, treat cuts on trees with an approved tree wound dressing within 20 min. of making a pruning cut or otherwise causing damage to the tree. Follow all local and state regulations when burning. If burning of brush is approved, pile and burn at approved locations. When working in state or national forests or parks, coordinate work with state and federal authorities. Testing, removal, and disposal of hazardous materials will be in accordance with Article 6.10, "Hazardous Materials."

Clear areas shown on the plans of all obstructions, except those landscape features that are to be preserved. Such obstructions include but are not limited to remains of houses and other structures, foundations, floor slabs, concrete, brick, lumber, plaster, septic tank drain fields, basements, abandoned utility pipes or conduits, equipment, fences, retaining walls, and other items as specified on the plans. Remove vegetation and other landscape features not designated for preservation, curb and gutter, driveways, paved parking areas, miscellaneous stone, sidewalks, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron, and debris, whether above or below ground. Removal of live utility facilities is not included in this Item. Remove culverts, storm sewers, manholes, and inlets in proper sequence to maintain traffic and drainage.

In areas receiving embankment, remove obstructions not designated for preservation to 2 ft. below natural ground. In areas to be excavated, remove obstructions to 2 ft. below the excavation level. In all other areas, remove obstructions to 1 ft. below natural ground. When allowed by the plans or directed, cut trees and stumps off to ground level. Plug the remaining ends of abandoned underground structures over 3 in. in diameter with concrete to form a tight closure. Backfill, compact, and restore areas where obstructions have been removed, unless otherwise directed. Use approved material for backfilling. Dispose of wells in accordance with Item 103, "Disposal of Wells."

Accept ownership, unless otherwise directed, and dispose of removed materials and debris at locations off the right of way in accordance with local, state, and federal requirements.

100.3. Measurement. This Item will be measured by the acre; by the 100-foot station, regardless of the width of the right of way; or by each tree removed.

100.4. Payment. For "acre" and "station" measurement, the work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Preparing Right of Way." For "each" measurement, the work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Preparing Right of Way (Tree)" of the diameter specified. This price is full compensation for pruning of designated trees and shrubs; removal and disposal of structures and obstructions; backfilling of holes; furnishing and placing concrete for plugs; and equipment, labor, tools, and incidentals.

Total payment of this Item will not exceed 10% of the original contract amount until final acceptance or the initial release of retainage. The remainder will be paid on the estimate after the partial release of retainage.

MODIFICATIONS TO ITEM Tx104

REMOVING CONCRETE

This modification page modifies, amplifies, or amends the technical specifications and plans. In the event of discrepancy, this modification shall take precedence over the plans and the technical specifications.

Paragraph 100.1 Description

This item shall govern for the removal of existing concrete sidewalks, driveways, steps, and other concrete or concrete-type materials.

Paragraph 100.2 Construction

All concrete to remain adjacent to removed concrete shall be saw cut along neat lines.

Paragraph 100.3 Measurement

Removal of concrete sidewalks and concrete driveways shall be measured by the square yard. Removal of concrete sidewalks includes stairs, walls, and associated concrete structures adjacent to or adjoining concrete sidewalks.

ITEM 104
REMOVING CONCRETE

104.1. Description. Break, remove, and salvage or dispose of existing hydraulic cement concrete.

104.2. Construction. Remove existing hydraulic cement concrete from locations shown on the plans. Avoid damaging concrete that will remain in place. Saw-cut and remove the existing concrete to neat lines. Replace any concrete damaged by the Contractor at no expense to the Department. Unless otherwise shown on the plans, accept ownership and properly dispose of broken concrete in accordance with federal, state, and local regulations.

104.3. Measurement. Removing concrete pavement, floors, porches, patios, riprap, medians, foundations, sidewalks, driveways, and other appurtenances will be measured by the square yard (regardless of thickness) or by the cubic yard of calculated volume, in its original position.

Removing curb, curb and gutter, and concrete traffic barrier will be measured by the foot in its original position. The removal of monolithic concrete curb or dowelled concrete curb will be included in the concrete pavement measurement.

Removing retaining walls will be measured by the square yard along the front face from the top of the wall to the top of the footing.

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.

104.4. 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 "Removing Concrete" of the type specified. This price is full compensation for breaking the concrete; loading, hauling and salvaging or disposing of the material; and equipment, labor, tools, and incidentals.

Removing retaining wall footings will not be paid for directly, but will be considered subsidiary to this item.

MODIFICATIONS TO ITEM Tx105

REMOVING STABILIZED BASE AND ASPHALT PAVEMENT

This modification page modifies, amplifies, or amends the technical specifications and plans. In the event of discrepancy, this modification shall take precedence over the plans and the technical specifications.

Paragraph 100.1 Description

This item shall govern for the removal of existing asphalt and gravel driveways.

Paragraph 100.2 Construction

Asphalt driveways shall be saw cut along neat lines.

Paragraph 100.3 Measurement

Removal of stabilized base and asphalt pavement shall be subsidiary to the asphalt driveway repair item – no direct pay.

ITEM 105

REMOVING STABILIZED BASE AND ASPHALT PAVEMENT

105.1. Description. Break, remove, and store or dispose of existing asphalt pavement or stabilized base materials.

105.2. Construction. Break material retained by the Department into pieces not larger than 24 in. Remove existing asphalt pavement prior to disturbing stabilized base. Avoid contamination of the asphalt materials and damage to adjacent areas. Repair material damaged by operations outside the designated locations.

When shown on the plans and as directed, stockpile materials designated salvageable at designated sites. Prepare stockpile site by removing vegetation and trash and by providing for proper drainage. Dispose of materials not designated as salvageable in accordance with federal, state, and local regulations.

105.3. Measurement. This Item will be measured by the 100-ft. station along the baseline of each roadbed, by the square yard of existing stabilized base and asphalt pavement in its original position, or by the cubic yard of existing stabilized base and asphalt pavement in its original position, as calculated by the average end area method. Square yard and cubic yard measurement will be established by the widths and depths shown in the plans and the lengths measured in the field.

105.4. Payment. The work performed in accordance with this Item and measured as provided under "Measurement" will be paid for at the unit price bid for "Removing Stabilized Base and Asphalt Pavement," of the depth specified. This price is full compensation for breaking the material, loading, hauling, unloading, stockpiling or disposing; repair to areas outside designated locations for removal; and equipment, labor, tools, and incidentals.

MODIFICATIONS TO ITEM Tx110

EXCAVATION

This modification page modifies, amplifies, or amends the technical specifications and plans. In the event of discrepancy, this modification shall take precedence over the plans and the technical specifications.

Paragraph 110.1. Description

This item includes all excavation required to complete the proposed work as shown in the plans. All excavation required to complete the proposed work shall be considered "unclassified excavation" which shall consist of the excavation and disposal of all material, regardless of its nature.

Paragraph 110.2. Construction

Material removed that is suitable for use as embankment where shown on the Plans shall be stockpiled separately from material excavated that is not suitable for use as embankment in accordance with this Item and Item 132 for Embankment.

Paragraph 110.3. Measurement

Excavation required to complete the work as shown in the plans shall not be measured directly.

Paragraph 110.4. Payment

Excavation required to complete the work as shown in the plans shall not be paid for directly and shall be subsidiary to the sidewalk pay item – no direct pay.

ITEM 110
EXCAVATION

110.1. Description. Excavate areas as shown on the plans or as directed. Remove materials encountered to the lines, grades, and typical sections shown on the plans and cross-sections.

110.2. Construction. Accept ownership of unsuitable or excess material and dispose of material in accordance with local, state, and federal regulations at locations outside the right of way.

Maintain drainage in the excavated area to avoid damage to the roadway section. Correct any damage to the subgrade caused by weather, at no additional cost to the Department.

Shape slopes to avoid loosening material below or outside the proposed grades. Remove and dispose of slides as directed.

A. Rock Cuts. Excavate to finish subgrade. Manipulate and compact subgrade in accordance with Article 132.3.D, "Compaction Methods," unless excavation is to clean homogenous rock at finish subgrade elevation. If excavation extends below finish subgrade, use approved embankment material compacted in accordance with Article 132.3.D to replace undercut material at no additional cost.

B. Earth Cuts. Excavate to finish subgrade. In areas where base or pavement structure will be placed on subgrade, scarify subgrade to a uniform depth at least 6 in. below finish subgrade elevation. Manipulate and compact subgrade in accordance with Article 132.3.D, "Compaction Methods."

If unsuitable material is encountered below subgrade elevations, take corrective measures as directed. Drying required deeper than 6 in. below subgrade elevation will be paid for in accordance with Article 9.4, "Payment for Extra Work." Excavation and replacement of unsuitable material below subgrade elevations will be performed and paid for in accordance with the applicable bid items. However, if Item 132, "Embankment," is not included in the Contract, payment for replacement of unsuitable material will be paid for in accordance with Article 9.4.

C. Subgrade Tolerances. For turnkey construction, excavate to within 1/2 in. in cross-section and 1/2 in. in 16 ft. measured longitudinally. For staged construction, excavate to within 0.1 ft. in cross-section and 0.1 ft. in 16 ft. measured longitudinally.

110.3. Measurement. This Item will be measured by the cubic yard in its original position as computed by the method of average end areas.

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.

Limits of measurement for excavation in retaining wall areas will be as shown on the plans.

Shrinkage or swelling factors will not be considered in determining the calculated quantities.

110.4. 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 "Excavation (Roadway)," "Excavation (Channel)," "Excavation (Special)," or "Excavation (Roadway and Channel)." This price is full compensation for authorized excavation; drying; undercutting subgrade and reworking or replacing the undercut material in rock cuts; hauling; disposal of material not used elsewhere on the project; scarification and compaction; and equipment, labor, materials, tools, and incidentals.

When a slide not due to the Contractor's negligence or operation occurs, payments for removal and disposal of the slide material will be in accordance with Article 9.4, "Payment for Extra Work."

Excavation in backfill areas of retaining walls will not be measured or paid for directly but will be subsidiary to pertinent Items.

MODIFICATIONS TO ITEM Tx132

EMBANKMENT

This modification page modifies, amplifies, or amends the technical specifications and plans. In the event of discrepancy, this modification shall take precedence over the plans and the technical specifications.

Paragraph 132.1. Materials

All embankment required to complete the proposed work shall be Type A or D or as approved by the Engineer.

Paragraph 132.3. Construction

All embankment required to complete the proposed work shall be constructed with Ordinary Compaction.

Paragraph 132.4. Measurement

Embankment required to complete the work as shown in the plans shall not be measured directly.

Paragraph 132.5. Payment

Embankment required to complete the work as shown in the plans shall not be paid for directly and shall be subsidiary to the sidewalk pay item – no direct pay.

ITEM 132
EMBANKMENT

132.1. Description. Furnish, place, and compact materials for construction of roadways, embankments, levees, dikes, or any designated section of the roadway where additional material is required.

132.2. Materials. Furnish approved material capable of forming a stable embankment from required excavation in the areas shown on the plans or from sources outside the right of way. Provide 1 or more of the following types as shown on the plans:

- **Type A.** Granular material that is free from vegetation or other objectionable material and meets the requirements of Table 1.

Table 1
Testing Requirements

Property	Test Method	Specification Limit
Liquid limit	Tex-104-E	≤ 45
Plasticity index (PI)	Tex-106-E	≤ 15
Bar linear shrinkage	Tex-107-E	≥ 2

The Linear Shrinkage test only needs to be performed as indicated in Tex-104-E.

- **Type B.** Materials such as rock, loam, clay, or other approved materials.
- **Type C.** Material meeting the specification requirements shown on the plans.
- **Type D.** Material from required excavation areas shown on the plans.

Retaining wall backfill material must meet the requirements of the pertinent retaining wall Items.

132.3. Construction. Meet the requirements of Item 7, “Legal Relations and Responsibilities to the Public,” when off right of way sources are used. To allow for required testing, notify the Engineer before opening a material source. Complete preparation of the right of way, in accordance with Item 100, “Preparing Right of Way,” for areas to receive embankment.

Backfill tree-stump holes or other minor excavations with approved material and tamp. Restore the ground surface, including any material disked loose or washed out, to its original slope. Compact the ground surface by sprinkling in accordance with Item 204, “Sprinkling,” and by rolling using equipment complying with Item 210, “Rolling,” when directed.

Scarify and loosen the unpaved surface areas, except rock, to a depth of at least 6 in., unless otherwise shown on the plans. Bench slopes before placing material. Begin placement of material at the toe of slopes. Do not place trees, stumps, roots, vegetation, or other objectionable material in the embankment. Simultaneously recompact scarified material with the placed embankment material. Do not exceed the layer depth specified in Section 132.3.D, “Compaction Methods.”

Construct embankments to the grade and sections shown on the plans. Construct the embankment in layers approximately parallel to the finished grade for the full width of the individual roadway cross sections, unless otherwise shown on the plans. Ensure that each section of the embankment conforms to the detailed sections or slopes. Maintain the finished section, density, and grade until the project is accepted.

- A. Earth Embankments.** Earth embankment is mainly composed of material other than rock. Construct embankments in successive layers, evenly distributing materials in lengths suited for sprinkling and rolling.

Obtain approval to incorporate rock and broken concrete produced by the construction project in the lower layers of the embankment. When the size of approved rock or broken concrete exceeds the layer thickness requirements in Section 132.3.D, "Compaction Methods," place the rock and concrete outside the limits of the completed roadbed. Cut and remove all exposed reinforcing steel from the broken concrete.

Move the material dumped in piles or windrows by blading or by similar methods and incorporate it into uniform layers. Featheredge or mix abutting layers of dissimilar material for at least 100 ft. to ensure there are no abrupt changes in the material. Break down clods or lumps of material and mix embankment until a uniform material is attained.

Apply water free of industrial wastes and other objectionable matter to achieve the uniform moisture content specified for compaction.

When ordinary compaction is specified, roll and sprinkle each embankment layer in accordance with Section 132.3.D.1, "Ordinary Compaction." When density control is specified, compact the layer to the required density in accordance with Section 132.3.D.2, "Density Control."

- B. Rock Embankments.** Rock embankment is mainly composed of rock. Construct rock embankments in successive layers for the full width of the roadway cross-section with a depth of 18 in. or less. Increase the layer depth for large rock sizes as approved. Do not exceed a depth of 2-1/2 ft. in any case. Fill voids created by the large stone matrix with smaller stones during the placement and filling operations.

Ensure the depth of the embankment layer is greater than the maximum dimension of any rock. Do not place rock greater than 2 ft. in its maximum dimension, unless otherwise approved. Construct the final layer with graded material so that the density and uniformity is in accordance with Section 132.3.D, "Compaction Methods." Break up exposed oversized material as approved.

When ordinary compaction is specified, roll and sprinkle each embankment layer in accordance with Section 132.3.D.1, "Ordinary Compaction." When density control is specified, compact each layer to the required density in accordance with Section 132.3.D.2, "Density Control." When directed, proof-roll each rock layer where density testing is not possible, in accordance with Item 216, "Proof Rolling," to ensure proper compaction.

- C. Embankments Adjacent to Culverts and Bridges.** Compact embankments adjacent to culverts and bridges in accordance with Item 400, "Excavation and Backfill for Structures."

- D. Compaction Methods.** Begin rolling longitudinally at the sides and proceed toward the center, overlapping on successive trips by at least 1/2 the width of the roller. On super elevated curves, begin rolling at the lower side and progress toward the high side. Alternate roller trips to attain slightly different lengths. Compact embankments in accordance with one of the following methods as shown on the plans:

- 1. Ordinary Compaction.** Use approved rolling equipment complying with Item 210, "Rolling," to compact each layer. The plans or the Engineer may require specific equipment. Do not allow the loose depth of any layer to exceed 8 in., unless otherwise approved. Before and during rolling operations, bring each layer to the moisture content directed. Compact each layer until there is no evidence of further consolidation. Maintain a level layer to ensure uniform compaction. If the required stability or finish is lost for any reason, recompact and refinish the subgrade at no additional expense to the Department.
- 2. Density Control.** Compact each layer to the required density using equipment complying with Item 210, "Rolling." Determine the maximum lift thickness based on the ability of the compacting operation and equipment to meet the required density. Do not exceed layer thickness of 16 in. loose or 12 in. compacted material, unless otherwise approved. Maintain a level layer to ensure uniform compaction.

The Engineer will use Tex-114-E to determine the maximum dry density (D_a) and optimum moisture content (W_{opt}). Meet the requirements for field density and moisture content in Table 2, unless otherwise shown on the plans.

Table 2
Field Density Control Requirements

Description	Density ¹	Moisture Content ¹
	Tex-115-E	
$PI \leq 15$	$\geq 98\% D_a$	
$15 < PI \leq 35$	$\geq 98\% D_a$ and $\leq 102\% D_a$	$\geq W_{opt}$
$PI > 35$	$\geq 95\% D_a$ and $\leq 100\% D_a$	$\geq W_{opt}$

Each layer is subject to testing by the Engineer for density and moisture content. During compaction, the moisture content of the soil should not exceed the value shown on the moisture-density curve, above optimum, required to achieve

- 98% dry density for soils with a PI greater than 15 but less than or equal to 35 or
- 95% dry density for soils with PI greater than 35.

When required, remove small areas of the layer to allow for density tests. Replace the removed material and recompact at no additional expense to the Department. Proof-roll in accordance with Item 216, "Proof Rolling," when shown on the plans or as directed. Correct soft spots as directed.

E. Maintenance of Moisture and Reworking. Maintain the density and moisture content once all requirements in Table 2 are met. For soils with a PI greater than 15, maintain the moisture content no lower than 4 percentage points below optimum. Rework the material to obtain the specified compaction when the material loses the required stability, density, moisture, or finish. Alter the compaction methods and procedures on subsequent work to obtain specified density as directed.

F. Acceptance Criteria.

1. Grade Tolerances.

- a. **Staged Construction.** Grade to within 0.1 ft. in the cross-section and 0.1 ft. in 16 ft. measured longitudinally.
- b. **Turnkey Construction.** Grade to within 1/2 in. in the cross-section and 1/2 in. in 16 ft. measured longitudinally.

2. Gradation Tolerances. When gradation requirements are shown on the plans, material is acceptable when not more than 1 of the 5 most recent gradation tests is outside the specified limits on any individual sieve by more than 5 percentage points.

3. Density Tolerances. Compaction work is acceptable when not more than 1 of the 5 most recent density tests is outside the specified density limits, and no test is outside the limits by more than 3 lb. per cubic foot.

4. Plasticity Tolerances. Material is acceptable when not more than 1 of the 5 most recent PI tests is outside the specified limit by no more than 2 points.

132.4. Measurement. Embankment will be measured by the cubic yard. Measurement will be further defined for payment as follows:

A. Final. The cubic yard will be measured in its final position using the average end area method. The volume is computed between the original ground surface or the surface upon which the embankment is to be constructed and the lines, grades, and slopes of the embankment. In areas of salvaged topsoil,

payment for embankment will be made in accordance with Item 160, "Topsoil." Shrinkage or swell factors will not be considered in determining the calculated quantities.

B. Original. The cubic yard will be measured in its original and natural position using the average end area method.

C. Vehicle. The cubic yard will be measured in vehicles at the point of delivery.

When measured by the cubic yard in its final position, 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.

Shrinkage or swell factors are the Contractor's responsibility. When shown on the plans, factors are for informational purposes only.

Measurement of retaining wall backfill in embankment areas is paid for as embankment, unless otherwise shown on plans. Limits of measurement for embankment in retaining wall areas are shown on the plans.

132.5. 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 "Embankment (Final)," "Embankment (Original)," or "Embankment (Vehicle)," of the compaction method and type specified. This price is full compensation for furnishing embankment; hauling; placing, compacting, finishing, and reworking; disposal of waste material; and equipment, labor, tools, and incidentals.

When proof rolling is directed, it will be paid for in accordance with Item 216, "Proof Rolling."

All sprinkling and rolling, except proof rolling, will not be paid for directly, but will be considered subsidiary to this Item, unless otherwise shown on the plans.

Where subgrade is constructed under this contract, correction of soft spots in the subgrade will be at the Contractor's expense. Where subgrade is not constructed under this contract, correction of soft spots in the subgrade will be paid in accordance with Article 9.4, "Payment for Extra Work."

MODIFICATIONS TO ITEM Tx162

SODDING FOR EROSION CONTROL

This modification page modifies, amplifies, or amends the technical specifications and plans. In the event of discrepancy, this modification shall take precedence over the plans and the technical specifications.

Paragraph 100.1 Description

This item shall govern for the placement of block sod as outlined in the Plans and Plan General Notes. Fertilizer and watering required to establish sod shall be subsidiary to this item. Watering shall be needed to supplement natural rainfall to keep the sod moist until grass establishment. The Contractor shall be responsible for adjusting watering rates as directed or approved by the Engineer to take into account actual field and weather conditions.

Paragraph 100.2 Construction

All sod shall be Bermuda block sod unless noted otherwise in the Plans or required by the Owner. All disturbed areas must be sodded.

Paragraph 100.3 Measurement

Block sod will be measured and paid for by the square yard of established sod. Fertilizer and watering required to establish block sod shall be subsidiary to this item. The quantities shown for block sod on the Proposal are theoretical calculations based on the expected soil disturbance from the construction of the proposed grade to the existing topography using typical tie-in slopes per the Plans. In general, this accounts for the area between the new sidewalk and the existing edge of curb or pavement for the entire length of new sidewalk. This Item shall be a plan quantity payment only. No adjustments to these quantities will be made unless otherwise approved by the Engineer.

ITEM 162

SODDING FOR EROSION CONTROL

162.1. Description. Provide and install grass sod as shown on the plans or as directed.

162.2. Materials. Use live, growing grass sod of the type specified on the plans. Use grass sod with a healthy root system and dense matted roots throughout the soil of the sod for a minimum thickness of 1 in. Do not use sod from areas where the grass is thinned out. Keep sod material moist from the time it is dug until it is planted. Grass sod with dried roots is unacceptable.

- A. Block Sod.** Use block sod free from noxious weeds, Johnson grass, other grasses, or any matter deleterious to the growth and subsistence of the sod.
- B. Mulch Sod.** Use mulch sod from an approved source, free from noxious weeds, Johnson grass, other grasses, or any matter deleterious to the growth and subsistence of the sod.
- C. Fertilizer.** Furnish fertilizer in accordance with Article 166.2, "Materials."
- D. Water.** Furnish water in accordance with Article 168.2, "Materials."
- E. Mulch.** Use straw mulch consisting of oat, wheat or rice straw or hay mulch of either Bermudagrass or prairie grasses. Use straw or hay mulch free of Johnson grass and other noxious and foreign materials. Keep the mulch dry and do not use molded or rotted material.
- F. Tacking Methods.** Use a tacking agent applied in accordance with the manufacturer's recommendations or a crimping method on all straw or hay mulch operations. Tacking agents must be approved before use, or may be specified on the plans.

162.3. Construction. Cultivate the area to a depth of 4 in. before placing the sod. Plant the sod specified and mulch, if required, after the area has been completed to lines and grades as shown on the plans. Apply fertilizer uniformly over the entire area in accordance with Article 166.3, "Construction," and water in accordance with Article 168.3, "Construction." Plant between the average date of the last freeze in the spring and 6 weeks prior to the average date for the first freeze in the fall according to the Texas Almanac for the project area.

A. Sodding Types.

- 1. Spot Sodding.** Use only Bermudagrass sod. Create furrows parallel to the roadway, approximately 5 in. deep and on 18-inch centers. Sod a continuous row not less than 3 in. wide in the 2 furrows adjacent to the roadway. Place 3-inch squares of sod on 15-inch centers in the remaining furrows. Place sod so that the root system will be completely covered by the soil. Firm all sides of the sod with the soil without covering the sod with soil.
- 2. Block Sodding.** Place sod blocks over the prepared area. Roll or tamp the sodded area to form a thoroughly compacted, solid mat filling all voids in the sodded area with additional sod. Keep sod along edges of curbs, driveways, walkways, etc., trimmed until acceptance.
- 3. Mulch Sodding.** Mow sod to no shorter than 4 in., and rake and remove cuttings. Disk the sod source in 2 directions, cutting the sod to a minimum of 4 in. Excavate the sod material to a depth of no more than 6 in. Keep excavated material moist or it will be rejected. Distribute the mulch sod uniformly over the area to a depth of 6 in. loose, unless otherwise shown on the plans, and roll with a light roller or other suitable equipment.

Add or reshape the mulch sod to meet the requirements of Section 162.3.B, "Finishing."

- B. Finishing.** Smooth and shape the area after planting to conform to the desired cross sections. Spread any excess soil uniformly over adjacent areas or dispose of the excess soil as directed.

C. Straw or Hay Mulch. Apply straw or hay mulch for "Spot Sodding" and "Mulch Sodding" uniformly over the area as shown on the plans. Apply straw mulch at 2 to 2-1/2 tons per acre. Apply hay mulch at 1-1/2 to 2 tons per acre. Use a tacking method over the mulched area.

162.4. Measurement. "Spot Sodding," "Block Sodding," and "Straw or Hay Mulch" will be measured by the square yard in its final position. "Mulch Sodding" will be measured by the square yard in its final position or by the cubic yard in vehicles as delivered to the planting site.

162.5. 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 "Spot Sodding," "Block Sodding," "Straw or Hay Mulch," or "Mulch Sodding." This price is full compensation for securing a source, excavation, loading, hauling, placing, rolling, finishing, furnishing materials, equipment, labor, tools, supplies, and incidentals. Fertilizer will not be paid for directly but will be subsidiary to this Item.

Unless otherwise specified on the plans, water, except for that used for maintaining and preparing the sod before planting, will be measured and paid for in accordance with Item 168, "Vegetative Watering."

MODIFICATIONS TO ITEM Tx420

CONCRETE STRUCTURES

This modification page modifies, amplifies, or amends the technical specifications and plans. In the event of discrepancy, this modification shall take precedence over the plans and the technical specifications.

Paragraph 100.1 Description

This item shall govern for the installation of concrete structures including, but not limited to, pedestrian bridge abutments.

Paragraph 100.2 Construction

Bridge abutments shall be per the dimensions, type, and reinforcement as indicated in the Plans. All concrete for bridge abutment construction shall be Class C, 3,500 psi minimum.

Paragraph 100.3 Measurement

Bridge abutments shall be measured and paid for per each installed (two per bridge). All excavation, backfill, reinforcing material, labor, and equipment required for complete installation shall be subsidiary to the bridge abutment pay item and shall not be paid for separately.