Item No. 302S
Aggregates for Surface Treatments

302S.1 Description

This item shall govern aggregate and precoated aggregate to be used in the construction of surface treatments.

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.

302S.2 Submittals

The submittal requirements of this specification item include:

A. Aggregate types, gradations and physical characteristics (i.e. flakiness index, % wear, soundness, polish value, etc).

B. Proposed proportioning of materials.

C. Aggregate precoat and fluxing material.

D. Type of mixing plant and associated equipage including chart indicating the calibration of each cold bin

E. Aggregate storage/stockpiling plans.

302S.3 Materials

A. Aggregates

Aggregates shall be composed of clean, tough and durable particles of gravel, crushed gravel, crushed stone, crushed slag or natural limestone rock asphalt. These materials shall not contain more than 2 percent by weight (mass) of soft particles and other deleterious materials as determined by TXDOT Test Method Tex-217-F, Part I. The natural limestone rock asphalt aggregate furnished shall have an average bitumen content from 4 to 7 percent by weight (mass) of naturally impregnated asphalt, as determined by TXDOT Test Method Tex-215-F and shall contain not more than 2 percent by weight (mass) of any one of or combination of iron pyrites or other objectionable matter, as determined by TXDOT Test Method Tex-217-F, Part I. No aggregate shall contain a total of more than 2 percent by weight (mass) of impurities or objectionable matter listed above.

The aggregate shall be either dark in color or be precoated. If not precoated, it shall be sufficiently washed as to produce a clean, dust free surface.

The aggregate shall not contain more than 1 percent loss from fine dust, clay-like particles and/or silt when tested in accordance with TXDOT Test Method Tex-217-F, Part II. The flakiness index for the aggregate, as determined by TXDOT Test Method Tex-224-F, shall not exceed 17 unless otherwise shown on the Drawings.

The percent of wear, as determined by TXDOT Test Method Tex-410-A (Los Angeles Abrasion Test), for each of the materials, except natural limestone rock asphalt (LRA), shall not exceed 35 percent. The percent of wear on natural limestone rock asphalt aggregate (LRA) shall not exceed 40 percent as determined by TXDOT Test Method Tex-410-A on that portion of the material retained on the No. 4 (4.75 mm) sieve, having a impregnated asphalt content of less than 1 percent.

Unless indicated otherwise on the drawings crushed gravel shall have a minimum of 85 percent of the particles retained on the No. 4 (4.75 mm) sieve with two or more mechanically induced crushed faces, as determined by TXDOT Test Method Tex-460-A, Part I.

The aggregate will be subjected to five (5) cycles of magnesium sulfate soundness testing in accordance with Test Method Tex-411-A. The loss shall not exceed 25 percent, unless indicated otherwise on the Drawings.

The polish value for the aggregate used in the surface or finish course shall be the value shown on the Drawings, when tested in accordance with TxDOT Test Method Tex-438-A. Unless otherwise shown on the Drawings, a minimum polish-value requirement of 30 will apply only to aggregate used in the travel lanes.

When aggregates requiring polish value are supplied from a source rated for a previous City of Austin roadway project or rated by TxDOT Materials and Tests Division, the Rated Source Polish Value (RSPV) for that source will be used to meet this requirement. When aggregates are supplied from a source that is not rated, the aggregate will be sampled and tested prior to use. The procedures will be in accordance with TxDOT Test Methods Tex-400-A and Tex-438-A, Part I. Blending of aggregates to achieve polish value will not be permitted, unless otherwise shown on the Drawings. If blending is allowed, TxDOT Test Method Tex-438-A, Part II, Method B will be used to determine the required blend percentages. However, a minimum of 50 percent by volume of non-polishing aggregate is required.

B. Precoat Material and Fluxing Material

1. The precoat material shall meet requirements for "Precoat Materials" as specified in Standard Specification Item No. 301S, "Asphalts, Oils and Emulsions".

2. The fluxing material shall meet the requirements for "Fluxing Material " as specified in Standard Specification Item No. 301S, "Asphalts, Oils and Emulsions".

3. Water in an amount not to exceed 3 percent by weight (mass) of the mixture may be used in preparing the mixture. The water shall be added as directed by the Engineer or designated representative during the mixing. In the event water is used in the mixing operation, adequate measuring devices shall be

used and the water shall be administered to the mix through an approved spray bar. Potable water from City of Austin supplies is preferred, but the Contractor may submit test results of other water sources for approval by the Engineer or designated representative before use.

302S.4 Types of Aggregates

The various types of aggregates are identified as follows:

A. Uncoated Aggregate Types.

Type	Description
A	gravel, crushed slag, crushed stone or natural limestone rock asphalt (LRA)
B	crushed gravel, crushed slag, crushed stone or natural limestone rock asphalt (LRA)
C	gravel, crushed slag or crushed stone
D	crushed gravel, crushed slag or crushed stone
E	Aggregate as shown on drawings
F	Trap Rock

B. Precoated Aggregate.

Precoated aggregate shall be aggregate of the type and grade specified above, coated with 0.5 to 1.5 percent, by mass, of residual bitumen from a precoating material. When indicated on the drawings, specific aggregates may be prohibited from being precoated.

Where limestone rock asphalt (LRA) is used, it shall be fluxed with 0.5 to 1.5 percent by mass of fluxing material. Limestone rock asphalt (LRA) that contains visual surface moisture or excessive quantities of fines shall not be precoated.

The grade of aggregate specified shall meet all requirements of sections 302S.3 and 302S.4 prior to the application of the precoat or fluxing material.

The materials may be mixed on the job or at a central mixing plant and shipped ready for use. Mixes that do not maintain flow qualities such that the precoated aggregate may be satisfactorily spread by approved mechanical spreading devices will not be acceptable.

Materials that are not uniformly and/or properly coated, in the opinion of the Engineer or designated representative, will not be accepted for use.

The various types of precoated aggregates are identified as follows:

Precoated Aggregate Types

Type	Description
PA	gravel, crushed slag, crushed stone or natural limestone rock asphalt (LRA)

PB	crushed gravel, crushed slag, crushed stone or natural limestone rock asphalt (LRA)
PC	gravel, crushed slag or crushed stone
PD	crushed gravel, crushed slag or crushed stone
PE	Aggregate as shown on drawings

302S.5 Grades

When tested by TXDOT Test Method Tex-200-F, Part I, the gradation requirements for the several grades of aggregate shall be as follows:

Sieve Designation		Percent Retained By Weight (Mass) for				
US	SI	Grade 1	Grade 2	Grade 3	Grade 4	Grade 5
1 inch	25.0 mm	0				
7/8 inch	22.4 mm	0 - 2	0			
3/4 inch	19.0 mm	20 - 35	0 - 2	0		
5/8 inch	16.0 mm	85 - 100	20 - 40	0 - 2	0	
1/2 inch	12.5 mm		80 - 100	20 - 40	0 - 5	0
3/8 inch	9.5 mm	95 -100	95 -100	80 -100	20 - 40	0 - 5
1/4 inch	6.25 mm			95 -100		
No. 4	4.75 mm				95 - 100	50 – 80
No. 8	2.36 mm	99 - 100	99 - 100	99 - 100	98 - 100	98 - 100

302S.6 Equipment For Precoating Aggregate

Mixing plants that will not continually meet all the requirements of this specification shall be rejected.

Mixing plants may be either the weigh batching type, the continuous mixing type or the drum mix type. Each type of plant shall be equipped with satisfactory conveyors, power units, aggregate handling equipment, aggregate screens and bins and shall consist of the essential pieces of equipment listed below:

If the Engineer or designated representative approves the use of emulsion as a precoat material, the Engineer or designated representative may also waive the requirement for a dryer, as specified below, if it is demonstrated that a satisfactory coating can be obtained without drying or heating the aggregate.

When using a low grade fuel oil or waste oil, the plant shall meet the requirements of article 340.4.(2) of TxDoT Specification Item 340, "Hot Mix Asphaltic Concrete Pavement".

A. Weigh Batching Type

1. Cold Aggregate Bin and Proportioning Device

The cold aggregate bins or aggregate stockpiles shall be of sufficient number and size to supply the amount of aggregate required to keep the plant in

continuous operation. The proportioning device shall be such as will provide a uniform and continuous flow of aggregate to the plant in the desired proportions.

2. Dryer

The dryer shall be of the type that continually agitates the aggregate during heating and in which the temperature can be so controlled that aggregate will not be damaged in the necessary drying and heating operations, which are required to obtain a mixture of the specified temperature.

3. Burner

The burner or combination of burners and type of fuel used shall be such that in the process of heating the aggregate to the desired or specified temperatures, no residue from the fuel shall adhere to the heated aggregate. A recording thermometer shall be provided which will record the temperature of the aggregate when it leaves the dryer. The dryer shall be of sufficient size to keep the plant in continuous operation. The dryer will not be required for precoating natural limestone rock asphalt.

4. Screening and Proportioning

The screening capacity and size of the bins shall be sufficient to screen and store the amount of aggregate required to properly operate the plant and keep the plant in continuous operation at full capacity. Proper provisions shall be made to enable inspection forces to have easy and safe access to the proper location on the mixing plant where accurate representative samples of aggregate may be taken from the bins for testing.

5. Weighing and Measuring Equipment

The weighing and measuring equipment shall be of sufficient capacity and of adequate design for proper batching. The following equipment, conforming to the requirements of the TxDOT Standard Specification, Item No. 520, "Weighing and Measuring Equipment", shall be furnished:

(a) Aggregate weigh box and batching scales.

(b) Bucket and scales for precoat material for flux oil.

A pressure type flow meter may be used to measure the precoat material or fluxing material for each batch.

If a pressure type flow meter is used to measure the asphaltic material, the requirements of TxDOT Specification Item 520, "Weighing and Measuring Equipment", shall apply.

Provisions of a permanent nature shall be made for checking the accuracy of the asphaltic material measuring device. The line to the measuring device shall be protected with a jacket of hot oil or other means approved by the Engineer to maintain the temperature of the line near the temperature specified for the precoating material.

6. Mixer

The mixer shall be of the pug mill type and shall have a capacity of not less than 3000 pounds (1 350 kilograms) in a single batch. The number of blades and the position of same shall be such as to give a uniform and complete circulation of the batch in the mixer. The mixer shall be equipped with an approved spray bar that will distribute the precoat material or fluxing material quickly and uniformly throughout the mixer. Any mixer that has a tendency to segregate the mineral aggregate or fails to secure a thorough and uniform mixing with the precoat material or fluxing material shall not be used. All mixers shall be provided with an automatic time lock that will lock the discharge doors of the mixer for the required mixing period. The dump door or doors and the shaft seals of the mixer shall be tight enough to prevent the spilling of aggregate or mixture from the pug mill.

B. Continuous Mixing Type

1. Cold Aggregate Bin and Proportioning Device.

Same as for weigh batching type of plant.

2. Dryer.

Same as for weigh batching type of plant.

3. Screening and Proportioning.

Same as for weigh batching type of plant. These requirements shall also apply to materials that are stockpiled and that are proposed for direct use by a continuous mixing plant without the use of plant bins.

4. Aggregate Proportioning Device.

The aggregate proportioning device shall be so designed, that when properly operated, a uniform and continuous flow of aggregate into the mixer will be maintained.

5. Spray Bar for Precoat Material and Fluxing Material.

The spray bar for the precoat material or fluxing material shall be so designed that the material will spray uniformly and continuously into the mixer.

6. Meter for Precoat Material or Fluxing Material.

An accurate recording meter for precoat material or fluxing material shall be placed in the line leading to the spray bar so that the accumulative amount of precoat material or fluxing material being used can be accurately determined. Provisions of a permanent nature shall be made for checking the accuracy of the meter output.

7. Mixer

The mixer shall be of the pug mill continuous type and shall have a capacity of not less than 40 tons (36 megagrams) of mixture per hour. Any mixer that

has a tendency to segregate the aggregate or fails to secure a thorough and uniform mixing of the aggregate with the precoat material or fluxing material shall not be used.

C. Drum Mix Plant

Unless otherwise indicated on the Drawings or if natural limestone rock asphalt is to be used, the Contractor may elect to use the drum-mixing process. The plant shall be adequately designed and constructed for the process of mixing aggregates and precoat material in the dryer-drum without preheating the aggregates. The plant shall be equipped with satisfactory conveyors, power units, aggregate-handling equipment and feed controls and shall consist of the following essential pieces of equipment.

1. Cold Aggregate Bin and Feed System

The number of compartments in the cold aggregate bin shall be equal to or greater than the number of stockpiles of individual materials to be used.

The bin shall be of sufficient size to store the amount of aggregate required to keep the plant in continuous operation and of proper design to prevent overflow of material from one compartment to another. There shall be vertical partitions meeting the requirements of article 340.4. (2) of TxDoT Specification Item 340, "Hot Mix Asphaltic Concrete Pavement". The feed system shall provide a uniform and continuous flow of aggregate in the desired proportion to the dryer. The Contractor shall furnish a chart indicating the calibration of each cold bin in accordance with the manufacturer's recommendations or in a method acceptable to the Engineer or designated representative.

The system shall provide positive weight (mass) measurement of the combined cold aggregate feed by use of belt scales or other approved devices. Provisions of a permanent nature shall be made for checking the accuracy of the measuring device, as required by TxDOT Specification Item 520, "Weighing and Measuring Equipment". When a belt scale is used, mixture production shall be maintained so that the scale normally operates between 50 percent and 100 percent of its rated capacity. Belt scale operation below 50 percent of the rated capacity may be allowed by the Engineer or designated representative if accuracy checks show the scale to meet the requirements of TxDOT Specification Item 520, "Weighing and Measuring Equipment", at the selected rate and it can be satisfactorily demonstrated to the Engineer or designated representative that mixture uniformity and quality have not been adversely affected.

2. Scalping Screen

A scalping screen shall be required, unless otherwise indicated on the Drawings and shall be located ahead of the combined aggregate belt scale.

3. Precoat Material Measuring System

An asphaltic material measuring device meeting the requirements of the TXDOT Item No. 520, "Weighing and Measuring Equipment", shall be placed

in the line leading to the drum mixer so that the accumulative amount of precoat material used can be accurately determined. Provisions of a permanent nature shall be made for checking the accuracy of the measuring device output. The measuring device and line to the measuring device shall be protected with a jacket of hot oil or other approved means to maintain the temperature of the line and measuring device near the temperature specified for the precoat material. The measuring system shall include an automatic temperature compensation device to maintain a constant percent by mass of precoating material in the mixture. Unless otherwise indicated, the temperature of the precoat material entering the measuring device shall be maintained at + 100 F (+60C) of the temperature at which the measuring set was calibrated and set.

4. Synchronization Equipment for Feed-Control Systems

The precoat material feed-control shall be coupled with the total aggregate weight (mass) measuring device in such a manner as to automatically vary the precoat material feed rate as required to maintain the required proportion.

5. Drum Mix System

The drum mix system shall be of the type that continually agitates the aggregate and precoat mixture during heating, and in which the temperature can be so controlled that aggregate and asphalt will not be damaged in the necessary drying and heating operations that are required to obtain a mixture at the specified temperature. A continuously recording thermometer shall be provided which will indicate the temperature of the mixture as it leaves the drum mixer.

6. Surge-Storage System

A surge-storage system will be required. It shall be adequate to minimize the production interruptions during the normal day's operations and shall be constructed to minimize segregation. A device such as a gob hopper or other similar devices approved by the Engineer or designated representative to prevent segregation in the surge-storage bin will be required.

7. Heating Equipment for Precoat Material and Fluxing Material

Heating equipment for precoat material and fluxing material shall be adequate to heat the amount of material required to the desired temperature. The material may be heated by steam coils, which shall be absolutely tight. Direct fire heating will be permitted, provided the heater used is manufactured by a reputable concern and there is positive circulation of the liquid throughout the heater. Agitation with steam or air will not be permitted. The heating apparatus shall be equipped with a recording thermometer with a 24-hour chart that will record the temperature of the precoat material of fluxing material where it is at the point of highest temperature.

302S.7 Storage, Proportioning and Mixing

A. Aggregate Storage

If the mineral aggregates are stored or stockpiled, they shall be handled in such a manner as to prevent segregation, mixing of the various materials or sizes and contamination with foreign materials. The grading of aggregates proposed for use and as supplied to the mixing plant shall be uniform. When directed by the Engineer or designated representative, aggregate materials shall not be added to stockpiles that have already been sampled for approval.

When asphalt cement is the precoating material, stockpile height shall be limited to approximately three (3) feet (one meter) immediately after production to limit the build up of heat. These stockpiles may be consolidated after cooling adequately, in the opinion of the Engineer or designated representative.

The use of limestone rock asphalt aggregate containing moisture in excess of the saturated surface-dry condition will not be permitted. Excess moisture will be evidenced by visual surface moisture on the aggregate or any unusual quantities of fines clinging to the aggregate.

B. Storage and Heating of Precoating Material or Fluxing Material

The precoating or fluxing material storage shall be ample to meet the requirements of the plant. The precoating materials shall not be heated in storage to a temperature in excess of 2500F (1200C) or the maximum temperature established in Standard Specification Item Number 301S, “Asphalts, Oils and Emulsions”. All equipment used in the storage and handling of precoat material or fluxing material shall be kept in a clean condition at all times and shall be operated in such manner that there will be no contamination with foreign matter.

C. Feeding and Drying of Aggregate

The feeding of various sizes of aggregate, other than natural limestone rock asphalt, to the dryer shall be done through the cold aggregate bin and proportioning device in such a manner that a uniform and constant flow of material in the required proportions will be maintained. The aggregate shall be heated to the temperature necessary to produce a mixture meeting the requirements of Article 302S.6.A.3 and 302S.7.

D. Proportioning

The proportioning of the various materials entering into the mixture shall be as directed by the Engineer or designated representative and in accordance with these specifications. Aggregate shall be proportioned by weight (mass) using the weigh box and batching scales herein specified when the weigh-batch type of plant is used and by volume using the aggregate proportioning device when the continuous mixer type of plant is used. The precoat material or fluxing material shall be proportioned by weight (mass) or by volume based on weight (mass) using the specified equipment.

E. Mixing

1. Batch Type Mixer

   In the charging of the weigh box and the charging of the mixer from the weigh box, such methods or devices shall be used as are necessary to secure a uniform mixture. In introducing the batch into the mixer, the mineral aggregate shall be introduced first; shall be mixed thoroughly, as directed, to uniformly distribute the various sizes throughout the batch before the precoat material or fluxing material is added; the precoat material or fluxing material shall then be added and the mixing continued until such time that the aggregate is properly coated. This mixing period may be varied, if in the opinion of the Engineer or designated representative the mixture is not uniform.

2. Continuous Type Mixer and Drum Mixer

   The amount of aggregate and precoat material or fluxing material entering the mixer and the rate of travel through the mixer shall be so coordinated that a uniform mixture of the specified grading and percent by weight (mass) of precoat material or fluxing material will be produced.

302S.8 Physical Properties of the Mixture

The materials shall be mixed at a central mixing plant and shipped ready for use. Mixes that do not remain workable over a sufficient period of time or do not maintain flow qualities such that the precoated aggregate may be satisfactorily spread by normal approved mechanical spreading devices will not be acceptable. Materials that are not uniformly and/or properly coated or fluxed, in the opinion of the Engineer or designated representative will not be accepted for use.

302S.9 Measurement and Payment

Aggregates and precoated aggregates provided in accordance with this specification will not be paid for directly but shall be included in the unit price bid for the item of construction in which this item is used.

End

SPECIFIC **CROSS REFERENCE MATERIALS**
Specification Item 302S "Aggregates for Surface Treatments"

City of Austin Standard Specifications

Designation	Description
Item No. 301S	Asphalts, Oils and Emulsions
Item No. 340S	Hot Mix Asphaltic Concrete Pavement

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

Designation	Description
Item 520	Weighing and Measuring Equipment

Texas Department of Transportation: Manual of Testing Procedures

Designation	Description
Tex-200-F	Sieve Analysis of Fine and Coarse Aggregates
Tex-215-F	Determination of Asphalt Content of Rock Asphalt By Hot Solvent Method
Tex-217-F	Determination of Deleterious Material and Decantation Test For Coarse Aggregates
Tex-224-F	Determination of Flakiness
Tex-400-A	Method of Sampling Stone, Gravel, Sand and Mineral Aggregates
Tex-410-A	Abrasion of Coarse Aggregate Using the Los Angeles Machine
Tex-411-A	Soundness of Aggregate by Use of Sodium Sulfate or Magnesium Sulfate

Tex-438-A	Accelerated Polish Test for Aggregate
Tex-460-A	Determination of Crushed Face Particle

RELATED **CROSS REFERENCE MATERIALS**
Specification Item 302S "Aggregates for Surface Treatments"

City of Austin Standard Specifications

Designation	Description
Item No. 206S	Asphalt Stabilized Base
Item No. 210S	Flexible Base
Item No. 306S	Prime Coat
Item No. 307S	Tack Coat
Item No. 310S	Emulsified Asphalt Treatment
Item No. 311S	Emulsified Asphalt Repaving
Item No. 320S	Two Course Surface Treatment

City of Austin Standard Details

Designation	Description
1000S-10	Local Street Sections
1000S-11 (1)	Residential and Neighborhood collector Street Sections
1000S-11 (2)	Industrial and Collector Street Sections
1000S-12 (1)	Primary Collector Street Sections
1000S-12 (2)	Primary Arterial Street Sections
1000S-13 (1)	Minor Arterial Street Sections (4 Lanes)

1000S-13 (2)	Minor Arterial Street Sections- (4 Lanes divided)
1000S-14	Major Arterial Street

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

Designation	Description
Item 300	Asphalts, Oils and Emulsions
Item 301	Asphalt Antistripping Agents
Item 310	Prime Coat (Cutback Asphaltic Materials)
Item 314	Emulsified Asphalt Treatment

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