Standard Specifications Manual

SERIES 200 - SUBGRADE AND BASE CONSTRUCTION

Item No.

ITEM NO. 201
SUBGRADE PREPARATION

201.1 Description

This item shall govern scarifying; blading and rolling the subgrade to obtain a uniform texture and provide as nearly as practicable a uniform density for the top 6 inches (150 mm) of the subgrade.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

201.2 Submittals

The submittal requirements of this specification item may include:

A. A plan identifying classification and characteristics (P.I., optimum moisture-density, etc.) of insitu subgrade soils, as well as the source, classification and characteristics of any proposed borrow material,

B. Type and size of equipment proposed to produce the required compaction, and

C. Compaction (moisture-density, etc) test results for in-situ subgrade soils and/or borrow materials.

201.3 Construction Methods

Prior to initiation of subgrade preparation activities, all operations involving Standard Specification Item No. 101," Preparing Right of Way" and/or Standard Specification Item No. 102, "Clearing and Grubbing" shall be completed. The surface of the subgrade shall be scarified and shaped in conformity with the typical sections and the lines and grades indicated on the Drawings; by the removal of existing material or addition of approved material as established by the Engineer or designated representative. Any deviation in the subgrade cross section which exceeds 1/2 inch in a length of 10 feet (12 mm in a length of 3 meters), measured longitudinally, shall be corrected by loosening, adding or removing material, and then reshaping and compacting by sprinkling and rolling.

All unsuitable material shall be removed and replaced with approved material. All foundations, walls or other objectionable material shall be removed in accordance with Standard Specification Item No. 104, "Removing Portland Cement Concrete" to a minimum depth of 18 inches (450 mm) under all structures and 12 inches (300 mm) under areas to be vegetated. All holes, ruts and depressions shall be filled with approved material and compacted by approved methods.

The subgrade shall be prepared sufficiently in advance to insure satisfactory prosecution of the Work. The Contractor will be required to set blue tops for the subgrade on the centerline, at the quarter points and along the curb lines or edge of pavement at maximum intervals of 50 feet (15.25 meters). The subgrade shall be tested by proof rolling in conformity with Standard Specification Item No. 236, "Proof Rolling" prior to placement of the first course of base material. Any unstable or spongy

subgrade areas identified by proof rolling shall be corrected either by additional re-working, drying and compaction, or by removal and replacement of unsuitable materials. When specifically directed by the Engineer or designated representative, the Contractor shall re-work the subgrade* as follows:

A. Remove the unstable subgrade to the full depth of the unstable in-situ material or to a minimum depth of 6 inches (150 mm), whichever is greater;

B. Spread the material over a sufficient area to allow reworking of the excavated material;

C. Disc, scarify or otherwise breakup the excavated material and allow to dry (Note: If approved by the Engineer or designated representative, the addition of lime or other additive may be used to aid in the drying process or to stabilize the unstable material);

D. Fill the excavated area with the re-worked material and compact to specified densities; and

E. Proof roll the re-worked area.

* The Rework process will not be allowed for unstable organic subgrade soils. These type soils will be permanently removed and replaced with materials approved by the Engineer or designated representative.

All suitable material removed in accordance with Standard Specification Item No, 111, “Excavation”, may be utilized in the subgrade with the approval of the Engineer or designated representative. All other material required for completion of the Subgrade, including those defined in accordance with Specification Item No. 130, “Borrow”, shall also be subject to approval by the Engineer or designated representative.

It is the intent of this specification to provide the required density and moisture control for the subgrade based on the plasticity characteristics of the approved materials. The subgrade materials shall be sprinkled as required and compacted to the extent necessary to provide the density specified below, unless otherwise indicated on the Drawings. The Plasticity Index (P.I.) will be established in accordance with TxDOT Test Methods Tex-104-E, Tex-105-E and Tex-106-E. The density determination will be made in accordance with TxDOT Test Method Tex-114-E and field density measurements will be made in accordance with TxDOT Test Method Tex-115-E.

Description	Density, Percent	Moisture
Non-swelling Soils (P.I. less than 20)	Not less than 95 nor more than 105*	
Swelling Soils(P.I. between 20 and 35	Not less than 95 nor more than 102	Not less than optimum
Swelling Soils (P.I. greater than 35)	Not less than 95 nor more than 100	Not less than optimum

* Where subgrade material is not conducive to laboratory testing (ie. solid rock), approval of subgrade shall be based on proof rolling or other information as approved by the Engineer or designated representative.

Subgrade materials on which planting or turf will be established shall be compacted to a minimum of 85 percent of the density as determined in accordance with TxDOT Test Method Tex-114-E. Field tests for density in accordance with TxDOT Test Method Tex-115-E will be made as soon as possible after compaction operations are completed. If the material fails to meet the density specified, it shall be reworked as necessary to obtain the density required.

Prior to placement of any base materials, the in-place density and moisture content of the top 6 inches (150 mm) of compacted subgrade shall be checked. If the tests indicate that the relative density and moisture do not meet the limits specified in the table above, the subgrade from the closest passing test at one end of the failed area to the closest passing test at the other end of the failed area shall be reworked as necessary to obtain the specified compaction and moisture content. The contractor, at his own expense, may have more tests performed to narrow the limits of the failed area. Unless otherwise accepted by the City of Round Rock, at least two tests shall be taken on each street being worked and at intervals not to exceed 1,000 square yards. If subgrade material changes within the 1,000 square yard interval, two tests shall be taken on each such change in material. Testing locations shall be subject to the City Inspector's discretion. All initial testing shall be paid for by the Owner/Developer. Any retesting of failed areas shall be paid for by the Contractor.

201.4 Measurement

All acceptable subgrade preparation will be measured by the square yard (square meter: 1 square meter equals 1.196 Square yards). The measured area includes the entire width of the roadway for the entire length as indicated on the Drawings.

201.5 Payment

This item will be considered subsidiary to Standard Specification Item Nos. 110, "Street Excavation" or 111, "Excavation" unless included as a separate pay item in the contract. When included for payment, it shall be measured as specified above and paid for at the contract unit bid price for "Subgrade Preparation". The bid price shall include full compensation for all work herein specified, including the furnishing of all materials, equipment, tools and labor and incidentals necessary to complete the work.

Payment, when included as a contract pay item, will be made under:

Subgrade Preparation Per Square Yard

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 201, "SUBGRADE PREPARATION"

City of Round Rock Standard Specification Items

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 104	Removing Portland Cement Concrete
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 130	Borrow
Item No. 236	Proof Rolling

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials

RELATED CROSS REFERENCE MATERIALS
Specification Item 201, "SUBGRADE PREPARATION"

City of Round Rock Standard Specifications

Designation	Description
Item No.132	Embankment

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-103-E	Determination of Moisture Content of Soil Materials

ITEM NO. 202
HYDRATED LIME AND LIME SLURRY

202.1 Description

This item establishes the requirements for hydrated lime and commercial lime slurry of the type and grade considered suitable for use in the treatment of natural or processed materials or mixtures for stabilization of subgrade, subbase and base construction.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

202.2 Submittals

The submittal requirements of this specification item may include:

A. A plan identifying type, grade, chemical and physical composition of proposed lime application, and

B. A plan for sampling and testing of lime slurry.

202.3 Materials

The various types and grades are defined and identified as follows:

A. Type A (Hydrated Lime)

Type A Hydrated Lime shall consist of a dry powder obtained by treating quicklime with enough water to satisfy its chemical affinity for water under the conditions of its hydration. This material shall consist essentially of calcium hydroxide or a mixture of calcium hydroxide and a small allowable percentage of calcium oxide, magnesium oxide and magnesium hydroxide.

When sampled and tested according to prescribed TxDOT Standard Specification Item No. 264, hydrated lime shall conform to the following requirements as to chemical and physical composition:

Chemical Composition Requirements

Total “active” lime content, percent by weight (mass) {i.e., % by weight (mass) [$Ca(OH)_2$] + % by weight (mass) [CaO]}	Minimum 90.0 %
Note: No more than 5 % by weight (mass) calcium oxide (unhydrated lime) will be allowed in determining the total ‘active lime content.	
Unhydrated lime content, % by weight (mass), CaO	Maximum 5.0 %
"Free water" content, % by weight (mass), H_2O	Maximum 5.0 %

The percent by weight (mass) of residue retained, wet sieve, shall conform to the following requirements:

Wet Sieve Requirements

Residue retained on No. 6 (3.35 mm) sieve	Maximum. 0.2 %
Residue retained on No. 30 (600 mm) sieve	4.0 %

Specifications for Type A applies specifically to the normal hydrate of lime made from "high-calcium" type limestone. Hydrated Lime for stabilization purposes shall be applied as a dry powder or mixed to form a slurry before application as indicated on the Drawings. The slurry shall be free of liquid other than water.

B. Type B (Commercial Lime Slurry)

Type B Lime Slurry shall be a pumpable suspension of solids in water. The slurry shall be furnished at or above the minimum "Dry Solids" content as approved by the Engineer or designated representative and must be of a consistency that can be handled and uniformly applied without difficulty. The water of the liquid portion of the slurry shall not contain dissolved material in sufficient quantity and/or nature to make it injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of "solids content", shall consist principally of hydrated lime of a quality and fineness sufficient to meet the requirements as to chemical composition and residue identified below.

When sampled and tested according to prescribed TxDOT Standard Specification Item No. 264, hydrated lime shall conform to the following requirements as to chemical and physical composition:

1. Chemical Composition. The "solids content" of lime slurry shall have a hydrate alkalinity $Ca(OH)_2$ of not less than 87 percent by weight (mass).

2. Residue (Wet Sieve)

The percent by weight (mass) of residue retained in the "solids content" of lime slurry shall conform to the following requirements:

Residue retained on No. 6 (3.35 mm) sieve	Maximum 0.2 %
Residue retained on No. 30 (600 mm) sieve	Maximum 4.0 %

C. Type C: Quicklime Pellets

Quicklime pellets shall conform to TxDOT Grade DS (TxDOT Specification Item 264) and are only allowable when indicated on the Drawings or when approved by the Engineer or designated representative. Quicklime pellets shall be of a gradation suitable for either "Dry Placing" or for preparation of a slurry for "Wet Placing".

When sampled and tested according to prescribed TxDOT Standard Specification Item No. 264, the quicklime lime shall conform to the following requirements as to chemical and physical composition:

1. Chemical Composition. The "solids content" of lime slurry shall have a hydrate alkalinity CaO of not less than 87 percent by weight (mass).

2. Residue (Wet and Dry Sieve)

   The percent by weight (mass) retained in the "solids content" of quicklime shall conform to the following requirements:

   Wet Sieve Requirements

Residue retained on No. 6 (3.35 mm) sieve	Maximum 8.0 %

Dry Sieve Requirements

Retained on 1 inch (25 mm) sieve	0.0 %
Retained on 3/4 inch (19 mm) sieve	Maximum of 10.0 %
Retained on No. 100 (150 mm) sieve	Minimum of 80.0 %

D. Water

Water shall be clean and free of industrial wastes and other objectionable substances harmful to the lime and the environment.

202.4 Sampling and Testing

The sampling and testing of lime slurry shall be conducted in accordance with TxDOT Test Methods: Tex-112-E, Tex-121-E and Tex-600-J.

202.5 Measurement and Payment

Lime will be measured and paid for in accordance with the governing specifications for the items of construction in which lime is used (e.g. Standard Specification Item 203, " Lime Treatment for Materials in Place"), except that lime treatment for small applications required to stabilize a problem area shall be paid per pound (kilograms: 1 kilogram equals 2.205 pounds) applied. The unit bid price for small applications shall include full compensation for all spreading, mixing and shaping required to stabilize the surface and for any other materials, manipulation, labor, tools, equipment and incidentals necessary to complete the work.

Payment will be made under the following:

Small Area Application of Hydrated Lime, Type A Per Pound.

Small Area Application of Lime Slurry, Type B Per Pound.

Small Area Application of QuickLime, Type C Per Pound.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 202, “HYDRATE LIME AND LIME SLURRY”

City of Round Rock Standard Specification Items

Designation	Description
Item No. 203	Lime Treatment for Materials in Place

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 264	Lime and Lime Slurry

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-112-E	Methods of Admixing Lime to Reduce Plasticity Index of Soils
Tex-121-E	Soil Lime Testing
Tex-600-J	Sampling and Testing of Hydrated Lime, Quicklime and Commercial Lime Slurry

RELATED CROSS REFERENCE MATERIALS
Specification Item 202, “HYDRATE LIME AND LIME SLURRY”

City of Round Rock Standard Specifications

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 130	Borrow
Item No. 132	Embankment
Item No. 210	Flexible Base
Item No. 236	Proof Rolling

RELATED CROSS REFERENCE MATERIALS - continued
Specification Item 202, “HYDRATE LIME AND LIME SLURRY”

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade and Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials

ITEM NO. 203
LIME TREATMENT FOR MATERIALS IN PLACE

203.1 Description

This item shall govern the preparation and treatment of the subgrade, existing subbase or existing base by pulverizing the existing materials; furnishing and applying lime; mixing; mellowing for a minimum of 12 hours and compacting the mixed material to the required depth and density. This item applies to treatment of natural ground, embankment or existing pavement structure and shall be constructed as specified herein and in conformity with the typical sections, lines and grades on the drawings or as directed by the Engineer or designated representative. If the type of lime to be placed is not indicated on the drawings, the Contractor shall use Type B, Commercial Lime Slurry or Type C quick lime pebbles for all applications on areas larger than 100 square feet (10 square meters).

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text inch-pound units are given preference followed by SI units shown within parentheses.

203.2 Submittals

The submittal requirements of this specification item may include:

A. Mix design information,

B. Type of lime and rate of lime application, and

C. Equipment proposed for use in proof rolling, pulverizing, mixing, placement and compaction operations.

203.3 Materials

A. Lime

The lime shall meet the requirements of Item No. 202, "Hydrated Lime and Lime Slurry" for the type of lime specified in the drawings or as directed by the Engineer or designated representative.

When Type B, Commercial Lime Slurry, is specified, the Contractor shall select the “Dry Solids” content to be used in the slurry prior to construction and any change shall be subject to the approval of The City no less than 5 working days before changing the “Dry Solids” content.

When dry placement of Type C quicklime pebbles are indicated on the Drawings or approved by the Engineer or designated representative, the pebbles shall conform to TxDOT Grade DS (TxDOT Specification Item 264) and shall have a gradation suitable for dry placement.

If lime is furnished in bags, each bag shall bear the manufacturer's certified weight (mass). Bags varying more than 5 percent from that weight (mass) may be rejected and the average weight (mass) of bags in any shipment, as shown by weighing 10 bags selected at random, shall not be less than the manufacturer's certified weight (mass).

B. Water

The water shall meet the material requirements of Standard Specification Item No. 220S, “Sprinkling for Dust Control”

C. Asphalt.

The asphalt shall conform to the requirements of Standard Specification Item No. 301, “Asphalts, Oils and Emulsions”

203.4 Equipment

The pulverizing, mixing and proof rolling machinery, tools and equipment, which are necessary for the proper execution of the work, shall be approved by the Engineer or designated representative. The equipment shall be located on the project site prior to the initiation of construction operations.

During the conduct of the Work all in-use machinery, tools and equipment shall be maintained in a satisfactory and workmanlike manner.

Hydrated lime shall be stored and handled in closed, weatherproof containers up to the time that mixing is initiated to form a slurry for distribution on the areas to be treated. If storage bins are used, they shall be completely enclosed. Hydrated lime in bags shall be stored in weatherproof buildings with adequate protection from ground dampness.

If lime is furnished in trucks, each truck shall have the weight (mass) of lime certified on public scales or the Contractor shall place a set of standard platform truck scales or hopper scales at a location approved by the Engineer or designated representative.

203.5 Construction Methods

A. General

Prior to commencement of the work, all required erosion control and tree protection measures shall be in place and existing utilities located and protected. Construction equipment shall not be operated within the drip line of trees unless approved by the City Forestry Manager. Construction materials shall not be stockpiled under the canopies of trees. Excavation or embankment materials shall not be placed within the drip line of trees until appropriate tree wells are constructed and approve by the City Forestry Manager.

The placement of lime shall not be allowed to adversely impact vegetation, drainage ways or waterways, storm water inlets or overflow channels. Structures shall be screened, blocked or protected to prevent lime from entering any structure or waterway.

It is the primary requirement of this specification to secure a completed course of treated material, which contains a uniform lime mixture at the rate specified on the drawings or directed by the Engineer or designated representative, is free from loose or segregated areas, exhibits uniform density and moisture content, is well bound for its full depth and displays a smooth surface suitable for placement of subsequent courses. It shall be the responsibility of the Contractor to: regulate the sequence of his work, use the proper amount of lime, maintain the work and rework the courses as necessary to meet the above requirements.

B. Preparation of Subgrade or Existing Base.

Prior to treatment of existing material and/or subgrade the layer to be treated shall be constructed and shaped to conform to the typical sections, lines and grades as indicated on the Drawings or as established by the Engineer or designated representative. This work shall be done in accordance with the provisions of applicable bid items. When shown on the Drawings, any existing asphaltic concrete pavement shall be removed and the work will be paid for in accordance with the applicable bid items.

When indicated on the drawings or directed by the Engineer or designated representative, the Contractor shall proof roll the roadbed in accordance with Standard Specification Item No. 236, “Rolling (Proof)” prior to pulverization or scarification of the existing material and/or subgrade. Any unstable or spongy subgrade areas identified by proof rolling shall be corrected either by additional re-working, drying and compaction, or by removal and replacement of unsuitable materials. When specifically directed by the Engineer or designated representative, the Contractor shall re-work the subgrade in accordance with Section 201.3, ‘Construction Methods of Standard Specification Item No. 201, “Subgrade Preparation”.

When the Contractor elects to use a cutting and pulverizing machine that will process the material to the specified 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.

The material, either before or after lime is applied, shall be excavated to the secondary grade (i.e. proposed depth of lime treatment) and removed or windrowed to expose the secondary grade. The secondary grade shall be blue topped at the edge, 1/4 points and along the centerline at not more than 50-foot (15.25 meters) centers. Any wet or unstable materials, located below the secondary grade, shall be corrected, as directed by the Engineer or designated representative, by removing the unstable material or by scarifying, adding lime and compacting until uniform stability is attained.

The Contractor shall instruct their crews in the proper handling of lime to ensure that the workers and the public are adequately protected during lime handling and application operations.

C. Premixing Surface

When any material is uncovered during the premixing operation that exhibits properties different from the anticipated material, the Engineer or designated representative shall secure a sample of the material for appropriate testing to establish a suitable rate of lime application for the material.

D. Lime Application

The percentage of lime to be added by weight (mass) in pounds per square yard (kilograms per square meter) shall be as directed in this document or in accordance with the Lime mix design indicated on the Drawings and may be varied by the Engineer or designated representative if conditions warrant.

Unless otherwise approved by the Engineer or designated representative, the lime operation shall not be started when the air temperature is below 41ºF (5ºC) and falling, but may be started when the air temperature is above 35ºF (2ºC) 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 or designated representative are unsuitable.

Lime shall only be applied to those areas that can be properly processed during the same working day.

The application and mixing of lime with the existing material shall be accomplished by the methods hereinafter described as “Dry Placement” or Slurry Placement’. Dry placement will only be permitted for small isolated areas as indicated on the drawings or as directed by the Engineer or designated representative. The rate of lime solids application shall be based on lime series curves developed by a geotechnical engineer for the project and shall not be less than seven (7) percent by weight (mass), unless indicated otherwise on the Drawings or as directed by the Engineer or designated representative.

Any lime exposed to the air for more than six (6) hours and any lime lost or damaged before application due to rain, wind or other cause will be rejected and replaced by the Contractor at its own expense.

1. Dry Placement

The lime shall be spread by a spreader approved by the Engineer or designated representative or by bag distribution at the rates shown on the Drawings or as directed by the Engineer or designated representative.

The lime shall be distributed at a uniform rate and in such manner as to reduce the scattering of lime by wind. Lime shall not be applied when the wind conditions, in the opinion of the Engineer or designated representative, are such that blowing lime becomes objectionable to adjacent property owners or dangerous to traffic. A motor grader will not be used to spread Type A Hydrated lime but may be used to spread Type C Quicklime Grade “DS” pebbles.

The material shall be sprinkled, as approved by the Engineer or designated representative, until the proper moisture content has been secured.

2. Slurry Placement

The lime shall be mixed with water in a mixer or trucks with approved distributors to form a slurry with a solids content approved by the Engineer or designated representative. Application of the slurry shall be attained by successive passes over a measured section of roadway until the proper moisture and lime content has been secured. The distributor truck shall be equipped with an agitator, which will keep the lime and water in a uniform mixture.

E. Mixing

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

During the interval of time between application and mixing, hydrated lime that has been exposed to the open air for a period of 6 hours or more or to excessive loss due to washing or blowing will not be accepted and the area shall be retreated.

In addition to the above, when Type C Quicklime, Grade "DS", is used 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. After mixing, and prior to compaction, the mixture of material, quicklime and water, shall be moist cured for two (2) to seven (7) days, as approved by the Engineer or designated representative. After curing, mixing shall continue until the material and lime are thoroughly blended to the satisfaction of the Engineer or designated representative.

The material and lime shall be thoroughly mixed by road pulverizer equipment approved by the Engineer or designated representative. The material and lime shall be brought to the proper moisture content and the mixing shall be continued until a homogeneous, friable mixture of material and lime is obtained. The lime-material mixture shall be free from all clods or lumps so that, when all nonslaking aggregates retained on the #4 (4.75 mm) sieve are removed, the remainder of the material shall meet the following pulverization requirements, when tested in accordance with TxDOT Test Method Tex-101-E, Part III:

	Percent
Minimum Passing the 1 3/4 inch (45 mm) Sieve	100%
Minimum Passing the 3/4 inch (19 mm) Sieve	85%
Minimum Passing the No. 4 (4.75 mm) Sieve	60%

When the lime-material mixture satisfies the requirements above, the mixture shall be allowed to “mellow” for a minimum of 12 hours prior to the initiation of compaction.

F. Compaction

Prior to initiation of compaction, the material shall be aerated or sprinkled as necessary to provide the optimum moisture. The lime-conditioned materials shall then be shaped and uniformly compacted to the sections; lines and grades indicated on the drawings or as directed by the Engineer or designated representative. Compaction shall continue until the entire depth of mixture is uniformly compacted as shown on the Drawings, as specified herein, or as directed by the Engineer or designated representative.

When shown on the Drawings or approved by the Engineer or designated representative, multiple lifts will be permitted; however the 12-hour “mellowing” procedure is required for each lift. Individual lift thickness should not exceed 8 inches (200 mm).

The course shall be sprinkled as required and compacted to the extent necessary to provide the density specified below:

Description	Density, Percent
For lime-conditioned subgrade, existing subbase or existing base that will receive subsequent subbase or base courses.	Not less than 95% of ‘optimum density or as otherwise indicated on the drawings.
For lime-conditioned existing base that will receive surface courses	Not less than 98% of ‘optimum density or as otherwise indicated on the drawings.

Testing for the ‘optimum density used for compaction control shall conform to TxDOT Test Method Tex-113-E. In addition to the requirements specified for density, the full depth of the material indicated shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section is completed and proof rolled in accordance with Specification Section No. 236, in place compaction tests will be conducted, in accordance with TxDOT Test Method, Tex 115-E. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements. Throughout the 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 Drawings or as established by the Engineer or designated representative.

If the lime-conditioned material, due to any reason or cause, loses the required stability, density and finish before the next course is placed, it shall be re-compacted and refinished at the sole expense of the Contractor.

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 during the reworking operation.

Reworking shall include loosening, road mixing as approved by the Engineer or designated representative, 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-113-E.

203.6 Finishing, Curing and Preparation for Surfacing

After the final layer or course of the lime conditioned subgrade, subbase or base has been compacted, it shall be brought to the required lines and grades in accordance with the typical sections indicated on the drawings. The completed section shall then be finished by rolling with a pneumatic tire or other suitable roller, approved by the Engineer or designated representative, that is sufficiently light in loading to prevent hair cracking.

The Contractor shall set blue tops at edges, 1/4 point, and along the centerline at not more than 50 foot (15.25 meter) spacing. The completed section shall be maintained in a moist cured condition for a minimum of 3 days or prevented from drying by the addition of an asphalt material indicated on the drawings or as directed by the Engineer or designated representative at the rate of 0.05 to 0.20 gallons per square yard (0.2 to 0.9 liters per square meter) before further courses are added or any through traffic is permitted, unless otherwise directed by the Engineer or designated representative. Curing shall continue for seven (7) days before further courses are added or traffic is permitted access, unless approved otherwise by the Engineer or designated representative

However the lime-conditioned material may be covered by other courses, the day following finishing, when approved by the Engineer or designated representative. In cases where lime-conditioned subgrade or subbase materials set up sufficiently to prevent objectionable damage from traffic, such layers may be opened to traffic 2 days after compaction. If the drawings require the lime-conditioned material to be sealed or covered by other courses of material, the seal or other course shall be applied within 14 days after final mixing is completed, unless otherwise directed by the Engineer or designated representative.

203.7 Sampling and Testing

The lime-conditioned mixture shall be tested daily at the Project site for conformance to specification requirements. The Engineer or designated representative shall determine sample locations based on the Contractor's anticipated production. Each day's anticipated production shall be sectioned into three (3) equal, single-pass, sub-area lots. Each day's sample locations shall be equally distributed over the three (3) sub-

areas. Also, no more than one location of the three (3) sub-areas is to be located in an irregular shaped area such as a cul-de-sac.

When, in the opinion of the Engineer or designated representative, test results appear unrepresentative, additional testing may be authorized. Retesting due to failures or to resolve unrepresentative results will be at the expense of the Contractor and the results of the retesting shall be averaged with the results of the original testing. If the results of retesting indicate that the original testing was erroneous, the original test results will be discarded.

The Engineer will ensure that samples of completed work are obtained to conduct the following tests:

Testing Requirement	TxDOT Test Procedure
Optimum Moisture Density	Test Method Tex-113E
In-Place Density of Lime Conditioning	Test Method, Tex 115-E
Thickness of Lime Conditioning	Test Methods Tex-140-E & Tex-600-J
PI Reduction	Test Method Tex-106-E

The contractor shall repair areas disturbed while obtaining samples.

203.8 Tolerances

A. In-Place Density

The Work may be accepted provided no more than one (1) out of the most recent five (5) density tests performed is below the specified density, provided that the failing test is not more than 3 pounds per cubic foot (50 kilograms per cubic meter) below the specified density.

B. Dimensional

Areas of lime conditioning which do not meet the tolerances specified below will be delineated and shall be corrected to drawing dimensions by scarifying, remanipulating and recompacting the deficient areas at the Contractor's sole expense.

1. Thickness Requirements:

Under thickness shall not exceed ¾ inch (19 mm). Over thickness will be waived at no additional cost to the Owner/Developer. In all cases the percent of lime by weight shall meet or exceed the specified amount.

2. Widths Requirements:

Roadway under width shall not exceed 6 inches (150 mm). Shoulder underwidth shall not exceed 3 inches (75 mm). If lime conditioning for both roadway and shoulder is constructed at the same time, the 6-inch (150-mm) underwidth tolerance shall apply. Overwidth will be waived at no additional cost to the Owner/Developer.

203.9 Measurement

Lime-conditioning of the type, grade and rate of application on the subgrade, existing subbase and existing base shall be measured by the square yard (square meter: 1 square yard equals 0.836 square meters) to neat lines as shown on the typical sections.

203.10 Payment

Work performed and materials furnished as prescribed by this item and measured as provided under "Measurement" will be paid for as follows:

"Lime Treated Subgrade", "Lime Treated Existing Subbase" and "Lime Treated Existing Base" will be paid for at the unit bid price per square yard.

The unit bid prices shall include full compensation for: preparing the roadbed; furnishing all materials; all freight involved; public scales weighing charges or furnishing scales and labor involved in weighing the material; loosening, mixing, pulverizing, spreading, drying, furnishing and application of lime, sprinkling, rolling, shaping, proof rolling, maintenance and all manipulations, reworking, labor, equipment, fuels, tools and incidentals necessary to complete the work.

Payment will be made under one of the following:

Lime Treated Subgrade, (____in. Thick)	Per Square Yard.
Lime Treated Existing Subbase, (____in. Thick)	Per Square Yard.
Lime Treated Existing Base, (____in. Thick)	Per Square Yard.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 203, “LIME TREATMENT FOR MATERIALS IN PLACE”

City of Round Rock Standard Specifications

Designation	Description
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 220	Sprinkling for Dust Control
Item No. 236	Proof Rolling
Item No. 301	Asphalts, Oils and Emulsions

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 203, “LIME TREATMENT FOR MATERIALS IN PLACE”

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-101-E, Part III	Preparation of Soil and Flexible Base Materials for Testing
Tex-106-E	Methods of Calculating the Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials
Tex-121-E, Part II	Soil Lime Testing
Tex-140-E	Measuring Thickness of Pavement Layer
Tex-600-J	Sampling and Testing of Hydrated Lime, Quicklime and Commercial Lime Slurry

RELATED CROSS REFERENCE MATERIALS
Specification Item 203, “LIME TREATMENT FOR MATERIALS IN PLACE”

City of Round Rock Standard Specifications

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 130	Borrow
Item No. 132	Embankment
Item No. 210	Flexible Base
Item No. 230	Rolling (Flat Wheel)
Item No. 231	Rolling (Pneumatic Tire)
Item No. 306	Prime Coat

RELATED CROSS REFERENCE MATERIALS
Specification Item 203, “LIME TREATMENT FOR MATERIALS IN PLACE”

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)
Item No. 264	Lime and Lime Slurry
Item No. 300	Asphalts, Oils and Emulsions

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-103-E	Determination of Moisture Content in Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils

ITEM NO. 204
PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE

204.1 Description

This item shall govern the treatment of materials in place by pulverizing soil or aggregate materials, adding Portland cement, mixing, wetting and then compacting the treated material to the required density, as herein specified and in conformity with the typical sections, lines, grades and thickness as shown on the Drawings or as established by the Engineer or designated representative. This item applies to natural subgrade soils, embankment materials, new base or existing base (with or without asphaltic concrete pavement layers) or combinations as shown on the Drawings.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text the inch-pound units are given preference followed by SI units shown within parentheses.

204.2 Submittals

The submittal requirements of this specification item may include:

A. A mix design identifying classification of in-place materials, type of cement, source of water and quantities of cement and water required in the proposed application to yield the specified compressive strength requirements, and

B. An update in the mix design, if source of material changes during construction,

C. A plan describing the construction equipment proposed for the work and identifying the type and condition of each equipment item.

204.3 Materials

A. Soil

Soil shall consist of approved material, free from vegetation or other objectionable matter, encountered in the existing roadway and/or other acceptable embankment or borrow material selected for use in preparation of the roadway in accordance with this specification.

B. Portland Cement

Portland cement shall be either Type 1, 1P or II and shall conform to TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges Item No. 524.

The Contractor, at his option, may use bag or bulk cement.

C. Water

Water shall be free from oils, acids, organic matter or other substances deleterious to the cement treatment of materials. The water shall not contain more than 1000 parts per million of chlorides as Cl nor more than 1000 parts per million of sulfates as SO4. Water from municipal supplies approved by the State Health Department will not require testing, but water from other sources will be

sampled and tested in accordance with AASHTO T-26. The water source shall be approved by the Engineer or designated representative.

204.4 Equipment

The equipment utilized for materials, which are specified to be measured or proportioned by weight (mass) shall be approved by the Engineer or designated representative. Prior to the start of construction operations the equipment necessary for the proper construction of the work shall be on the project site, in first class working condition and approved by the Engineer or designated representative, both as to type and condition. The Contractor shall at all times provide sufficient equipment to enable continuous prosecution of the work and to insure completion in the required number of working days.

"Portland Cement Treatment for Materials in Place" may be constructed with any machine or combination of machines and auxiliary equipment that will produce results as outlined in this specification.

Mixing may be accomplished by (1) a multiple-pass traveling mixing plant or (2) a single-pass traveling mixing plant.

The equipment provided by the Contractor shall be operated by experienced and capable workers and shall be that necessary to provide a cement treatment meeting the requirements herein specified.

204.5 Mix Design

Cement content will be selected by the Engineer or designated representative, based on compressive strength test results from a testing laboratory accepted by the City of Round Rock. The mix design shall meet the strength requirements as shown on the Drawings or indicated in the Specifications.

Unless otherwise indicated in the Drawings or established by the Engineer or designated representative, the mix will be designed with the intention of producing a minimum average 7 day compressive strength of 400 pounds per square inch (2750 kilopascals) using the unconfined compression testing procedures described in TxDOT Test Method Tex-120-E.

When material properties or sources change, the Contractor shall provide additional mix design tests and adjust the cement content as necessary to meet the compressive strength requirements.

204.6 Construction Methods

A. General

Prior to commencement of this work, all required erosion control and tree protection measures shall be in place and existing utilities located and protected.

Construction equipment shall not be operated within the drip line of trees unless otherwise approved by the City Forestry Manager. Construction materials shall not be stockpiled under the canopies of trees. Excavation or embankment materials shall not be placed within the drip line of trees until tree wells are constructed and approved by the City Forestry Manager

It is the primary requirement of this specification to secure a uniformly treated course of cement treated material, free from loose or segregated areas, of uniform density and moisture content, well bound for its full depth and with a smooth surface suitable for placing subsequent courses.

B. Preparation of Subgrade or existing surface

Prior to scarifying or pulverizing the existing material, the subgrade or existing surface shall be graded and shaped as required to construct the "Portland Cement Treatment for Materials in Place" in conformance with the lines, grades, thickness and cross section indicated on the Drawings or as approved by the Engineer or designated representative. Unsuitable material shall be removed and replaced with acceptable material.

The Contractor shall proof roll the subgrade or existing surface in accordance with Standard Specification Item No, 236. The subgrade or existing surface shall be firm and able to support without displacement the construction equipment and the compaction hereinafter specified. Soft or yielding subgrade shall be corrected and made stable before construction proceeds.

When the Contractor elects to use a cutting and pulverizing machine that will process the material to the specified 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 smooth surface over the entire width of the cut. The machine shall be of such design that a visible indication is provided at all times that the machine is cutting to the proper depth. If the machine fails to achieve the proper cutting depth, it shall be removed from the project or adjusted to the satisfaction of the Engineer or designated representative to accomplish the work as specified

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 Drawings or as established by the Engineer or designated representative. The windrowed material shall be uniformly replaced before the cement is applied.

C. Pulverization

The existing subgrade material to be stabilized shall be so pulverized that, a minimum of 80 percent passes a No. 4 (4.75 mm) sieve, exclusive of gravel or stone retained on this sieve. When shown on the Drawings or approved by the Engineer or designated representative, this pulverization requirement may be waived if the material contains a substantial amount of aggregate.

Existing asphaltic concrete wearing surfaces, subbases and bases shall be pulverized so that 100 percent will pass a 2 inch (50 mm) sieve.

D. Application of Cement (Roadmix)

It shall be the responsibility of the Contractor to (1) regulate the sequence of his work, (2) process a sufficient quantity of material to provide full depth and width as indicated on the Drawings, (3) use the proper amount of Portland cement, that is established by the approved job mix design or approved by the Engineer or designated representative and (4) maintain the work and rework the courses as necessary to meet the design strength requirements.

The cement shall be spread by an approved spreader or by bag distribution. It shall be distributed at a uniform rate and in such a manner as to reduce to a minimum the scattering of cement by wind. Cement treatment shall not be mixed or placed when the wind velocity exceeds 15 miles (25 kilometers) per hour or when the air temperature is below 40^0F (4^0C) and falling, but may be mixed or placed when the air temperature is above 35^0F (2^0C) and rising. The temperature shall be taken in the shade and away from artificial heat. In any event cement treatment shall be mixed or placed only when weather conditions, in the opinion of the Engineer or designated representative, are suitable. If a bulk cement spreader is used, it shall be positioned with string lines or other approved method during spreading to insure a uniform distribution of cement.

Cement shall be applied only in that area where the mixing, compacting and finishing operations can be continuous and completed in daylight within 6 hours of such application.

The percentage of moisture in the soil at the time of cement application shall not exceed the quantity that will permit uniform and intimate mixture of material and cement during dry mixing operations. The percentage of moisture in the soil at the time of cement application shall not exceed the optimum moisture content for the cement-stabilized mixture.

No equipment, except that used in spreading and mixing, will be allowed to pass over the freshly spread cement until it is mixed.

E. Mixing and Processing

Either single or multiple soil stabilizer mixers shall be used.

After any required mixing of the material(s), the cement shall be dry mixed with the material(s) prior to the addition of water. Immediately after dry mixing, water shall be uniformly applied. After mixing, the mixture shall be in a loose, evenly spread state ready for compaction. The mixture shall be mixed and compacted in one (1) lift.

The mixer shall be provided with means for the visible and accurate gauging of the water application. The water shall be uniformly applied through a pressure spray bar.

After the cement is spread, the mixing operation shall proceed as follows:

1. The mixer shall in one continuous operation*:* mix the air-dry material and cement to the full depth indicated on the Drawings, provide for the addition of water uniformly, thoroughly moist-mix the material, cement and water, spread the completed cement mixture evenly over the machine processed width of the subgrade, and leave it in a loose condition ready for immediate compaction.
2. The stabilized cement mixture shall not remain undisturbed after mixing and before compacting for more than 30 minutes.

F. Compaction

Unless otherwise shown on the Drawings or established by the Engineer or designated representative, the cement treated course shall be sprinkled as required herein and compacted to the extent necessary to provide not less than 95 percent of the density as determined by TxDOT Test Method Tex-120-E, Part II. The in place roadway density will be determined by TxDOT Test Method Tex-115-E.

At the start of compaction, the percentage of moisture in the mixture and in unpulverized soil lumps, shall be within 2 percentage points either side of the specified optimum moisture content as determined by TxDOT Test Method Tex-120-E, unless otherwise approved by the Engineer or designated representative. The percent of moisture will be determined in accordance with TxDOT Test Method Tex-103-E.

If the percent of moisture is outside the allowable tolerance, the Contractor shall adjust operations to meet this requirement. When the uncompacted cement stabilized mixture is wetted by rain so that the average moisture content exceeds the specified tolerance at the time of final compaction, the entire section shall be reconstructed in accordance with this specification at the sole expense of the Contractor.

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, the treated material shall be removed and replaced, unless otherwise approved by the Engineer or designated representative. Removal and

replacement with acceptable treated material will be at the Contractor's expense. All initial density testing will be paid for by the Owner/Developer. All retesting shall be paid for by the Contractor.

G. Finishing

The resulting surface shall be "clipped", "skinned" or "tight bladed" by a maintainer or subgrade trimmer to a depth of approximately 1/4 inch (6 mm), removing all loosened materials. The loosened materials will be disposed of at the Contractor's expense and at a location approved by the Engineer or designated representative. The surface shall then be rolled with the pneumatic roller in accordance with Standard Specification Item No. 232, adding small increments of moisture as needed during rolling. Throughout this operation, the shape of the course shall be maintained and the surface upon completion shall be smooth and in conformity with the typical sections, lines and grades as shown on the Drawings or as established by the Engineer or designated representative.

If plus No. 4 (4.75 mm) aggregate is present in the mixture, one complete coverage of the section with the flat wheel roller in accordance with Standard Specification Item No. 230 shall be made immediately after the "clipping" operation. When directed by the Engineer or designated representative, surface finishing methods may be varied from this procedure, provided a dense, uniform surface, free of surface compaction planes, is produced.

The moisture content of the surface material must be maintained within two (2) percentage points of optimum during all finishing operations. Surface compaction and finishing shall proceed in such a manner as to produce, in not more than 2 hours, a smooth, closely knit surface conforming to the crown, grade and line indicated which is free of cracks, ridges or loose material.

204.7 Curing

A. Protection and Cover

After the cement treated course has been finished as specified herein, the surface shall be protected against rapid drying by either one of the following curing methods. The protection measures shall be continued: (a) for the specified period, but in no case less than 3 days, or (b) until the surface or subsequent courses are placed:

1. Maintain in a thorough and continuously moist condition by sprinkling.
2. Apply a 2 inch (50 mm) layer of earth on the completed course and maintain in a moist condition.
3. Apply an asphaltic material to the treated course at the rate of 0.05 to 0.20 gallon per square yard (0.25 to 0.90 liters per square meter), as determined by the Engineer or designated representative. The asphalt used shall be the type and grade shown on the Drawings or as approved by the Engineer or designated representative, in accordance with Standard Specification Item No. 301. The asphalt shall completely cover and seal the total surface of the base and fill all voids.

If the Contractor elects to use this method, it shall be his responsibility to protect the asphalt membrane from being picked up by traffic by either sanding or dusting the membrane surface. The asphalt membrane may remain in place when the proposed surface or other base courses are placed.

B. Surface

The surface or other base courses may be applied on the finished base as soon after completion as operations will permit.

204.8 Construction Joints

At the end of each day's construction, a straight transverse construction joint shall be formed by cutting back into the total width of completed work to form a vertical face free of loose and shattered material.

Cement treatment for large, wide areas shall be built in a series of parallel lanes of convenient length and width meeting the approval of the Engineer or designated representative.

204.9 Traffic

Completed sections of cement treated material in place may be opened immediately to local traffic, construction equipment and all traffic after the curing period, provided the cement treated course has hardened sufficiently to prevent marring or distorting of the surface by equipment or traffic.

204.10 Maintenance

The Contractor shall be required to maintain the cement treated course in good condition until all work has been completed and accepted. Maintenance shall include immediate repairs of any defects that may occur. This work shall be done by the Contractor at his own expense and repeated as often as may be necessary to keep the area continuously intact. Any improper, insufficient or faulty work shall be replaced to the full depth of treatment.

It is the intent of this specification that the Contractor construct the plan depth of cement treatment in one homogeneous mass. The addition of thin stabilized layers will not be permitted to provide the minimum specified depth.

204.11 Measurement

"Portland Cement Treatment for Materials in Place" will be measured as follows:

Cement treatment for materials in place will be measured by the square yard (square meter: 1 square meter equals 1.196 square yards) of surface area of completed and accepted work.

Portland Cement, specified by the Engineer or designated representative for incorporation in the cement treatment, will be measured by the barrel of 376 pounds (170 kilograms) of cement.

204.12 Payment

This item will be paid for at the contract unit bid price for "Portland Cement" and "Portland Cement Treatment of Materials in Place".

The unit bid prices shall each include full compensation for: (a) mix designs, (b) preparing the roadbed; (c) furnishing all material; (d) all freight charges involved; (e) furnishing scales and labor involved in weighing the material; (f) pulverizing; applying cement and water, (g) all processing, mixing, spreading, sprinkling, compacting, finishing and curing the cement treated soil; and (h) all manipulations, labor, equipment, fuels, tools and incidentals necessary to complete the work.

Payment will be made under one of the following:

Portland Cement Treatment of Materials in Place

___ inch thickness Per Square Yard.

Portland Cement Per Barrel.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 204, “PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE”

City of Round Rock Standard Contract Documents

Designation	Description
Section 00700	General Conditions

City of Round Rock Standard Specifications

Designation	Description
Item No. 230	Rolling (Flat Wheel)
Item No. 232	Rolling (Pneumatic Tire)
Item No. 236	Proof Rolling
Item No. 301	Asphalts, Oils and Emulsions

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 524	Hydraulic Cement

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-115-E	Field Method for Determination of In-Place Density Soils & Base Materials
Tex-120-E	Soil Cement Testing

SPECIFIC CROSS REFERENCE MATERIALS - CONTINUED
Specification Item 204, “PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE”

American Association of Highway and Transportation Officials, Standard Specifications

Designation	Description
T-26	Quality of Water Used in Concrete

RELATED CROSS REFERENCE MATERIALS
Specification Item 204, “PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE”

City of Round Rock Standard Specification Items

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 104	Removing Portland Cement Concrete
Item No. 110	Street Excavation
Item No. 111	Excavation

Item No. 130	Borrow
Item No. 132	Embankment
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 203	Lime Treatment for Materials in Place
Item No. 210	Flexible Base

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)
Item No. 275	Portland Cement Treated Materials (Road Mixed)
Item No. 276	Portland Cement Treated Base (Plant Mixed)
Item No. 421	Portland Cement Concrete
Item No. 522	Portland Cement Concrete Plants

RELATED CROSS REFERENCE MATERIALS - CONTINUED

Specification Item 204, “PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE”

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-101-E	Surveying and Sampling Soils for Highways
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-112-E	Methods of Admixing Lime to Reduce Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-117-E	Triaxial Compression Tests for Disturbed Soils and Base Materials

ITEM NO. 206
ASPHALT STABILIZED BASE

206.1 Description

This item shall govern Asphalt Stabilized Base (ASB) courses composed of a compacted mixture of aggregates and asphalt cement mixed hot in a mixing plant. The ASB shall be constructed on previously completed and approved subgrade, base material, existing pavement or bituminous surface in accordance with the details shown on the Drawings and the requirements specified herein.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

206.2 Submittals

The submittal requirements of this specification item may include:

A. A mix design identifying classification and gradation of aggregate materials, source and designation of the asphalt cement and quantities of aggregate materials and asphalt cement required in the proposed application to meet the specified strength (grade) requirements,

B. An update in the mix design, if source of material changes during construction,

C. A Job Mix Formula for each mix design prior to placement of ASB, and

D. A plan describing the construction equipment proposed for the work and identifying the type and condition of each equipment item.

206.3 Materials

A. Asphalt Material:

The asphalt cement for the asphalt stabilized mixture shall be the grade shown on the Drawings or designated by the Engineer or designated representative and shall meet the requirements of Standard Specification Item No. 301, "Asphalts, Oils and Emulsions". The Contractor shall notify the Engineer or designated representative of the source of the asphalt material prior to the design of the asphalt stabilized mixture. This source shall not be changed during the course of the project without the authorization of the Engineer or designated representative. If the source of asphalt material is changed, the moisture resistance of the new material combination will be evaluated to verify that the requirements of section 206S.4 are met.

Asphalt material for tack coat, if directed, shall conform to Standard Specification Item No. 307, "Tack Coat".

B. Aggregate:

The aggregate shall meet all requirements of and conform to Type A of Specification Item 340, "Hot Mix Asphalt Concrete Pavement". When shown on the drawings, the gravel portion of the aggregate shall be so crushed as to have

a minimum of 60 percent of the particles retained on the # 4 (4.75 mm) sieve with two or more mechanically induced crushed faces, as determined by TxDoT Test Method Tex-460-A (Part I).

206.4 Asphalt Stabilized Mixtures

Asphalt Stabilized Base mixture shall consist of a uniform mixture of aggregate, hot asphalt cement and additives if allowed or required on the Drawings. The mix will be designed in accordance with TxDoT Test Method Tex-126-E to conform to the requirements herein.

A. Mixture Design.

The Contractor shall submit to the Engineer or designated representative a mix design: (1) which has been reviewed, signed and sealed by a Registered Professional Engineer, Licensed in the State of Texas, or (2) prepared and certified by a Level II Quality Management and Mix Design Specialist as certified by the Hot Mix Asphalt Center. The mix design will be valid for one (1) year provided that there are no significant changes in the material being produced.

Unless otherwise shown on the Drawings, the mixture of aggregate, asphalt and additives proposed for use will be evaluated in the design stage for moisture susceptibility, in accordance with TxDoT Standard Specification Item No. 301, “Asphalt Anti-stripping Agents”. The Engineer or designated representative may waive this test if a similar design, using the same ingredients, has proven satisfactory.

To substantiate the design, trial batches shall be produced and tested using all the proposed project materials and equipment prior to any ASB placement. The Engineer or designated representative may waive trial mixtures if similar designs have proven satisfactory.

A Job Mix Formula shall be submitted for each project for review by the Engineer or designated representative before ASB is placed. The ASB mixture shall contain between 3.0 and 9.0 percent asphalt cement when designed in accordance with TxDoT Test Method Tex-126-E. At optimum asphalt content, the design specimens shall have the following minimum strength when tested in accordance with TxDoT Test Method Tex-126-E.

	SLOW STRENGTH*	
GRADE	PSI	kPa
1	50	345
2	40	275
3	30	205
4*	30	205

* Unless a higher minimum strength is shown on the Drawings.

B. Grades

The aggregate gradation shall conform to the master grading limits shown below for the grade of mix specified on the Drawings.

Sieve Size		Grade			
US	SI	1	2	3	4
1 3/4"	45 mm		100	100	As Shown On Drawings
1 1/2"	38 mm		90-100		
1	25 mm	90-100			
3/8	9.5 mm	45-70			
#4	4.75 mm	30-55	25-55		
#40	425 um	15-30	15-40	15-40	

C. Tolerances:

Gradation approval may be based on stockpile samples if a single stockpile is used. If more than one stockpile is used, the mixture will be tested in accordance with TxDoT Test Method Tex-210-F or TxDoT Test Method Tex-228-F will be used in conjunction with combined cold feed belt samples tested in accordance with TxDoT Test Method Tex-229-F. Other tests of proven accuracy may be used if approved by the Engineer or designated representative. The gradation of the aggregate shall not vary from the master grading limits for the specified grade except that a tolerance of 2 percent is allowed on the sieve size for each mixture grade in the table above, which shows 100 percent passing. When disagreements concerning the determination of specification compliance occur between allowed sampling and testing procedures, extracted aggregate testing shall take precedence over the cold feed belt sampling.

The asphalt content shall not vary by more than 0.5 percent from that designated by the Engineer or designated representative using TxDoT Test Method Tex-210-F or Test Method Tex-228-F.

If the produced mixture varies from the master grading limits and/or the asphalt content tolerance, adjustments shall be made by the Contractor until the mixture meets these requirements.

206.5 Equipment

The equipment for the handling of all materials and for mixing, placing and compacting of the mixture shall be maintained in good repair and operating condition and subject to the approval of the Engineer or designated representative. Any equipment found to be defective or which may potentially yield a negative impact on the quality of the paving mixture will not be allowed.

All equipment shall conform to the requirements of Standard Specification Item No. 340, "Hot Mix Asphalt Concrete Pavement" with the following exception.

ASB for confined or isolated areas or for a single day's production of 500 square yards (400 square meters) or less may be spread with a maintainer or a rubber-tired front-end loader. The Contractor shall exercise caution to assure that the use of a maintainer or a loader does not produce segregation of the aggregate in the ASB.

206.6 Storage, Proportioning and Mixing

All storage, proportioning and mixing shall conform to the requirements of Standard Specification Item No. 340, "Hot Mix Asphaltic Concrete Pavement".

206.7 Construction Methods

A. General:

The Contractor shall produce, transport, place and compact a paving mixture conforming to these specifications and provide a safe environment to enable inspection forces to inspect the work, observe sampling and inspect/monitor the plant.

When the ASB is placed directly on the subgrade, the subgrade shall be proof rolled prior to placing the ASB in accordance with Standard Specification Item No. 236. Soft spots shall be repaired and area proof rolled again until entire subgrade is free of soft spots.

When a spreading and finishing machine is used, the ASB shall not be placed when the air temperature is 40°F (4^0C) and is rising. When a motor grader is used, the ASB shall not be placed when the air temperature is below 60°F (16^0C) and is falling, but it may be placed when the air temperature is 50°F (10^0C) and is rising. The air temperature shall be taken in the shade away from any artificial heat.

It is further provided that the ASB shall be placed only when the humidity, general weather conditions, temperature and moisture conditions of the subgrade and subbase, in the opinion of the Engineer or designated representative, are suitable.

If, after being discharged from mixer and prior to placing, the temperature of the asphalt mixture is 50^0F (10^0C) or more below the selected discharge temperature established by the Contractor in the submitted mix design, all or any part of load may be rejected and payment will not be made for rejected material. Any material placed which is too cool to compact properly shall be removed and replaced with material which meets these specifications.

Thickness of the compacted lift shall not exceed 8 inches (200 mm) and shall not be less than twice the size of the maximum nominal size aggregate.

During placement of tack coat, care shall be taken to prevent splattering of adjacent pavement, curb and gutters or structures. Contractor shall clean any splattered areas.

B. Tack Coat:

The tack coat shall be applied conforming to Standard Specification Item No. 307, "Tack Coat". Before ASB mixture is placed, the surface upon which the tack coat is to be placed shall be thoroughly cleaned to satisfaction of Engineer or designated representative. The surface shall be given a uniform application of tack coat in accordance with Standard Specification Item No. 307. The tack coat shall be applied as directed by Engineer or designated representative but in no case more than 0.10 gallons per square yard (0.45 liters per square meter).

Where the ASB mixture will adhere to the surface without the use of a tack coat, the tack coat application may be eliminated, if approved by the Engineer or designated representative. Contact surfaces of curbs, structures and all joints shall be painted with a thin uniform coat of asphalt material meeting requirements for tack coat (Standard Specification Item No. 307). The tack coat shall be rolled with a light pneumatic tire roller when directed by Engineer or designated representative.

C. Compaction:

The ASB mixture shall be compacted thoroughly and uniformly with the necessary rollers to obtain the required density (as determined by TxDoT Test Method Tex-126-E) and cross-section of the finished pavement in accordance with the requirements of the Drawings and Specifications.

The Contractor shall be responsible for determining the numbers and type of rollers to be used to obtain the required density. The rollers shall be operated in accordance with the requirements of this specification, Standard Specification Item Nos. 230 and 232, and as approved by the Engineer or designated representative. The rolling patterns shall be established by the Contractor as outlined in TxDoT Test Method Tex-207-F, Part IV, to achieve the maximum compaction, unless otherwise directed by the Engineer or designated representative. When changes develop in the mixture or placement conditions, a new rolling pattern shall be established.

Static, vibratory, and flat steel wheel rolling shall be terminated before the ASB surface temperature cools below 175^0F (80^0C). Pneumatic tire rolling may be undertaken on the ASB layer at temperatures below 175^0F (80^0C). The surface of the ASB, after compaction, shall be smooth and true to established line, grade and cross-section.

The motion of rollers shall be slow enough to avoid other than normal initial displacement of the mixture. If any displacement occurs, it shall be corrected to the satisfaction of the Engineer or designated representative. The roller shall not be allowed to stand on a pavement, which has not been fully compacted. In order 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. The Contractor shall take necessary precautions to prevent the dropping of diesel, gasoline, oil, grease or other foreign matter on the ASB, either when the rollers are in operation or when standing.

D. Density Control.

For the purpose of determining the density, the "project" shall be defined to be the total quantity of ASB to be placed. Portions of the ‘project may be designated by the Engineer or designated representative as separate ’paving sections created by: (a) staging of paving operations due to traffic considerations, (b) changes in the Job Mix Formula, (c) phasing of large projects or (d) other factors affecting the consistency in the production, lay-down compaction and/or use of completed portions. Acceptability of the completed work will be based on the average of tests per paving section as defined above.

The Engineer or designated representative will ensure that a testing laboratory secures, in accordance with TxDoT Test Method Tex-222-F, a minimum of three 6 inch (150 mm) diameter core samples or sections of completed ASB lifts, for every 1,500 square yards (1250 square meters) or portions thereof, of ASB placed. The in place densities of the sampled locations shall be determined in accordance with TxDoT Test Method Tex-126-E, unless directed otherwise by the Engineer or designated representative. The nuclear-density gauge or other methods of determining in-place compaction, which correlate satisfactorily with those results obtained through the use of TxDoT Test Method Tex-126-E, may be used. In-place density at the sampled locations shall be determined by the following equation:

$$\text{Percent in place Density} = [G_A / G_T] \times 100$$

where G_A = Bulk specific gravity of core (tested in conformance with Tex-207-F) and

G_T = Maximum theoretical specific gravity of each core (tested in conformance with Tex-227-F.

If the in-place density falls 0.1 to 1.0 percentage points below the minimum density from TxDoT Test Method Tex-126-E, the Contractor shall investigate the causes and make the necessary corrections. Production may proceed for no more than one full day while corrections to the construction operations or mixture are being made to obtain the minimum density. If the minimum density is not obtained after one day, production shall cease. The Contractor will then be required to place a test strip in accordance with Item 345.6 of TxDoT Standard Specification Item 345, " Asphalt Stabilized Base (Plant Mixed)" to demonstrate that the minimum density is produced.

If the in-place density is more than 1.0 percent below the minimum density, production shall cease immediately and a test strip shall be required. Full production may only resume when it is demonstrated in a test strip that a satisfactory density can be obtained.

Increasing the asphalt content of the ASB mixture in order to increase density shall not be allowed.

The Contractor is encouraged to perform supplemental nuclear density compaction testing for his own information to aid in developing rolling patterns.

The Contractor shall patch the area where samples are taken with no extra payment being made for this work. Laboratory technician will remove the ASB specimen on the day following placement or as soon as practicable thereafter.

Initial sampling and testing of the in place ASB will be at the cost of the Owner/Developer, except for the cost of material and work involved in the restoration of damage caused by the sampling procedures. Retesting shall be performed at the Contractor's expense.

E. Opening to Traffic:

Pavement may be opened to local traffic as soon as possible after required temporary pavement markings are in place and after approval from Engineer or designated representative.

Contractor's attention is directed to the fact that all construction traffic allowed on any pavement open to public will be subject to City Ordinances and State Laws governing traffic on streets and highways.

Surface raveling, cracking, segregation and other defects resulting from traffic shall be corrected at Contractor's expense as directed by Engineer or designated representative. The Contractor shall provide traffic control and other expenses, if any, necessitated by required repairs.

206.8 Measurement

Measurement for this item shall be by either Method A or Method B as described below and as established in Bid Documents.

Method A: Work and material shall be measured by the ton of 2000 pounds (megagrams: 1 megagram equals 1.1 tons) of composite "Asphalt Stabilized Base" of the grade actually used in the completed and accepted in accordance with the Drawings and Specifications for the project. The material weight (mass) shall be calculated using the average densities of the designated 'paving sections and the specified ASB layer thickness.

Method B: Work and materials shall be measured by the square yard (square meter: 1 square meter equals 1.196 square yards) of surface area in the each designated 'paving sections to the specified thickness, complete in accordance with the Drawings and Specifications for the project.

206.9 Payment

The work performed and materials furnished in accordance with this item and measured as provided under "Measurement" will be paid at unit bid price for "Asphalt Stabilized Base," of the grade specified. The unit bid price shall represent full compensation for a) quarrying, furnishing all materials and additives, b) all heating mixing, and hauling, c) cleaning the existing sub base, base or surface course, d) tack coat, e) placing, rolling and finishing, temporary pavement markings and f) all manipulations, labor, tools, equipment, freight involved; and incidentals necessary to complete the work. Correction of defective work and subsequent retesting shall be considered subsidiary to "Asphalt Stabilized Base".

The contract unit price for Asphalt Stabilized Base shall be adjusted in accordance with the following for all work that fails to meet density requirements:

DENSITY ACCEPTANCE SCHEDULE (TEX-207-F/TEX-227-F)

Percent Density	**Percent Contract Unit Price Reduction**
Above 97	100, Remove and Replace
91.0 to 97.0	0
90.9 to 87.0	0.625% per 0.10% Deficiency in Density
Less than 87.0	100, Remove and Replace

Templates, straightedges, scales and other weighing and measuring devices necessary for proper construction, measuring and checking work shall be furnished, operated and maintained by Contractor at its own expense.

Saw cutting as indicated or as directed by Engineer or designated representative will not be measured or paid for directly, but shall be considered subsidiary to this item, unless included as a separate pay item in the Bid Document.

Payment for work meeting specifications will be made under one of the following:

Asphalt Stabilized Base Per Ton.

Asphalt Stabilized Base _____In. Per Square Yard.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 206, “ASPHALT STABILIZED BASE”

City of Round Rock Standard Specifications

Designation	Description
Item No. 230	Rolling (Flat Wheel)
Item No. 232	Rolling (Pneumatic Tire)
Item No. 236	Proof Rolling
Item No. 301	Asphalts, Oils and Emulsions
Item No. 307	Tack Coat
Item No. 340	Hot Mix Asphaltic Concrete Pavement

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 301	Asphalt Anti-stripping Agents
Item No. 345	Asphalt Stabilized Base (Plant Mixed)

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 204, “PORTLAND CEMENT TREATMENT FOR MATERIALS IN PLACE”

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-126-E	Molding, Testing and Evaluation of Bituminous Black Base Materials
Tex-207-F	Determination of Density of Compacted Bituminous Mixtures
Tex-210-F	Determination of Asphalt Content of Bituminous Mixtures by Extraction
Tex-222-F	Method of Sampling Bituminous Mixtures
Tex-227-F	Theoretical Maximum Specific Gravity of Bituminous Mixtures
Tex-228-F	Determination of Asphalt Content of Bituminous Mixtures By The Nuclear Method
Tex-229-F	Combined HMAC Cold-Belt Sampling and Testing Procedures
Tex-460-A	Determination of Crushed Face Particle Count

RELATED CROSS REFERENCE MATERIALS
Specification Item 206, “LIME TREATMENT FOR MATERIALS IN PLACE”

City of Round Rock Standard Specifications

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 104	Removing Portland Cement Concrete
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 130	Borrow
Item No. 132	Embankment
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 203	Lime Treatment for Materials in Place
Item No. 210	Flexible Base
Item No. 310	Emulsified Asphalt Treatment
Item No. 320	Two Course Surface Treatment

RELATED CROSS REFERENCE MATERIALS - CONTINUED
Specification Item 206, “LIME TREATMENT FOR MATERIALS IN PLACE”

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)
Item No. 300	Asphalts, Oils and Emulsions
Item No. 301	Asphalt Anti-stripping Agents
Item No. 345	Asphalt Stabilized Base (Plant Mixed)

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-101-E	Surveying and Sampling Soils for Highways
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils

Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials
Tex-117-E	Triaxial Compression Tests for Disturbed Soils and Base Materials

ITEM NO. 210
FLEXIBLE BASE

210.1 Description

This item governs furnishing and placing a crushed stone base course for surfacing, pavement, or other base courses. “Flexible Base" shall be constructed on an approved, prepared surface in one or more courses conforming to the typical sections and to the lines and grades, indicated on the Drawings or established by the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

210.2 Submittals

The submittal requirements of this specification item may include:

A. Source, gradation and TxDoT test results for the crushed limestone material,

B. Notification that the crushed limestone is completed and ready for testing, and

C. Field density test results for in-place compacted flexible base,

210.3 Material

A. Mineral Aggregate

The material shall be crushed argillaceous limestone meeting the requirements specified herein. The material shall be from sources approved by the City and shall consist of durable crushed stone that has been screened to the required gradation.

Flexible base materials shall be tested according to the following TxDoT standard test methods:

a) Preparation for Soil Constants and Sieve Analysis	Tex-101-E
b) Liquid Limit	Tex-104-E
c) Plastic Limit	Tex-105-E
d) Plasticity Index	Tex-106-E
e) Sieve Analysis	Tex-110-E
f) Wet Ball Mill	Tex-116-E
g) Triaxial Test	Tex-117-E, Part II

Base material shall be stockpiled after crushing and approved by the Engineer or designated representative prior to being hauled to the Project.

The material shall be well graded and shall meet the following requirements:

Sieve Designation		Other Requirements	% Retained	
US	SI			
1 3/4"	45 mm		0	
7/8"	22.4 mm		10-35	
3/8"	9.5 mm		30-50	
#4	4.75 mm		45-65	
#40	425 mm		70-85	
		Maximum Plasticity Index		10
		Maximum Wet Ball Mill		42
Maximum Increase in passing #40 (425 mm) sieve from Wet Ball Mill Test			20	

Minimum compressive strength when subjected to the triaxial test shall be 35 psi at 0 psi lateral pressure [240 kiloPascal (kPa) at 0 kPa lateral pressure] and 175 psi at 15 psi lateral pressure [1200 kiloPascal (kPa) at 100 kPa lateral pressure].

B. Asphaltic Material

Prime Coat. Prime Coat shall conform to the requirements of Standard Specification Item 306, "Prime Coat", except for measurement and payment.

210.4 Stockpiling, Storage and Management

A. Managing Material:

The stockpile shall be constructed on a relatively smooth area that has been cleared of debris, weeds, brush, trees and grass. Stockpiles shall contain between 25,000 and 50,000 cubic yards (19,100 to 38,200 cubic meters). The stockpile shall be constructed using scrapers, bottom dumps or other similar equipment that allows dumping and spreading without rehandling. The stockpile shall be constructed to allow dumping and spreading in one direction only. The height of the stockpile shall not exceed the capabilities of available equipment to make a full cut (bottom to top) on any of the four sides.

The Contractor shall provide material only from stockpiles acceptable to the City. A ticket showing the date, source, stockpile number, and net weight (mass) shall be provided to the Inspector with each load of material delivered to the Project.

Material shall be loaded from the stockpile by making successive vertical cuts through its entire depth.

B. Test Sampling:

Unless sampling and testing is waived by the City, samples from locations

determined by the Inspector shall be taken and combined into test specimens from which a testing laboratory can obtain a sample.

C. Testing and Acceptance:

The Owner/Developer will pay for initial testing of the base material delivered to the site. When initial tests indicate that the material is unacceptable, the Contractor may, at his expense, have the material sampled under observance of the Inspector and tested one more time.

210.5 Construction Methods

A. Preparation of Subgrade:

Flexible base shall not be placed until the Contractor has verified by proof rolling that the subgrade has been prepared and compacted in conformity with Standard Specification Item 201, "Subgrade Preparation," to the typical sections, lines and grades indicated on the Drawings. Any deviation shall be corrected and proof rolled prior to placement of the flexible base material.

The Contractor shall not place flexible base until the subgrade has cured to the satisfaction of the Engineer or designated representative, regardless of whether or not the subgrade has been successfully proof rolled. As a minimum, this will be after the surface displays no damp spots and there is no evidence of “sponginess” in the subgrade.

B. First Lift:

Immediately before placing the flexible base material, the subgrade shall be checked for conformity with grade and section. The thickness of each lift of flexible base shall be equal increments of the total base depth. No single lift shall be more than six inches (150 mm) or less than three inches (75 mm) compacted thickness.

The material shall be delivered in approved vehicles. It shall be the responsibility of the Contractor to deliver the required amount of material. If it becomes evident that insufficient material was placed, additional material as necessary shall be delivered and the entire course scarified, mixed and compacted.

Material deposited upon the subgrade shall be spread and shaped the same day unless otherwise approved by the Engineer or designated representative. In the event inclement weather or other unforeseen circumstances render spreading of the material impractical, the material shall be spread as soon as conditions allow.

Additionally, if the material cannot be spread and worked the same day it is deposited, the Contractor shall "close up" the dump piles before leaving the job site. “Closed up” shall be defined as the use of a motor grader to blade all dump piles together, leaving no open space between piles.

The material shall be spread, sprinkled, if required, then thoroughly mixed; bladed, dragged and shaped to conform to the typical sections indicated on the Drawings.

All areas and "nests" of segregated coarse or fine material shall be corrected or

removed and replaced with well-graded material.

Each lift shall be sprinkled as required to bring the material to optimum moisture content, then compacted to the extent necessary to provide not less than the percent density specified in Section 210.5.D, "Density." In no case shall the material be worked at more than 2 percent above or below optimum moisture as determined by TxDoT Test Method Tex-113-E. In addition to the requirements specified for density, the full depth of flexible base material shall be compacted to the extent necessary to remain firm and stable under construction equipment. After each section of flexible base material is completed, tests, as necessary, will be performed. As a minimum, three in-place density tests per section per day will be taken. If the material fails to meet the density requirements, it shall be reworked as necessary to meet these requirements. All initial testing will be paid for by the Owner/Developer. All retesting shall be paid for by the Contractor.

Throughout the entire operation, the surface of the material shall be maintained by blading and, upon completion, shall be smooth and shall conform to the typical section indicated on the Drawings and to the established lines and grades.

In that area on which pavement is to be placed, any deviation in excess of 1/4 inch (6.5 mm) in cross section or 1/4 inch in a length of 16 feet (6.5 mm in a length of 5 meters) measured longitudinally shall be corrected by loosening, adding or removing material, and by reshaping and recompacting. All irregularities, depressions or weak spots shall be corrected immediately by scarifying the areas affected, adding suitable material as required, and by reshaping and recompacting. Should the lift, due to any reason or cause, lose the required stability, density and/or finish before the surfacing is complete, it shall be recompacted and refinished at the Contractor's expense.

C. Succeeding Lifts:

Construction methods for succeeding lifts shall be the same as prescribed for the first lift. For that lift of the flexible base upon which the curb and gutter will be constructed, as well as the last flexible base lift (i.e. top of the flexible base), the Contractor shall check the surface of the lift for conformity to the lines and grades by setting "blue tops" at intervals not exceeding 50 feet (15 meters) on the centerline, at quarterpoints, at curb lines or edge of pavement, and at other points that may be indicated on the Drawings.

When the thickness of a particular lift of the flexible base is in question, the Contractor shall check the surface of the lift for conformity to the lines and grades by setting "blue tops" at intervals not exceeding 50 feet (15 meters) on the centerline, at quarter points, at curb lines or edge of pavement, and at other points that may be indicated on the Drawings.

D. Density:

The flexible base shall be compacted to not less than 100 percent nor more than 105 percent density as determined by TxDoT Test Method Tex-113-E.

Field density determination shall be made in accordance with TxDoT Test

Method Tex-115-E unless otherwise approved by the Engineer or designated representative. Each lift of the flexible base shall also be tested by proof rolling in conformity with Standard Specification Item 236 “Proof Rolling.”

E. Priming:

After the flexible base material has been compacted to not less than 100 percent nor more than 105 percent density, and tested by proof rolling, a prime coat will be applied in accordance with Standard Specification Item 306, "Prime Coat."

F. Curing:

Pavement materials, such as a tack coat or surface course, shall not be placed on the primed surface until the prime coat has been absorbed into the base course. At least 24 hours, or longer if designated by the Engineer or designated representative, shall be allowed when cutback asphalt is used as the prime coat.

210.6 Measurement

"Flexible Base" will be measured by the cubic yard (cubic meter: 1 cubic meter equals 1.196 cubic yards), complete in place, as indicated in the Contract Documents.

210.7 Payment

This item will be paid for at the contract unit bid price for "Flexible Base". The unit bid price shall include full compensation for all work specified herein, including the furnishing, hauling, placing and compacting of all materials; for rolling, proof rolling, recompacting and refinishing; for all water required; for retesting as necessary; for priming; and for all equipment, tools, labor and incidentals necessary to complete the Work.

Prime coat will not be measured and paid for directly but shall be considered subsidiary to Standard Specification Item 210, "Flexible Base.”

Payment will be made under one of the following:

Flexible Base Per Cubic Yard.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 210, “FLEXIBLE BASE”

City of Round Rock Standard Specifications

Designation	Description
Item No. 201	Subgrade Preparation
Item No. 236	Proof Rolling
Item No. 306	Prime Coat

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Tex-101-E	Preparation of Soil and Flexible Base Materials for Testing
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic Limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-110-E	Determination of Particle Size Analysis of Soils
Tex-113-E	Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials and Cohesionless Sands
Tex-115-E	Field Method for Determination of In-Place Density of Soils and Base Materials
Tex-116-E	Ball Mill Method for Determination of the Disintegration of Flexible Base Material
Tex-117-E	Triaxial Compression Tests for Disturbed Soils and Base Materials

ITEM NO. 211
RECYCLING EXISTING AGGREGATE

211.1 Description

This item governs: (1) breaking up existing asphalt pavement surfaces, (2) salvaging and placing existing broken up asphalt surface and flexible base materials on an existing subgrade and (3) compacting the courses in conformity with typical sections indicated in the Drawings, directions of the Engineer or designated representative and requirements herein specified.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

211.2 Submittals

The submittal requirements of this specification item may include:

A. Source, gradation and test results for the recycled existing material, and

B. Field density test results for in-place compacted recycled aggregate layers.

211.3 Materials

Materials required for use under this specification item shall conform to the following specification items as applicable:

Description of Activity	Item No.
Street Excavation	110
Hydrated Lime and Lime Slurry	202
Lime Treatment for Materials in Place	203
Portland Cement Treatment for Materials in Place	204
Flexible Base (Crushed Stone)	210
Asphalts, Oils and Emulsions	301
Emulsified Asphalt Treatment	310
Two Course Surface Treatment	320
Hot Mix Asphaltic Concrete Pavement	340

211.4 Construction Methods

The existing roadway right of way shall be cleared of any vegetation or contaminants that would be in the path of the recycling equipment. The existing asphaltic concrete surface shall be scarified, loosened and broken up and pulverized in place into 1 inch (25 mm) maximum size pieces. The salvaged asphaltic concrete surface materials will be removed prior to scarifying the underlying existing base material. The Contractor shall make any necessary provision to prevent contamination of the asphaltic material during and after removal. When the existing pavement consists only of a surface treatment, it will not be necessary to remove the surface treatment before scarifying the underlying existing base material.

The existing base, with or without an existing asphaltic concrete pavement, shall be cleaned of all objectionable materials by blading, brooming or other approved methods, prior to scarifying. After cleaning, the existing material shall be scarified for its full width and depth, unless otherwise shown on the Drawings. In no case shall the underlying subgrade be disturbed. Unless otherwise shown on the Drawings, the materials shall be broken into particles of no more than 2½ inches (63 millimeters) in largest dimension.

All salvaging operations, including temporary stockpiling or windrowing, shall be conducted in such a manner as not to interfere with traffic, proper drainage or the general requirements of the Work. All material shown on the Drawings to be salvaged shall be kept reasonably free of soil from the subgrade or roadbed during the salvaging operation. The scarified material shall be removed from the roadbed using equipment approved by the Engineer or designated representative. The salvaged material may be placed in temporary stockpiles or windrows until sufficient subgrade has been prepared to receive the material.

Prior to replacing the salvaged material, the subgrade shall be constructed and shaped to conform to the typical sections as shown on the Drawings or as established by the Engineer or designated representative. This work shall be done in accordance with the provisions of Standard Specification Item 201, “Subgrade Preparation”.

Prior to replacing the salvaged material, when shown on the Drawings and when directed by the Engineer or designated representative, the Contractor shall proof roll the roadbed in accordance with Standard Specification Item 236, “Proof Rolling”. Soft spots, unstable or spongy areas shall be undercut, backfilled with suitable material and compacted by approved methods.

The salvaged base material shall be mixed, spread and shaped to conform to the typical sections shown on the Drawings. However, in no case, shall the underlying subgrade be disturbed. New base material and/or salvaged asphaltic materials, when shown on the Drawings to be mixed with the scarified base materials, shall be placed on the existing scarified material, and uniformly incorporated.

Unless shown otherwise on the Drawings, each lift of salvaged material shall be sprinkled as required and compacted to the extent necessary to provide not less than 98 percent density as determined by TxDoT Test Method Tex-113-E. Field density determination shall be made in accordance with TxDoT Test Method Tex-115-E

If the reworked base material, due to any reason or cause, loses the required stability, density or finish before placement of the next lift of the reworked base material, placement of the next course of material or prior to acceptance of the project, it shall be recompacted and refinished at the Contractor's expense. All initial testing will be paid for by the Owner/Developer. All retesting shall be paid for by the Contractor.

211.5 Measurement

Recycled aggregate will be measured by the cubic yard (cubic meters: 1 cubic meter equals 1.307 cubic yards), or by the square yard (square meter: 1 square meter equals 1.196 square yards) of the thickness indicated on the Drawings, complete in place.

211.6 Payment

This item will be paid for at the contract unit bid price for "Recycling Existing Aggregate". The unit bid price shall include full compensation for all work herein specified, including: scarifying, loosening and breaking up the existing asphaltic surface and base materials; removing, saving, loading, hauling and stockpiling materials; placing of salvaged materials with or without additional base materials; all water required and all equipment, tools, labor and incidentals necessary to complete the work. Any new materials required shall be paid under their respective items listed above, but the pulverizing of new and old materials shall be incidental to complete the work.

Payment will be made under:

Recycling Existing Aggregate - Per Cubic Yard.

Recycling Existing Aggregate - ___ In. Per Square Yard.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 211, “RECYCLING EXISTING AGGREGATE”

City of Round Rock Standard Specifications

Designation	Description
Item No. 110	Street Excavation
Item No. 201	Subgrade Preparation
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 203	Lime Treatment for Materials in Place
Item No. 204	Portland Cement Treatment For Materials in Place
Item No. 210	Flexible Base
Item No. 236	Proof Rolling
Item No. 301	Asphalts, Oils, and Emulsions
Item No. 310	Emulsified Surface Treatment
Item No. 320	Two Course Surface Treatment
Item No. 340	Hot Mix Asphaltic Concrete Pavement

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-113-E	Laboratory Compaction Characteristics and Moisture-Density Relationship of Base Materials and Cohesionless Sand
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials

RELATED CROSS REFERENCE MATERIALS
Specification Item 211, “RECYCLING EXISTING AGGREGATE”

City of Round Rock Standard Specifications

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 104	Removing Portland Cement Concrete
Item No. 111	Excavation
Item No. 230	Rolling (Flat Wheel)
Item No. 232	Rolling (Pneumatic Tire)
Item No. 307	Tack Coat

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)
Item No. 300	Asphalts, Oils and Emulsions
Item No. 301	Asphalt Antistripping Agents
Item No. 345	Asphalt Stabilized Base (Plant Mixed)

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil

ITEM NO. 220
SPRINKLING FOR DUST CONTROL

220.1 Description

This item shall govern the authorized application of water for dust control on specified streets, detours, haul routes or construction sites, as shown on the Drawings or directed by the Engineer or designated representative, for the purpose of maintaining these areas relatively free of dust.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, inch-pound units are given preference with SI units shown within parentheses.

220.2 Submittals

The submittal requirements of this specification item may include:

A. The manufacturer, model and description of the proposed dust control equipment,

B. The sprinkling plan including application rate, pattern of sprinkling and scheduled times of application.

220.3 Materials

Water shall be furnished by the Contractor and shall be clean and free from industrial wastes and other objectionable matter.

220.4 Construction Methods

Sprinkling for dust control shall only be conducted with prior approval of the Engineer or designated representative. The Contractor shall furnish and operate an approved sprinkler, equipped with positive and rapidly working cut-off valves and approved spray bars to insure the distribution of water in a uniform and controllable rate of application over the entire width sprinkled. The Contractor shall apply the water in the quantity specified on the Drawings or as directed by the Engineer or designated representative.

It shall be the Contractor's continuous responsibility at all times, including nights, holidays and weekends until acceptance of the project by the City, to maintain the specified areas relatively free of dust in a manner that will cause the least inconvenience to the public.

220.5 Measurement

Sprinkling for dust control will be considered subsidiary to other items of the contract unless included as a separate pay item in the contract. When included for payment in the contract as a separate contract pay item, it will be measured in units of 1,000 gallons (3.785 kiloliters) actually placed as authorized by the Engineer or designated representative.

220.6 Payment

When this item is specified on the Drawings as a separate pay item, the water furnished and the work performed as prescribed by this item and measured as provided under Section 220.5, "Measurement" will be paid for in accordance with the contract unit bid price for 'Sprinkling for Dust Control'. The unit bid price shall include total compensation for all labor, materials, tools, machinery, equipment and incidentals necessary to complete the work as indicated on the Drawings.

Payment, when specified in the contract, will be made under the following:

Sprinkling for Dust Control (Water) - Per 1000 gallon Unit.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 220, “SPRINKLING FOR DUST CONTROL”

City of Round Rock Standard Specification Items

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 120	Channel Excavation
Item No. 132	Embankment
Item No. 201	Subgrade Preparation

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 132	Embankment
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling

ITEM NO. 230
ROLLING (FLAT WHEEL)

230.1 Description

This item shall govern compaction of subgrade, embankment, flexible base, surface treatments and asphalt surfaces by the operation of approved power rollers as herein specified and as directed by the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

230.2 Submittals

The submittal requirements of this specification item may include:

A. A plan describing the condition of each roller proposed for the work, as well as the type, size, weight, configuration (three wheel, tandem, etc) for each individual roller, and

B. The operating speed proposed for each individual roller.

230.3 Equipment

A. Embankments and Flexible Bases

Power rollers shall be of the 3-wheel, self-propelled type, weighing not less than 10 tons (9 megagrams) and shall provide compression on the rear wheels of not less than 325 pounds per linear inch (5.80 kilograms per linear millimeter) of wheel width. All wheels shall be flat. The rear wheels shall have a diameter of not less than 48 inches (1.2 meters) and each shall have a wheel width of not less than 20 inches (510 millimeters).

B. Surface Treatments and Pavements

Power rollers shall be the 3-wheel or tandem, self-propelled type, weighing not less than 3 tons (2.7 megagrams) nor more than 6 tons (5.4 megagrams). All wheels shall be flat. Rollers shall be equipped with an adequate scraping or cleaning device on each wheel. Rollers used to compact asphalt mixture shall be equipped with a water system, which will keep all tires uniformly wet.

In lieu of the rolling equipment specified, the Contractor may, upon written permission from the Engineer or designated representative, 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 Engineer or designated representative, its use shall be discontinued and the Contractor will be required to furnish the specified equipment.

Rollers shall be maintained in good repair and operating condition and shall be approved by the Engineer or designated representative.

230.4 Construction Methods

This work shall only be conducted at the direction of the Engineer or designated representative. A sufficient number of rollers shall be provided to compact the material in a satisfactory manner. When operations are isolated and a single roller unit cannot produce the required compaction satisfactorily, additional roller units shall be provided.

A. Subgrades, Embankments and Flexible Base

The subgrade, embankment layer or base course shall be sprinkled, if required by Standard Specification Item Nos. 201, "Subgrade Preparation" and 210, "Flexible Base". Rolling with a power roller shall start longitudinally at the sides of the designated area and proceed towards the center, overlapping on successive trips by at least 1/2 the width of the rear wheel of the power roller. On superelevated curves, rolling shall begin at the low sides and progress toward the high sides. Alternate trips of the roller shall be slightly different in length. Rolling shall be conducted in accordance with Standard Specification Item Nos. 201, "Subgrade Preparation" and 210, "Flexible Base". The rollers, unless otherwise directed by the Engineer or designated representative, shall be operated at a speed between 2 and 3 miles (3 and 5 kilometers) per hour.

B. Surface Treatments and Pavements

Rolling shall be done as called for in the surface treatment (Items 310 and 320) and asphalt pavement (Item 340) Standard Specification Items. The sequence of work shall be as specified above for embankment layer or base course. The operating speed shall be determined by the Contractor and approved by the Engineer or designated representative.

230.4 Measurement and Payment

Compensation will not be allowed for materials, equipment or labor required by this item, but shall be considered subsidiary to the various items included in the contract.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 230, “ROLLING (FLAT WHEEL)”

City of Round Rock Standard Specifications

Designation	Description
Item No. 201	Subgrade Preparation
Item No. 210	Flexible Base
Item No. 310	Emulsified Asphalt Treatment
Item No. 320	Two Course Surface Treatment
Item No. 340	Hot Mix Asphaltic Concrete Pavement

RELATED CROSS REFERENCE MATERIALS
Specification Item 230, “ROLLING (FLAT WHEEL)”

City of Round Rock Standard Specifications

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 104	Removing Portland Cement Concrete
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 130	Borrow
Item No. 132	Embankment
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 203	Lime Treatment for Materials in Place
Item No. 232	Rolling (Pneumatic Tire)
Item No. 236	Proof Rolling
Item No. 301	Asphalts, Oils and Emulsions
Item No. 306	Prime Coat
Item No. 307	Tack Coat
Item No. 402	Controlled Low Strength Material
Item No. 403	Concrete for Structures

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)

Item No. 264	Lime and Lime Slurry
Item No. 300	Asphalts, Oils and Emulsions

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 301	Asphalt Anti-stripping Agents
Item No. 310	Prime Coat (Cutback Asphaltic Materials)
Item No. 314	Emulsified Asphalt Treatment
Item No. 316	Surface Treatments
Item No. 345	Asphalt Stabilized Base (Plant Mixed)

RELATED CROSS REFERENCE MATERIALS - CONTINUED

Specification Item 230, “ROLLING (FLAT WHEEL)”

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-101-E	Surveying and Sampling Soils for Highways
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials
Tex-117-E	Triaxial Compression Tests for Disturbed Soils and Base Materials
Tex-120-E	Soil Cement Testing
Tex-121-E	Soil Lime Testing
Tex-126-E	Molding, Testing and Evaluation of Bituminous Black Base
Tex-207-F	Determination of Density of Compacted Bituminous Mixtures
Tex-210-F	Determination of Asphalt Content of Bituminous Mixtures by Extraction
Tex-222-F	Method of Sampling Bituminous Mixtures
Tex-228-F	Determination of Asphalt Content of Bituminous Mixtures By The Nuclear Method
Tex-600-J	Sampling and Testing of Hydrated Lime, Quicklime & Commercial Lime Slurry

ITEM NO. 232
ROLLING (PNEUMATIC TIRE)

232.1 Description

This item shall govern compaction of embankment, flexible base, surface treatments or pavements by the operation of approved pneumatic tire rollers as herein specified and as directed by the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

232.2 Submittals

The submittal requirements of this specification item may include:

A. A plan describing the condition of each roller proposed for the work, as well as the type of traction (self propelled or drawn), Type, size, weight, tire pressure and configuration for each individual roller, and

B. The operating speed proposed for each individual roller.

232.3 Equipment

A. General Requirements

When used on seal coats, asphaltic surface treatments and bituminous mixture pavements, the roller shall be self propelled and equipped with smooth tread tires whether "Rolling (Light Pneumatic Tire)" or "Rolling (Medium Pneumatic Tire)" is specified on the Drawings. The roller shall be so constructed as to be capable of being operated in both a forward and a reverse direction. When used on bituminous mixture pavements, the roller shall have suitable provisions for moistening the surface of the tires while operating.

When turning is impractical or detrimental to the work and when specifically directed by the Engineer or designated representative, the roller shall be capable of being operated in a forward or backward motion.

In lieu of the rolling equipment specified, the Contractor may, upon written permission of the Engineer or designated representative, 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 Engineer or designated representative, its use shall be discontinued and the Contractor will be required to furnish the specified equipment.

Rollers shall be maintained in good repair and operating condition and shall be approved by the Engineer or designated representative.

Tire pressure is critical to successful operation of the roller. The Contractor shall have equipment on the construction site to inflate tires as required.

B. Light Pneumatic Tire Roller

The light pneumatic tire roller shall consist of not less than 9 pneumatic tired wheels, running on axles in such manner that the rear group of tires will cover the entire gap between adjacent tires of the forward group and mounted in a rigid frame and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such a manner that the roller may be turned within a minimum circle. The pneumatic tire roller, under working conditions, shall have an effective rolling width of approximately 60 inches (1.5 meters) and shall be so designed that by ballast loading, the total load may be varied uniformly from 9,000 pounds (4 megagrams) or less to 18,000 pounds (8 megagrams) or more. The roller shall be equipped with tires that will afford ground contact pressures to 45 pounds per square inch (310 kiloPascals) or more. The operating load and tire air pressure shall be within the range of the manufacturer's chart 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 roller under working conditions shall provide a uniform compression under all wheels. Individual tire inflation pressures shall be within + 5 psi (+ 34 kiloPascals) of each other. The pneumatic tire roller shall be drawn by a suitable crawler type tractor, a pneumatic tired tractor, a truck of adequate tractive effort or may be of the self-propelled type. The roller, when drawn or propelled by either type of equipment, shall be considered a light pneumatic tire roller unit.

C. Medium Pneumatic Tire Roller (Type A)

The medium pneumatic tire roller (Type A) shall consist of not less than 7 pneumatic tired wheels, running on axles in such manner that the rear group of tires will cover the entire gap between adjacent tires of the forward group and mounted in a rigid frame and provided with a loading platform or body suitable for ballast loading. The front axle shall be attached to the frame in such a manner that the roller may be turned within a minimum circle. The pneumatic tire roller, under working conditions, shall have an effective rolling width of approximately 84 inches (2.1 meters) and shall be so designed that, by ballast loading, the total load may be varied uniformly from 23,500 pounds (10.5 megagrams) or less to 50,000 pounds (22.5 megagrams) or more. The roller shall be equipped with tires that will afford ground contact pressures of 80 pounds per square inch (550 kiloPascals) or more. The operating load and tire air pressure shall be within the range of the manufacturer’s chart. The roller under working conditions shall provide a uniform compression under all wheels. Individual tire inflation pressures shall be within + 5 psi (+ 34 kiloPascals) of each other.

The pneumatic tire roller shall be drawn by a suitable crawler type tractor, a pneumatic tired tractor, a truck of adequate tractive effort or may be of the self-propelled type. The roller, when drawn or propelled by any type of equipment, shall be considered a medium pneumatic tire roller unit. The power unit shall have adequate tractive effort to properly move the operating roller at variable uniform speeds up to approximately 5 miles per hour (8 kilometers per hour).

D. Medium Pneumatic Tire Roller (Type B)

The medium pneumatic tire roller (Type B) shall conform to the requirements for Medium Pneumatic Tire Roller (Type A) as specified above, except that the roller shall be equipped with tires that will afford ground contact pressures to 90 psi (620 kiloPascals) or more.

232.4 Construction Methods

The embankment layer or the base course shall be sprinkled in accordance with Standard Specification Item Nos. 201, "Subgrade Preparation" and 210, "Flexible Base". Rolling with a pneumatic tire roller shall start longitudinally at the sides of the designated area and shall proceed towards the center, overlapping on successive trips by at least 1/2 of the width of the pneumatic tire roller. On superelevated curves, rolling shall begin at the low sides and progress toward the high sides. Alternate trips of the roller shall be slightly different in length.

The light pneumatic tire roller shall be operated at speeds, which shall be between 3 and 11 miles per hour (between 6 and 19 kilometers per hour) for asphalt surfacing work and between 2 and 6 miles per hour (between 3 and 10 kilometers per hour) for all other work.

The medium pneumatic tire roller shall be operated at speeds as directed by the Engineer or designated representative, which produce a satisfactory product.

Sufficient rollers shall be provided to compact the material in a satisfactory manner. When operations are so isolated from one another that 1 roller unit cannot produce the required compaction satisfactorily, additional roller units shall be provided.

232.5 Measurement and Payment

Compensation will not be allowed for materials, equipment or labor required by this item. These items shall be considered subsidiary to the various items of the contract. **End**

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 232, “ROLLING (PNEUMATIC TIRE)”

City of Round Rock Standard Specifications

Designation	Description
Item No. 201	Subgrade Preparation
Item No. 210	Flexible Base

City of Round Rock Standard Specifications

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 130	Borrow
Item No. 132	Embankment
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 203	Lime Treatment for Materials in Place
Item No. 230	Rolling (Flat Wheel)

City of Round Rock Standard Specifications

Designation	Description
Item No. 236	Proof Rolling
Item No. 301	Asphalts, Oils and Emulsions
Item No. 306	Prime Coat
Item No. 307	Tack Coat
Item No. 310	Emulsified Asphalt Treatment
Item No. 320	Two Course Surface Treatment
Item No. 340	Hot Mix Asphaltic Concrete Pavement
Item No. 402	Controlled Low Strength Material
Item No. 403	Concrete for Structures

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinklin
Item No. 210	Rolling (Flat Wheel)

RELATED CROSS REFERENCE MATERIALS
Specification Item 232, “ROLLING (PNEUMATIC TIRE)”

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges (continued)

Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)
Item No. 264	Lime and Lime Slurry
Item No. 300	Asphalts, Oils and Emulsions
Item No. 301	Asphalt Anti-stripping Agents
Item No. 310	Prime Coat (Cutback Asphaltic Materials)
Item No. 314	Emulsified Asphalt Treatment
Item No. 316	Surface Treatments
Item No. 345	Asphalt Stabilized Base (Plant Mixed)

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-101-E	Surveying and Sampling Soils for Highways
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soil & Base Materials
Tex-117-E	Triaxial Compression Tests for Disturbed Soils and Base Materials
Tex-120-E	Soil Cement Testing
Tex-121-E	Soil Lime Testing
Tex-126-E	Molding, Testing and Evaluation of Bituminous Black Base Materials
Tex-207-F	Determination of Density of Compacted Bituminous Mixtures
Tex-210-F	Determination of Asphalt Content of Bituminous Mixtures by Extraction
Tex-228-F	Determination of Asphalt Content of Bituminous Mixtures By The Nuclear Method
Tex-600-J	Sampling and Testing of Hydrated Lime, Quicklime & Commercial Lime Slurry

ITEM NO. 234
ROLLING (TAMPING)

234.1 Description

This item shall govern compaction of embankment, lime-treated subgrade or other courses by the operation of approved tamping rollers as herein specified and as directed by the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text and accompanying tables, the inch-pound units are given preference followed by SI units shown within parentheses.

234.2 Submittals

The submittal requirements of this specification item may include:

A. A plan describing the condition of each roller proposed for the work, as well as the type of traction (self propelled or drawn), Type of roller, size, weight, and configuration of each individual tamping roller, and

B. The operating speed proposed for each individual tamping roller.

234.3 Equipment

The tamping rollers shall consist of 2 metal rollers, drums or shells of 40 inches (1 meter) minimum diameter; each not less than 42 inches (1.067 meters) in length. The drums shall be unit mounted in a rigid frame in such a manner that each roller may oscillate independently of the other.

Each roller, drum or shell shall be surmounted by metal studs with tamping feet projecting not less than 7 inches (180 millimeters) from the surface and spaced not less than 6 inches (150 millimeters) nor more than 10 inches (254 millimeters), measured diagonally center to center and the cross-sectional area of each tamping foot, measured perpendicularly to the axis of the stud, shall not be less than 5 nor more than 8 square inches (less than 3200 nor more than 5200 square millimeters). The roller shall be supplemented with cleaning teeth to provide self-cleaning.

The roller shall be so designed that, by ballast loading, the load on each tamping foot may be varied uniformly from 125 to 550 psi (860 to 3800 kiloPascals) of cross sectional area. The load per tamping foot will be determined by dividing the total weight (mass) of the roller by the number of tamping feet in 1 row parallel to or approximately parallel to the axis of the roller. The compression to be provided at any time shall be as directed by the Engineer or designated representative.

The tamping roller shall be drawn by suitable power equipment of adequate tractive effort. Two tamping rollers, consisting of 4 cylinders, conforming to the above prescribed requirements, drawn by approved power equipment, shall be considered a roller unit.

Where turning is impractical or detrimental to the work and when specifically directed by the Engineer or designated representative, the roller shall be capable of being operated in a forward and backward direction. When operations are confined to narrow widths

and when specifically directed in writing by the Engineer or designated representative, 1 tamping roller consisting of 2 cylinders, fastened to the front end of approved power equipment shall be considered a roller unit.

In lieu of the rolling equipment specified, the Contractor may, upon written permission from the Engineer or designated representative, 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 Engineer or designated representative, its use shall be discontinued and the Contractor will be required to furnish the specified equipment.

Rollers shall be maintained in good repair and operating condition and shall be approved by the Engineer or designated representative.

234.4 Construction Methods

The embankment layer, subbase or the base course shall be sprinkled in accordance with Standard Specification Item Nos. 201, "Subgrade Preparation" and 203, "Lime Treatment for Materials In Place". Rolling with a tamping roller unit shall start longitudinally at the sides of the designated area and proceed toward the center, overlapping on successive trips by at least 1/2 of the width of the tamping roller unit. On superelevated curves, rolling shall begin at the low sides and progress toward the high sides. Alternate trips of the unit shall be slightly different in length. The tamping roller unit, unless otherwise directed by the Engineer or designated representative, shall be operated at a speed between 2 and 3 miles per hour (3 and 5 kilometers per hour).

Sufficient rollers shall be provided to compact the material in a satisfactory manner. When operations are so isolated from one another that one roller cannot perform the required compaction satisfactorily, additional rollers shall be provided and operated as directed by the Engineer.

234.5 Measurement and Payment

No additional payment will be made for the materials, equipment or labor required by this item, but shall be considered subsidiary to the various items included in the contract.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 234, “ROLLING (TAMPING)”

City of Round Rock Standard Specifications

Designation	Description
Item No. 201	Subgrade Preparation
Item No. 203	Lime Treatment for Materials in Place

RELATED CROSS REFERENCE MATERIALS
Specification Item 234, “ROLLING (TAMPING)”

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 132	Embankment
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)

City of Round Rock Standard Specifications

Designation	Description
Item No. 101	Preparing Right of Way
Item No. 102	Clearing and Grubbing
Item No. 110	Street Excavation
Item No. 111	Excavation
Item No. 130	Borrow
Item No. 132	Embankment
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 210	Flexible Base
Item No. 230	Rolling (Flat Wheel)
Item No. 232	Rolling (Pneumatic Tire)
Item No. 236	Proof Rolling
Item No. 301	Asphalts, Oils and Emulsions
Item No. 306	Prime Coat
Item No. 307	Tack Coat
Item No. 310	Emulsified Asphalt Treatment
Item No. 320	Two Course Surface Treatment
Item No. 340	Hot Mix Asphaltic Concrete Pavement
Item No. 402	Controlled Low Strength Material
Item No. 403	Concrete for Structures

RELATED CROSS REFERENCE MATERIALS - continued
Specification Item 234, “ROLLING (TAMPING)”

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 264	Lime and Lime Slurry

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 300	Asphalts, Oils and Emulsions
Item No. 301	Asphalt Anti-stripping Agents
Item No. 310	Prime Coat (Cutback Asphaltic Materials)
Item No. 314	Emulsified Asphalt Treatment
Item No. 316	Surface Treatments
Item No. 345	Asphalt Stabilized Base (Plant Mixed)

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-101-E	Surveying and Sampling Soils for Highways
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials
Tex-117-E	Triaxial Compression Tests for Disturbed Soils and Base Materials
Tex-120-E	Soil Cement Testing
Tex-121-E	Soil Lime Testing
Tex-126-E	Molding, Testing and Evaluation of Bituminous Black Base Materials
Tex-207-F	Determination of Density of Compacted Bituminous Mixtures
Tex-210-F	Determination of Asphalt Content of Bituminous Mixtures
Tex-600-J	Sampling and Testing of Hydrated Lime, Quicklime & Commercial Lime Slurry

ITEM NO. 236S
PROOF ROLLING

236.1 Description

This item shall govern furnishing and operating heavy pneumatic tired compaction equipment for locating unstable areas of embankment, subgrade and flexible base courses.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, the inch-pound units are given preference followed by SI units shown within parentheses.

236.2 Submittals

The submittal requirements of this specification item may include:

A. A plan describing the condition of each roller proposed for the work, as well as the type of traction (self propelled or drawn), Type of roller, size, weight, tire pressure (if appropriate) and configuration of each individual roller, and

B. The operating speed proposed for each individual roller.

236.3 Equipment

A. Standard Proof Roller:

The proof rolling equipment shall have a loading platform or body suitable for ballast loading that is supported on a minimum of two (2) axles with not more than two (2) pneumatic tired wheels per axle. All wheels shall be arranged so that they will carry approximately equal loads when operating on uneven surfaces. Pneumatic proof rolling equipment with multiple pivotal axles and more than two tires along the front or rear axle axis shall have articulating axle supports to equally distribute the load to all tires over uneven surfaces.

The proof roller unit, under working conditions, shall have a minimum contact width of 7-1/2 feet (2.3 meters) and shall be so designed that the gross roller weight may be varied uniformly from 25 tons to 50 tons (23 megagrams to 45 megagrams) by ballast loading. The tires shall be capable of operating under various loads with variable air pressures up to 145 psi (up to 1000 kiloPascals). The tires shall be smooth tread and shall impart a minimum ground contact pressure of 75 pounds per square inch (520 kiloPascals). Tires shall be practically full of liquid (i.e. 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 as directed by the Engineer or designated representative.

The proof roller shall be drawn by a power train of adequate tractive effort or may be of a self-propelled type. The proof rolling equipment shall be equipped with a reverse mode transmission or be capable of turning 180 degrees in the street width. When a separate power train is used to draw the proof roller, the power train weight shall not be considered in the weight of the proof roller. The power

train shall be rubber-tired when rolling subgrade and base materials. A cleated or track-type power train may be used on earth and rock embankments.

B. Alternate Equipment:

With the written approval of the Engineer or designated representative, the Contractor may utilize alternate equipment on embankment courses, subgrade and base courses subject to the requirements of the standard proof roller except with respect to minimum contact width, axle/tire arrangement and tire tread.

Alternate equipment for stability testing of embankments shall be restricted to equipment that can be shown to impart a stress distribution on the embankment structure equivalent to or greater than the stress induced by the concentrated weight of a standard proof roller.

C. Equipment Submittals:

All standard proof rollers and proposed alternate equipment must be approved by the Engineer or designated representative prior to their use. The Contractor shall furnish the Engineer or designated representative with 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.

Alternate equipment submittals for proof rolling of embankments shall be signed and sealed by a registered Professional Engineer licensed in the State of Texas.

236.4 Construction Methods

A. General:

Within the ranges set forth in Section 236.3, the load and tire inflation pressures shall be adjusted as directed by the Engineer or designated representative. It is proposed to use a contact pressure corresponding as nearly as practical to the maximum supporting value of the earthwork or base. The entirety of prepared surfaces to be tested by this method shall be proof rolled by a minimum of two passes of the proof roller tires. Each succeeding trip of the proof roller shall be offset by not greater than one tire width.

When alternate equipment is proposed and only one axle meets minimum requirements, only the qualifying axle shall be used to proof roll. If the operation of the proof roller shows an area to be unstable, the substandard area shall be brought to satisfactory stability and uniformity by additional curing, compaction, or by removal and replacement of unsuitable materials. The re-worked area shall then be proof rolled.

Proof rollers shall be operated at speeds between 2 and 6 miles per hour (3 and 10 kilometers per hour) or as directed by the Engineer or designated representative.

Acceptable limits of elastic and plastic deformation of prepared subgrade courses shall be established by proof rolling Test Sections of representative soil conditions, previously tested and approved for density and moisture requirements of the governing subgrade and earth embankment items. Proof

rolling of first course base over a plastic subgrade may be waived by the Engineer or designated representative if it is determined that the prepared first course base will be damaged by the proof roller.

B. Roadway Construction:

The subgrade and all lifts of base material shall be proof rolled in new roadway construction and in the reconstruction of existing streets. Proof rolling of the curb course base shall be substituted for proof rolling of final course base at the direction of the Engineer or designated representative. Proof rolling may be waived by the Engineer or designated representative where construction is limited to turn lanes, street widening less than 7-1/2 feet (2.3 meters) in width, or where the site is otherwise congested.

C. Trenches:

Trenches shall be proof rolled where no limitations to the operation of the proof roller exist as may be determined by the Engineer subject to the provisions hereunder.

All trenches shall be proof rolled in new roadways or in existing roadways under reconstruction. Trenches shall be proof rolled at the street subgrade elevation by longitudinal and perpendicular passes of the roller as may be dictated by the width of the trench.

Proof rolling of trenches in existing paved streets shall be limited to pavement cross-sections capable of sustaining the weight of the proof rolling equipment without imparting damage to the remaining pavement structure as determined by the Engineer. Trenches less than 4 feet (1.2 meters) in width shall be exempted of all proof rolling requirements. Only the final course base shall be proof rolled in trenches 4 feet (1.2 meters) or wider but narrower than the proof roller contact width. The subgrade, the first course and the final course base shall be proof rolled in trenches 7-1/2 feet (2.3 meters) or wider.

D. Embankment Construction:

All embankment courses shall be proof rolled, unless otherwise directed by the Engineer or designated representative.

If required by the Engineer or designated representative, stability testing of embankments constructed to the finished cross-section and elevation or to interim elevations shall either be conducted with a standard proof roller or alternate equipment, which can be proven to impart a horizontal and vertical pressure distributions equivalent to or greater than those induced by a standard proof roller.

236.5 Measurement and Payment

No direct payment will be made for the materials, equipment or labor required by this item, but shall be considered subsidiary to the various items included in the contract.

End

SPECIFIC CROSS REFERENCE MATERIALS
Specification Item 236, “PROOF ROLLING”

City of Round Rock Standard Specifications

Designation	Description
Item No. 101S	Preparing Right of Way
Item No. 102S	Clearing and Grubbing
Item No. 110S	Street Excavation
Item No. 111S	Excavation
Item No. 130S	Borrow
Item No. 132S	Embankment
Item No. 201	Subgrade Preparation
Item No. 202	Hydrated Lime and Lime Slurry
Item No. 203	Lime Treatment for Materials in Place
Item No. 204	Portland Cement Treatment For Materials in Place
Item No. 206	Asphalt Stabilized Base (Plant Mix)
Item No. 210	Flexible Base
Item No. 230	Rolling (Flat Wheel)
Item No. 232	Rolling (Pneumatic Tire)
Item No. 234	Rolling (Tamping)
Item No. 301	Asphalts, Oils and Emulsions
Item No. 306	Prime Coat
Item No. 307	Tack Coat
Item No. 310	Emulsified Asphalt Treatment
Item No. 320	Two Course Surface Treatment
Item No. 340	Hot Mix Asphaltic Concrete Pavement
Item No. 402	Controlled Low Strength Material
Item No. 403	Concrete for Structures

RELATED CROSS REFERENCE MATERIALS
Specification Item 236, “PROOF ROLLING”

Texas Department of Transportation: Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges

Designation	Description
Item No. 100	Preparing Right of Way
Item No. 110	Excavation
Item No. 112	Subgrade Widening
Item No. 132	Embankment
Item No. 150	Blading
Item No. 158	Specialized Excavation Work
Item No. 204	Sprinkling
Item No. 210	Rolling (Flat Wheel)
Item No. 211	Rolling (Tamping)
Item No. 213	Rolling (Pneumatic Tire)
Item No. 264	Lime and Lime Slurry

RELATED CROSS REFERENCE MATERIALS - continued
Specification Item 236, “PROOF ROLLING”

Item No. 300	Asphalts, Oils and Emulsions
Item No. 301	Asphalt Anti-stripping Agents
Item No. 310	Prime Coat (Cutback Asphaltic Materials)
Item No. 314	Emulsified Asphalt Treatment
Item No. 316	Surface Treatments
Item No. 345	Asphalt Stabilized Base (Plant Mixed)

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-101-E	Surveying and Sampling Soils for Highways
Tex-103-E	Determination of Moisture Content of Soil Materials
Tex-104-E	Determination of Liquid Limit of Soils
Tex-105-E	Determination of Plastic limit of Soils
Tex-106-E	Method of Calculating the Plasticity Index of Soils
Tex-114-E	Laboratory Compaction Characteristics & Moisture Density Relationship of Subgrade & Embankment Soil
Tex-115-E	Field Method for Determination of In-Place Density of Soils & Base Materials
Tex-117-E	Triaxial Compression Tests for Disturbed Soil and Base Materials
Tex-120-E	Soil Cement Testing
Tex-121-E	Soil Lime Testing
Tex-126-E	Molding, Testing and Evaluation of Bituminous Black Base Materials
Tex-207-F	Determination of Density of Compacted Bituminous Mixtures
Tex-210-F	Determination of Asphalt Content of Bituminous Mixtures
Tex-600-J	Sampling and Testing of Hydrated Lime, Quicklime & Commercial Lime Slurry

ITEM NO. 281
TERMITE CONTROL

281.1 Description

This item shall govern soil treatment below slabs-on-grade and at foundation perimeter for subterranean insects. The lines and grades shall not be disturbed without approval of the Engineer or designated representative.

This specification is applicable for projects or work involving either inch-pound or SI units. Within the text, the inch-pound units are given preference followed by SI units shown within parentheses.

281.2 Submittals

The submittal requirements shall include:

A. A listing of each proposed application (i.e. slab on grade, foundation walls, utilities, etc.) of a toxicant chemical.

B. Specific information for each chemical toxicant in the listing including:

1. Manufacturer, product name and description of chemical composition,
2. Handling, storage and mixing requirements,
3. Application recommendations, retreatment procedures, and
4. MSDS Sheets.

C. Warning sign information including Description, legend and areas of application.

281.3 Materials

A. Toxicant Chemical the toxicant chemical shall be a water-based emulsion of uniform composition with a synthetic dye to permit visual identification of the treated soil.

B. Acceptable Products

1. Pryfon 6
2. Dursban TC
3. Tribute
4. Dragnet
5. Demon

The toxicant chemical shall be diluted with water to yield the manufacturer's recommended concentration.

281.4 Construction Methods

A. Inspection

The inspection shall verify that the soil surfaces are not frozen, and sufficiently dry to absorb toxicant and ready to receive the treatment.

B. Application

The user shall acquire and review the current Material Safety Data Sheet (MSDS), for warnings and precautions, and shall follow the directions in the use of the product and disposal of all containers after use. The user shall apply the toxicant chemical with a low-pressure spray (less than 50 p.s.i. [345 kPa]) consistent with the manufacturer's recommendations. The diluted toxicant solution shall be applied using a metered applicator to the soil in the following locations at the rates recommended by the manufacturer:

1. Under floor slabs-on-grade
2. Both sides of foundation wall.
3. Soil within 10 feet (3 meters) of building perimeter for a depth of 1 foot (0.3 meter).
4. Expansion joints.
5. Utility entrances.
6. Critical locations such as where utilities pass through exterior walls and through floor slabs.

The diluted toxicant solution shall be applied immediately prior to installation of vapor barrier under slabs-on-grade or finish grading outside foundation walls.

Extra treatment shall be applied in a coarse spray to ensure uniform distribution to structure penetrations, pipe ducts and other soil penetrations. Any treated soil that is disturbed shall be retreated.

C. Directions For Use

The user shall become fully informed of the recommended precautions in the handling and storage of the chemical toxicant, as well as the directions for use of the toxicant chemical as listed on the current MSDS and in conformance with the Uniform Fire Code, Article 86, Pesticide Storage and Display. Signs warning workers that soil poisoning has been applied shall be posted in areas of application. The signs shall be removed once the areas are covered by other construction.

D. Retreatment

If inspection identifies the presence of termites, the soil shall be retreated and subsequently retested. The retreatment toxicant shall be the same as the original toxicant treatment.

281.5 Measurement

Accepted work performed as prescribed by this item will be measured by the square foot (square meter: 1 square meter equals 10.764 square feet) of treated area for "Termite Control".

281.6 Payment

The work performed as prescribed by this item will be paid for at the unit bid price per square foot of treated area for "Termite Control". The unit bid price shall include full compensation for furnishing chemicals and application of solution on the prepared subgrade.

Payment, when included as a pay item, will be made under:

Termite Control Per Square Foot

End

RELATED CROSS REFERENCE MATERIALS
Specification Item 281, “TERMITE CONTROL”

City of Round Rock Standard Specifications

Designation	Description
Item No. 410	Concrete Structures
Item No. 721	Steel Structures