SECTION 100
MOBILIZATION

100.1 MEASUREMENT: Measurement of the Item, "Mobilization" as specified herein will be by the "Lump Sum", as the work progresses.

100.2 PAYMENT: Partial payments of the "Lump Sum" bid for mobilization will be as follows: (The adjusted contract amount for construction items as used below is defined as the total contract amount less the lump sum bid for Mobilization.)

1) When 1% of the adjusted contract amount for construction items is earned, 50% of the mobilization lump sum bid will be paid.

2) When 10% of the adjusted contract amount for construction items is earned, 90% of the mobilization lump sum bid will be paid. Previous payments under this item will be deducted from the above amount.

3) Upon completion of all work under this contract, payment for the remainder of the lump sum bid for "Mobilization" will be made.

SECTION 101
PREPARING RIGHT-OF-WAY

This item shall govern preparing the right-of-way and work areas for construction operations by removing and disposing of all obstructions from the right-of-way, designated easements, and other work areas where removal of such obstructions is not otherwise provided for in the plans and specifications.

Such obstructions shall be considered to include, but not limited to, remains of houses not completely removed by others, foundations, floor slabs, concrete, brick, lumber, plaster, cisterns, septic tanks, basements, abandoned utility pipes or conduits, equipment or other foundations, fences, retaining walls, outhouses, shacks, and all other debris as well as buried concrete slabs, curbs, driveways, and sidewalks.

This item shall also include the removal of trees, stumps, bushes, shrubs, brush, roots, vegetation, logs, rubbish, paved parking areas, miscellaneous stone, brick, drainage structures, manholes, inlets, abandoned railroad tracks, scrap iron and all debris, whether above or below ground, except live utility facilities.

This item shall not govern for the demolition of buildings by the use of explosives. Such demolition work shall be governed by the use of a special specification controlling the work.

It is the intent of this specification to provide for the removal and disposal of all obstructions to the new construction together with other objectionable materials not specifically provided for elsewhere by the plans and specifications.

Unless shown otherwise on the plans, all fences along the right-of-way and in the clear zone which are damaged or removed temporarily by the Contractor shall be replaced by the Contractor to an equal or better condition at no additional cost to the City.

If the Contractor encounters hazardous substances, industrial waste, environmental damage, underground storage tanks, or conditions conducive to environmental damage, Contractor shall immediately stop work in the area affected and report the condition to the Owner's representative in writing. Contractor shall not be responsible for or required to conduct any investigation, site monitoring, containment, cleanup, removal, restoration or other remedial work of any kind or nature (the "remedial work") under any applicable level, state or federal law, regulation or ordinance, or any judicial order. If the Contractor agrees in writing to commence and/or prosecute some or all of the remedial work, all costs and expenses, to include any extension of the contract time, of such remedial work shall be paid by Owner to Contractor as additional compensation.

Subsidiary Items include 508 and the removal and replacement of stone walls.

CONSTRUCTION METHODS: Areas designated on the plans shall be cleared of all obstructions, vegetation, abandoned structures, etc., as defined above, except trees or shrubs specifically designated by the Engineer for preservation. Trees and shrubs designated for preservation shall be carefully trimmed as directed and shall be protected from scarring, barking, or other injuries during construction operations. Exposed ends of pruned limbs shall be treated with an approved pruning material.

Unless otherwise indicated on the plans, all underground obstructions shall be removed to the following depths:

1.) In areas to receive embankment, 2 feet [610 mm] below natural ground.
2.) In areas to be excavated, 2 feet [610 mm] below the lowest elevation of the excavation.

3.) All other areas, 2 feet [610 mm] below natural ground.

Holes remaining after removal of all obstructions, objectionable materials, vegetation, etc. shall be backfilled and tamped as directed by the Inspector, and the entire area bladed to prevent ponding of water and to provide drainage. In areas that are to be immediately excavated, backfilling and blading may be eliminated if approved by the Inspector. Areas to be used as borrow sites and material sources shall have all obstructions, objectionable materials, vegetation, etc., removed to the complete extent necessary to prevent such objectionable matter from becoming mixed with the material to be used in the construction.

Where a conduit is shown to be replaced, it shall be removed in its entirety and all connections to the existing conduit shall be extended to the new line. Where an existing conduit is to be cut and plugged, the line shall be cut back not less that 2 feet [610 mm] and a plug of concrete not less that 2 feet [610 mm] long shall be poured and held in the end of the pipe or the plug may be accomplished by using a precast stopper grouted into place.

MEASUREMENT: "Preparing Right-of-Way" for new construction will be measured by the lump sum.

PAYMENT: This item will be paid for at the contract lump sum price bid for "Preparing Right-of-Way" , which price shall be full compensation for work herein specified, including the furnishing of all materials, equipment, tools, labor, and incidentals necessary to complete the work. The lump sum price will be pro-rated based on the number of phases in the project. A phase will be eligible for payment when street excavation is completed for that phase.

SECTION 103
REMOVE CONCRETE

This item shall govern the breaking up, removing, and satisfactorily disposing of existing concrete, as classified, at locations shown on the plans or as directed by the Engineer. Existing concrete not shown on the plans, located beneath the natural ground surface, not indicated by the Engineer or not obvious to the naked eye will not be covered under this item. Such materials will be removed as needed and paid for under Item 104 "Street Excavation", Item 105 "Channel Excavation", or Item 306 "Structural Excavation".

CONSTRUCTION METHODS: The existing concrete shall be broken up, removed, and disposed of by the Contractor.

When only a portion of the existing concrete is to be removed, care shall be exercised to avoid damage to that portion to remain in place. The existing concrete shall be cut to neat lines shown on the plans or as established by the Engineer, by sawing to a minimum depth of ½ inch [13 mm]. Any existing concrete which is damaged or destroyed beyond the neat lines so established shall be replaced at the Contractor's expense.

Where reinforcement is encountered in the removed portions of the concrete, a minimum of 1-foot [305 mm] shall be cleaned of all old concrete and left in place to tie into the new concrete construction.

MEASUREMENT: These items will not be measured.

PAYMENT: This item will be paid for at the contract unit price bid for "Remove Concrete, Excavation and Backfill", which price shall be full compensation for all work herein specified, including the furnishing of all materials, equipment, tools, labor, and incidentals necessary to complete the work.

SECTION 104
STREET EXCAVATION

104.1 DESCRIPTION: The work covered by this section consists of excavating and properly utilizing or otherwise satisfactorily disposing of all excavated material, of whatever character, within the limits of the work and the constructing, compacting, and shaping, and finishing of all earthwork on the entire length of the street and approaches to same in accordance with specification requirements herein outlined and in conformity with the required lines, grades, and typical cross sections, shown on the plans or directed by the Engineer. Remove abandoned waterline if it is exposed or within 6 inches of the surface.

104.2 CLASSIFICATION: All excavation shall be unclassified, and shall include all materials encountered regardless of their nature or the manner in which they are removed, except those covered by pay items of this contract.

104.3 CONSTRUCTION METHODS: The subgrade shall be shaped in conformity with the typical sections shown so the plans and to the lines and grades established by the Engineer by the removal of existing material or addition of approved material. All unstable or otherwise objectionable material shall be removed from the subgrade and replaced with approved material. All holes, ruts, and depressions shall be filled with approved material. The surface of the subgrade shall be finished to the lines and grades established, and be in conformity with the typical sections shown on the plans. Any deviations in excess of one-half (1/2) inch in cross section and in a length of sixteen (16) feet measured longitudinally shall be corrected by loosening, adding, or removing material, reshaping and compacting by sprinkling and rolling. Sufficient subgrade shall be prepared in advance to insure satisfactory prosecution of the work.

Material removed may be utilized in the addition of material to the subgrade if approved by the Inspector. All other material required for completion of the subgrade shall also be subject to approval by the Inspector.

Subgrade shall be compacted to at least 90 percent of the maximum dry density. The moisture content should be between optimum and four (4) percentage points above optimum moisture immediately prior to placement of the base or next pavement layer. The moisture must be maintained in the subgrade until placement of the base or next pavement layer. The Owner or Engineer may request additional testing of the subgrade if it appears that the density and/or moisture content does not meet specification requirements.

Moisture density relationships shall be developed in sufficient quantity to accurately test and evaluate the subgrade. Atterburg limit test (liquid limit, plastic limit and plasticity index) shall be performed and reported for all moisture-density relationships.

Unsuitable excavation or excavation in excess of that needed for construction shall be known as "Waste" and shall become the property of the Contractor and it shall become his sole responsibility to dispose of this material off the limits of the right-of-way.

104.4 TESTING: Test subgrade for density-moisture relationship in accordance with ASTM D 698. A separate test will be performed for each type of subgrade material used and at a minimum frequency of 1 test per 5000 square yards of subgrade. Tests for density will be made within 45 hours after compacting operations are completed. If material fails to meet density specified, it will be reworked as necessary to obtain the density required.

Prior to placing any base materials, compaction and moisture content of the top 3 inches of compacted subgrade will be tested in accordance with ASTM D 2922 for every 500 square yards of subgrade material placed. If testing shows the moisture content to be below the optimum or more than 4% above the optimum, the course shall be reworked as necessary to obtain specified compaction and moisture content.

104.5 MEASUREMENT AND PAYMENT: Street Excavation will not be measured for payment. The work performed, materials furnished, and all labor, tools, equipment, and incidentals necessary to complete the work under

this item will not be paid for directly, but will be included in the applicable contract price for the item to which the work pertains.

SECTION 106
EXCAVATION AND BACKFILLING

DESCRIPTION: This item shall govern the excavation for placing of storm drainage box culverts, ramps, and channels whether cast-in-place or precast, within the limits shown on the plans, regardless of the type of material encountered; removing and properly utilizing or otherwise satisfactorily disposing of all excavated materials; and the constructing, shaping, backfilling and finishing of all earthwork involved in conformity with the required lines, grades and cross sections, and in accordance with the plans and specification requirements herein outlined. This item does not apply to excavation of pipe storm sewers or pipe sanitary sewers as excavation for those types of construction are governed by the conditions set forth in their respective specification requirements. Excavation required for other small drainage structures such as manholes, inlets, junction boxes and outfall structures shall be governed and paid for under Item 306, "Structural Excavation".

CLASSIFICATION: All subject excavation will be unclassified, and shall include all materials encountered regardless of their nature or the manner in which they are removed. If the Contractor encounters hazardous substances, industrial waste, environmental damage, underground storage tanks, or conditions conducive to environmental damage, Contractor shall immediately stop work in the area affected and report the condition to the Owner's representative in writing. Contractor shall not be responsible for or required to conduct any investigation, site monitoring, containment, cleanup, removal, restoration or other remedial work of any kind or nature (the "remedial work") under any applicable level, state or federal law, regulation or ordinance, or any judicial order. If the Contractor agrees in writing to commence and/or prosecute some or all of the remedial work, all costs and expenses, to include any extension of the contract time, of such remedial work shall be paid by Owner to Contractor as additional compensation. All asphaltic material shall be disposed of or recycled at a facility authorized to accept the material for such purposes.

CONSTRUCTION METHODS: All subject excavation shall be performed as specified herein and shall conform to the established alignment, grades and cross sections or other limits indicated in the plans. Suitable excavated materials shall be utilized, insofar as practicable, in backfilling around the box culvert, or other drainage structures or in constructing required embankments, if applicable. Unsuitable materials below footing grade shall be removed and replaced with "Gravel Subgrade Filler", Item 410. Excavated materials which are unsuitable for embankments or backfilling, or excavation in excess of that needed for construction shall become the property of the Contractor and it shall become his sole responsibility to properly dispose of this material outside the limits of the project. Backfilling to the top of the box culvert or wall (initial backfill) shall be done by the methods shown on the plans. Backfilling from the top of the culvert to the top of the trench, or proposed subgrade elevation, shall be done in accordance with Item 400, "Backfill". Backfill behind walls shall not begin until the concrete has attained a compressive strength of 2000 psi [15 MPa]. Backfill on top of supporting slabs shall not begin until the concrete has attained a compressive strength of 3000 psi [20 MPa].

(a) Material for backfill shall be placed in uniform layers not more than 9 inches [305 mm] in depth (loose measurement) and shall be compacted to the density specified herein. Each layer of backfill material, if dry, shall be wetted uniformly to the moisture content required to obtain the specified density and shall be compacted to the required density, by means of a mechanical tamper. All compaction shall be such that the apparent dry density of each layer shall be not less than 95% of the maximum dry density as determined by tests on samples as outlined in TXDOT Method Tex 113-E, unless otherwise shown on the plans.

(b) A gravel approved by the Engineer, may be used for backfill material from the bottom of the trench to the top of the conduit. The gravel shall be placed in the trench and lightly tamped to consolidate and seat the mass against conduit and earthen surfaces. A filter fabric shall be placed between the gravel backfill (initial backfill) and secondary backfill. The filter material shall have an apparent opening size of U.S. Sieve No. 40.

MEASUREMENT: This item will not be measured.

PAYMENT: Payment for this item shall be included in the contract unit price bid for "Transport & Install Precast 10’ x 4’ Concrete Box Culvert, Including Excavation and Backfill". Replacement of unsuitable material with gravel subgrade will be paid for under Item 410. Price bid shall be full compensation for all work herein specified, including excavating all material, backfilling, compacting, furnishing all materials, equipment, tools, labor, and incidentals necessary to complete the work.

TECHNICAL PROVISIONS
SECTION 108
LIME TREATED SUBGRADE

108.1.DESCRIPTION: *Treat the subgrade by pulverizing, adding lime, mixing, and compacting to the required density. This item applies to both natural ground and embankment subgrade and shall be constructed as specified herein and in conformance with the typical sections, lines and grades as shown on the plans or as established by the Engineer. The high plasticity clay subgrade should be stabilized to the specified thickness with lime by dry weight in accordance with TXDOT 1993 Standard Specifications Item 260, Lime Treatment for Materials used as Subgrade. The quantity of lime required should be determined after the site is stripped of loose soil and the subgrade soils are exposed. We anticipate that approximately* ***6*** *to* ***10*** *percent lime will be required depending upon the material encountered.* ***Assume 7 percent lime for the purposes of bidding.*** *However, for construction the actual quantity of lime shall be sufficient to:*

1. result in a pH of at least ***12.4*** *when tested in accordance with ASTM* ***C977,*** *Appendix XI; and*
2. reduce the PI of the clay subgrade to less than ***20.***

For the purposes of lime stabilization, the dry weight of the high plasticity clay soils may be taken as 100 pounds per cubic foot (pcf). The amount of lime required may vary over the site. The limed soil should be compacted to at least 95 percent of the standard Proctor maximum dry density as evaluated by ASTM D698 at moisture contents ranging from optimum to plus four (+4) percentage points of optimum moisture content. Compaction tests should be performed as outlined in the Quality Control section in the soil report. Get testing and recommendation from independent testing lab required in the General Notes.

108.2.MATERIALS: Lime for this item shall conform to the requirements of TxDOT Item No. 260,"Lime Treatment – Road Mixed" of the Texas Department of Transportation Standard Specifications (Latest Edition). Acceptable forms of lime shall be:

•"Type A, Hydrated Lime,"

•"Type B, Commercial Lime Slurry," or

•"Type C, Quicklime."

The Contractor shall select, prior to construction, the grade to be used and shall notify the Engineer in writing before changing from one grade to another. Lime shall be placed in slurry form only, unless written permission is granted by the Engineer and a safety and containment plan is submitted to the Engineer by the Contractor seven days prior to use. In circumstances where it would be beneficial to utilize lime for "drying" subgrade materials to expedite construction, the Contractor may request approval from the Engineer to use pelletized lime.

Provide materials in conformance with the following Items and requirements:

A.Lime. TxDOT DMS-6350 "Lime and Lime Slurry."

B.Mix Design. The Engineer will determine the target lime content and optimum moisture content in accordance with TxDOT Tex -121-E.

108.3.EQUIPMENT: The machinery, tools and equipment necessary for proper prosecution of the work shall be on the project and approved by the Engineer prior to the beginning of construction operations. All machinery, tools and equipment used shall be maintained in a satisfactory and workmanlike manner.

When lime is furnished in trucks, the weight of lime shall be determined on certified scales and delivered to

the job site with exit ports sealed at the plant.

108.4.CONSTRUCTION:

A. General. The completed course shall be uniformly treated, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and shall have a smooth surface.

B. Preparation of Subgrade or Existing Base. Prior to treating existing material, it shall be shaped to conform to the typical sections, as shown on the plans.

Before pulverizing or scarifying an existing material, when directed by the Engineer, the Contractor shall proof roll the roadbed in accordance with TxDOT Item 216, "Proof Rolling."

Soft spots shall be corrected as directed by the Engineer. When the Contractor elects to use a cutting and pulverizing machine that will process the material to the plan depth, the Contractor will not be required to excavate to the secondary grade or windrow the material. This method will be permitted only if a machine is provided which will insure that the material is cut uniformly to the proper depth and which has cutters that will plane the secondary grade to a uniform surface over the entire width of the cut. The machine shall provide a visible indication of the depth of cut at all times.

In lieu of using the cutting and pulverizing machine, the Contractor shall excavate and windrow the material to expose the secondary grade to the typical sections, lines and grades as shown on the plans or as established by the Engineer.

C. Pulverization. The existing pavement or base material shall be pulverized or scarified so that100 % shall pass the 2-½ inch sieve.

D. Application. The percentage by weight or pounds per square yard of lime to be added will be as shown on the plans and may be varied by the Engineer if conditions warrant.

Lime shall be spread only on that area where the mixing operations can be completed during the same working day.

Unless otherwise approved by the Engineer, the lime operation shall not be started when the air temperature is below 40ºF and falling, but may be started when the air temperature is above 35ºF and rising. The temperature will be taken in the shade and away from artificial heat. Lime shall not be placed when weather conditions in the opinion of the Engineer are unsuitable.

The application and mixing of lime with the material shall be accomplished by the methods herein described as "Slurry Placing." "Dry Placing" is not allowed unless approved by the Engineer as described in Section 108.2, "Materials." Type A, Hydrated Lime shall be applied by "Slurry Placing" unless otherwise shown on the plans or approved by the Engineer. Type Commercial Lime Slurry shall be applied by "Slurry Placing." Type C Quicklime shall be applied by "Slurry Placing" only. "Dry Placing" will not be allowed unless approved by the Engineer. When Type C Quicklime isused for dry placement, it shall be Grade "DS." When Type C Quicklime is used for slurry placement, it shall be either Grade "DS"or Grade "S."Grade "S" shall be used in slurry placement only.

CAUTION: Use of quicklime can be dangerous. Users should be informed of the recommended precautions in handling, storage and use of quicklime.

1.Slurry Placing. When Type A Hydrated Lime is specified and slurry placement is to be used, the Type A Hydrated Lime shall be mixed with water to form a slurry with a solids content approved by the Engineer.

Type B Commercial Lime Slurry shall be delivered to the project in slurry format or above the

minimum dry solids content approved by the Engineer. The distribution of lime at the rate(s) shown on the plans or approved by the Engineer shall be attained by successive passes over a measured section of roadway until the proper lime content has been secured.

When Type C Quicklime is applied as slurry, the amount of dry quicklime shall be 80percent of the amount shown on the plans. The slurry shall contain at least the minimum

dry solids content approved by the Engineer. The residue from the slurrying procedure shall be spread uniformly over the length of the roadway currently being processed unless otherwise approved by the Engineer. This residue is primarily inert material with little stabilizing value, but may contain a small amount of quicklime particles that slake slowly. A concentration of these particles could cause the compacted stabilized material to swell during slaking.

Slurry shall be of such consistency that it can be applied uniformly without difficulty.

When the distributor truck is not equipped with an agitator, the Contractor shall have a standby pump available on the project for agitating the lime and water as required by the Engineer in case of undue delays in dispersing the slurry.

2.Dry Placing. Dry placing is not allowed unless approved by the Engineer as described in Section 108.2, "Materials." If allowed, the lime shall be distributed by an approved spreader at the rate shown on the plans or as directed by the Engineer. The lime shall be distributed at a uniform rate and in such a manner as to reduce the scattering of lime by the wind. The material shall be sprinkled as approved by the Inspector.

E. Mixing. The mixing procedure shall be the same for "Slurry Placing" or "Dry Placing" as herein described.

Begin Mixing within 6 hours of lime application. During the interval between application and mixing, hydrated lime that has been exposed to the open air for a period of six (6) hours or more or to excessive loss due to washing or blowing will not be accepted for payment.

1.Initial Mixing. The material and lime shall be thoroughly mixed. The material and lime shall be brought to the proper moisture content and left to mellow for 1 to 4 days. When pebble grade quicklime is used, allow the mixture to mellow for 2 to 4 days as approved by the Engineer.

In addition to the above, when Type C Quicklime, Grade "DS," is approved for use by the Engineer under "Dry Placing," the material and lime shall be mixed as thoroughly as possible at the time of the lime application. Sufficient moisture shall be added during the mixing to hydrate the quicklime.

During the mellowing period, the material shall be kept moist as directed by the Inspector.

When shown on the plans or approved by the Engineer, the pulverization requirement may be waived when the material contains a substantial quantity of aggregate.

2.Final Mixing. After the required mellowing time, the material shall be uniformly mixed by approved methods. If the soil binder-lime mixture contains clods, they shall be reduced in size by the use of approved pulverization methods.

Following mixing, a sample of the material at roadway moisture will be obtained for pulverization testing. All non-slaking aggregates retained on the ¾ inch sieve will be removed from the sample. The remainder of the material shall meet the followingpulverization requirement when tested by TXDOT Test Method Tex-101-E, Part III:

Minimum passing 1 ¾" sieve 100

Minimum passing ¾" sieve 85

Minimum passing No. 4 sieve 60

F. Compaction. Prior to compaction, the material shall be aerated or sprinkled as necessary to provide the optimum moisture. Compaction of the mixture shall begin immediately after final mixing and in no case more than 24 hours after final mixing.

Compaction shall continue until the entire depth of the mixture is uniformly compacted. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion shall be smooth and in conformity with the typical sections, lines and grades as shown on the plans or as established by the Engineer.

1.Ordinary Compaction. Roll with approved compaction equipment, as directed. Correct irregularities, depressions, and weak spots immediately by scarifying the areas affected, adding or removing treated material as required, reshaping, and recompacting.

2.Density Control. Each course shall be sprinkled as required and compacted to the extent necessary to provide not less than 95 percent of the optimum density. Unless otherwise shown on the plans, the Engineer will determine roadway density of completed sections in accordance with TxDOT Test Method Tex-115-E. The Engineer may accept the section if no more than 1 of the 5 most recent density tests is below the specified density and the failing test is no more than 3 pcf below the specified density.

When the material fails to meet the density requirements, or should the material lose the required stability, density or finish before the next course is placed, or the project is accepted ,it shall be reworked as specified below.

G. Reworking a Section. When a section is reworked within 72 hours after completion of compaction, the Contractor shall rework the section to provide the required compaction. When a section is reworked more than 72 hours after completion of compaction, the Contractor shall add 25 percent of the specified rate of lime. Reworking shall include loosening, road mixing as approved by the Engineer, compacting, and finishing. When a section is reworked, a new optimum density will be determined from the reworked material in accordance with TXDOT Test Method Tex-121-E, part II and shall compact in-place to a minimum of 95% of this density.

H. Finishing. Immediately after completing compaction, clip, skin, or tight-blade the surface of the lime treated material with a maintainer or subgrade trimmer to a depth of approximately¼-inch. Remove loosened material and dispose of it at an approved location. Roll the clipped surface immediately with a pneumatic-tire roller until a smooth surface is attained. Add small increments of water as needed during rolling. Shape and maintain the course and surface in conformity with the typical sections, lines and grades shown on the plans or as directed.

Finish grade of constructed subgrade in accordance with the following grade tolerances

1.Staged Construction. Grade to within 0.1-foot in the cross-section and 0.1-foot in 16-feet measured longitudinally.

2.Turnkey Construction. Grade to within ½-inch in the cross-section and ½-inch in 16-feet measured longitudinally.

Do not surface patch.

I. Curing. After the final layer or course of the lime treated material has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections.

The completed section shall then be finished by rolling with a pneumatic tire or other suitable roller. The completed section shall be moist cured or prevented from drying by addition of an asphalt material at the rate of 0.05 to 0.20 gallons per square yard. Curing shall continue for 2 to 5 days before further courses are added or traffic is permitted, unless otherwise approved by the Engineer.

However, the lime treated material may be covered by other courses, the day following finishing, when approved by the Engineer. When the plans provide for the treated material to be covered by other courses of material, the next course shall be applied within 14 calendar days after final compaction is completed, unless otherwise approved by the Engineer.

108.5.MEASUREMENT: When Lime is furnished in trucks, the weight of lime will be determined on certified scales, or the Contractor must provide a set of standard platform scales at a location approved by the Engineer. Scales must conform to the requirements of TxDOT Standard Specification Item 520, "Weighing and Measuring Equipment."

A.Hydrated Lime.

1.Dry. Lime will be measured by the ton (Dry Weight).

2.Slurry. Lime slurry will be measured by the ton (dry weight) of the hydrated lime used toprepare the slurry at the site.

3.Commercial Lime Slurry. Lime slurry will be measured by the ton (dry weight) as calculated from the minimum percent dry solids content of the slurry, multiplied by the weight of the slurryin tons delivered.

B.Quicklime.

1.Dry. Lime will be measured by the ton (dry weight) of the quicklime.

2.Slurry. Lime slurry will be measured by the ton (dry weight) of the quicklime used to prepare the slurry multiplied by a conversion factor of 1.28 to give the quantity of equivalent hydrated lime, which will be the basis of the payment

108.6.PAYMENT: "Lime Treatment for Subgrade" will be paid for at the contract unit price bid per square yard, which price shall be full compensation for all correction of secondary subgrade, for loosening, mixing, pulverizing, spreading, drying, application of lime, water content of the slurry, shaping and maintaining, for all sprinkling and rolling, for all manipulations required, for all hauling and freight involved, for all tools, equipment, labor and incidentals necessary to complete the work including furnishing all lime.

TECHNICAL PROVISIONS
SECTION 113
MOISTURE CONDITIONED SUBGRADE

Description: Moisture conditioned subgrade shall consist of compacting subgrade material at its optimum moisture content for the construction of roadways or other improvements.

Materials: Shall consist of competent native material.

Construction Methods: Native material shall be dry scarified to a minimum depth of six inches and compacted to 95% of the maximum dry density according to ASTM D-698 and tested by ASTM D-2922 (nuclear method). Test moisture and density at intervals at no more than 100 feet.

Measurement and Payment: Moisture conditioned subgrade will be measured in square yards for the depth shown on plans and shall include materials, labor, tools, equipment, and incidentals necessary to complete the work under this item.

SECTION 200
FLEXIBLE BASE

DESCRIPTION: This item shall govern for a foundation course for surfacing, pavement, or other base courses composed of crushed stone, and constructed as herein specified in one or more courses in conformity with the typical sections shown on the plans and to the lines and grades as established by the Engineer.

MATERIAL: The material shall be crushed as necessary to meet the requirements hereinafter specified, and shall consist of durable stone crushed and/or screened to the required particle size, with or without other approved fine sized material. The material shall be from approved sources.

Testing of flexible base materials shall be in accordance with the following TXDOT standard laboratory test procedures:

Preparation for Soil

Constants and Sieve Analysis	Tex-101-E
Liquid Limit	Tex-104-E
Plastic Limit	Tex-105-E
Plasticity Index	Tex-106-E
Linear Shrinkage	Tex-107-E
Sieve Analysis	Tex-110-E
Los Angeles Abrasion	ASTM C131 (Grad. A)

Samples for testing the material shall be taken prior to the compaction operations.

The material shall be well graded and when properly tested, shall meet the following requirements:

Retained on 1-3/4 inch sieve	0%
Retained on No. 4 sieve	45 to 75%
Retained on No. 40 sieve	60 to 85%

The material passing the No. 40 sieve shall be known as Soil Binder and shall meet the following requirements:

Liquid Limit shall not exceed	40
Plasticity Index shall not exceed	12

The crushed stone shall have an abrasion of not more than forty (40) when subjected to the Los Angeles Abrasion Test.

CONSTRUCTION METHODS: The flexible base material shall be placed on the approved subgrade in courses not to exceed 4-inches compacted depth. It shall be the responsibility of the Contractor that the required amount of material be delivered and uniformly spread and shaped. All material shall be moved from the place where it is dumped by cutting into windrows. After the material has been cut into windrows, it shall be sprinkled, spread, shaped, and rolled in proper sequence to prevent segregation and as necessary for required compaction.

The surface upon completion shall be smooth and in conformity with typical sections and to the established lines and grades. Any deviation in excess of 1/4-inch in cross section and in length of 16-feet measured longitudinally shall be corrected. All irregularities, depressions, or weak spots which develop shall be corrected.

Flexible base shall be compacted to an apparent dry density of not less than 95 percent of the maximum dry density as determined in accordance with TXDOT Test Method Tex 113-E. Tests for density will be made within 24 hours after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to meet the density required. Just prior to the placing of any succeeding course of flexible base or surfacing on a previously completed course, the density and moisture of the top 3-inches of flexible base shall be checked and if test show the density to be more than 2 percent below the specified minimum or the moisture content to be more than 3 percent above or below the optimum, the course shall be reworked as necessary to obtain the specified compaction and moisture content.

MEASUREMENT: "Flexible Base" will be measured by the square yard, complete in place, for the thickness specified on the plans, or by the cubic yard, complete in place as indicated in the proposal.

PAYMENT: This item will be paid for at the contract unit price bid for "Flexible Base" which price shall be full compensation for all work herein specified, including the furnishing, hauling, and placing of all materials, for all water required, and for all equipment, tools, labor, and incidentals necessary to complete the work.

SECTION 202
PRIME COAT

DESCRIPTION: This item shall govern for the application of asphaltic material on the completed base course and/or other approved areas in accordance with these specifications as and directed by the inspector.

MATERIALS: The asphaltic material for Prime Coat shall meet the requirements for Cut-Back Asphalt, "MC-30", Emulsified Asphalt "EA-11M" or "EA-10S', or other asphalts or emulsions as shown on the plans, or as directed, or approved, by the Engineer. Asphalts and Emulsions shall conform to the requirements of Item 300, "Asphalts, Oils and Emulsions' of the Standard Specifications of the Texas Department of Transportation. Where Emulsified Asphalts are used, the amount of emulsified asphalt as a percentage by volume of the total mixture shall be within the limits shown on the plans, or shall be of a percentage as directed by the Engineer.

CONSTRUCTION METHODS: When, in the opinion of the inspector, the area and/or base is satisfactory to receive the prime coat, the surface shall be cleaned by sweeping with a vacuum sweeper or other approved methods as directed by the Inspector. If directed by the Inspector, the surface shall be lightly sprinkled with water just prior to application of the asphaltic material. The asphaltic material shall be applied on the clean surface by an approved type of self-propelled pressure distributor so operated as to distribute the prime coat at a rate not to exceed 0.20 gallon per square yard of surface, evenly and smoothly, under a pressure necessary for proper distribution. During the application of prime coat, care shall be taken to prevent splattering of adjacent pavement, curb and gutters or structures.

Prime Coat shall not be applied when the air temperature is below 60 ^{O}F and falling, but it may be applied when the air temperature is above 50 ^{O}F and is rising; the air temperature being taken in the shade and away from artificial heat. Asphaltic material shall not be placed when general weather conditions, in the opinion of the Inspector, are not suitable.

MEASUREMENT: The asphaltic material for prime coat will be measured at the point of delivery on the project in gallons at the applied temperature. The quantity to be paid for shall be the number of gallons of asphaltic material used, as directed, in the accepted prime coat to the pay limits as shown on the plans. When emulsions are used, only that percentage of emulsified asphalt as a percentage by volume of the total mixture shall be paid for by the gallon of asphaltic material used in the accepted prime coat. Water used will not be measured for payment.

PAYMENT: The work performed and materials furnished as prescribed by this item will be paid for at the contract unit price bid per gallon for "Prime Coat", which price shall be full compensation for cleaning the area and/or base; for furnishing, heating, hauling and distributing the prime coat as specified; for all freight involved, and for all manipulations, labor, tools, equipment, and incidentals necessary to complete the work.

SECTION 203
TACK COAT

DESCRIPTION: This item shall govern for the application of asphaltic material on the completed base course after the prime coat has sufficiently cured, and in other locations as indicated on the plans in accordance with these specifications and as directed by the Inspector.

MATERIALS: The asphaltic material used for Tack Coat shall meet the requirements for 'Asphalt Cement", "Cut-Back Asphalt" or "Emulsified Asphalt" in Item No. 300, "Asphalts, Oils and Emulsions" of the Texas Department of Transportation Standard Specifications. The asphaltic material used for Tack Coat shall be that type or grade shown on the plans, or shall be as directed, or approved, by the Engineer.

CONSTRUCTION METHODS: Before the tack coat is applied, the surface shall be cleaned thoroughly with by Owner's street vacuum sweeper to the satisfaction of the Inspector. The asphaltic material shall be applied on the clean surface by an approved type of self-propelled pressure distributor, so operated as to distribute the tack coat at a rate not to exceed 0.10 gallon per square yard of surface, evenly and smoothly under a pressure necessary for proper distribution. Where the pavement mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be eliminated by the Inspector. All contact surfaces of curbs and structures and all joints shall be painted with a thin uniform coat of the asphaltic material used for tack coat. During the application of tack coat, care shall be taken to prevent splattering of adjacent pavement, curb and gutters or structures.

MEASUREMENT: The asphaltic material for tack coat will be measured at point of delivery on the project in gallons at the applied temperature. The quantity to be paid for shall be the number of gallons of asphaltic material used, as directed, in the accepted tack coat. Water used with Emulsions will not be measured for payment.

PAYMENT: The work performed and materials furnished as prescribed by this item is incidental to other items. The contract unit prices for other items will include the cost for "Tack Coat" and shall be full compensation for cleaning the surface, for furnishing, heating, hauling and distributing the tack coat as specified; for all freight involved; and for all manipulations, labor, tools, equipment, and incidentals necessary to complete the work.

SECTION 205
HOT MIX ASPHALTIC CONCRETE PAVEMENT

DESCRIPTION: This item shall govern for the installation of a base course, a leveling-up course, a surface course or any combination of these courses as shown on the plans, each to be composed of a compacted mixture of mineral aggregate and asphaltic material. The pavement shall be constructed on the previously completed and approved subgrade, base, as herein specified and in accordance with the details shown on the plans.

MATERIALS: Materials used in Hot Mix Asphaltic Concrete Pavement shall meet the requirements as set forth in Item 340, "Hot Mix Asphaltic Concrete Pavement" of the Texas Department of Transportation Standard Specifications.

PAVING MIXTURES: Paving mixtures used shall be Types B, C, or D as shown an the plans. The paving mixtures shall consist of a uniform mixture of aggregate, hot asphalt cement, and additives if allowed or required. The mix shall be designed in accordance with TXDOT Construction Bulletin C-14 and Test Method Tex-204-F. The mixture shall be designed to produce an acceptable mixture at an optimum density of 96.0 percent, when tested in accordance with Test Method Tex-207-F and Test Method Tex-227-F. The operating range for control of laboratory density during production shall be optimum density plus or minus 1.5 percent. The materials used in the mixture design shall produce a mixture with a stability value of at least 35, unless otherwise shown on the plans, when tested in accordance with Test Method Tex-208-F.

EQUIPMENT:

(1) General: All equipment for the handling of all materials, mixing, placing and compacting of the mixture shall be maintained in good repair and operating condition and subject to the approval of the Engineer. Any equipment found to be defective and potentially having a negative effect on the quality of the paving mixture or ride quality will not be allowed.

(2) Spreading and Finishing Machine. The spreading and finishing machine shall be approved by the Engineer and shall meet the requirements indicated below.

(a) Screed Unit. The spreading and finishing machine shall be equipped with a heated compacting screed. It shall produce a finished surface meeting the requirements of the typical cross sections and the surface test.

Extensions added to the screed shall be provided with the same compacting action and heating capability as the main screed unit, except for use on variable depth tapered areas and/or as approved by the Engineer.

The spreading and finishing machine shall be equipped with an approved automatic dual longitudinal screed control system and automatic transverse screed control system. The longitudinal controls shall be capable of operating from any longitudinal grade reference including a string line, ski, mobile string line, or matching shoe.

The Contractor shall furnish all equipment required for grade reference. It shall be maintained in good operating condition by personnel trained in the use of this type of equipment.

The grade reference used by the Contractor may be of any type approved by the Engineer. The contractor shall set the grade reference to have sufficient support so that the maximum deflection shall not exceed 1/16 inch between supports.

(b) Tractor Unit. The tractor unit shall be equipped with a hydraulic hitch sufficient in design and capacity to maintain contact between the rear wheels of the hauling equipment and the pusher rollers of the finishing machine while the mixture is being unloaded.

No portion of the weight of hauling equipment, other than the connection, shall be supported by the asphalt paver. No vibrations or other motions of the loading equipment, which could have a detrimental effect on the riding quality of the completed pavement, shall be transmitted to the paver.

The use of any vehicle which requires dumping directly into the finishing machine and which the finishing machine cannot push or propel to obtain the desired lines and grades without resorting to hand finishing will not be allowed.

(3) Material Transfer Equipment. Equipment to transfer mixture from the hauling units or the roadbed to the spreading and finishing machine will be allowed unless otherwise shown on the plans. A specific type of material transfer equipment shall be required when shown on the plans.

(4) Motor Grader. The motor grader, when used, shall be a self-propelled motor grader and shall be equipped with smooth tread pneumatic tired wheels unless otherwise directed. It shall have a blade length of not less than 12 feet and a wheelbase of not less than 16 feet.

(5) Rollers. Rollers provided shall meet the requirements for their type as follows:

(a) Pneumatic-Tire Roller. The roller shall be an acceptable medium pneumatic tire roller. Pneumatic-tire rollers used for compaction shall provide a minimum 80 psi ground contact pressure. When used for kneading and sealing the surface only, they shall provide a minimum of 55 psi ground contact pressure.

(b) Two-Axle Tandem Roller. This roller shall be an acceptable self-propelled tandem roller weighing not less than 8 tons.

(c) Three-Wheel Roller. This roller shall be an acceptable self-propelled three wheel roller weighing not less than 10 tons.

(d) Three-Axle Tandem Roller. This roller shall be an acceptable self-propelled three axle roller weighing not less than 10 tons.

(e) Trench Roller. This roller shall be an acceptable self-propelled trench roller equipped with a sprinkler for keeping the wheels wet and an adjustable road wheel so that the roller may be kept level during rolling. The drive wheel shall be not less than 20 inches wide. The roller under working conditions shall produce not less than 325 pounds per linear inch of roller width and be so geared that a speed of approximately 1.8 miles per hour is obtained in low gear.

(f) Vibratory Steel-Wheel Roller. This roller shall have a minimum weight of 6 tons. The compactor shall be equipped with amplitude and frequency controls and shall be specifically designed to compact the material on which it is used.

(g) Straightedges and Templates. When directed by the Inspector, the Contractor shall provide acceptable 10 foot straight edges for surface testing.

CONSTRUCTION METHODS:

(1) General. It shall be the responsibility of the Contractor to produce, transport, place and compact the specified paving mixture in accordance with the requirements herein.

The asphaltic mixture, when placed with a spreading and finishing machine, or the tack coat shall be placed when the air temperature is at least 50° F.

The asphaltic mixture, when placed with a motor grader, shall not be placed when the air temperature is below 55° F and is falling, but may be placed when the air temperature is above 45° F and is rising. The air temperature shall be taken in the shade away from artificial heat. The maximum depth of asphalt mixture placed with a motor grader will not exceed 5 inches of compacted material.

Mat thickness of 1-1/2 inches and less shall not be placed when the temperature of the surface on which the mat is to be placed is below 50° F.

It is further provided that the tack coat or asphaltic mixture shall be placed only when the humidity, general weather conditions, temperature and moisture condition of the base, in the opinion of the Inspector are suitable.

If, after being discharged from the mixer and prior to placing, the temperature of the asphaltic mixture falls below 200° F, all or any part of the load may be rejected and payment will not be made for the rejected material.

(2) Tack Coat. The surface upon which the tack coat is to be placed shall be cleaned thoroughly to the satisfaction of the Inspector. The surface shall be given a uniform application of tack coat using asphaltic materials of this specification. Thick tack coat shall be applied, as directed by the Engineer, with an approved sprayer at a rate not to exceed 0.10 gallon residual asphalt per square yard of surface. Where the mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be eliminated by the Inspector.

All contact surfaces of curbs and structures and all joints shall be painted with a thin uniform application of tack coat. During the application of tack coat, care shall be taken to prevent splattering of adjacent pavement, curb and gutter and structures.

(3) Transporting Asphaltic Concrete. The asphaltic mixture shall be hauled to the work site in tight vehicles previously cleaned of all foreign material. The dispatching of the vehicles shall be arranged so that all material delivered is placed and all rolling completed during daylight hours unless otherwise shown on the plans. In cool weather or for long hauls, covering and insulating of the truck bodies may be required. If necessary, to prevent the mixture from adhering to the inside of the truck body, the inside of the truck may be given a light coating of release agent satisfactory to the Engineer.

(4) Placing.

(a) The asphaltic mixture shall be dumped and spread on the approved prepared surface with the spreading and finishing machine. When properly compacted, the finished pavement shall be smooth, of uniform texture and density and shall meet the requirements of the typical cross sections and the surface tests. In addition, the placing of the asphaltic mixture shall be done without tearing, shoving, gouging or segregating the mixture and without producing streaks in the mat.

Unloading into the finishing machine shall be controlled so that bouncing or jarring the spreading and finishing machine shall not occur and the required lines and grades shall be obtained without resorting to hand finishing.

(b) When approved by the Engineer, level-up courses may be spread with a motor grader.

(c) The spreading and finishing machine shall be operated at a uniform forward speed consistent with the plant production rate, hauling capability, and roller train capacity to result in a continuous operation. The speed shall be slow enough that stopping between trucks is not ordinarily required. If, in the opinion of the Inspector, sporadic delivery of material is adversely affecting the mat, the Inspector may require paving operations to cease until acceptable methods are provided to minimize starting and stopping of the paver.

The hopper flow gates of the spreading and finishing machine shall be adjusted to provide an adequate and consistent flow of material. These shall result in enough material being delivered to the augers so that they are operating approximately 85 percent of the time or more. The augers shall provide means to supply adequate flow of material to the center of the paver. Augers shall supply an adequate flow of material for the full width of the mat, as approved by the Engineer. Augers should be kept approximately one-half to three-quarters full of mixture at all times during the paving operation.

(d) When the asphaltic mixture is placed in a narrow strip along the edge of an existing pavement, or used to level up small areas of an existing pavement, or placed in small irregular areas where the use of a finishing machine is not practical, the finishing machine may be eliminated when authorized by the Engineer.

(e) Adjacent to flush curbs, gutters and structures, the surface shall be finished uniformly high so that when compacted, it will be slightly above the edge of the curb or structure.

(f) Construction joints of successive courses of asphaltic material shall be offset at least 6 inches. Construction joints on surface courses shall coincide with lane lines, or as directed by the Engineer.

(g) If a pattern of surface irregularities or segregation is detected, the Contractor shall make an investigation into the causes and immediately take the necessary action. With the approval of the Inspector, placement may continue for no more than one full production day from the time the Contractor is first notified and while corrective actions are being taken. If the problem still exists after that time, paving shall cease until the Contractor further investigates the causes and the Engineer approves further corrective action to be taken.

(5) Compacting.

(a) The pavement shall be compacted thoroughly and uniformly with the necessary rollers to obtain the compaction and cross section of the finished paving mixture meeting the requirements of the plans and specifications.

(b) When rolling with the three-wheel, tandem or vibratory rollers, rolling shall start by first rolling the joint with the adjacent pavement and then continue by rolling longitudinally at the sides and proceed toward the center of the pavement, overlapping on successive trips by at least 1 foot, unless otherwise directed by the Engineer. Alternate trips of the roller shall be slightly different in length. On super-elevated curves, rolling shall begin at the low side and progress toward the high side, unless otherwise directed by the Inspector.

When rolling with vibratory steel-wheel rollers, equipment operation shall be in accordance with the manufacturer's recommendations, unless otherwise directed by the Engineer. Vibratory rollers shall not be left vibrating while not rolling or when changing directions. Unless otherwise shown on the plans or approved by the Engineer, vibratory rollers shall not be allowed in the vibrating mode on mats with a plan depth of less than 1-1/2 inches.

The motion of the rollers shall be slow enough to avoid other than usual initial displacement of the mixture. If any displacement occurs, it s hall be corrected to the satisfaction of the Inspector. The roller shall not be allowed to stand on pavement which has not been fully compacted. To

prevent adhesion of the surface mixture to the steel-wheel rollers, the wheels shall be kept thoroughly moistened with water, but an excess of water will not be permitted. Necessary precautions shall be taken to prevent the dropping of diesel, gasoline, oil, grease or other foreign matter on the pavement, either when the rollers are in operation or when standing.

(c) The edges of the pavement along curbs, headers and similar structures, and all places not accessible to the roller, or in such positions as will not allow thorough compaction with the rollers, shall be thoroughly compacted with lightly oiled tamps.

(d) Rolling with a trench roller will be required on widened areas, in trenches and other limited areas where satisfactory compaction cannot be obtained with the approved rollers.

(6) In-Place Compaction Control. In-place compaction control is required for all mixtures.

(a) Ordinary Compaction Control. One (1) three-wheel roller, one (1) pneumatic-tire roller, and one (1) tandem roller shall be furnished for each compaction operation except as provided below or approved by the Engineer. The use of a tandem roller may be waived by the Engineer when the surface is already adequately smooth and further steel-wheel rolling is shown to be ineffective. With approval of the Engineer, the Contractor may substitute a vibratory roller for the three-wheel roller and/or the tandem roller. Use of at least one (1) pneumatic -tire roller is required.

Additional or heavier rollers shall be furnished if required by the Engineer.

Rolling patterns shall be established by the Contractor to achieve the maximum compaction. The selected rolling pattern shall be followed unless changes in the mixture or placement conditions occur which affect compaction. When changes in the mixture or placement conditions occur, a new rolling pattern shall be established.

(b) Compaction Cessation Temperature. Regardless of the method required for in-place compaction control, all rolling for compaction shall be completed before the mixture temperature drops below 175° F.

(7) Opening to Traffic. If the surface ravels, flushes, ruts or deteriorates in any manner prior to final acceptance of the work, it will be the Contractor's responsibility to correct this condition at his expense, to the satisfaction of the Inspector and in conformance with the requirements of this specification.

MEASUREMENT: Hot Mix Asphaltic Concrete Pavement shall be measured by square yard, complete in place, for the thickness specified on the plans. Limits of payment will be from face of curb to face of curb. Pavement area shall not exceed the limits shown on the plans without written authorization.

PAYMENT: The work performed and materials furnished, as prescribed by this item, measured as provided herein, shall be paid for at the contract unit bid price per square yard, complete in place, for the thickness specified on the plans of "Hot Mix Asphaltic Concrete Pavement" or “HMAC”, which price shall be full compensation for furnishing and placing all materials, and for all labor, tools, equipment, and incidentals necessary to complete the work. The unit bid price includes Prime Coat and Tack Coat.

SECTION 216
ROLLING (Proof)

This Item shall govern for furnishing and operating heavy pneumatic tired compaction equipment for locating unstable areas of earthwork or base.

EQUIPMENT. The proof rolling equipment shall consist of not less than four pneumatic tired wheels, running on axles carrying not more than two wheels, and mounted in a rigid frame and provided with loading platform or body suitable for ballast loading. All wheels shall be arranged so that they will carry approximately equal loads when operating on uneven surfaces.

The proof roller under working conditions shall have a rolling width of from 8 feet [2.5 m] to 10 feet [3 m], and shall be so designed that, by ballast loading, the gross load may be varied uniformly from 25 tons [23 megagrams] to 50 tons [45 megagrams]. The tires shall be capable of operating under the various loads with variable air pressure up to 150 pounds per square inch [1000 kPa]. Tires shall be practically full of liquid. (Tires shall be considered as being practically full when liquid will flow from the valve stem of a fully inflated tire with the stem in the uppermost position). The operating load and tire pressure shall be within the range of the manufacturer's chart. The Contractor shall furnish the Inspector charts or tabulations showing the contact areas and contact pressures for the full range of tire inflation pressures and for the full range of loadings for the particular tires furnished.

The proof roller shall be the self-propelled type.

There shall be a sufficient quantity of ballast available to load the equipment to a maximum gross weight of 50 tons [45 megagrams].

Rubber tired tractive equipment shall be used on base courses and asphalt pavements. Other type tractive equipment may be used on embankment subgrade. The heavy pneumatic tire roller unit shall be capable of turning 180 degrees in the crown width or operating in forward and reverse modes.

In lieu of the rolling equipment specified, the Contractor may, upon written permission from the Inspector, operate other compacting equipment that will produce equivalent relative compaction in the same period of time as the specified equipment. If the substituted compaction equipment fails to produce the desired compaction within the same period of time as would be expected of the specified equipment, as determined by the Inspector, its use shall be discontinued.

CONSTRUCTION METHODS. This work shall be done only when directed by the Inspector. The subgrade and/or base layer shall be proof rolled to locate unstable areas when directed by the Inspector.

Within the ranges previously set forth, the load and tire inflation pressures shall be adjusted as directed by the Inspector. It is proposed to use a contact pressure corresponding as nearly as practical to the maximum supporting value of the earthwork or base. A minimum of two coverages of the proof roller will be required. Each succeeding trip of the proof roller shall be offset by not greater than one tire width. Rollers shall be operated at speeds directed by the Inspector which shall be between 2 and 6 miles per hour [3 km/h and 10 km/h].

Where the operation of the proof roller unit shows are area to be unstable or non-uniform, it shall be corrected in accordance with the applicable Item of Work.

MEASUREMENT and PAYMENT: Rolling (Proof) will not be measured or paid for directly, but shall be included in the unit price bid for the items of construction in which the operations occur.

SECTION 300
CONCRETE

Description: This item shall govern for the material used; for storing and handling of materials; and for the proportioning, mixing and transporting of concrete for all concrete construction.

The concrete shall be composed of Portland Cement, mineral filler, if necessary, natural aggregates (fine and coarse), and water, proportioned and mixed as hereinafter provided in these specifications.

This specification does not cover the placement, consolidation, curing, or protection of the concrete.

Material: Concrete shall meet all the requirements as set forth in ASTM Designation C-94.

Portland Cement: ASTM C-150, Type I. Unless otherwise acceptable to the Engineer.

Fly Ash: ASTM C-618, Type C or F. Limit use of Fly Ash in concrete mix design not to exceed 20% of cement content by weight.

Air-Entraining Admixtures: ASTM C-260, certified by manufacturer to be compatible with other required admixtures.

Water-Reducing, Retardant Admixtures: ASTM C-494, Type D, and contain not more than 0.1% chloride ions.

Normal Weight Aggregates: ASTM C-33

Water: Potable

Classifications and Proportions: The minimum cement content, maximum allowable water content, and maximum slump of the various classes of concrete shall conform to the following table:

Class	Min. Comp. Strength 28 day psi	Max. Water Cement Ratio gals./94 lb. bag	Slump Range	Min.-Max Sacks Cement per C.Y.
A	3,000	7.0	2"-5"	5.0
B	2,500	8.0	2"-5"	4.5
C	2,000	9.0	1"-4"	4.0
D	1,500	11.0	1"-3"	3.0
F	5,000	5.75	2"-3"	5.5-7.0
G	6,000	5.75	2"-3"	6.0-7.0
H	4,000*	5.10	2"-4"	5.5-6.0

*Air content for Class H concrete shall be 6% (± 1%).

Prepare design mixes for each type and strength of concrete by either laboratory trial batch or field experience methods as specified in ACI 301. If trial batch is used, use an independent testing facility acceptable to the Engineer for preparing proposed mix designs.

Quality Assurance Testing: Collect four test cylinders for each 100 cubic yards (or fraction thereof) of concrete placed in accordance with ASTM C31, C172 and C617. Test two cylinders for compressive strength in accordance with ASTM C 39 at the end of 7 days. Test the remaining two cylinders at the end of 28 days. Measure the temperature in accordance with ASTM C 1064, perform one slump test in accordance with ASTM C143 and perform one Air Content Test in accordance with ASTM C 231 or ASTM C173 with each set of cylinders collected.

Submittals: Prior to placing any concrete on the project, submit to the Engineer certified copies of the mix designs with trial batch test results. The mix design must be approved by the Engineer prior to placement of concrete. Engineer's approval of the mix design shall pertain to its conformance to the specifications and shall not relieve the contractor of his responsibility for quality control and to provide work free of defects in accordance with the contract documents.

Submit certified test results for each set of test cylinders within five days of compressive strength testing. Submit all other test results with monthly summary report.

Measurement and Payment: Concrete will be measured for payment by the linear foot, the square yard, or the cubic yard, depending on the type of structure being constructed. The unit price bid will include all work performed, materials furnished, and all labor, tools, equipment, and incidentals necessary to complete the work under this item.

SECTION 301
REINFORCING STEEL

DESCRIPTION: This item shall provide for the furnishing and placing of bar reinforcing steel of the size and quantity designated for use in structures and other concrete items that require reinforcing steel as shown on the plans and in accordance with these specifications.

MATERIALS: Reinforcing steel shall be grade 60 and all bar reinforcement shall be deformed, conforming to the requirements of item 440, "Reinforcing Steel" of the Texas Department of Transportation Standard Specifications. Reinforcing steel bars produced outside of the United States are acceptable if such bar reinforcement conforms to the requirements of the ASTM Specifications for the various designations of bars.

BENDING, TOLERANCES AND STORAGE: Bending, tolerances and storage of reinforcing steel shall conform to articles 440.3, "Bending", 440.4, "Tolerances", and 440.5, "Storage" in Item 440, "Reinforcing Steel" of the Texas Department of Transportation Standard Specifications.

SPLICES: No splicing of bars, except when provided on the plans, will be permitted without approval of the Engineer.

PLACING REINFORCEMENT: All steel reinforcing shall be accurately placed in the position shown on the plans and firmly held during the placing and setting of concrete. All reinforcement shall be free from dust, rust, mill scale, paint, oil, mortar or foreign material. Bars shall be tied at all intersections, except that where spacing of bars in each direction is less than 12 inches, only alternate intersections need be tied. Distances from forms shall be maintained by means of stays, precast blocks, ties, hangers, metal chairs or other approved supports. Blocks for holding reinforcing bars from contact with the forms shall be precast concrete blocks of approved shape and dimensions or other equally suitable-devices. The use of pebbles, pieces of broken stones or brick, metal pipe and wooden blocks shall not be permitted. Reinforcement in any sections shall be placed and then inspected and approved by the Inspector before the placing of concrete begins.

MEASUREMENT: The measurement of quantities of bar reinforcing furnished and placed, will be based on the calculated weight of the steel actually placed in accordance with the plans and these specifications, with no allowance made for added bar lengths for splices nor for extra steel used when bars larger than those specified are substituted with the permission of the Consulting Engineer. Tie wires and supporting devices will not be included in the calculated weights. The calculated weight of bar reinforcement will be determined using the theoretical bar weight set forth in Table No. 1 with no allowance for overrun or under-runs.

PAYMENT: Reinforcing Steel will not be paid for as a separate item, but will be considered as incidental to the cost for concrete items. The contract unit price bid per unit of concrete shall be full compensation for furnishing, bending, fabricating, welding and placing reinforcement; for all clips, blocks, metal spacers, ties, wire or other materials used for fastening reinforcement in place, and for all tools, labor, equipment and incidentals necessary to complete the work.

TABLE 1

Bar size number (mm)	Nominal diameter inches(mm)	Nominal Area square inch (mm^2)	Weight per linear foot (kg/m)
2 (6)	0.250 (6.35)	0.05 (32.26)	0.167 (0.249)
3 (10)	0.375 (9.525)	0.11 (70.97)	0.376 (0.560)
4 (12)	0.500 (12.7)	0.20 (129.03)	0.668 (0.994)
5 (15)	0.625 (15.875)	0.31 (200.00)	1.043 (1.552)
6 (20)	0.750 (19.05)	0.44 (283.87)	1.502 (2.235)
7 (22)	0.875 (22.225)	0.60 (387.10)	2.044 (3.042)
8 (25)	1.000 (25.4)	0.79 (509.68)	2.670 (3.973)
9 (28)	1.128 (28.651)	1.00 (645.16)	3.400 (5.060)
10 (30)	1.270 (32.258)	1.27 (819.35)	4.303 (6.404)
11 (35)	1.410 (35.814)	1.56 (1006.45)	5.313 (7.907)
14 (40)	1.693 (43.00)	2.25 (1451.61)	7.65 (11.384)
18 (55)	2.257 (57.328)	4.00 (580.64)	13.60 (20.239)

SECTION 304
EXPANSION JOINT MATERIALS

DESCRIPTION: This item shall govern for the furnishing and placing of all expansion joint material as herein specified in the various items of these specifications or as shown on the plans or as directed by the Engineer.

MATERIAL: The material used for expansion joints shall conform to either of the following:

1. Preformed Bituminous Fiber Material shall be formed from cane or other suitable fibers of a cellular nature securely bound together and uniformly impregnated with a suitable asphaltic binder and shall meet the requirements of the Standard Specifications for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction, ASTM D-1751.

2. Boards for expansion joints shall be obtained from Redwood or Cypress timber and shall be sound heartwood, free from sapwood, knots, clustered birdseye, checks and splits. Occasional sound or hollow birdseye, when not in clusters, will be permitted provided the board is free from any other defects that will impair its usefulness as a joint filler.

CONSTRUCTION METHODS: All materials used shall extend the full depth of the concrete and shall be perpendicular to the exposed face. All joints shall be shaped to conform to the contour of the finished section in which they are installed. All material shall be a minimum of 1/2 inch thick. See plans for specific dimensions.

MEASUREMENT and PAYMENT: No measurement or direct payment will be made for Expansion Joint Materials. All material supplied and installed as specified herein shall be considered subsidiary work to the various items of these specifications calling for Expansion Joint Materials.

SECTION 305
MEMBRANE CURING

DESCRIPTION: This item shall consist of curing by the impervious membrane method of all curbs, sidewalks, driveways, drive approaches, concrete structures and other concrete as specified in the various items of these specifications or as indicated in the plans.

MATERIALS: The membrane curing compound shall comply with the "Standard Specification for Liquid Membrane-forming Compounds for Curing Concrete", ASTM C309, Type I clear or translucent without dye, Type 1-D clear or translucent with fugitive dye, or Type 2 white pigmented. The vehicle shall be Class A - no restrictions on vehicle solids material, or Class B - vehicle solids restricted to all resin material. The material shall have a minimum flash point of 80° F when tested by the "Pensky-Martin Closed Cup Method".

It shall be of such consistency that it can be satisfactorily applied as a fine mist through an atomizing nozzle by means of approved pressure spraying equipment at atmospheric temperatures above 40° F.

It shall be of such a nature that it will not produce permanent discoloration of concrete surfaces nor react deleteriously with the concrete or its components. Type I-D compound shall contain a fugitive dye that will be distinctly visible not less than 4 hours nor more than 7 days after application. Type 2 compound shall not settle out excessively or cake in the container and shall be capable of being mixed to a uniform consistency by moderate stirring and shall exhibit a daylight reflectance of not less than 60 percent of that of magnesium oxide.

The compound shall produce a firm, continuous, uniform moisture impermeable film free from pinholes and shall adhere satisfactorily to the surfaces of damp concrete. It shall, when applied to the damp concrete surface, at the rate of coverage specified herein, dry to touch in not more than 4 hours and shall not be tacky or track off concrete after 12 hours of curing. It shall adhere in a tenacious film and when sprayed, in a single application at the specified rate, on the vertical face of damp concrete, shall not run off or appreciably sag.

The compound shall not disintegrate, check, peel or crack during the required curing period. It shall not peel or pick up under traffic and shall disappear from the surface of the concrete by gradual disintegration.

The compound shall be delivered to the job only in the manufacturer's original sealed containers which shall be legibly marked with the name of the manufacturer, the trade name of the compound, the type of compound and class of vehicle, the nominal percentage of non-volatile material, and a batch number or symbol with which test samples may be correlated.

> The permissible percentage moisture loss (at the rate of coverage specified herein) shall not exceed the following:
>
> 24 hrs. after application.....2%
> 72 hrs. after application.....4%

CONSTRUCTION METHODS: Just before using the membrane curing compound, it shall be thoroughly agitated in its original container until any settlement has been uniformly redispersed. Redispersion shall be checked with a 1 inch by 1 inch wooden slat or similar device scraped along the interior of the container and then examined for accumulation of settlement and uniformity of dispersion. The compound shall be maintained in a uniform condition, substantially free of settlement, during its use.

The compounds shall not be applied to a dry surface and if the surface of the concrete has become dry, it shall be thoroughly moistened by water fogging prior to application of membrane.

The membrane curing compound shall be applied after the surface finishing has been completed, and immediately after the free surface moisture has disappeared. The surface shall be sealed with a single coat of the specified type of curing compound applied uniformly at the rate of coverage recommended by the manufacturer and directed by the Inspector, but not less than one (1) gallon per 180 square feet of surface area. The curing compound shall not be thinned or diluted in any manner prior to application. The Contractor shall provide satisfactory means and facilities to properly control and check the rate of application of the compound.

At locations where the coating shows discontinuities, pinholes, or other defects, or if rain falls on the newly coated surface before the film has dried sufficiently to resist damage, an additional coat of the compound shall be applied immediately at the same rate of coverage specified herein at no additional cost to the owner.

To insure proper coverage, the Inspector will inspect all treated areas after application of the compound for the period of time designated in the governing specification for curing, either for membrane curing or for other methods. Dry areas are identifiable because of the lighter color of dry concrete as compared to damp concrete. All suspected areas shall be tested by placing a few drops of water on the suspected areas. If the water stands in round beads or small pools which can be blown along the surface of the concrete without wetting the surface, the water-impervious film is present. If the water wets the surface of the concrete as determined by obvious darkening of the surface or by visible soaking into the surface, no water-impervious film is present. Should the foregoing test indicate that any area during the curing period is not protected by the required water-impervious film, an additional coat or coats of the compound shall be applied immediately, and the rate of application of the membrane compound shall be increased until area areas are uniformly covered by the required water-impervious film.

When temperatures are such as to warrant protection against freezing, curing by this method shall be supplemented with an approved insulating material capable of protecting the concrete for the specified curing period.

If at any time, there is reason to believe that the method of curing is unsatisfactory or is detrimental to the work, the Contractor, when notified, shall immediately cease the use of this method and shall change to curing by one of the other methods specified under this contract.

MEASUREMENT and PAYMENT: "Membrane Curing" as prescribed herein will not be measured or paid for directly. All materials when installed as specified herein shall be considered subsidiary work to the various items of these specifications calling for membrane curing.

SECTION 307
CONCRETE STRUCTURES

DESCRIPTION: This item shall govern for the construction of box culverts, headwalls, wingwalls, box transitions, retaining walls, inlets and storm sewer structures. All concrete structures shall be constructed in accordance with specifications herein outlined and in conformity with the required lines, grades, sections and details shown on the plans or as directed by the Engineer.

MATERIALS:

1. Concrete: All concrete shall conform to the provisions of Item No. C300, "Concrete (Class A)" or shall be of class as noted on the plans.

2. Reinforcing Steel: All reinforcing steel shall conform to the provisions of Item No. 301, "Reinforcing Steel".

3. Membrane Curing Compound: All membrane curing compound shall conform to the provisions of item No. 305 "Membrane Curing".

4. Expansion Joint Materials: All expansion joint materials shall conform to the provisions of item No. 304, "Expansion Joint Materials".

5. Cast Iron Castings: All cast iron castings shall conform to the provisions of Item No. 409, "Cast Iron Castings".

6. Metal for Structures: Metal for structures shall conform to the provisions of Item No. 302, "Metal for Structures".

CONSTRUCTION METHODS:

1. Forms: Forms shall be of wood, metal or other approved materials and shall conform to the following requirements:

   a. Wood Forms:

      (1) Unexposed concrete surfaces, No. 2 common or better lumber.

      (2) Exposed concrete surfaces, dressed and matched boards of uniform thickness and width.

   b. Plywood: Commercial standard Douglas Fir, moisture resistant, concrete form plywood, not less than 5 ply and at least 9/16th of an inch in thickness. The face of the plywood shall be free from knot holes and other blemishes.

   c. Metal Forms: Metal forms of an approved type that will produce surfaces equal to or better than those specified for wood forms.

   Forms may be constructed of any of the above substances or of other material if suited to the intended purpose and when approved by the Inspector. Forms shall be built mortar tight and of sufficient strength to prevent bulging between supports and shall be set and maintained to the line and grade designated until the concrete is sufficiently hardened to permit removal. All details of form construction shall be subject to the approval of the Inspector, and in special cases the approval of the Engineer may be required. Permission to place concrete will not be given by the Inspector until all form work has been placed in accordance with the above requirements. If

at any stage of the work, the forms show signs of bulging, sagging or moving, that portion of the concrete causing such condition shall be immediately removed if required by the Inspector and the forms reset and securely braced against further movement.

All corners and edges, which will be exposed after construction, shall be chamfered with triangular chamfer strips 3/4 inch measured on the sides.

2. Placing Reinforcement: All steel reinforcement shall be placed in accordance with item No. 301, "Reinforcing Steel".

3. Placing Concrete: The base slabs of inlets, headwalls, and other structures shall be placed and allowed to set before the remainder of the structure is constructed. Suitable provision shall be made for bonding the sidewalls to the base slab by means of longitudinal keys so constructed as to prevent the percolation of water through the construction joints. Before concrete is placed in the walls, the keyed-edge joints shall be thoroughly cleaned of all shavings, sticks, trash or other extraneous materials. The top slabs of culverts and like structures may be poured monolithic with the walls, provided the walls are poured and allowed to set a minimum of one (1) hour, but no more than two (2) hours shall elapse between the placing of the concrete in the wall and that in the top slab; such interval is to allow for shrinkage of the concrete in the wall. Under adverse weather conditions the minimum time will be increased by the Inspector.

   All concrete shall be placed with the aid of mechanical vibrating equipment supplemented inside the forms. Vibrating equipment shall be of the internal type and shall maintain a speed of 6000 impulses per minute, when submerged in concrete. Vibrators shall be adequate in number of units to properly consolidate all concrete. Form or surface vibrators shall not be used. The duration of vibration shall be limited to that required to properly consolidate the concrete without causing objectionable segregation of aggregates. Insertion of vibrators into lower courses that have commenced initial set, or the disturbance or reinforcement in concrete beginning to set shall be avoided.

   Concrete shall not be allowed to drop freely more than 5 feet in unexposed work, nor more than 3 feet in exposed work; where greater drops are required, a tremie or other approved means shall be employed. Concrete shall not be placed when the ambient temperature is below 40° F, or where the concrete is likely to be subject to freezing before final set has occurred. When the air temperature is expected to drop below 40° F during the first 72 hours of the curing period, polyethylene sheeting or burlap-polyethylene blankets shall be placed in direct contact with the top surface of the concrete. Concrete may be poured in temperatures below 40° F when poured in protected areas, or where adequate protection can be provided against freezing, if approved by the Inspector. When concrete is poured in air temperatures above 85° F, an approved retarding agent, meeting the requirements of ASTM C494, Type B, will be required in all concrete used in superstructures and top slabs of culverts unless directed otherwise by the Inspector.

4. Form Removal: Forms shall be removed only with the approval of the Inspector and in a manner to insure complete safety of the structure where the structure as a whole is supported on shoring. Form removal from structures shall not begin <u>until</u> the concrete has attained the following compressive strengths:

a. Vertical forms shall not be removed until the concrete has set a minimum of twenty-four (24) hours, or the concrete has attained a minimum compressive strength of 500 psi.

b. When wall and top slabs are poured monolithically, wall forms shall not be removed until the concrete has attained a minimum compressive strength of 2000 psi.

c. Forms for the top slab shall not be removed until the top slab has-attained a minimum compressive strength of 2000 psi.

5. Finish: Honeycomb and other minor defects shall be patched with cement mortar composed of one (1) part cement to two (2) parts fine aggregate. All exposed surfaces shall be given one of the following finishes:

a. Rough Finish: Concrete for which no other finish is indicated or specified shall have fins and rough edges removed.

b. Smooth Finish: Smooth finish shall be given to the interior of inlets, junction boxes, culverts and other structures. Joint marks, fins and rough edges shall be smoothed off and blemishes removed, leaving finished surfaces smooth and unmarred subject to approval by the Inspector.

c. Floor Finish: Floor finish shall be given to the floors of all inlets, culverts and other structures, and shall be struck off true to the required grade as shown on the drawings and floated to a smooth, even finish by manual or mechanical methods. No coarse aggregate shall be visible after finishing.

d. Rubbed Finish: All exposed surfaces of retaining walls, wingwalls, headwalls and other structures, after patching and pointing has been completed, and the surface has been wetted, shall be given a first rubbing with a No. 16 Carborundum Stone. After the first rubbing is completed and the ground material has been evenly spread, the material shall be allowed to take a reset. After sufficient aging, the surface shall be wetted and given a finish rubbing with a No. 30 Carborundum Stone, after which the surface shall be neatly striped with a brush and allowed to take a reset. On the inside surfaces of all culvert walls an area from the top slab, on a line 30 degrees from the vertical, to the bottom slab shall be rubbed as specified above. The entire structure shall be left with a clear neat uniform finish, free from form markings and shall be uniform in color.

e. Sidewalk surfaces shall be given a wood float finish, a light broom finish, or may be stripped with a brush as directed by the Inspector or specified in the plans.

f. Roadway slabs shall be given a broom finish after completion of the floating or straight-edging operation, but before the disappearance of the moisture sheen. The grooves of the finish shall be parallel to the centerline of the roadway. The average texture depth of the grooves shall be a minimum of 0.035 inches.

6. Curing: Immediately after placing or finishing, concrete surfaces not covered by forms shall be protected from loss of surface moisture for not less than four (4) curing days. When forms are left in place they shall be kept sufficiently wet to reduce cracks in the forms and prevent the form joints from opening. If forms are removed before four (4) curing days have transpired,

the formed surface shall be protected for the remainder of the four (4)-day curing period. Protection and curing shall be accomplished by the following methods and shall be subject to the approval of the Inspector during the entire curing process:

Membrane-Compound Curing: Membrane-compound curing shall conform to the provisions of Item No. C305, "Membrane Curing".

7. Fine Grading: All fine grading of structure foundations shall provide for seating on firm, clean natural earth foundation except as otherwise provided. Any under-cut foundations, except where authorized, shall be corrected to the satisfaction of the Inspector at the sole expense of the Contractor.

8. Excavation and Backfilling shall conform to Item No. 306, "Structural Excavation".

9. Water Curing: Water curing shall be effected by covering exposed surfaces with cotton or burlap mats, previously wetted before applying, and kept thoroughly wet during the entire curing period. The application of the mats shall not mar or disturb surfaces which will be exposed on completion.

MEASUREMENT AND PAYMENT: The work performed as prescribed by this item, will be paid for at the contract unit price bid per linear foot for retaining wall, which price shall be full compensation for furnishing and placing all materials, including dowel bars and expansion joints and for all other materials, manipulations, labor, tools, equipment and incidentals necessary to complete the work.

SECTION 400
STORM DRAIN PIPE EXCAVATION,
TRENCHING AND BACKFILLING

DESCRIPTION: This item shall govern the excavation, trenching and backfilling for storm drainage pipe, unless otherwise noted on the plans, details and the specifications. The work shall include all necessary pumping or bailing, sheeting, drainage and the construction and removal of any required cofferdams. All existing utilities shall be protected from damage during the excavation and backfilling of trenches, and if damaged, shall be replaced or repaired by the Contractor at his expense. Unless otherwise shown on the plans and bid proposal all excavation shall be unclassified, and shall include all materials encountered regardless of their nature or the manner in which they are removed.

EXCAVATION: The Contractor shall perform all excavation of every description and of whatever substances encountered, to the lines and grades shown on the plans or determined by the Engineer. During excavation, material suitable for backfilling shall be stockpiled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and properly disposed of by the Contractor or as directed by the Engineer. Such grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations, and any water accumulating therein shall be removed by pumping or by other approved methods. Sheeting and shoring shall be done as may be necessary for the protection of the work, adjoining property, and for the safety of the personnel. Unless otherwise indicated, excavation shall be by open cut except that short sections of a trench may be tunneled, if in the opinion of the Engineer, the pipe or structure can be safely and properly installed or constructed, and backfill can be properly tamped in such tunnel sections.

If the Contractor encounters hazardous substances, industrial waste, environmental damage, underground storage tanks, or conditions conducive to environmental damage, Contractor shall immediately stop work in the area affected and report the condition to the Owner's representative in writing. Contractor shall not be responsible for or required to conduct any investigation, site monitoring, containment, cleanup, removal, restoration or other remedial work of any kind or nature (the "remedial work") under any applicable level, state or federal law, regulation or ordinance, or any judicial order. If the Contractor agrees in writing to commence and/or prosecute some or all of the remedial work, all costs and expenses, to include any extension of the contract time, of such remedial work shall be paid by Owner to Contractor as additional compensation.

TRENCHING:

1. Trench walls shall be vertical and the practice of undercutting at the bottom or flaring at the top will not be permitted unless at the Engineer's direction. In special cases where trench flaring is permitted and directed by the Engineer, the trench walls shall remain vertical to a depth of at least 1 foot above the top of the pipe. The bottom of the trench shall be square or slightly curved to the shape of the trenching machine cutters. The bottom of the trenches shall be accurately graded to provide uniform bearing and support for each section of pipe on the undisturbed soil at every point along its entire length, except for the portions of pipe sections where it is necessary to excavate for bells and for the proper sealing of pipe joints. Bell holes and depressions for joints shall be dug after the trench bottom has been graded in order that the pipe may rest upon the prepared bottom for as nearly its full length as practicable. Whenever over-excavation occurs, the under-cut trench shall be restored to grade, to the satisfaction of the Inspector, by replacement of excavated material compacted to the same density as the surrounding natural ground.

Whenever wet or otherwise unstable soil that is incapable of properly supporting the structure or pipe, as determined by the Engineer, is encountered in the bottom of the trench, such soil shall be removed to the depth shown on the plans or determined by the Engineer and the trench backfilled to the proper grade with a subgrade filler as specified in Item No. C410, "Granular Fill".

The depth of cut indicated on cut sheets, as furnished by the Consultant, is from the off-set or cut hub elevation to the invert of the pipe. The width of the trench shall be at least the outside diameter of the pipe plus 6 inches on each side of the pipe for pipe sizes under 42 inches in diameter.

The maximum working room for pipe 42 inches in diameter and under shall not exceed 1/2 of the outside diameter of the pipe or 12 inches whichever is greater, from the edge of the pipe to the face of the trench walls, or inside face of the shoring protection. For pipe over 42 inches in diameter the maximum width of the trench shall be such that the working space from the pipe to the trench wall, or shoring protection as the case may be, will be a minimum of 12 inches, and a maximum of 24 inches. If allowable trench widths are exceeded through over-shooting of rock, caving of earth trenches or over excavation, the Contractor shall employ corrective measures or alternative designs as determined by the Engineer.

It shall be understood that the depth of cut as indicated on the cut sheet may be more or less than the actual excavated depth due to ground conditions existing at the site. For this reason the Consultant shall determine the depth for pay purposes based on the surface elevation prior to the Contractor's operation and the invert of the sewer line. The Consultant's decision shall be final.

2. Where water, silt, muck, trash, debris or rock in ledge, boulder or coarse gravel (particle size larger than 1 3/4 inch is encountered at the bearing level, the Contractor shall, as directed by the Inspector, under-excavate and remove such materials to a depth not less than 4 inches below the bottom of the pipe and replace with a material conforming to the requirements of Item C410, "Granular Fill".

BACKFILLING:

1. General: Excavation shall not be backfilled until the constructed structures or appurtenances as installed conform to the requirements specified. The excavation shall be carefully backfilled with the excavated materials approved for backfilling, consisting of earth, loam, sandy clay, flexible base material, sand and gravel, soft shale or other approved materials, free from large clods of earth or stones.

Where pipe is specially coated for protection against corrosion, care shall be taken not to damage the coating. Any excavation improperly backfilled, or where settlement occurs, shall be re-opened to the depth required for proper compaction, then refilled and compacted with the surface restored to the required grade and compaction. The use of sand backfill shall not be allowed.

All compaction shall be such that the apparent dry density of each layer shall be not less than ninety percent (90%) of the maximum dry density as determined by tests on samples as outlined in TXDOT Testing Method Tex 113-E, unless otherwise shown on the plans.

2. Storm Drainage Pipe Backfilling: Pipe backfilling to a point 12 inches above the top of the pipe shall be done by either method (a), (b) or (c) below. Backfilling from a point 12 inches above the top of the pipe to the top of trench or proposed subgrade elevation shall be done by method (d) below.

(a) Material for backfill shall be selected fine compactable soil material. It shall be compacted at near optimum moisture content in layers not to exceed 6 inches in compacted thickness. Each layer shall be compacted to the required density by approved hand or mechanical tamping equipment.

Care shall be exercised to thoroughly compact the backfill under the haunches of the pipe and to insure that the backfill soil is in intimate contact with the sides of the pipe. Backfill material shall be kept at the same elevation on both sides of pipe.

(b) A clean gravel or gravel approved by the Engineer, conforming to the requirement of Item No. C410, "Granular Fill" may be used for backfill material. The gravel shall be placed in the trench and lightly tamped to consolidate and seat the mass against the conduit and earthen surfaces. Backfill material shall be kept at the same elevation on both sides of pipe.

(c) Cement Stabilized Backfill shall conform to "Class D" Concrete as defined in Item No. 300 "Concrete" of these specifications. Cement Stabilized Backfill shall be placed within one (1) hour after mixing and shall be placed and rodded in such a manner as to completely fill the backfill area.

Before placing Cement Stabilized Backfill, the trench shall be cleaned of any extraneous material and thoroughly wet. All surplus dirt excavated from the ditch shall be removed from the site.

(d) After the backfill has been completed to a point 12 inches above the top of the pipe by one of the methods outlined above, suitable rolling equipment may be used on these portions which are accessible to such equipment to obtain the compaction effect. Material for backfill shall be placed in uniform layers no more than 12 inches in depth (loose measurement) and shall be compacted to the density specified herein. Each layer of backfill material, if dry, shall be wetted uniformly prior to placement in the trench to the moisture content required to obtain the specified density, and shall be compacted to the required density by means of rolling equipment or other suitable mechanical method. No rolling equipment shall be used which may damage the pipe.

DISPOSAL OF EXCAVATED MATERIALS: The excess excavated material, not utilized after all fill requirements have been met, shall become the property of the Contractor and he shall dispose of it by hauling and wasting outside the limits of the right-of-way of this project and of public thoroughfares and water courses, in conformity with pertinent City ordinances and in a manner meeting the approval of the Engineer.

MEASUREMENT: Excavation, Trenching and Backfill will not be measured for payment.

PAYMENT: No direct payment shall be made for excavation, trenching and backfilling for pipe culverts, pipe storm sewers, and all costs in connection therewith shall be included in the applicable contract price for the item to which the work pertains.

Excavation for reinforced concrete box culverts channels, and ramps will be measured and paid for at the contract price bid under Item No. 106, "Excavation and Backfill".

Subgrade filler will be measured and paid for at the contract unit price as provided for in Item No. 410, "Granular Fill."

ITEM 407
CONCRETE ENCASEMENT, CRADLES, SADDLES AND COLLARS

407.1 DESCRIPTION: This item shall govern the placement of concrete encasements, cradles, saddles, collars on either existing or proposed water/sewer mains, when specified in the contract documents, or as directed by the Engineer.

407.2 MATERIALS: All concrete shall conform to the provisions of Item 300, "Concrete (Class B)," in the technical specifications or as noted otherwise in the contract documents.

407.3 CONSTRUCTION:

A. **Concrete Encasement.** When concrete encasement is shown in the contract documents, or when directed by the Engineer, the trench shall be excavated and fine graded to a depth conforming to details and sections shown in the plans. The main shall be supported by precast concrete blocks of the same strength as the concrete for encasement and securely tied down to prevent floatation. Encasement shall then be placed to a depth and width conforming to the details and sections shown in the contract documents or per the referenced standard drawings.

B. **Concrete Cradles.** When concrete cradles are shown in the contract documents or when called for by the Engineer, the trench shall be prepared and the main supported in the same manner as described in Item No. 407.3.A, of this specification and shall be constructed in accordance with details and sections shown in the contract documents. Straps/Tie Downs shall be a minimum of No. 4 diameter rebar.

C. **Concrete Saddles.** When shown in the contract documents or when directed by the Engineer, the main to receive concrete saddles shall be backfilled in accordance with Item 400, "Excavation, Trenching and Backfill" in the technical specifications to the spring line and concrete placed for a depth and width conforming with details and sections shown in the contract documents.

D. **Concrete Collars.** When shown in the contract documents or when directed by the Engineer, concrete collars shall be constructed in accordance with details and sections shown in the contract documents.

407.4 MEASUREMENT: Concrete Encasement, Cradles, Saddles, and Collars will be measured by the cubic yard of accepted work, complete in place. Reinforcing, if required by the Engineer, shall not be measured for payment.

407.5 PAYMENT: Concrete Encasement, Cradles, Saddles and Collars will be paid for at the unit price bid per cubic yard, which price shall be full compensation for furnishing and placing all materials, manipulation, labor, tools, equipment and incidentals necessary to complete the work. Payment for concrete encasement shall consist of 6 inches of concrete around the pipe where required as per the details in the plan, minus manholes, structures, etc.

SECTION 410
GRANULAR FILL

DESCRIPTION: This item shall consist of furnishing and placing materials for purposes of stabilizing subgrades in trenches, or as bedding for trenches, or as instructed by the Inspector, where quicksand, muck or other unstable material is encountered and the Inspector deems the measures provided herein warranted.

CLASSES: The subgrade fillers shall be Gravel Subgrade Filler or Granular Fill.

MATERIALS:
ASTM C-33 fine aggregate (concrete sand). See plans for specific gradation.

CONSTRUCTION METHODS: Where the soil encountered in the subgrade for a trench at established pipe bearing grade is unstable material, the Inspector may order its removal to any depth deemed necessary and replacement with the filler specified above. Where so ordered by the Inspector, the following procedures shall govern:

Gravel subgrade filler will be used to replace wet subgrade or other unstable materials regarded as unsatisfactory for support of the structure involved. In such cases, subgrade material shall be removed to such depth below the established bearing elevation as may be ordered. The soil removed shall be replaced with gravel or crushed stone as subgrade filler, placed in uniform layers of suitable depth, as directed by the Inspector.

Gravel subgrade filler will be used as bedding material for trenches, as described in the plans and specifications relating to these items. Gravel subgrade filler will also be used as initial select backfill in trenches.

MEASUREMENT: Granular Fill, in place in accordance with these specifications, complete and accepted, will be measured for payment by the cubic yard [cubic meter] of material in place.

PAYMENT: Payment for the subgrade filler will be made at the contract unit price bid respectively for "Granular Fill". Such prices shall include full compensation for removal and disposal of unstable soil materials and replacement with granular fill. Payment under “Granular Fill” will also include the cost of trench bedding material and geotextiles. However, the cost of initial select backfill will not be a separate pay item.

SECTION 500
CONCRETE CURBING

This item shall govern for installation of Portland cement concrete curbing with or without reinforcing steel as required, construction on an approved subgrade or base in accordance with this specification and in conformity with the lines, grades, section and details shown on the plans, or as established by the Engineer.

MATERIALS:

1. Concrete: All concrete shall conform to the provisions of Item 300, "Concrete (Class A)," or shall be of the class as noted on the plans.

2. Reinforcing Steel: All reinforcing steel shall conform to the provisions of Item 301, "Reinforcing Steel."

3. Expansion Joint Materials: All expansion joint materials shall conform to the provisions of Item 304, "Expansion Joint Materials."

4. Membrane Curing Compound: All membrane curing compound shall conform to the provisions of Item 305, "Membrane Curing."

CONSTRUCTION METHODS: Subgrade for curbing shall be excavated so as to have a cushion, a minimum of 2 inches thick of crusher screenings, gravel or crushed rock, which shall be spread, wetted and thoroughly tamped. If dry, the cushion shall be sprinkled lightly before concrete is deposited thereon. Where the subgrade is rock, or gravel, 70% of which is rock, the 2-inch cushion need not be used. The Inspector will determine if the subgrade meets the above requirement.

If the subgrade is undercut, or the natural ground is below "top of subgrade," the necessary backfill shall be made with an approved material and compacted with a mechanical tamper. Hand tamping will not be permitted.

Forms shall be of metal or well-seasoned wood. Forms shall be clean, straight and free from warp and of the depth required. All forms shall be securely staked to line and grade and maintained in a true position during the depositing of concrete. The inside forms shall be rigidly attached to the outside forms. Before concrete is placed, all forms shall be oiled with a light form oil.

The reinforcing steel, if required shall be placed in position as shown on the typical section. Care shall be exercised to keep all steel in its proper location.

Expansion joint material shall be provided at intervals not to exceed 50 feet, and shall extend the full width and depth of the concrete. Templates for "dummy" joints shall be of steel, not less than 3/16 of an inch in thickness and patterned to the shape of the curb. Templates shall be cleaned and oiled and spaced to cut the curb in sections 10 feet in length. The templates shall extend a distance of 8 inches into the curb from the top down.

Two round smooth dowel bars 3/8 of an inch in diameter and 18 inches in length shall be installed at each expansion joint. One 9-inch end of each dowel shall be thoroughly coated with hot oil asphalt so that it will not bond to the concrete; approved types of slip joints may be used in lieu of coating ends of dowels. The dowels shall be placed on the vertical centerline 3 inches from the top and bottom.

Concrete shall be placed in the forms, rodded and tamped to exclude all air and honeycomb. After the concrete has become sufficiently set, the exposed edges shall be rounded by the use of an edging tool to the radii indicated on the plans. After the inside form has been removed, the surface shall be dusted with a dust consisting of one (1) part "Portland Cement" and two (2) parts fine sand. The entire exposed surface of the curb shall be floated to a uniform smooth surface then finished with a camel hair brush or wood float to a gritty texture. It is not permissible to plaster curb where forms have stayed on over night. The forms must be removed and the curb finished monolithic the same day as concrete is poured.

Immediately after finishing the curb, it shall be protected by a membrane-compound curing agent.

The curb shall be backfilled to the full height of the concrete, tamped and sloped as directed by the Inspector. The top 4 inches of fill shall be of clean topsoil, free of stones and debris.

MEASUREMENT: Accepted work as prescribed by this item will be measured by the linear foot of concrete curb, complete in place.

PAYMENT: The work performed as prescribed by this item will be paid for at the contract unit price bid per linear foot for "Concrete Curbing," which price shall be full compensation for preparing the subgrade, for furnishing and placing all materials, including reinforcing steel, all expansion joint material, curing, and for any other materials, manipulations, labor, tools, equipment, and incidentals necessary to complete the work.

SECTION 502
CONCRETE

502.1 Materials:

a. Concrete: All concrete for sidewalks shall conform to the provisions of Item 300, "Concrete (Class B)". All concrete for driveways and drainage aprons shall conform to the provisions of Item 300, "Concrete (Class A)".

b. Reinforcing Steel: All reinforcing steel shall conform to the provisions of Item 301, "Reinforcing Steel".

c. Welded wire Flat Sheets: All welded wire fabric shall conform to the provisions of Item 303, "Welded Wire Flat Sheets".

d. Expansion Joint Materials: All expansion joint materials shall conform to the provisions of Item 304, "Expansion Joint Materials".

e. Membrane Curing Compound: All membrane-curing compound shall conform to the provisions of Item 305 "Membrane Curing".

f. Exposed aggregate sidewalk: Natural Aggregate: All natural aggregate (fine and coarse) shall be obtained from a "Medina River Source" or other similar source. These aggregates shall be of a tan to brown color so as to impart an "earth-tone" color. Samples of the aggregates shall be submitted prior to construction for approval by the City.

502.2 Construction Methods: The subgrade shall be excavated and shaped to the lines, grades and cross section shown on the plans, or as directed by the Engineer, and shall be thoroughly compacted. A cushion, 2 inch (50 mm) minimum thickness, of crusher screenings, gravel, crushed rock or flex based material shall be spread, wetted thoroughly, tamped and leveled. The cushion shall be moist at the time the concrete is placed. If the subgrade is undercut, or the natural ground is below "top of subgrade" then necessary backfill shall be made with approved material and compacted with a mechanical tamper. Hand tamping will not be permitted.

Where the subgrade is rock or gravel, 70% of which is rock, the 2 inch (50 mm) cushion need not be used. The Inspector will determine if the subgrade meets the above requirements. Forms shall be of metal or well-seasoned wood of a section satisfactory to the Inspector; clean, straight, free from warp, and of a depth equal to the thickness of the finished work. All forms shall be securely staked to line and grade maintained in a true position during the depositing of concrete. Before concrete is placed, forms shall be thoroughly oiled with a light form oil.

Expansion joint material, ½ inch thick (13 mm), shall be provided at intervals not to exceed 50 feet (15 mm) and where the new construction abuts the existing curbs or driveways if the Inspector deems it necessary. The expansion joint material shall be placed vertically and shall extend the full depth and width of the concrete.

A minimum of two (2) round smooth dowel bars 3/8 inches (10 mm) in diameter and 18 inches (457 mm) in length shall be spaced 18 inches (457 mm) apart at each expansion joint. Nine inches (229 mm) of each dowel shall be thoroughly coated with hot oil asphalt or greased, so that it will not bond to the concrete. Approved types of slip joints may be used in lieu of coating ends of dowels.

Sidewalks shall be marked with transverse “dummy” joints as shown on detail sheets, by the use of approved jointing tools.

Concrete sidewalks and driveways shall be reinforced as shown on the plans. Reinforcement for sidewalks shall consist of either one (1) layer of 6”x6” – W2.9 x W2.9 welded wire flat sheets or No. 3 (3/8”) (10 mm) reinforcing steel, placed not more than 18 inches (457 mm) on center both directions. Reinforcement for driveways shall consist of either one layer of 6”x 6” – W5 x W5 welded wire flat sheet or No. 3 (3/8”) (10 mm) reinforcing steel placed no more than 12 inches (305 mm) on center both directions. All reinforcement shall be placed equidistant from the top and bottom of the concrete. Care shall be exercised to keep all steel in its proper position during the depositing of concrete. Splices in wire fabric shall conform with the requirements set forth in Item 303, “Welded Wire Flat Sheets”. Splices in the No. 3 bars shall have a minimum lap of 12 inches (305 mm).

Reinforcing for commercial driveways shall consist of either one (1) layer of 6”x6” – W10 x W10 welded wire flat sheets or No. 4 (1/2”) (12 mm) reinforcing steel placed not more than 12 inches (457 mm) on center both directions. The concrete slab will be a minimum of 6 inches (152 mm) thick or as shown on the plans.

Concrete shall be placed in the forms and spaded, tamped and thoroughly compacted until mortar entirely covers the surface and has a monolithic finish. The top surface shall be floated and troweled to a uniform smooth surface, then finished with a camel hairbrush or wood float to a gritty texture. The outer edges and joints shall be rounded with approved tools and the radii shown on the plans.

Finish for Exposed Aggregate Sidewalks: Wash concrete surface after initial set with staff bristle brush and water to remove matrix and clean each piece of exposed coarse aggregate. Unless other wise acceptable to the Inspector, perform washing and brushing 3-4 hours after casting. Care shall be taken to uniformly expose about a third of each piece of coarse aggregate, removing no more of the matrix than necessary to achieve a uniform exposure of coarse aggregate across the panel surface and as required to achieve appearance similar to adjacent existing work. After seven days, follow with a final cleaning with a mild acid solution and final rinsing with clear water.

Immediately after finishing, the surface shall be protected by a membrane-curing compound, or by wetted cotton or burlap mats. Either method shall be subject to approval by the Inspector.

All necessary excavation for the sidewalk section, will be considered incidental work pertaining to this item, and will not be paid for directly. The adjacent excavation and grading of the slopes shall be done in a manner acceptable to the Inspector.

502.3 Measurement: Accepted work performed as prescribed by this item will be measured by the square yard (square meter) of surface area of concrete.

502.4 Payment: The work performed as prescribed by this item will be paid for at the contract unit price bid per square yard (square meter) for “Concrete Sidewalks” or “Concrete Driveways”, which price shall be full compensation for preparing the subgrade; for furnishing and placing all materials, including all reinforcing steel and expansion joint materials, and for any other materials, manipulation, labor, tools, equipment and incidentals necessary to complete the work.

507
CHAIN LINK WIRE FENCE

507.1. DESCRIPTION: *This item shall govern for chain link fabric supported on posts and with bracing and accessories as shown in the plans or as specified herein, erected complete in place as shown in the plans or as directed by the inspector.*

507.2. MATERIALS: Before installation of the chain link fence, furnish certification from the fence materials manufacturer stating that all fencing materials comply with the requirements of this Item. Use only new materials.

A. General. Furnish materials in accordance with the following:

1. Concrete. Item 300, "Concrete," Class "B."

2. Galvanizing. Texas Department of Transportation Item 445, "Galvanizing."

B. Fabric. Provide wire fabric with:

1. Nine (9) gauge (0.148 in. diameter) steel wire with a minimum breaking strength of 1,290 lb. meeting ASTM A 392 Class I or ASTM A 491;

2. mesh size of 2 in. ±⅛ in. between parallel wires with at least 7 meshes in a vertical dimension of 23 in. along the diagonals of the openings; and

3. knuckled selvages at the top and bottom edge of the fabric, unless otherwise shown on the plans.

C. Posts. Provide posts of the size and weight shown on the plans. Do not provide rerolled or open-seam posts. Use material meeting ASTM F 1083 for all posts. When specified, furnish thin-wall, high-strength pipe posts manufactured by cold rolling using steel strip conforming to ASTM A 1011, CS (Commercial Steel).

D. Post Caps. Provide malleable iron post caps designed to exclude all moisture. If barbed wire is shown on the plans, furnish barbed wire support arms integral with the post caps. If top rail is shown on the plans, furnish post caps with an opening for the top rail. Post caps must have a 2-in. skirt.

E. Gates. Provide gates fabricated from round sections of pipe of the size and weight shown on the plans. Use material meeting ASTM F 1083 for all gate pipes. For each gate, include:

1. corner and tee fittings of malleable iron or pressed steel with means for attaching diagonal bracing members;

2. hinges of malleable iron allowing a full 180° swing, easily operated by one person;

3. ball-and-socket-type bottom hinges that do not twist or turn from the action of the gate and prevent the closed gate from being lifted off the hinges;

4. a positive stop that prevents any portion of the gate from swinging over an adjacent traffic lane;

5. malleable iron pulley systems for roll type gate (only when required);

6. diagonal braces consisting of ⅜-in.-diameter cable with turnbuckles, 2 to each gate frame, and, for vehicle gates, a vertical pipe brace of the size and weight shown on the plans at the center of each gate leaf;

7. latches of malleable iron or steel for single gates with a single-fork latch and padlock eye that will keep the gate closed;

8. two fork latches mounted on a center plunger rod with a padlock eye for double-leaf gates;

9. holdbacks for each leaf of vehicular gates, with a semi-automatic holdback catch anchored at least 12 in. into a 12 in.-diameter by 24 in.-deep concrete footing; and

10. a malleable iron center rest, designed to receive the plunger rod anchored as shown on the plans for all double-leaf gates.

F. Top Rail. When shown on the plans, provide top rail manufactured from 1.660 in. OD standard weight (Schedule 40) steel pipe weighing 2.27 lb. per foot or high-strength pipe weighing 1.82 lb. per foot. Use material meeting ASTM F 1083 for all top rail pipes. Provide pipe in sections at least 18 ft. long joined with outside steel sleeve couplings at least 6 in. long with a minimum wall thickness of 0.70 in. Use couplings designed to allow for expansion of the top rail.

G. Tension Wire. Unless shown on the plans, use 7 gauge (0.177-in.) carbon steel wire with a minimum breaking strength of 1,950 lb. for the bottom edge of all fence fabric, and for the top edge of fence fabric when a top rail is not specified.

H. Truss Bracing. Provide truss bracing as shown on the plans.

I. Stretcher Bars. Provide stretcher bars made of flat steel at least 3/16 in. by ¾ in. and not more than 2 in. shorter than the fabric height. Provide 1 stretcher bar for each gate and end post and 2 stretcher bars for each corner and pull post.

J. Grounds. Provide copper-clad steel rods 8 ft. long with a minimum diameter of ⅝ in., or other UL-listed ground rods.

K. Tie Wire. Wire for attaching fabric to tension wire and to top rail shall be not less than No. 12 gauge galvanized wire, or fastenings in accordance with the manufacturer's standard design. Sufficient fastening material shall be furnished to provide for attaching the fabric to the tension wire and to the top rail and posts at the spacing shown on the plans.

L. Braces and Cables. Braces or cables shall be installed at all corner, tension, terminal and gate posts and shall be extended to adjacent line posts, in accordance with the plans. Braces and trussing material shall be high carbon steel of good commercial quality and shall meet the dimensions and other requirements on the plans. Brace rods shall be ⅜ inch diameter and be equipped with turnbuckles. Cables shall be ⅜ inch diameter and shall be composed of seven wires. Cables shall be installed as shown on the plans, and shall include the use of ⅜ inch drop-forged eye-and-eye, or eye-and-clevis turnbuckles.

M. Steel Pipe. All steel pipe, except for thin-wall, high strength pipe, used for top rails, line posts, corner, tension, terminal or gate posts, braces or gate frames shall conform to the

requirements of ASTM A 120. Thin-wall, high strength pipe shall be manufactured by cold rolling using steel strip conforming to ASTM A 569.

N. Galvanizing and Aluminum Coating. Unless specified on the plans, hot-dip galvanize all materials. Fabric and tension wire may be aluminum coated or alloy-coated if approved. When shown on the plans, additionally coat all material except bolts, nuts, and washers with thermally fused polyvinyl chloride (PVC) in accordance with ASTM F 668, Class 2B, meeting the specified color.

1. Fabric.

a. Galvanizing. Hot-dip galvanize in accordance with ASTM A 392, Class I.

b. Aluminum Coating. Aluminum-coat in accordance with ASTM A 491.

c. Alloy Coating. Coat with zinc-5% aluminum-mischmetal alloy (Zn-5A1-MM) in accordance with ASTM F 1345, Class I.

2. Posts.

a. Inside and Outside Galvanizing. Hot-dip galvanize inside and outside in conformance with ASTM F 1083.

b. Alloy Coating. Coat inside and outside with Zn-5A1-MM in accordance with ASTM F 1043, Class C.

3. Braces and Gates.

a. Galvanizing. Hot-dip galvanize braces and gates inside and out in conformance with ASTM F 1083.

b. Alloy Coating. Coat inside and out with (Zn-5A1-MM) in accordance with ASTM F 1043, Class C.

4. Fittings, Bolts, and Other Miscellaneous Hardware. Galvanize all fittings, bolts and miscellaneous hardware in conformance with TxDOT Item 445, “Galvanizing.”

5. Tension Wire. Zinc-coat tension wire with a minimum coating of 0.80 oz./sq. ft. or aluminum-coat with a minimum coating of 0.30 oz./sq. ft.

6. Barbed Wire. Zinc-coat barbed wire in accordance with ASTM A 121 (0.80 oz./sq. ft.) or aluminum-coat in accordance with ASTM A 585 (0.30 oz./sq. ft.).

7. Pull Cable. Zinc-coat pull cable with a minimum coating of 0.80 oz./sq. ft. of individual wire surface when tested in conformance with ASTM A 116.

O. Sampling. If there is reason to confirm the Certification provided in 507.2, “Materials,” the Contractor shall furnish, upon request of the Engineer, samples of each component part of the fence, including fittings. These samples shall be subjected to the galvanizing, weight and, where applicable, strength tests. A sample may be taken from each shipment and all samples shall be furnished to the City without cost. If a sample or specimen fails to meet the requirements of this specification, two additional samples or specimens shall be taken from the same shipment and

tested, either samples or specimens so tested shall meet the requirements in every respect, or the lot represented by the samples may be rejected.

507.3. EQUIPMENT: Provide the machinery, tools and equipment necessary for proper prosecution of the work. All machinery, tools and equipment used shall be maintained in a satisfactory and workmanlike manner.

507.4. CONSTRUCTION: Erect the chain link fence to the lines and grades established on the plans. Overall height of the fence when erected is the height above the grade shown.

A. Clearing and Grading. Clear all brush, rocks, and debris necessary for the installation of this fencing. Unless otherwise shown on the plans, stake the locations for corner posts and terminal posts. Follow the finished ground elevations for fencing panels between corner and terminal posts. Level off minor irregularities in the path of the fencing.

B. Erection of Posts. Install posts as shown on the plans. Plumb and permanently position posts with anchorages firmly set before fabric is placed. Brace corner and pull posts as shown on the plans.

1. Post Spacing. Space posts as shown in Table 1.

Post Type	Required Spacing of Placement
Line Posts	at most 8 ft. apart
Tension Posts	at most 330 ft. apart and at each change in direction exceeding 20° vertically
Corner Posts	At each horizontal angle point

Install cables on all terminal posts and extend to adjacent posts. Install cables on each side of corner and pull posts with a ⅜-in. drop-forged eye-and-eye or eye-and-clevis turnbuckle, unless otherwise shown on the plans.

2. Postholes. Drill holes for concrete footings for all posts to provide footings of the dimensions shown on the plans.

Where solid rock is encountered before reaching plan depth, penetrate the solid rock by at least 12 in. (18 in. for end, corner, gate, and pull posts) or to plan depth. Drill holes in the solid rock with a diameter at least 1 in. greater than the outside diameter of the post.

After the posts are set and plumbed, fill the hole in the solid rock with grout consisting of 1 part hydraulic cement and 3 parts clean, well-graded sand. Other grouting materials may be used if approved. Thoroughly work the grout into the hole, leaving no voids. Construct concrete footings from the solid rock to the top of the ground.

3. Gate Posts. Align the tops of all gate frames with the fencing top tension wire or top rail. If curbs are shown on the plans, provide vehicular gates that are greater in overall height than the adjacent fencing by the height necessary to extend to within 2 in. of the pavement between the curbs.

4. Concrete Footings. Center posts in their footings. Place concrete and compact by tamping or other approved methods. Machine mix all batches of concrete over ½ cu. yd. Hand mixing concrete is allowed on batches under ½ cu. yd.

Use forms for footings where the ground cannot be satisfactorily excavated to neat lines. Crown the concrete or grout (for solid rock) to carry water from the post. Keep the forms in place for at least 24 hr. Backfill the footing with moistened material as soon as each form is removed, and thoroughly tamp. Cover concrete with at least 4 in. of loose moist material, free of clods and gravel, immediately after placing concrete. No other curing is required.

Spread all excess excavated and loose material used for curing neatly and uniformly. Remove excess concrete and other construction debris from the site.

C. Erection of Fabric. After all posts have been permanently positioned and anchorages firmly set, place the fabric with the cables drawn taut with the turnbuckles. Secure one end and apply enough tension to the other end to remove all slack before making attachments. Unless otherwise shown on the plans, cut the fabric and independently attach each span at all corner posts and pull posts.

Follow the finished contour of the site with the bottom edge of fabric located approximately 2 in. above the grade. Grade uneven areas so the maximum distance between the bottom of fabric and ground is 6 in. or less. Fasten fabric at 12 in. intervals to the top and bottom tension wires between posts. When top rail is shown on the plans, fasten the fabric in the same manner. On gate frames, fasten the fabric to the top and bottom of the gate frame at 12 in. intervals. Use steel wire fabric ties of 9 gauge steel or larger.

Fasten fabric to terminal posts by steel stretcher bars and stretcher bar bands fitted with carriage bolts and nuts of the size and spacing shown on the plans. Use stretcher bars to fasten endposts, pull posts, corner posts, and gateposts with stretcher bar bands at intervals of at most 15 in. Attach stretcher bars to terminal posts with 1 in. × ⅛ in. flat steel bands with ⅜-in. carriage bolts at intervals up to 15 in.

D. Electrical Grounds. Provide at least 1 electrical ground for each 1,000 ft. of fence, located near the center of the run. Provide additional grounds directly under the point where power lines pass over the fence. Vertically drive or drill in the grounding rod until the top of the rod is approximately 6 in. below the top of the ground. Connect a No. 6 solid copper conductor to the rod and to the fence by a UL-listed method so that each element of the fence is grounded.

E. Repair of Coatings. Repair damaged zinc coating in accordance with TxDOT Item 445, Section 445.3.D, “Repairs.”

507.5. MEASUREMENT: “Chain Link Wire Fence,” of the height specified, will be measured by the linear foot of fence at the bottom of the fabric along the center line of the fence from center to center of end posts, exclusive of gates. “Chain Link Wire Fence” shall include all end posts, angle and corner posts, and tension posts, complete in place with all bracing and accessories.

Gates will be measured per each gate of each type, complete in place with gate posts, all bracing and all accessories.

507.6. PAYMENT: “Chain Link Wire Fence” measured as prescribed above, will be paid for at the contract unit price bid per linear foot for “Chain Link Wire Fence” of the height specified, which price shall be full compensation for furnishing and installing all fencing materials, end posts, angle and corner posts, tension posts, line posts, caps, tension wires, top rail, and connection fittings; digging post holes or setting into retaining wall and structures; furnishing and placing concrete for setting posts; all hauling and

hauling charges; and for all manipulation, labor, tools, equipment, and incidentals necessary to complete the work.

Gates measured as prescribed above will be paid for at the contract unit price bid for each “Gate, Pedestrian” or “Gate, Vehicular” of each size called for, which price shall be full compensation for furnishing all materials; fabrication, preparation, hauling, handling charges, and erecting; including gate and gate posts, posts caps, braces, miscellaneous fitting and fastenings, latches, hinges, stops and holding devices; and for all manipulation, labor, tools, concrete for setting posts, equipment and incidentals necessary complete installation.

SECTION 513
REMOVE AND REPLACE MAIL BOXES

513.1. DESCRIPTION: *This item shall govern for the removal, temporarily relocating, and replacing of mailbox assemblies of the type specified on the plans or as directed by the Engineer.*

513.2. MATERIALS: Provide materials to meet the requirements of section 513.4, "Construction."

513.3. EQUIPMENT: Provide the machinery, tools and equipment necessary for proper prosecution of the work. All machinery, tools and equipment used shall be maintained in a satisfactory and workmanlike manner.

513.4. CONSTRUCTION: Mail boxes, whether rock/masonry or on posts, and any supporting posts or concrete foundations shall be removed from their present location, installed in a temporary, serviceable location or locations during construction and reconstructed to a condition equal or better than the original in its original location or in a location approved of by the engineer when construction is complete. As a minimum final condition, each individual mailbox shall be set on a 4 inch x 4 inch wood post, equal or better than the original, at the location and to the height shown on the plans. Relocate mailbox assemblies to permanent locations upon completion of construction work. Temporary community boxes may be required in lieu of temporarily relocating existing mail boxes. Maintain mailbox assemblies in a serviceable condition while in their temporary locations. The Contractor is not responsible for damage to the mailbox not of their causing while in the temporary locations. Any damage to the mail boxes, posts, supporting members, braces etc., caused by negligence of the Contractor shall be remedied by the Contractor at his expense. All such repairs shall be made in such a manner so as to insure the unit to be in as good as, or better condition than it was originally. Any such repairs shall be subject to approval by the Engineer.

513.5. MEASUREMENT: "Removing and Replace Mail Boxes" will be measured by the number of mail boxes so removed and replaced.

513.6. PAYMENT: The work performed as prescribed by this item will be paid for at the contract unit price bid, per mail box, for "Removing and Replacing Mail Boxes" which price shall be full compensation for removing mail boxes from their present position, temporary relocation in a serviceable position, and relocation to permanent location, for resetting in concrete if required, for furnishing all materials, labor, tools, equipment and incidentals necessary to complete the work.

ITEM 515
TOPSOIL

515.1 DESCRIPTION: This item shall govern for the furnishing, placing and spreading of approved selected topsoil, to the lines and grades, at locations shown on the plans or as directed by the Inspector and in conformity with these specifications. Use as much topsoil as necessary to restore disturbed areas to conditions that match or exceed pre-project conditions.

515.2 MATERIALS: The topsoil shall be obtained from approved sources, suitable to support plant growth (seeding or sodding). It shall be fertile loam, easily cultivated, and free from roots, weeds, stones or other objectionable material detrimental to plants.

515.3 CONSTRUCTION METHODS: Topsoil shall be placed and spread on the places designated on the plans, or on areas as directed by the Inspector. The minimum thickness of topsoil shall be 4 inches on excavated areas. Where no excavation was accomplished, the topsoil shall be placed and spread and brought to the proper line and grades as shown on the plans. After the topsoil has been placed and shaped, it shall be sprinkled with water. If the topsoil settles below the established grade after the application of water, additional topsoil shall be added and sprinkled with water as directed by the Inspector.

515.4 MEASUREMENT: Measurement of "Topsoil" shall be made by the cubic yard in place and only for those areas designated on the plans, or to areas as directed by the Inspector.

515.5 PAYMENT: No measurement or direct payment will be made for topsoil. All material supplied and installed as specified herein shall be considered subsidiary work to the various items of these specifications calling for topsoil.

ITEM 516
SODDING

516.1 DESCRIPTION: This item shall govern for the furnishing and planting of Bermuda, St. Augustine, or other acceptable grass sod on the areas designated on the plans or as directed by the Engineer. All planting shall be completed as soon as practical to avoid erosion of topsoil and graded areas in advance of acceptance of the work. As much sod as necessary shall be used to restore disturbed areas to match or exceed pre-project conditions.

516.2 MATERIALS: The sod shall consist of live, growing grass secured from sources where the soil is fertile. All grass sod shall have a healthy virile root system of dense thickly matted roots throughout the soil of the sod for a minimum thickness of 1 inch. The Contractor shall not use sod from areas where the grass is thinned out, nor where the grass roots have been dried out by exposure to air and sun to such an extent as to damage its ability to grow when transplanted. The sod shall be free from noxious weeds or other grasses and shall not contain any matter deleterious to its growth or which might affect its subsistence or hardiness when transplanted. Sources from which sod is to be obtained shall be subject to approval by the Engineer. Match existing sod types when abutting private property.

516.3 CONSTRUCTION METHODS:

1. General. After the designated areas have been completed to the lines, grades, and cross sections shown on the plans and as provided for in other items of this contract, sodding of the type specified on the plans or as designated by the Inspector, shall be performed in accordance with the requirements hereinafter described.

Where rolling is specified by the following subarticles, the roller shall be a light corrugated drum roller.

2. Watering. Sod shall be thoroughly watered immediately after planting and subsequently at such intervals to promote growth or as directed by the Inspector.

3. Fertilizing. A pelleted or granulated fertilizer shall be used with an analysis of 16-8-8. (The figures in the analysis represent the percent of nitrogen, phosphoric acid, and potash nutrients respectively.)

The fertilizer shall be applied uniformly over the sodded areas and in the manner directed. The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected. Distribution of fertilizer for the particular item of work shall meet the approval of the Inspector. Unless otherwise indicated on the plans, fertilizer shall be applied uniformly at the average rate of 300 pounds per acre for all types of sod.

4. Planting Season. All planting shall be done between the average date of the last freeze in the spring and six weeks prior to the average date for the first freeze in the fall according to the U.S. Weather Bureau for the area.

5. Finishing: Where applicable, the shoulders, slopes, and ditches shall be smoothed after planting has been completed and shaped to conform to the cross-section previously provided and existing at the time sodding operations were begun. Any excess dirt from the planting operations shall be spread uniformly over adjacent areas or disposed of as directed by the Inspector so that the completed surfaces will present a good appearance.

6. Block Sodding. At locations shown on plans or where directed by the Inspector, sod blocks shall be carefully placed on the prepared areas. The fertilizer shall then be applied and thoroughly watered. When sufficiently dry, the sodded area shall be rolled or tamped to form a thoroughly compacted, solid mat. Any voids left in the block sodding shall be filled with additional sod and tamped.

7. Sequence of Sodding: It is the intent of this specification that all sodding be placed and watered twice a week, unless intervening rains make watering unnecessary. Watering shall be required for at least thirty (30) days after planting to establish growth or until acceptance of the work by the Owner. If the season is inappropriate, the Inspector may require that the sodding operations be advanced or retarded as may seem advisable. All areas shall be covered with live sod before final acceptance. Any blocks which show no signs of life shall be replaced with live sod before the work shall be measured for payment.

516.4 MEASUREMENT: Measurement of acceptable "Sodding", complete in place, will be by the square yard. Fertilizer and water will not be measured for payment.

516.5 PAYMENT: No measurement or direct payment will be made for “Sodding”. All material supplied and installed as specified herein shall be considered subsidiary work to the various items of these specifications calling for "Sodding".

SECTION 520
HYDROMULCHING

520.1 DESCRIPTION: This item shall govern for preparing ground, providing for sowing of seeds, mulching with cellulose fiber and other management practices along and across such areas as are designated on the plans and in accordance with these specifications. All areas shall be covered with live grass before acceptance.

520.2 MATERIALS:

1. Seeds: All seed must meet the requirements of the Texas Seed Law including the labeling requirements for showing purity, germination, name and type of seed. Seed furnished shall be of the previous season's crop for the date of the project. Each variety of seed shall be furnished and delivered in separate bags or containers. A sample of each variety shall be furnished for analysis and testing when directed by the Engineer. The amount of seed planted per acre shall be of the type specified below and shall equal or exceed the following percentages for purity and germination or an equivalent amount of pure live seed.

Common Name: Bermuda and Giant
Bermuda grass (hulled)

Scientific Name: Cynodon Dactylon

Purity: 95%

Germination: 90%

Annual Rye grass will be free of Johnson grass, field bind weed, dodder seed, and free of other seed to the limits allowable under the Federal Seed Act and applicable State Seed Laws.

Annual Rye grass will be added into slurry between October 1 through March 15. No additional cost will be charged to the City.

2. Wood Cellulose Fiber Mulch: Wood cellulose fiber mulch shall be natural cellulose fiber mulch produced from grinding clean, whole wood chips, or fiber produced from ground newsprint with a labeled ash content not to exceed 7%. The mulch shall be designed for use in conventional mechanical planting, hydraulic planting of seed or hydraulic mulching of grass seed, either alone or with fertilizer and other
additives. The mulch shall be such that when applied, the material shall form a strong, moisture-retaining mat without the need of an asphalt binder.

The mulch material will also be dyed with a green color to assist in determining coverage and to provide an immediate pleasing appearance. The wood cellulose fiber is also required to be dispersed rapidly in water to form a homogeneous slurry and remain in such state when agitated in the hydraulic mulching unit with the specified materials.

3. Fertilizers: Fertilizer shall have a chemical analysis of 15-15-15 with micronutrients and shall be water soluble. (The figures in the analysis represent the percent of nitrogen, phosphoric acid and potash nutrients respectively.) Fifty percent or greater of the Nitrogen required shall be in the form of Nitrate Nitrogen (N0 3). The remaining Nitrogen required may be in the form urea Nitrogen (C0(NH2)2).

In the event it is necessary to substitute a fertilizer of a different analysis, it shall be a pelleted or granulated fertilizer with a lower concentration, but the total amount of nutrients furnished and applied per acre shall equal or exceed that specified for each nutrient.

The fertilizer shall be dry and in good physical condition. Fertilizer that is powdered or caked will be rejected.

4. Tactifier and binder: Natural vegetable gum containing gelling and hardening agents that when mixed with water and properly cured, shall form an insoluble network.

5. Water. Shall be furnished by the contractor and shall be clean and free of substances harmful to the growth of vegetation.

6. Herbicide: Herbicide used shall be an easy to apply, effective in a short term, chemical agent to inhibit or destroy weed growth, while being harmless to seed and grass being implanted.

7. Topsoil: Topsoil shall conform to the provisions of Item C515 "Topsoil".

520.3 CONSTRUCTION METHOD:

1. Security of stored hydromulch materials will be the sole responsibility of the Contractor at no additional expense to the City.

It is the contractor's responsibility to verify the location of all utility lines, electric cables, sprinkling systems and conduits so that the proper precautions must be taken not to disturb or damage any subsurface improvements. Should obstructions be found, the Contractor will promptly notify the City Inspector. Any damage caused by the contractor shall be repaired by himself at no cost to the City. Any such repairs shall be subject to approval by the Inspector.

2. Preparation of Subsoil: Inspect subsoil for the presence of objectionable materials, such as rocks (2 inches [50 mm] in diameter and larger), concrete waste, building debris, weeds, grass or other material that would be detrimental to the growth of grasses. Protect existing underground improvements from damage.

Cultivate to a depth of 3 inches [76 mm] in areas to receive hydromulch. If compaction is due to equipment, traffic or storage, cultivate to a depth of 6 inches, and apply herbicide as directed by manufacturer.

Remove any foreign or objectionable materials collected during cultivation.

Grade to eliminate rough spots and low areas where ponding may occur. Assure positive drainage away from all buildings. Maintain smooth, uniform grades.

Hydromuch area and weed control shall consist of killing all weeds and maintaining a weed-free condition until completion of the project by applying herbicide as directed by the manufacturer.

3. Seeded Lawns: The following construction sequences and procedures shall be observed:

a) The contractor shall notify the Inspector not less than 48 hours in advance of any seeding operation and shall not begin the work until areas prepared or designated for seeding have been approved.

b) Before placement of hydromulch, all areas shall be cultivated to a depth of 3 inches [76 mm] unless otherwise specified or ordered by the City Inspector. Cultivation of the soil may be done by disc, spring tooth harrow, rototiler, or similar equipment. This operation shall be done at right angles to the natural flow of water on the slopes.

c) The area shall then be rolled in two directions; the second shall be done at right angles to the first rolling.

d) Rake the area to make it smooth and level. Add soil where necessary or as directed by the Inspector.

e) The finished grade shall be 1 inch (25 mm) below all curbs, sidewalks, and/or other appurtenances.

f) Apply the fertilizer at the rate and mixture specified. The fertilizer shall be applied by an approved hand or mechanical method.

g) Roll the area in one direction.

h) Slurry to be sprayed evenly in two intersecting directions with a hydraulic seeder.

i) Erect a barrier of stakes and strings, and post warning signs where necessary, or as directed by the Inspector.

j) Apply water as required to keep the mulch damp at all times throughout germination and initial growth period as determined by the Inspector.

k) Upon completion, all excess material shall be removed and disposed of off the project site at contractor's expense.

4. Slurry: The slurry will be mixed and spread uniformly over the area at the following rate:

Residential area or commercial area:
Wood Cellulose Fiber Mulch --2000 lb./acre.
Fertilizer -- 400 lb./acre.
Bermuda -- 1.5 lb./1000 sq. ft.
Annual Ryegrass (Oct. through March 15) --
20 lbs. per 1000 sq. ft.

Water and binder to be added according to manufacturer's recommendations.

5. Guarantee and Lawn Established Period: The guarantee and lawn established period shall begin immediately after the completion of the planting and shall start with the Provisional Acceptance and end with the Final Acceptance.

a) Provisional Acceptance:
Upon completion of hydromulching and written request of Contractor, the Inspector will inspect all the work for Provisional acceptance.

b) Guarantee Period:

The guarantee period shall begin upon completion of the provisional acceptance. All plant materials shall be guaranteed by the Contractor for a period of thirty days (30) from the date of provisional acceptance, to be in good, healthy, and nourished condition. The exceptions are damages resulting from neglect by the property owner, abuse or damage by others, or unusual phenomena or incidents which are beyond the Contractor's control.

During the lawn establishment period, it shall be the contractor's responsibility to ensure the continuing healthy growth. This care shall include labor, water and material necessary to keep the project in a presentable condition, including but not limit to removal of litter, mowing, trimming, removal of grass clippings, edging, fertilization, insecticide and fungicide applications, weed control, and repair and reseeding any and all damaged areas.

Water application shall be accomplished each week from March through October. An even application of one inch minimum of water shall be required over all lawn areas weekly. The rate and frequency of water application may be changed, as directed by the Inspector, depending on weather, and soil conditions.

c) Replacement:

The Contractor shall replace, without cost to the City, and as soon as weather conditions permit, all dead grassed areas not in a vigorous, thriving condition, as determined by the Inspector during and at the end of the guarantee period. Replacements shall be subject to all requirements stated in this specification. The Contractor shall make all necessary repairs to grades, grassed areas, and terrace paving required because of grass replacement at no cost to the City.

d) Final Inspection and Acceptance:

At the end of the guarantee period and upon written request of the contractor, the Inspector will inspect all guaranteed work for final acceptance. The written request shall be submitted to the City ten(10) days prior to the anticipated date of inspection.

Acceptance of hydromulching lawn as herein specified shall be based on a uniform stand of grass and a uniform grade at the time of final inspection. Area of two square feet or more that are bare or have a poor stand of grass and area not having a uniform grade for any cause before final inspection shall be regraded, rehydromulched and reseeded as specified at the Contractor's expense.

Upon completion by the Contractor of all repairs or renewals, which may appear at that time to be necessary in the judgment of the City or its authorized representative, the final acceptance of the hydromulching will be issued.

520.4 MEASUREMENT AND PAYMENT: Measurement of "Hydromulching", complete in place, shall not be made. Payment shall be made on a lump sum basis and shall include all materials and labor required to vegetatively stabilize all unpaved areas disturbed by the project work.

SECTION 530
BARRICADES, SIGNS & TRAFFIC HANDLING

This item shall govern for providing, installing, moving, repairing, maintaining, cleaning and removing upon completion of work, all barricades, signs, cones, lights and other such type devices and of handling traffic as indicated on the plans or as directed by the Engineer.

CONSTRUCTION METHODS: All barricades, signs, and other types of devices listed above shall conform to the requirements of the Texas Manual on Uniform Traffic Control Devices (TMUTCD). It is the contractor's responsibility to see that all traffic control devices are properly installed and maintained at the jobsite. If it is determined by the Engineer that the traffic control devices do not conform to the established standards, or are incorrectly placed to protect the general public, the Engineer shall have the option to stop the work, at no expense to the City, until the situation is corrected by the Contractor. If it is determined that additional temporary traffic control devices, special directional devices, and/or business name signs are required, they will be provided by the contractor at no additional cost. As work progresses, the location of temporary traffic control devices will be adjusted and modified as necessary by the Contractor.

All retroreflective traffic control devices such as barricades, vertical panels, signs, etc., shall be maintained by cleaning, replacing or a combination thereof such that during darkness and rain, the retroreflective characteristics shall equal or exceed the retroreflective characteristics of the standard reflective panels in the Inspector's possession.

The contractor shall contact the Engineer and/or the City of San Antonio Traffic Operations Section (as applicable) prior to removing any traffic signs or traffic signals. Prior to completion of the contract and removal of barricades, all applicable
permanent traffic signs and signals must be in place and functioning properly. All permanent signs or traffic control devices missing or damaged during construction shall be replaced at the contractor's expense. Permanent pavement markings shall be applied prior to the opening of any street to traffic. Temporary short-term expendable pavement markings may be provided prior to application of permanent markings.

The contractor must maintain all streets open to through traffic by repairing trenches, potholes, etc., at no direct payment. The contractor shall provide reasonable access to residences and all businesses within all phases of the work, as well as providing suitable access accommodations for school children, pedestrians, Service. Temporary pedestrian crossing will be determined in the field by the Police Department Accident Prevent Bureau. Temporary pedestrian crossings shall be 4 feet [1.2 m) wide by 4 inches [102 mm] thick asphalt treated base and will be paid for under Item 206.

MEASUREMENT: This item will not be measured as it is a lump sum item.

PAYMENT: The work performed and materials furnished in accordance with this item will be paid for at the unit price bid for "Barricades, Signs and Traffic Handling". This price shall be full compensation for furnishing all labor, materials, supplies, equipment and incidentals necessary to complete the work as specified.

Payment will be made on the following basis:

(1) The total payment for this Item will not exceed 10 percent of the total contract amount prior to "Final Acceptance". The portion of the contract amount for this Item in excess of 10

percent of the total contract amount, less any adjustments as specified below, will be paid on the next monthly estimate cycle after the retainage estimate.

(2) Payment for this Item will begin on the first payable monthly construction estimate after barricades, signs and traffic handling devices have been installed and construction has begun.

(3) Monthly payment will be made each succeeding month for this Item provided the barricades, signs and traffic handling devices have been installed and maintained until the contract amount for Barricades, Signs and Traffic Handling has been paid unless adjusted by paragraph (4).

(4) The quantity under this Item will not exceed the total plan quantity except when additional work is added by an approved field alteration or extra work order. Also when work is suspended for the convenience of the City, through no fault of the Contractor, additional quantity may be paid when approved by field alteration.

(5) An overrun of the plan quantity for this Item will not be allowed for approving designs, testing, material shortages, closed construction seasons, curing periods, test periods, failure to complete the work prior to payment of the amount allowed by (1) and (3) above nor delays caused directly or indirectly by requirements of the contract.

(6) If the contract is completed prior to payment of the amount allowed by (1), (3) and (7), the balance due will be paid on the semi-final estimate. When the plans establish pay items for particular work called for in the plans, that work will be measured and paid for under the governing items.

(7) If the Contractor fails, within the time frame established by the Inspector, to provide or properly maintain signs and barricades in compliance with the contract requirements, the Contractor will be considered in non-compliance with this Item and no payment will be made for this Item for the month(s) in question.

BID ITEMS:

Item 530: Barricades, Signs and Traffic Handling.

SECTION 542
TEMPORARY SEDIMENT CONTROL FENCE (SILT FENCE)

This item shall govern for the materials to be furnished and for the installation, maintenance and removal of temporary sediment control fence of the dimensions shown on the plans. This item will be used temporarily during construction to control erosion and sedimentation.

MATERIALS:

1. **Fence Description.** The fence shall be a net-reinforced fence, using woven geotextile fabric.

2. **Fabric**. Fabric may be manufactured from polyester, polypropylene or polyamide and shall be resistant to ultraviolet degradation, mildew and rot and shall be suitable for use in a wet soil and stagnant water environment. The edge of woven fabric shall be sealed or selveged to prevent raveling. Fabric shall be at least 36 inches [1 m] wide with 6 to 8 inches [152 mm – 203 mm] inches of the width buried in a trench to prevent undercutting, unless specified otherwise on the plans. The fabric shall exhibit the following physical properties when sampled and tested using the specified methods shown in Table 1.
3. **Posts** . Posts shall be a minimum of 48 inches [1.2m] long, essentially straight, and shall be wood or steel, unless otherwise shown on the plans. Soft wood posts shall be at least 3 inches [76 mm] in diameter or nominal 2x4 inches [50 mm x100 mm]. Hardwood posts shall have a minimum cross section of 1.5 x 1.5 inches [38 mm x 38 mm]. Steel posts shall be "T" or "L" shaped with a minimum weight of 1.3 pounds per linear foot [6.3 kg per meter].

4. **Net Reinforcement**. Net reinforcement shall be galvanized welded wire mesh of a minimum 12.5 gauge wire or equal as approved by the Engineer with a maximum opening size of 2 inches [50 mm] by 4 inches [102 mm] and shall be at least 24 inches [610 mm] wide unless otherwise shown on the plans.

5. **Staples**. Staples used to secure reinforcement and fabric to wood posts shall have a crown at least 3/4 inch [19 mm] wide and legs 1/2 inch [13 mm] long.

6. **Used Materials** . Previously-used materials, meeting the above requirements and when approved by the Engineer, may be used.

CONSTRUCTION METHODS.

The temporary sediment control fence shall be used during construction near the downstream perimeter of a disturbed area to intercept sediment from sheet flow. The fence may be incorporated into the erosion control measures used to control sediment in areas of higher flow. The fence installation methods shall be as specified below, unless otherwise shown on the plans. The physical alignment and location of the fence shall be as shown on the plans or as directed by the Engineer.

1. **Installation of Post.** Posts shall be embedded 18 inches [457 mm] deep, or adequately anchored if in rock, with a spacing of 6 to 8 feet [2 m -2.4 m], and installed on a slight angle toward the anticipated run-off source.

2. **Fabric Anchoring.** Trenches shall be dug along the uphill side of the fence to anchor 6 to 8 inches [152 mm - 203 mm] of fabric. The trench shall have a minimum cross section of 6 x 6 inches [150 mm x 150 mm]. The fabric shall be installed in the trench such that 4 to 6 inches [102 mm - 152 mm] of fabric is against the side of the trench and approximately 2 inches [50 mm] of fabric is across the

bottom in the upstream direction. The trench shall then be backfilled and hand tamped as approved by the Engineer.

3. **Fabric Attachment.** The reinforcement shall be attached to the end posts, if wood, by staples, or if steel, by T-clips or sewn vertical pickets at a minimum of 4 locations. The reinforcement shall be attached to each succeeding post as approved by the Engineer. The ends of successive reinforcement sheets or rolls shall be connected at a fence post at least 6 times with hog rings. The fabric shall be fastened to the top strand of reinforcement by hog rings or cord at a maximum spacing of 15 inches [381 mm].

4. **Fabric Splices**. Splices shall occur at a fence post and shall have a minimum lap of 6 inches (152 mm)
attached in at least six places. Splices in concentrated flow areas will not be permitted.

MAINTENANCE: The temporary sediment control fence shall be maintained in good condition (including staking, anchoring, tension adjustments, etc.) by the Contractor. All necessary work and materials to maintain the integrity of the fence, including keeping fabric free of accumulated silt, debris, etc., shall be provided until earthwork construction and permanent erosion control features are in place and/or the disturbed area has been adequately stabilized as per Item 540 "Temporary Erosion, Sedimentation and Water Pollution Prevention and Control". The areas damaged by the removal process shall be stabilized by the Contractor using appropriate methods as approved by the Engineer.

Torn or punctured fabric shall be repaired by the placement of a patch consisting of an additional layer of fabric over the damaged area. The patch shall have a minimum overlap of 18 inches [457 mm] in all directions and be securely attached to the repaired fabric.

When the accumulated sediment deposit reaches a depth of approximately 6 inches [152 mm], it shall be removed and disposed of at approved sites in a manner that will not contribute to additional siltation. If the structure ceases to function as intended, the engineer may direct that the fence or portions thereof be replaced. Such replacement will not be measured for payment.

MEASUREMENT: This item will not be measured.

PAYMENT: The work performed and materials furnished as prescribed by this Item will be paid for subsidiary to Section 540.

Table 1

Physical Property	Test Method	Min. Req.
(1) TensileStrength, 1b	ASTM D 4632	90 MIN
(2) Elongation @ Yield, %	ASTM D 4632	100 MIN
(3) Trapezoidal Tear, 1b	ASTM D 4533	35 MIN
(4) Apparent Opening Size	ASTM D 4751	50-80
(5) Permittivity, 1/sec	ASTM D 4491	1.0 MIN
(6) Ultraviolet Stability original tensile strength retained after 500 hrs. exposure, %	ASTM D 4355	80 MIN

SECTION 543
CONSTRUCTION EXIT

This item shall govern for the materials to be furnished and for the installation, maintenance, and removal of construction exits of the type and dimensions shown on the plans.

GENERAL: This item will be used temporarily during construction to control the tracking of sediment, mud, gravel, etc., from a construction site or other areas identified by the Engineer to a public right of way, street, sidewalk or parking area.

MATERIALS: All materials shall meet the applicable requirements as indicated below for the specified type of construction exit.

1. **Rock Construction Exit.** Rock used for long and short-term construction exits shall consist of crushed stone. The aggregates shall be clean, hard, durable materials free from adherent coatings, salt, alkali, dirt, clay, loam, shale, soft or flaky materials, or organic and injurious matter.

2. **Timber Construction Exit.** Timber for long term construction exits shall consist of treated railroad ties and timbers. The railroad ties and timbers shall be treated to control rot and shall be No. 2 quality or
better and free of large and loose knots. Timber shall be fastened with nuts and bolts or lag bolts all of which shall meet or exceed ASTM - A307. Timber for short-term construction exits shall be treated to control rot and shall be No. 2 quality or better and free of large and loose knots. Plywood and/or pressed wafer board shall be a minimum of ½ inch [13 mm] thick.

3. **Foundation Course.** The foundation course shall be flexible base, bituminous concrete, portland cement concrete or other materials as approved by the Engineer.

CONSTRUCTION METHODS: When tracking conditions exist, traffic shall not be allowed to cross or leave the construction site and move directly onto a public roadway, alley, sidewalk, parking area, or other right of way in areas other than at locations of construction exits. Construction exits can be either for long or short term use. Foundation courses, if needed, shall be used with the long-term construction exits.

1. **Long-Term Construction Exit.** The exit shall be placed over a foundation course, if needed. The foundation course and/or compacted subgrade shall be properly graded to direct runoff from the construction exit to a sediment trap as shown on the plans or as directed by the Engineer. The exit shall normally be constructed a minimum length of 50 feet [15 m]. The width shall be at least 14 feet [4.3 m] for one-way traffic and 20 feet [6 m] for two-way traffic but shall not be less than full width of all points of ingress and egress and shall be sufficient for all ingress and egress.

   (a) Type 1 Construction Exit. This exit shall consist of open-graded crushed stone with a size of 4 - 8 inches [102 mm- 203 mm] as shown on the plans. The depth of the aggregate shall not be less than 8 inches [203 mm].

   (b) Type 2 Construction Exit. This exit shall be constructed of treated railroad ties and timbers as shown on the plans.

2. **Short-Term Construction Exit.**

(a) Type 3 Construction Exit. This exit shall be either open-graded crushed stone with a size of 2 or 4 inches [50 mm - 102 mm], or plywood or wafer board. This exit shall be used for daily operations when tracking conditions exist such as traffic crossing the construction site at locations where long-term exits are not practicable.

(b) Type 4 Construction Exit. This exit shall be as shown on the plans.

MAINTENANCE: Exits shall be maintained in a condition which will prevent tracking or flowing of sediment onto public right of way. This may require periodic removal and replacement of stone or timber, or other material as conditions demand and repair and/or clean out of any measures used to trap sediment. Sediment spilled, dropped, washed or tracked onto public right of way shall be immediately removed by the Contractor and disposed of at an approved site and in a manner that will not contribute to additional siltation.

When necessary, wheels shall be cleaned to remove sediment prior to entrance onto public right of way. When necessary or when directed by the engineer, the construction exits may be removed and/or replaced as many times as needed.

The construction exits shall be removed promptly when directed by the Engineer. Discarded materials shall become the property of the Contractor for his disposal at an approved site. The area beneath the construction exit and any area damaged by the removal process shall then be stabilized by the Contractor using appropriate methods as approved by the Engineer. Stabilization shall be as defined by Item 540, "Temporary Erosion, Sedimentation and Water Pollution Prevention and Control".

MEASUREMENT: Construction exits will not be measured.

PAYMENT: The work performed and materials furnished as prescribed by this item are subsidiary to Section 540.

Construction of sediment traps as well as the periodic removal of accumulated sediment deposits (as described under "Maintenance") used in conjunction with the construction exit will not be measured and paid for, but are considered subsidiary to this item.

SECTION 550
TRENCH EXCAVATION SAFETY PROTECTION

This item shall govern for the Trench Excavation Safety Protection required for the construction of all trench excavation protection systems to be utilized in the project and including all additional excavation and backfill necessitated by the protection system.

CONSTRUCTION METHODS: Trench Excavation Safety Protection shall be accomplished as required by the most recent provisions of, Part 1926, Subpart P - Excavations, Trenching, and Shoring of the Occupational Safety and Health Administration (OSHA) Standards and Interpretations, as may be amended.

MEASUREMENT: Measurement will be by the linear foot and shall match the length of box culvert installed in this project.

PAYMENT: Payment for Trench Safety Excavation Protection shall be made according to the amount of box culvert installed.

Payment shall include all components of the Trench Excavation Safety Protection System which can include, but not be limited to sloping, sheeting, trench boxes or trench shields, sheet piling, cribbing, bracing, shoring, dewatering or temporary diversion and proper recapture and transportation of water to provide adequate drainage. Incidental payment shall also include the additional excavation and backfill required, any jacking, jack removal, and removal of the trench supports after completion.

Payment of all work prescribed under this item shall be full compensation for all additional excavation and backfill associated with the item; for any retention by contractor of structural design/geotechnical/safety/equipment consultant; for furnishing, placing and removing all shoring, sheeting, or bracing; for dewatering or temporary diversion and proper recapture and transportation of water; for all jacking and jack removal; and for all other labor, material, tools, equipment and incidentals necessary to complete this portion of the work.

SECTION 552
DIVERSION AND CARE OF WATER

GENERAL

DESCRIPTION:

A. General:
   1. This Specification Section covers diversion of water and care of the receiving waterways and de-watering the project site (if necessary).
   2. The Contractor shall furnish all materials for, and shall construct and maintain, all necessary cofferdams, channels, flumes, pipes, drains, filters, sumps, pumps, piping, culverts and/or other temporary diversion and protective works necessary for diversion and care of water during construction.
   3. After having served their purpose, all temporary diversion and protective works in the construction area which are not a permanent part of the permanent features shall be removed and graded to the original grades, or the proposed grades as shown on the Drawings. All other temporary diversion and protective works shall be removed so as not to interfere in any way with the operation or the usefulness of the Project, and in a manner acceptable to the Engineer. Temporary channels shall be properly refilled to match the level of adjacent elevations and grades.
   4. The Contractor shall be responsible for, and shall repair at his own expense, any damage to the foundations, structures, or any other part of the Contract Work caused by floods, water, or failure of any part of the diversion or protective works.

APPLICABLE STANDARDS:

A. Federal, State, and local laws and permits shall apply to the work of this section and are hereby made a part of the Specifications to the extent required.

SUBMITTALS:

A. Within 14 days after notice of award of the Contract, the Contractor shall submit his water control plan and schedule showing his proposed method for the temporary diversion and care of the water during construction, assuming it becomes necessary. The plan may be placed in operation upon approval, but nothing in this Section shall relieve the Contractor of full responsibility for the adequacy of the diversion and protective works.

PRODUCTS

GENERAL:

A. The Contractor shall furnish all materials, equipment, and appurtenances, as required, for installing and removing all diversion and related control structures and facilities.

EXECUTION

DIVERSION AND CONTROL:

A. During the construction period, the Contractor shall at all times pass the runoff which is directed to the excavation areas.

B. Temporary diversion flows shall be discharged in a manner and at an elevation to minimize erosion of the ditches and receiving waterways.

D. The Contractor's diversion plan shall consider the possible adverse effects of water retained by any cofferdam(s) or dikes through the foundation sediments, both on the safety of the cofferdam and on downstream ground water levels in the channel areas to be excavated, cleaned, and prepared. It shall be the Contractor's responsibility to incorporate zones, barriers, filters, drainage, and other protective works as necessary to assure the integrity and efficiency of any cofferdam(s).

CLEANUP:

A. All materials furnished by the Contractor and placed for temporary diversion and construction shall remain the property of the Contractor and shall be removed from the site and disposed of.

PAYMENT: Payment will be based on a lump sum prorated over the project duration.

SECTION 579
OTHER ROCK WORK AND MISCELLANEOUS LANDSCAPING

This item shall govern the rebuilding of existing rock edging, landscaping, sprinkler system and any other landscaping features damaged during construction of the inlet. Any landscaping features shall be built to the condition it was originally, or better, before the damage. Note that this section does not include the rebuilding of the rock wall if damaged during construction (refer to Section 577)

CONSTRUCTION METHODS: Utilize appropriate equipment to rebuild existing rock edging, landscaping, sprinkler system and any other landscaping features damaged during construction of the inlet. Any landscaping features shall be built to the condition it was originally, or better, before the damage.

MEASUREMENT: The rebuilding of existing rock edging, landscaping, sprinkler system and any other landscaping features shall be measured per lump sum.

PAYMENT: This item will be paid for per lump sum and shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools, labor and incidentals necessary to complete the work.

SECTION 590
OBTAIN CITY OF UNIVERSAL CITY PERMITS

DESCRIPTION: *This section shall govern for the obtaining of permits from the City of Universal City.*

SERVICES: Contractor shall obtain tree removal and building permits from the City of Universal City. Any surveying, engineering and fees required for these permits shall be provided by the owner at no additional cost to the contractor.

MEASUREMENT: "Obtain City of Universal City Permits" shall be measured as a lump sum.

PAYMENT: Payment for 'Obtain City of Universal City Permits,' measured as prescribed above, will be paid at the contract unit price bid per lump sum after permits are obtained.

ITEM 851
ADJUSTING EXISTING MANHOLES

851.1 Description: This item shall consist of the adjustment of all existing manholes, to include the replacing of existing manholes covers and rings regardless of type shown on the plans and in conformity with the provisions of these specifications.

851.2 Construction: Manholes shall be lowered below subgrade before placing base materials and opening shall be protected by hatch covers.

Existing manhole rings and covers which are determined by the CPS Inspector to be in an unacceptable condition, will be removed and replaced with new rings and cover. Contractor shall take all necessary measures to prevent damage to existing or new rings, cover, or cone from equipment and materials used in or taken through the work area. If an existing or new manhole cover, ring, or cone is damaged by the Contractor, it shall be replaced (as directed by CPS inspector) by the Contractor at his expense.

Manholes shall be adjusted after the base material has been laid and before placing of the surface course. Manhole that are going to be adjusted on an existing surface course not being replaced will be in accordance to the City of San Antonio utility Excavation Criteria Manual Standard Drawing No. 8.8. All manholes shall then be raised, or lowered a sufficient height so as to be level with the finished surface course. Adjustment in height will be made by addition or removal of "throat rings" above the manhole "cone" where feasible. A minimum of two and a maximum of six throat rings shall be used at each manhole. Material excavation from around the manholes shall be replaced with concrete in accordance with Standard Drawings, and select materials from the excavation. All excess materials shall be disposed of by the Contractor at his own expense an in an approved location.

851.3 Measurement: Manholes completely adjusted, as prescribed above, will be measured by the unit of each manhole adjusted. The excavation and the amount of concrete or reinforced concrete as necessary to fill the area excavated will not be measured for payment.

851.4 Payment: The work performed as prescribed by this item will be paid for at the contract unit price bid per manhole for "Adjusting Existing Manholes" which price shall be full compensation for all excavation, including saw cutting of surfaces as required, reinforced concrete and disposal of material excavated; for furnishing and placing all materials and for all labor, tools, equipment, and incidentals necessary to complete the work.

ITEM 900
REMOVE AND REPLACE RESIDENTIAL SPRINKLER SYSTEM HEADS

900.1 Description: This Item shall govern for the removal and replacement of existing residential sprinkler system heads and associated piping that are determined by the Contractor, in cooperation with the local resident, to be in conflict with the proposed street or drainage improvements.

900.2 Construction Methods and Materials: The contractor will be required to meet with each affected resident individually prior to performing any operations which will damage the existing sprinkler systems. The purpose of this meeting will be to assess the condition of the existing sprinkler system and to reach an agreement with the local owner about how the removal and replacement of the existing sprinkler system will be performed.

The Contractor will be required to remove and replace existing sprinkler system components and restore them to their condition as of the beginning of this project, to the satisfaction of the local resident. Removal and replacement of the existing materials will be permitted only if it is possible to do so without damage to the existing components. If it is not possible to remove and replace the existing materials without damage to the materials, the original materials shall be replaced with materials of equal or greater value, as approved by the local owner of the sprinkler system.

900.3 Measurement and Payment: Remove and Replace Sprinkler Heads will not be measured for payment. The work performed, materials furnished, and all labor, tools, equipment, and incidentals necessary to complete the work under this item will not be paid for directly and is considered subsidiary to other pay items.

UNIVERSAL CITY – FLINTSTONE DRIVE STREET IMPROVEMENTS

FUNDED BY THE U.S. DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT (HUD) COMMUNITY DEVELOPMENT BLOCK GRANT (CDBG) PROGRAM

Program Number: B-24-UC-48-0500

Grant Allocation: $300,000

BEXAR COUNTY
ECONOMIC & COMMUNITY
DEVELOPMENT

UNIVERSAL CITY
Gateway to Randolph AFB

BEXAR BEXAR COUNTY COMMISSIONERS COURT

Peter Sakai	County Judge
Rebeca Clay Flores	Commissioner Pct. 1
Justin Rodriguez	Commissioner Pct. 2
Grant Moody	Commissioner Pct. 3
Tommy Calvert, Jr.	Commissioner Pct. 4

UNIVERSAL CITY

Tom Maxwell	Mayor
Christina Fitzpatrick	Mayor Pro-tem
Bear Goolsby	Councilmember
Lori Putt	Councilmember
Ashton Bulman	Councilmember
Bernard Rubal	Councilmember
Phil Vaughan	Councilmember

Bexar County Economic and Community Development Department (ECD)
Deborah Carter, ECD Director
Robert H. Reyna, Manager
233 North Pecos, Suite 320
San Antonio, Texas 78207

Engineer's Information:
Givler Engineering, Inc.
515 Busby Dr., Ste. 101
San Antonio, Texas 78209

Contractor's Information:

PROJECT SIGN SHALL BE 4'-0" HIGH BY 8-'0" WIDE ON (2) 4X4 WOOD POSTS SET IN CONCRETE. TOP OF SIGN SHALL BE 9'-0" ABOVE GRADE