STANDARD
SPECIFICATIONS
FOR
STATE ROAD
AND BRIDGE
CONSTRUCTION

METRIC VERSION

Kansas Department
of
Transportation
DIVISION 600

FLEXIBLE PAVEMENT
SECTION 601
EQUIPMENT

Unless otherwise noted, equipment shall conform to the requirements specified in Division 150.
SECTION 602

ASPHALT APPLICATION TEMPERATURES

602.01 DESCRIPTION.

The application temperatures for the various types and grades of asphalts shall be within the ranges listed below.

Table 1.—Asphalt Application Temperatures

<table>
<thead>
<tr>
<th>TYPE</th>
<th>GRADE</th>
<th>Temperature Range (Degrees Celsius)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Spraying</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Min.</td>
</tr>
<tr>
<td>Asphalt Cement (AC &amp; VAC)</td>
<td></td>
<td>135</td>
</tr>
<tr>
<td>Cutback Asphalt</td>
<td>(MC)</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td></td>
<td>52</td>
</tr>
<tr>
<td></td>
<td>(MC &amp; RC)</td>
<td>65</td>
</tr>
<tr>
<td>Hot Recycling Agent</td>
<td>(RA)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asphalt Rejuvenating Agent</td>
<td></td>
<td>21</td>
</tr>
<tr>
<td>Emulsified Asphalt CRS-1H</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Emulsified Asphalt SS-1H &amp; CSS-1H</td>
<td>None</td>
<td>65</td>
</tr>
<tr>
<td>Emulsified Asphalt RS-1H</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Emulsified Asphalt CMS-1</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Emulsified Asphalt MS-1</td>
<td></td>
<td>38</td>
</tr>
<tr>
<td>Emulsified Asphalt HFMS-1</td>
<td></td>
<td>38</td>
</tr>
</tbody>
</table>

* 150 Second Saybolt Viscosity
** 75 Second Saybolt Viscosity

Temperatures for these viscosities may be obtained from the Materials and Research Center.

Except for minor fluctuations, all Asphalt Cements and Cutback Asphalts reheated to temperatures above 10°C higher than the maximum shown will be considered overheated and may be rejected pending resampling and retesting of the material at the discretion of the Engineer. Except for minor fluctuations, all Emulsified Asphalts heated to temperatures above the maximum shown above will be considered as overheated and may be rejected pending resampling and retesting of the material at the direction of the Engineer.
SECTION 603
PLANT MIX BITUMINOUS CONSTRUCTION

603.01 DESCRIPTION.

This work shall consist of one or more courses of bituminous mixture constructed on the prepared foundation in accordance with these specifications and the specific requirements of the type under Contract, and in reasonably close conformity with the lines, grades, thickness, and typical cross sections shown on the Plans or established by the Engineer.

BID ITEMS

Aggregate for Bituminous Surface Course (*).
Aggregate for Bituminous Base Course (*).
Asphalt Cement (*).
Cutback Asphalt (*).
Emulsified Asphalt (*).
Asphaltic Pavement Sampling.
Extraction Apparatus.
Solvent.
Water.

* Designated Type and Grade.

603.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Bituminous Materials .................................................. Section 1200
Aggregates for Bituminous Mixtures ................................. Section 1100

603.03 CONSTRUCTION REQUIREMENTS.

(a) Plant Operation.

(1) General.
All plant operations shall be adjusted to operate as continuously as possible.

(2) Preparation of the Bituminous Material.
(2.1) General.
The material shall be heated to within a range as established in Section 602. The bituminous material shall be heated to the specified temperature in a manner that will avoid local overheating and provide a continuous supply of the bituminous material to the mixer at a uniform temperature at all times.
Asphalt cement received from the refinery at temperatures not to exceed 190°C may be used as received. This provision is not meant to conflict with the requirements regarding the reheating of asphalt as set forth in Section 602.

(2.2) Commingling of Asphalt Cements.

The addition or commingling of asphalt cements from two or more sources into a storage tank is prohibited. If this occurs the contents of the storage tank shall be considered contaminated and shall not be used on the project, except as follows: It will be permissible, at the Contractor's option, to thoroughly mix the contents of the tank and request sampling of the mixture. Samples shall be submitted to the Materials and Research Center for testing. The use of the sampled asphalt will not be allowed until testing is completed and, if needed, a new mix evaluation is completed.

(2.3) Asphalt Sources.

If the Contractor desires to change sources of asphalt on a project, the Engineer shall be given two weeks notice and be provided a sufficient quantity of the proposed asphalt for testing.

(2.4) Testing Requirements.

No asphalt cement may be used for production of a bituminous mix on a project prior to completion of testing, including the testing for mix design.

(3) Preparation of Mineral Aggregate.

(3.1) General.

When the mineral aggregate is composed of two or more ingredients they shall be combined as shown in the approved design job mix.

(3.2) Temperature Requirements.

Except for minor fluctuations, the aggregate for the mixture shall be dried and heated to a temperature which will provide an asphalt-aggregate mixture temperature immediately after mixing within the 75 to 150 second Saybolt viscosity range of the asphalt used. Temperatures for this viscosity range may be obtained from the Materials and Research Center. The minimum temperature, as stipulated above, may be revised by the District Engineer provided it is demonstrated that satisfactory results can be obtained at a lower temperature. In such event the bituminous mixture shall be delivered to the paver at a temperature sufficient to allow the material to be satisfactorily placed and compacted to the specified density and surface tolerance requirements.
(4) Preparation of Bituminous Mixture.
(4.1) General.
Dried aggregate as specified for asphaltic concrete and prepared as prescribed above shall be combined in the plant in accordance with the approved design job mix. Asphalt cement shall be introduced into the mixture in the proportionate amount determined by the Engineer from the design job mix.

(4.2) Basis of Rejection.
Bituminous Mixture shall be rejected if the aggregate, as it is discharged from the drum or the pugmill, contains sufficient moisture to cause foaming of the mixture or, if the temperature of the aggregate is such that the asphalt-aggregate mixture temperature is in excess of that specified in subsection 603.03 (a) (3.2).

(4.3) Mixing Time.
Drum mixers shall operate at a rate that provides adequate uniform aggregate coating in a continuous operation. For batch and continuous type plants wet mixing time shall not be less than 40 seconds. In all cases it shall be sufficient to produce a uniform mixture in which all the aggregate particles are thoroughly coated. On batch plants, the timing shall begin at the start of the asphalt introduction into the pugmill and end upon the opening of the discharge gate. Mixing time in seconds for continuous flow plants shall equal (pugmill dead capacity in kilograms) divided by (pugmill output in kilograms per second).

(4.4) Manufacturers Specifications.
All drying, pumping and mixing equipment shall be operated within the limits specified by the manufacturer unless it can be demonstrated to the satisfaction of the Engineer that such limits can be exceeded without detriment to the bituminous mixture.

(4.5) Batch Operation.
Bituminous mixture batchers (Gob Hoppers) shall be coordinated with the plant production rate at all times so that the hopper will be more than ¾ full before the gates open and, the gates will close before material can drop through the gob hopper directly into the surge bin, weigh hopper or truck.

(4.6) Wasted Material.
(4.6.1) If after an interruption of production, the drum-mixer contains cold, uncoated, or otherwise unsuitable material, such material shall be wasted through a diversion chute. Such unsuitable material in a continuous or batch plant drier shall be wasted through the pugmill.
(4.6.2) At the end of a production run, any segregated material in the cone of the storage bin shall be wasted and not paid for.
(b) Road Surface Preparation.

(1) Preparation of Earth Subgrade.

When the bituminous mixture is placed on a prepared subgrade and unless other subgrade preparation is called for on the Plans, the Contractor shall, as a part of the work, prior to the delivery of materials for the base course, prepare the subgrade surface by sprinkling, lightly scarifying where necessary, blading and rolling, until the proper crown is obtained. The originally compacted crust or top portion of the subgrade shall be disturbed as little as possible. When completed and ready for base construction, the subgrade shall be well compacted, smooth, hard, and uniform.

At all grade control points, such as existing pavements and bridges, the subgrade shall be excavated in accordance with the grades and lines shown on the plans prior to any subgrade treatment. Excess excavated material shall be disposed of by the Contractor on sites approved by the Engineer.

The subgrade modification or compaction, designated on the Plans, shall be applied through these areas. If the Plans do not provide for subgrade preparation, these areas shall be compacted to meet the requirements of "Type B" compaction and MR-90 moisture range. The depth of the compaction shall be 150 millimeters below the subgrade as excavated. After subgrade preparation, plan crown and grade shall be restored. It shall be the sole responsibility of the Contractor to maintain the subgrade as prepared until it is covered with the base course, and any defects which may develop shall be corrected at his expense.

If the surface of the prepared subgrade becomes excessively dry the Contractor shall sprinkle the subgrade, at his expense, prior to the placing of the bituminous mixture.

(2) Preparation of a Bituminous Pavement.

When the bituminous mixture is placed on an existing bituminous surface, the surface shall be cleaned of all foreign material and broomed as necessary to remove dust. Areas shown on the Plans or designated by the Engineer to be patched shall be excavated to a depth directed by the Engineer, filled with bituminous mixture and compacted. When the Contract does not provide for a patching item, the unit price for the bituminous mixture used in this work shall be adjusted as specified in Section 603.09. The excavation required will not be paid for directly but will be considered subsidiary to the item of Aggregate for Bituminous Surface Course adjusted in unit price.
(3) Preparation of a Concrete or Brick Pavement.
When the bituminous mixture is placed on an existing concrete pavement or brick pavement, the surface shall be cleaned of all foreign material and broomed as necessary to remove dust. Cracks and joint cleaning and filling, and surface leveling shall be as shown on the Plans or in the Contract.

(4) Tack Coat.
When designated on the Plans, a tack coat shall be applied to the existing surface prior to the placing of the bituminous mixture. The type and grade of asphalt used shall be that designated in Contract documents except as set forth below, and the rate of application shall be designated by the Engineer.

When warranted by weather conditions the Engineer may authorize a change of grade of either cutback or emulsified asphalt, or change from emulsified to cutback, or vice versa. When such changes have been made, the unit price per metric ton of the material being used shall be the unit price bid for the material designated in the Contract plus or minus the difference in the invoice price per metric ton of the two materials at the refinery as determined at the time of application.

Emulsions used for tack or surface prime shall be diluted with water. The amount of water added shall approximately equal the amount of emulsion delivered from the supplier for use.

Water shall meet the requirements of Section 2402.

(c) Weighing Operations.

(1) Scale Tickets.
The scale operator shall fill out each scale ticket in quadruplicate, giving the original and first carbon copy to the truck driver, retaining one copy at the plant for the Contractor and leaving the third carbon copy in the book.
The truck driver shall give both copies to the road inspector who shall acknowledge receipt of the material by initialing both copies, keeping the original and returning the copy to the driver.
The original copies shall be used to determine pay quantities.
When an approved electronic weighing system is used, the printouts shall contain the same basic information as scale tickets and be distributed in the same manner.

(2) Calibration and Checking of Scales.
Scales shall be calibrated as specified in Division 150.
All scale checks shall be conducted at random intervals as directed by the Engineer.
Zero balancing of platform scales shall be completed each day before work starts and at least twice during the day. Tare truck mass shall be taken at least twice during the day.

All scales shall be checked at least twice a week by weighing a loaded truck on a separate approved scale or as directed by the Engineer.

Results of all scale checks shall be included in the project permanent records.

(d) Hauling Operations.

The Contractor shall schedule his hauling operation to minimize hauling over a final course as much as feasible.

All bituminous mixtures shall be delivered to the paver at a temperature sufficient to allow the material to be placed and compacted to the specified density and surface tolerance.

(e) Paving Operations.

(1) General.

The bituminous mixture shall be spread and finished reasonably true to crown and grade by an automatically controlled bituminous paver except when other methods are approved. The paver shall be operated at a speed which will provide a uniform rate of placement without undue interruption. The paver hopper shall, at all times, be kept sufficiently full to prevent non-uniform flow of the bituminous mixture to the augers and screed.

If the automatic grade control devices break down the Engineer may permit the paver to operate to the close of the working day provided the surface is satisfactory, but it shall not operate on a lift that was laid without automatic controls.

(2) Surface Quality.

The paver shall spread the bituminous mixture without tearing the surface and strike a finish that is smooth, free of segregation, true to cross section, uniform in density, texture, and free from surface irregularities. If the pavement does not conform to all of these requirements, plant production and paving shall be suspended until the deficiency is corrected.

(3) Leveling Courses.

In general, leveling course mixtures shall be spread by the method which will produce the best results under prevailing conditions, the objective being to secure a smooth base of uniform grade and cross section. The leveling course may be spread with a properly equipped paver or motor grader.
(4) Lift Thickness.
Except for leveling courses, nominal compacted thickness of the bituminous mixture shall not exceed 50 millimeters for surface courses and 100 millimeters for other courses, unless otherwise specified. The Engineer may adjust lift thickness to utilize the most efficient method of acquiring specified density and surface quality.

(5) Grade Control.
Grade control shall be achieved by use of one or more of the following grade reference devices. Approval of any of these devices will depend upon its satisfactory performance.

(5.1) Traveling String Line.
A traveling string line or ski type attachment, not less than nine meters long, shall be attached to the paver and operating parallel with its line of travel.

(5.2) Reference Shoe.
A short reference shoe or joint matching device shall be attached to the paver for control in matching surface grades along longitudinal joints.

(5.3) Erected String Line.
An erected string line consisting of a tightly stretched wire or string offset from and parallel to the pavement edge on one or both sides shall be used. The erected string line shall be parallel to the established pavement surface grade and supported at such intervals as necessary to maintain the established grade and alignment.

An erected string line shall be used to establish grade when paving on a fresh subgrade that has not been trimmed by an automatically controlled machine. It may be used on the first pass of the first or second lift. When directed by the Engineer an erected string line shall be used to match grade control points such as bridges.

(6) Surface Tolerances.
The surface will be tested for smoothness using a three meter straight edge or eight meter string line at selected locations designated by the Engineer. The maximum variation of the surface in three meters shall not exceed five millimeters and the maximum variation in eight meters shall not exceed eight millimeters. All humps or depressions exceeding the specified tolerance shall be corrected by removing the defective work and replacing it with new material, by overlaying (not patching), or by other means satisfactory to the Engineer. All necessary corrections will be at the expense of the Contractor.

(7) Compaction of Mixtures.
The bituminous mixture shall be uniformly compacted as soon after spreading and strike-off as possible without exces-
sive shoving or tearing. Rollers shall be self-propelled and operated at speeds slow enough to avoid displacement of the bituminous mixture. The use of equipment and/or rolling procedures which results in excessive crushing of the aggregate will not be permitted. The number and mass of rollers shall be sufficient to compact the bituminous mixture to the required density, however a minimum of two rollers shall be used. Final rolling of the surface course shall be done with a steel roller unless otherwise specified. Vibratory rollers used for finishing shall be operated in the static mode on the final pass.

The frequency, amplitude and forward speed of the vibratory roller shall be coordinated to achieve satisfactory compaction without objectionable undulations.

Rollers shall be kept in operation as necessary to insure that all parts of the pavement will receive substantially equal compaction at the proper time. The Engineer shall suspend delivery to the project at any time proper compaction is not being performed.

The specified percentage of Field Mold Density will be the absolute minimum density permitted.

Any mixture that becomes loose, broken, mixed with foreign material, which does not comply in all other respects with Specifications shall be removed, replaced with suitable material, and finished in accordance with these Specifications.

(8) Density Requirements.

For specified lift thickness greater than 40 millimeters, the bituminous mixture shall be compacted to a Road Density equal to or greater than the percent of the Field Mold Density as set forth below.

<table>
<thead>
<tr>
<th>Type Construction</th>
<th>Required Percent of Field Mold Density</th>
</tr>
</thead>
<tbody>
<tr>
<td>Base Course (First lift on fresh untreated subgrade)</td>
<td>94</td>
</tr>
<tr>
<td>Base Course (Except first lift on untreated subgrade)</td>
<td>96</td>
</tr>
<tr>
<td>Surface Course</td>
<td>96</td>
</tr>
<tr>
<td>Shoulders</td>
<td>94</td>
</tr>
</tbody>
</table>

Road Density and Field Mold Density tests shall be determined in accordance with Section 603.05.

When the specified lift thickness is 40 millimeters or less the bituminous mixture shall be compacted using the approved rolling procedure.
The Engineer shall evaluate different rolling procedures by determining, with a nuclear meter, the density achieved by each and shall establish an approved rolling procedure. The evaluation may include the effect of an additional roller. For each procedure tested, the maximum density must be achieved before the temperature of the bituminous mixture falls below 78°C. If there is a significant change in controlling factors, such as weather or compaction equipment, the rolling procedure shall be reevaluated and modified, as needed. The Contractor shall use the approved rolling procedure at all times.

(9) Contact Surfaces.

Contact surfaces of curbing, gutters, manholes, and similar structures shall be painted with a thin uniform coating of asphaltic material. The bituminous mixture shall be placed uniformly high near the contact surfaces so that after compaction it will be approximately six millimeters above the edge of such structures.

(10) Adjustment of Manholes.

Adjustment of existing manholes on resurfacing projects shall be accomplished by raising the frame to the desired grade by use of adjustable metal extension rings. The adjusting ring shall be of an approved type and shall be rigidly secured to the existing frame by approved methods. The adjustment at any one location shall be made using a maximum of two adjustment rings. This work shall be subsidiary to other items of the Contract.

Existing manhole covers shall be salvaged and reused in the adjustment.

(11) Construction Joints.

(11.1) Transverse Construction Joints. The Contractor shall use a method of making transverse construction joints which will provide a thorough and continuous bond, provide an acceptable surface texture and which meets density specifications. The surface elevation shall not vary more than five millimeters in three meters when tested longitudinally across the joint. The repair of the joint, when required, shall be diligently pursued by an adequate crew or paving operations will not be allowed to continue.

(11.2) Longitudinal joints. Care shall be taken to obtain a well bonded and sealed longitudinal joint by placing the hot bituminous mixture in a manner insuring maximum compaction at this point. If it is deemed necessary by the Engineer to properly seal the joint a light coat of asphaltic material shall be applied to the exposed edge before the joint is made.
Before placing the fresh mixture against a cut joint or against old pavement, the contact surface shall be sprayed or painted with a thin uniform coat of asphalt material. Where a finishing machine is used, the longitudinal joint shall be made by deposing a sufficient amount of mixture so that the joint formed will be smooth and tight.

The longitudinal joint in successive courses shall be offset not less than 150 millimeters nor more than 300 millimeters. The width of the surface of top course placements shall conform to traffic lane edges.

(12) Shoulder Surfacing and Widening.

When the placement width of shoulders or uniform width widenings is less than can be accomplished with a regular paver, each course shall be spread with a mechanical spreading device which will produce satisfactory results.

(13) Rumble Strip.

When shown on the Plans or in the Contract, rumble strips shall be constructed.

A rumble strip shall consist of depressions in the shoulder surface perpendicular to the shoulder, placed in a line approximately 150 millimeters from the pavement edge and spaced approximately 200 millimeters apart. They may be formed with a modified roller or other approved means. Finished depressions shall be approximately half-round in shape, 50 millimeters wide, 25 millimeters deep, and one meter long with the edges shaped to drain. They shall be formed after breakdown rolling while the temperature and density of the bituminous mixture is such that the specified final dimension can be obtained without tearing or otherwise disturbing the surface. Payment for this item shall be subsidiary to other items of the Contract.

(f) Maintenance of Traffic.

Maintenance of traffic shall be in accordance with Section 821 and the following.

When a Traffic Control Plan is not a part of the Contract, on overlay projects that require traffic be maintained through the project, detouring of traffic will not be permitted. All construction operations shall be coordinated to result in the least practicable delay of traffic. One-way traffic shall be maintained and traffic speeds restricted to 30 kilometers per hour in the vicinity of the workers, unless otherwise designated. The Contractor shall provide flaggers, warning signs, barricades, and pilot cars sufficient to control traffic through the overlay and
rolling operations. Pilot cars shall be used to lead traffic through the area of paving and rolling operations and if directed, through a curing area. The pilot car will not be required through patching operations unless excessive delay is caused in these areas to the traffic, in which case the use of a pilot car may be required. Pilot cars shall meet the requirements stipulated in Section 821.

One flagger shall be stationed ahead of the application of tack asphalt and one flagger ahead of the area that is being protected from traffic. Suitable speed limit signs and other signs as required shall be displayed, and the signs shall be moved forward as the work progresses. Adequate protection shall be taken for traffic on side roads approaching the tack area.

All signs shall be furnished by the Contractor as specified in Division 100.

On overlay of projects with four lanes or more for traffic use, the Engineer may waive the pilot car requirements.

(g) Surface Drop-off Treatment.

(1) General.

On projects that carry traffic through construction, the following criteria shall be considered a minimum for treatment of surface drop-offs adjacent to traffic lanes not physically separated by acceptable positive barrier. A surface drop-off is defined as “the vertical distance between the top of the lift being constructed or riding surface to the top of the existing shoulder or adjoining lane.”

(2) Shoulder Treatment.

All lifts regardless of thickness shall be constructed with an edge slope of 1:1 or flatter. Appropriate signing and delineation as shown in the contract documents will be required.

When the surface drop-off is greater than 125 millimeters, a temporary or permanent wedge shall be constructed against the pavement edge to provide a 3:1 or flatter slope. For unusual and justifiable conditions, the Engineer may modify this requirement to permit the use of drums, barricades, or other channelizing devices in lieu of the wedge to alert drivers of the drop-off condition. Surface drop-offs greater than 125 millimeters shall not be left unprotected overnight without the wedge or channelizing devices in place. An obstruction free recovery area should be provided to the extent possible.

For multi-lift projects with lifts greater than 125 millimeters, shoulders may be constructed in conjunction with the place-
ment of all lifts or the vertical drop-off shall be treated as stated previously.

When used, wedges shall be constructed of a material acceptable to the Engineer and constructed with a final maximum slope of 3:1 or flatter. Construction of the wedge or the use of alternate channelizing devices shall be considered as subsidiary to other items of the Contract.

When channelizing devices are used, the space between the devices (in meters) should be approximately one half the posted speed limit for high speed roadways. For low speed or urban streets, a closer spacing should be used.

Shouldering operations shall commence as soon as practicable and no later than three weeks after placement of the final lift. The shouldering shall be a continuous operation from that time on until completion with the weather being the only delaying factor.

(3) Centerline and Adjacent Lane Treatment.

When any compacted centerline or adjacent lane joint height is greater than a nominal 40 millimeters but not in excess of 125 millimeters, the joint shall be constructed to produce an edge slope of 3:1 or flatter. This slope shall be maintained as long as traffic is traversing the edge.

(b) Treatment of Adjacent Areas.

The sideroads, entrances and turnouts for mailboxes shall be surfaced as shown on the Plans. All widening areas shall be overlaid.

603.04 PROCESS CONTROL.

(a) Requirements for All Mix Designations.

(1) General.

The Contractor shall establish limits and proportions for each individual aggregate and mineral filler. The limits and proportions specified shall be such that the material produced will meet the applicable requirements of the Materials Division. After the limits and proportions have been established for all individual aggregates, the Contractor shall be responsible for process control. The Department will determine if the design job mix is acceptable, will inspect plants, and will monitor control of the operation to assure conformity with the specifications. At no time will the Department's representative issue instructions to the Contractor or producer as to setting of dials, gauges, scales, and meters. However, the Department's rep-
resentatives may question and caution the Contractor against the continuance of any operation or sequence of operations which would obviously result in unsatisfactory compliance with specification requirements. The Contractor shall advise the Engineer when changes in the plant settings are made which could change the proportions of the aggregates or asphalt in the mix.

(2) Acceptance Tests.
Each mix designation will be accepted at each plant, with respect to gradation, plasticity index, percent of uncrushed minus 75 micrometer, percent of natural sand, and screen spread limits on a Lot to Lot basis. The gradation will be that of the specified mix designation prior to addition of the asphalt. Samples of aggregate for the mix designation shall be obtained from the combined cold feed. The sampling device and procedures used to obtain the samples shall be approved by the Engineer. If a mineral filler supplement is added beyond the cold feed, the combined aggregate gradation will be calculated theoretically using the gradations and proportions of the mineral filler supplement and the combined aggregate in the mix. The material will be tested for acceptance in accordance with the provisions of the following requirements. However, any load or loads of mixture which, in the opinion of the Engineer, are unacceptable for reason of being excessively segregated, aggregate improperly coated, foaming aggregate, or of excessively high or low temperature shall be rejected.

The Engineer may cause production of bituminous mix to cease at any time the mix or process is determined to be unsatisfactory. The Contractor shall make the necessary corrections before production will be allowed to resume.

(3) Lot Definition.
A Lot is defined as an isolated quantity of a specified material produced from a single source or operation, or it is a measured amount of specified construction produced by the same process. When the Contractor desires to change the process, thereby necessitating the termination of the current Lot and starting a new Lot, the Contractor must request, in writing, approval for the process change stating why the process should be changed. The Engineer must approve the request prior to the change being made. Process changes will include the following: any change in the design job mix, in the source of materials, in the plant operation, in the equipment, or in the aggregate gradation which could affect the mix characteristics.

(4) Lot Disposition.
When a deficiency within a Lot is determined to exist causing termination of production, the applicable payment as
shown in these specifications shall be applied to the entire Lot and any additional tonnage within the next Lot that has not been sampled. When multiple deficiencies occur within a Lot, only the greater penalty shall be applied to that Lot. After the determination of the appropriate pay factor in Table 2, (Schedule of Adjusted Payment), the Engineer shall decide on the disposition of each Lot as to the acceptance, the rejection, or the acceptance at an adjusted payment. The Engineer’s decision will be final. Lots with Pay Factors footnoted in Table 2 shall be removed and replaced, accepted without payment, or accepted at an adjusted payment as stated in these specifications.

(5) Resampling of Lots.
It is the intent of these specifications that Lots of materials, products, items of construction, or completed construction will meet the specification requirements at the time of submission. No samples for re-test will be taken for acceptance purposes.

(6) Multiple Projects.
If multiple projects are supplied from one or more plants, the Lots at each hot mix plant will carry over from project to project.

(b) Requirements for Bituminous Mixes.
In addition to the requirements listed under subsection 603.04 (a), the mix shall meet the following requirements.

(1) Lot Size.
A standard size Lot at each plant shall consist of four equal sublots of 500 metric tons each of bituminous mix. When the quantity represented is less than 2,000 metric tons, the number of sublots (N) in a Lot will vary from N=1 to N=4 according to the following (sublot to be approximately equal size).

<table>
<thead>
<tr>
<th>Metric Tons</th>
<th>Number of Sublots</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-500</td>
<td>1</td>
</tr>
<tr>
<td>501-1000</td>
<td>2</td>
</tr>
<tr>
<td>1001-1500</td>
<td>3</td>
</tr>
<tr>
<td>1501-2000</td>
<td>4</td>
</tr>
</tbody>
</table>

* Rounded to nearest metric ton

It is anticipated that Lot size will be as specified. However, the Engineer may re-define Lot size for reasons such as, but not limited to, change in contract quantities or interruption of the work. One sample shall be taken during production of each sublot and utilized to determine disposition of the Lot in which it occurs.
(2) Increased Lot Size.

After eight consecutive sublots have been produced within specification and without penalty, the sublot size may be increased by the Engineer to 750 metric tons (Lot size 3,000 metric tons), provided the normal production rate of the plant is greater than 175 metric tons per hour.

If either Lot termination condition exists as described below under subsection 603.04 (b) (3), the sublot size will be decreased to 500 metric tons. When the Increased Lot Size criteria is again met, the sublot size may be increased to 750 metric tons (3,000 metric tons Lot).

(3) Lot Termination.

When the results of two consecutive acceptance tests on any single bituminous mix designation fails to meet the specifications, the production of that mix will be suspended until the requirements can be met or another design job-mix has been approved. Acceptance tests for this determination will include gradation compliance with the design job-mix band, plasticity index, percent of uncrushed minus 75 micrometer, percent of natural sand, and screen spread limits. Such suspension will constitute termination of the Lot. Production will be suspended pending the satisfactory results of a pre-production sample, unless waived by the Engineer.

The process will be considered Out-of-Control when one or more test result(s) on any sieve(s) falls within the range set for the 80 percent pay factor for the values in the “1 Test” column in Table 2 (Schedule of Adjusted Payment). When this occurs, the Lot will be terminated. Production will be suspended pending the satisfactory results of a pre-production sample.

Whenever the Lot is terminated due to either of the above conditions, the adjusted payment will be determined using the number of completed tests for that Lot and applied to an adjusted Lot size which shall be the number of metric tons produced up to the point of termination.

(4) Pre-Production Sample.

A pre-production sample from each plant will be tested before delivery of bituminous mixture from that plant to the project or projects, both at initial start-up and after a change in the design job-mix, unless otherwise directed by the Engineer. Such samples will not be used in determining adjusted payment for a Lot. Pre-production sample test results must be in compliance with the gradation, plasticity index, percent uncrushed minus 75 micrometer, percent of natural sand, and screen spread limits before delivery of mix to a project will be
permitted. Delivery before completion of the plasticity index test may be authorized by the Engineer.

(5) Change in Design Job-Mix.

The Contractor will be permitted to change the design job-mix within a Lot, subject to the requirements of this specification. On the first Lot only of production of any mix designation, penalty for the entire Lot will be assessed on the basis of the revised design job-mix (if any), provided no change in asphalt content is required as a result of the revision. For changes made in the design job-mix on subsequent Lots, computation of adjusted payment will not be retroactive within the Lot(s).

(6) Basis of Acceptance and Payment.

Acceptance of the mixture shall be on the basis of test results on consecutive random samples from each Lot. One random sample shall be taken from each subplot. Sublots will normally be of equal size and the number of sublots shall be as shown in this specification. Calculated values for acceptance tests for gradation shall be shown to the nearest hundredth (0.01) percent.

The absolute value of the deviation between the acceptance test results and the design job-mix single point will be determined for the 4.75 mm, 2.36 mm, 600 μm, and 75 μm pay sieves for each subplot. Using these absolute values, the deviation for each pay sieve will be accumulated (totaled) for each lot to determine the disposition of that Lot. Payment for the Lot will be made on the basis of Table 2, Schedule of Adjusted Payment for Bituminous Mixes. Adjusted payment will be based on the gradation results obtained on the 4.75 mm, 2.36 mm, 600 μm, or 75 μm sieve, whichever results in the greatest price reduction.
# TABLE 2

**SCHEDULE OF ADJUSTED PAYMENT FOR BITUMINOUS MIXES**

<table>
<thead>
<tr>
<th>TOLERANCE</th>
<th>PAY FACTOR</th>
<th>FOR 1 TEST</th>
<th>FOR 2 TESTS</th>
<th>FOR 3 TESTS</th>
<th>FOR 4 TESTS</th>
</tr>
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<tr>
<td>± 7</td>
<td>1.00</td>
<td>0.00-7.00</td>
<td>0.00-9.00</td>
<td>0.00-12.12</td>
<td>0.00-14.00</td>
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<td></td>
<td>0.98</td>
<td>7.01-7.50</td>
<td>9.31-10.60</td>
<td>12.13-12.99</td>
<td>14.01-15.00</td>
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<tr>
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<td>0.95</td>
<td>7.51-8.00</td>
<td>10.61-11.32</td>
<td>13.00-13.86</td>
<td>15.01-16.00</td>
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<td>0.90*</td>
<td>8.01-8.50</td>
<td>11.33-12.02</td>
<td>13.87-14.73</td>
<td>16.01-17.00</td>
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<tr>
<td></td>
<td>0.80*</td>
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<td>over 12.02</td>
<td>over 14.73</td>
<td>over 17.00</td>
</tr>
<tr>
<td>± 6</td>
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<td>0.00-10.38</td>
<td>0.00-12.00</td>
</tr>
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<td>8.49-9.20</td>
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<td>12.01-13.00</td>
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<td>13.01-14.00</td>
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<td>14.01-15.00</td>
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<td>over 7.50</td>
<td>over 10.60</td>
<td>over 12.99</td>
<td>over 15.00</td>
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<tr>
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<td>0.00-8.61</td>
<td>0.00-10.00</td>
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<td>12.01-13.00</td>
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<td>over 13.00</td>
</tr>
<tr>
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<td>over 7.78</td>
<td>over 9.54</td>
<td>over 11.00</td>
</tr>
<tr>
<td>± 3</td>
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<td>0.00-4.24</td>
<td>0.00-5.19</td>
<td>0.00-6.00</td>
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<td>4.25-4.52</td>
<td>5.20-5.55</td>
<td>6.01-6.40</td>
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<td>6.41-6.80</td>
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<td>6.81-7.60</td>
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<tr>
<td></td>
<td>0.80*</td>
<td>over 3.80</td>
<td>over 5.38</td>
<td>over 6.57</td>
<td>over 7.60</td>
</tr>
<tr>
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<td>0.00-4.32</td>
<td>0.00-5.00</td>
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<tr>
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<td>4.33-4.68</td>
<td>5.01-5.40</td>
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<td>3.83-4.10</td>
<td>4.69-5.01</td>
<td>5.41-5.80</td>
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<tr>
<td></td>
<td>0.80*</td>
<td>over 3.30</td>
<td>over 4.66</td>
<td>over 5.73</td>
<td>over 6.60</td>
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<tr>
<td>± 2</td>
<td>1.00</td>
<td>0.00-2.20</td>
<td>0.00-3.12</td>
<td>0.00-3.81</td>
<td>0.00-4.40</td>
</tr>
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<td></td>
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<td>4.41-4.80</td>
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<td>over 2.75</td>
<td>over 3.88</td>
<td>over 4.77</td>
<td>over 5.56</td>
</tr>
</tbody>
</table>

* If approved by the Department, the Contractor may accept the indicated partial pay. The Department may require removal and replacement at no additional cost. The Contractor has the option to remove and replace at no cost to the Department at any time.
603.05 COMPACTION TESTING.

(a) Requirements for Road Densities are specified in Section 603.03 as a percent of Field Mold Density.

(b) Field Mold Densities shall be determined as work progresses, using specimens molded from freshly mixed bituminous mixture.

(c) At the option of the Engineer either of the following methods may be used to determine Road Density.

1) The Contractor shall furnish a set of three cores, 100 millimeters in diameter, suitable for determining Road Density, from each location designated by the Engineer.

2) A nuclear meter may be used to determine the road density at each designated location.

603.06 WEATHER LIMITATIONS.

(a) Bituminous mixtures shall not be placed on any wet or frozen surface or when weather conditions otherwise prevent the proper handling and finishing of the mixture.

(b) Bituminous mixtures may only be placed when either the ambient air temperature or the road surface temperature is equal to or greater than that shown in Table 3.

<table>
<thead>
<tr>
<th>Paving Course</th>
<th>Thickness (Millimeters)</th>
<th>Air Temperature (Degrees C.)</th>
<th>Road Surface Temperature (Degrees C.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Surface</td>
<td>All</td>
<td>10</td>
<td>12</td>
</tr>
<tr>
<td>Subsurface</td>
<td>Less than 75</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>Subsurface</td>
<td>75 or more</td>
<td>-1</td>
<td>2</td>
</tr>
</tbody>
</table>

(c) Regardless of the temperatures herein specified, paving will not be allowed unless specified density, either by percent of field mold density or by rolling procedure, can be achieved before the bituminous mixture cools to 80°C.

603.07 EXTRACTION TESTING SOLVENT.

On projects requiring field extraction testing of bituminous mixtures, testing will be performed in a Type D laboratory as specified in Section 805. The extraction apparatus will be as specified in Section 151. Extraction testing will be performed as outlined in Section 2500.

The Contractor shall supply to the Engineer, as needed the following:
Solvent. Trichloroethane, Technical, 1,1,1, inhibited Federal Specification O-T-620a (Int. Amd. 3) or Methylene Chloride, Technical Grade.

Only working quantities, 20 liters maximum, may be stored within the laboratory. Fresh solvent in excess of 20 liters working quantity shall be stored outside the laboratory. Used solvent collection drums shall be placed outside the laboratory.

It shall be the Contractor's responsibility to dispose of spent solvent in accordance with applicable regulations.

Reclaimed solvents are permitted under this specification provided that such reclaimed solvent meets the specified requirements for new solvents.

Safety Warning. The solvents listed above are hazardous materials. It shall be the responsibility of the Contractor to consult and establish appropriate safety and health practices and establish the applicability of regulatory limitations prior to use.

The Engineer may, from time to time, engage in monitoring of toxicity levels defined in terms of operator exposure. Such monitoring is for the purpose of data gathering relative to the safety of the workplace and the testing operation, and shall not establish an approval or disapproval of the operation. Monitoring of toxicity levels conducted by the Engineer shall not be construed as relieving the Contractor of any responsibility which may be otherwise stipulated by applicable regulations.

603.08 METHOD OF MEASUREMENT.

(a) Aggregate for Bituminous Surface Course and Aggregate for Bituminous Base Course shall be measured in metric tons of material at the time of delivery to the road and no deduction will be made for the mass of bituminous material in the mixture. Batch mass will not be permitted as a method of measurement unless the plant is equipped with an approved automatic printer system which will print the mass of the material delivered, provided the system is used in conjunction with an approved automatic batching and mixing control system. Such mass shall be evidenced by a weigh ticket for each load. This item shall include preparation of the subgrade or roadway, the furnishing of the materials, the drying and screening of the aggregates, the mixing of the aggregates with the bituminous materials, the placing, finishing, and compaction of the mixed materials. The materials used for widening and leveling of the existing surface shall be included in the quantities as measured for bituminous base.
Due to possible variations in the specific gravity or mass per cubic meter of the aggregates, the tonnage used may vary from the proposal quantities and no adjustment in Contract unit price will be made because of such variations.

(b) When the Contractor is required to remove any base course, subgrade or existing surface course and provisions are not made in the Plans and Contract, the aggregates used for repair and patching shall be measured separately and paid for as provided in Section 603.09.

(c) Bituminous materials shall be measured by the metric ton as provided in Division 100. Deductions shall be made for the number of metric tons which are not placed on the road.

(d) Each set of three cores required to determine Road Density shall be measured per each set for payment. No payment will be made for cores unsuitable for determining density.

No measurement will be made of density sampling required for resampling or for additional tests required to determine limits of areas deficient in density.

(e) Water will be measured by the cubic meter by means of calibrated tanks or distributors or by means of an accurate water meter placed in the pipeline near the point of delivery. No measurement will be made of water used to maintain the prepared subgrade during hauling operations, emulsion dilution, and in dust control on haul roads, around plant installations, etc. The Contractor shall meet all applicable regulations concerning environmental considerations.

(f) Extraction Apparatus shall be measured per each as required by the Contract. Solvent shall be measured by the liter for each liter consumed in extraction testing.

603.09 BASIS OF PAYMENT.

(a) The amount of completed work measured as provided above shall be paid for at the Contract unit price per metric ton for the various types and grades of bituminous material, including the bituminous materials used for repair and patching, and per cubic meter for "Water". "Aggregate for Bituminous Base Course" and "Aggregate for Bituminous Surface Course" shall be paid for at the Contract unit price per metric ton or at an adjusted unit price, determined as specified in Section 603.04. The adjusted unit price, as appropriate, shall apply to all materials produced within the Lot irrespective of usage. Payment at the Contract unit price or adjusted unit price, as appropriate, shall be full compensation for furnishing
all materials, for all labor, equipment, tools, supplies and incidentals necessary to complete the work.

(b) The amount of aggregate used in the repair and patching of the base and/or subgrade including the existing surface course measured as provided above shall be paid for at the adjusted price of 2\(\frac{1}{2}\) times the Contract unit price per metric ton, adjusted as specified, for "Aggregate for Bituminous Surface Course" or "Aggregate for Bituminous Base Course".

No payment will be made for the amount of material used in the repair of damage due to the Contractor's negligence.

(c) The amount of completed and accepted work measured as provided above shall be paid for at the Contract unit price set for "Asphaltic Pavement Sampling," which price shall be full compensation for furnishing all materials including cooling substance, for all labor, equipment, tools, supplies and incidentals necessary to complete the work. When the quantity of "Asphaltic Pavement Sampling" overruns or underruns the Contract quantity by any amount, the Contract unit price shall govern.

(d) When the quantity of water furnished overruns or underruns the Contract quantities, the Contract unit price shall govern regardless of the total quantity furnished.

(e) The accepted "Extraction Apparatus" shall be paid for at the Contract unit price per each which shall be full compensation for furnishing, installing, repairing and replacement of any component required to provide continuity of testing operations. "Solvent" shall be paid for at the Contract unit price per cubic meter, which shall be full compensation for furnishing solvents, storage and proper disposal of spent solvents and any labor, tools, and incidentals.

(f) Sideroads, entrances and mailbox turnouts that are not shown on the Plans or listed in the Contract that are to be surfaced shall be paid for at 1\(\frac{1}{2}\) times the unit price for "Aggregate for Bituminous Surface Course" or "Aggregate for Bituminous Base Course".
SECTION 604

HOT RECYCLED BITUMINOUS CONSTRUCTION

604.01 DESCRIPTION.

This work shall consist of milling and reclaiming asphalt pavement, when applicable, combining the reclaimed asphalt pavement (RAP) material with virgin aggregate and asphalt cement or recycling agent, and constructing one or more courses of this mixture in accordance with these Specifications and sections shown on the Plans or established by the Engineer.

BID ITEMS

Aggregate for (*) Special.
Processing Reclaimed Asphalt Pavement Material (RAP).
Asphalt Cement (AC*).
Recycling Agent (RA*).
Emulsified Asphalt (*) for Tack.
Milling.

(*) Designated Type and Grade.

604.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Bituminous Material ............................................. Section 1200
Aggregate for Hot Recycled Bituminous Mixtures ........ Section 1100

The composition of the recycled bituminous mixture will be shown in the Contract.

The actual percentage of each material for hot recycled bituminous mixture will be determined by the Engineer. They may vary from those shown in the Contract. No adjustments will be made in the Contract unit price for each individual material or combined virgin aggregate regardless of the percent used.

No gradation specifications for the final combined recycled mixture will be required.

604.03 EQUIPMENT.

(a) Hot mix plants for hot recycled bituminous construction shall comply with the requirements specified in Division 150. In addition they shall be modified to produce a uniform mix-
ture, having proper proportions and temperature, which will meet specified requirements for surface quality and density when spread and compacted.
(b) Other equipment necessary to perform this work shall comply with the requirements of Division 150.

604.04 CONSTRUCTION REQUIREMENTS.

(a) Cold Milling.

(1) The pavement shall be milled to the required depth and width, one lane at a time. The milling operation shall be co-
ordinated to eliminate, as much as possible, traffic on the milled pavement. Saturday work may be required by the En-
gineer when deemed necessary to keep the exposure time of the final milled surface to a minimum. The milling operation
shall be not more than three kilometers ahead of the paving operation unless otherwise approved by the Engineer or shown
otherwise on the Plans.

(2) Unless otherwise specified or directed in writing by the Engineer, the RAP material shall be used only as part of the
recycled bituminous mixture. It shall be kept free of contami-
nation and handled and stockpiled in a manner which will minimize waste.

(b) Preparation of Bituminous Material.

Preparation of bituminous material shall comply with the re-
quirements specified in subsection 603.03 (a) (2).

(c) Preparation of Virgin Aggregate and RAP Mixture.

(1) The temperature of the recycled mix shall be between
140°C and 157°C.

(2) The maximum temperature of the virgin aggregate shall
be kept below that which will cause the aggregate particles
to fracture.

(d) Preparation of Recycled Bituminous Mixture.

(1) Virgin aggregates and RAP material as specified for re-
cycled bituminous mixture shall be combined with asphalt ce-
ment or recycling agent in the approved proportions.

(2) The amount of RAP material shall be measured by belt
scales or other approved methods, and pass a 55 millimeter
screen or grizzly before entering the plant.

(3) In addition to the above requirements, the preparation of
recycled bituminous mixture shall comply with the require-
ments specified in subsection 603.03 (a) (4.2) through 603.03 (a) (4.6), except the temperature specified in subsection 603.03 (a) (4.2) shall be between 140°C and 157°C.

(e) Road Surface Preparation.

The surface shall be cleaned of all foreign material and broomed as necessary to remove dust and a tack coat applied in accordance with the requirements specified in subsection 603.03 (b) (4).

(f) Weighing operations shall comply with the requirements of subsection 603.03 (c).

(g) Hauling operations shall comply with the requirements of subsection 603.03 (d).

(h) Paving operations shall comply with the requirements of subsection 603.03 (e) thru subsection 603.03 (g).

604.05 PROCESS CONTROL.

(a) Requirements Prior to Plant Operation.

(1) The Contractor shall furnish samples of proposed materials as specified in Section 1104.

(2) The Contractor will be allowed to mill small amounts from project roadway sites, three meters long plus transition tapers (one meter per 10 millimeters of depth or flatter), at a maximum of three locations designated by the Engineer prior to issuing the Notice to Proceed. Milled areas shall be transitioned to avoid a drop-off or bump with necessary drainage maintained at all times. The milling machine shall be a recognized pavement miller and the milling drum shall be at least two meters in width in order to maintain the representative samples. No time will be assessed the Contractor during this operation.

If the contract milling depth is greater than 40 millimeters nominal, patching of the milled area by the Contractor will be required. The Contractor may obtain the patching material from the nearest KDOT mixing strip that has patching material or furnish a comparable material at his expense. If the Engineer determines the pavement being milled is of adequate strength to carry traffic without patching, the Contractor may mill to centerline of the roadway and construct a longitudinal joint to produce an edge of 3:1 or flatter.

The Contractor will be responsible for all necessary signing to effectively control traffic in accordance with the standard specifications, Traffic Control Standards, and MUTCD.
The Contractor will be liable for any and all claims as set out in Division 100 of the Standard Specifications during this operation.
This item will not be paid for directly, but will be subsidiary to other items of the contract.
(3) The Contractor shall provide a single point gradation for each individual virgin aggregate or combined virgin aggregate, which is specified in the Contract. Individual virgin aggregates and the hot recycled mix will be approved in accordance with Section 1104.

(b) Additional Requirements.

(1) After the design job mix band is approved, the Contractor shall be responsible for process control. The Engineer will inspect plants and monitor control of the operation to assure conformity with the specifications. At no time will the Engineer issue instructions to the Contractor or producer as to setting of dials, gauges, scales and meters. However, the Engineer may question and caution the Contractor against the continuance of any operation or sequence of operations which would obviously result in unsatisfactory compliance with the Specification requirements. The Contractor shall advise the Engineer when changes in plant settings are made which could change the proportions of the mix.

(2) Process control for hot recycled bituminous construction shall also comply with the requirements of subsections 603.04 (a) (2), through (b) (6) and the following substitution of terms shall be made.
Substitute “combination of virgin aggregates” for “mix designation”.
Substitute “hot recycled bituminous mixture” for “bituminous mixture”.

604.06 COMPACTION TESTING.

Compaction testing shall comply with the requirements specified in Section 603.05.

604.07 WEATHER LIMITATIONS.

Weather limitations stipulated in Section 603.06 shall apply.

604.08 METHOD OF MEASUREMENT.

(a) Milling shall be measured as specified in Section 616.
(b) Bituminous materials shall be measured as provided in Division 100. Deductions shall be made for the number of metric tons which are not placed on the roadway.

(c) Hot recycled bituminous mixture shall be measured in metric tons in the manner stipulated for Aggregate for Bituminous Surface Course in Section 603.08.

(d) Virgin aggregates and processed RAP material shall be measured in metric tons, and the amount of each aggregate shall be determined by multiplying the percent of each used in the hot recycled bituminous mixture times the metric tons of hot recycled bituminous mixture.

604.09 BASIS OF PAYMENT.

The amount of completed work as measured above shall be paid for as follows.

(a) Milling shall be paid for as specified in Section 616.

(b) Bituminous material shall be paid for as specified in Section 603.09.

(c) Processing Reclaimed Asphalt Pavement Material (RAP) shall be paid for at the Contract unit price per metric ton.

(d) Each virgin aggregate or combined virgin aggregate mix shall be paid for at the Contract unit price per metric ton or at an adjusted price as specified in subsection 604.04 (b). The material for a Lot shall be metric tons of hot recycled bituminous mixture incorporated into the project.

(e) The amount of Hot Recycled Bituminous Mixture used for repair and patching the base, subgrade or surface shall be paid for at the adjusted price of 2½ times the Contract unit price of the processed RAP material and the virgin aggregates measured as provided above. No payment will be made for the amount of material used in the repair of damage due to the Contractor's negligence.

(f) Payment for the items listed above shall be full compensation for furnishing and processing all materials, for all labor, equipment, tools, supplies and incidentals necessary to complete the work.
SECTION 605
PLANT MIX BITUMINOUS MIXTURE—COMMERCIAL GRADE

605.01 DESCRIPTION.
This work shall consist of aggregate and bituminous material mixed in a central plant and spread and compacted in accordance with this specification and in reasonably close conformity with the line, grades, thickness and typical cross section shown on the Plans or established by the Engineer.

BID ITEM
Plant Mix Bituminous Mixture-Commercial Grade.

605.02 MATERIALS.

(a) Requirements.
The bituminous mixture shall be approved by the Engineer. This approval will in general be based upon the following conditions:
(1) All materials shall be furnished by recognized producers.
(2) The hot mix plant shall be of a recognized type.
(3) The mixture produced will meet BM-2 requirements or the Engineer may approve the use of another mix designation meeting the requirements of Section 1103.
(4) The Contractor shall submit a complete proposed Marshall mix design for review and approval by the Engineer for each plant location to be used for production.

(b) Following approval of the mix, the Contractor may commence delivery of mix to the project.
(1) The mixture shall be workable and capable of being spread without tearing or flushing under compaction.
(2) Asphalt for tack may be any asphalt approved by the Engineer.
(3) The Contractor shall certify that the mixture produced for use meets the requirements of the approved mix design.

605.03 PROCESS CONTROL.

(a) General.
During construction, the Engineer may conduct tests for gradation to verify compliance of the approved mix design. Non-
compliance will be subject to the price adjustment as outlined in Table 2, Schedule of Adjusted Payment for Bituminous Mixes in Section 603.04.

For projects having less than 500 metric tons the Engineer may conduct tests for gradation to verify compliance of the approved mix design.

For projects having greater than 500 metric tons the testing frequency shall be one test for each 500 metric ton Lot or fraction thereof. However, should the Department fail to sample a Lot, that Lot will not be subject to price adjustment.

The combined cold feed sample shall be taken at times designated by the Engineer and analyzed as time allows at locations provided by the Engineer.

(b) Basis of Acceptance and Payment.

Acceptance of the mixture shall be made on test results of samples taken from each 500 metric tons produced.

Calculated values for acceptance test results for gradations shall be shown to the nearest hundredth (0.01) percent.

The absolute value of the deviation between the acceptance test results and the design job-mix single point will be determined for the 4.75 mm, 2.36 mm, 600 µm, and 75 µm pay sieves for each Lot. Using the absolute value, the deviation for each pay sieve will determine the disposition of that Lot. Payment for the Lot will be made on the basis of one test from Table 2, Schedule of Adjusted Payment for Bituminous Mixes in Section 603.04. Adjusted Payment will be based on the gradation results obtained on the 4.75 mm, 2.36 mm, 600 µm, and 75 µm sieve, whichever results in the greatest price reduction.

605.04 EQUIPMENT.

Laydown, compacting, hauling and truck weighing equipment specified in Division 150, except that approval by the Weights and Measures Division of the Kansas Board of Agriculture will satisfy all accuracy requirements of truck weighing equipment.

605.05 CONSTRUCTION REQUIREMENTS.

Rolling of the mixture shall be accomplished using a minimum of two rollers. On incidental and miscellaneous work the Engineer may waive the minimum roller requirements if conditions warrant. All compaction will be performed using standard and recognized techniques. Except for variations approved by the Engineer, final rolling shall be completed while
the temperature of the mixture is approximately 80°C or above. Tacking between lifts shall be as directed by the Engineer.

605.06 WEATHER LIMITATIONS.

Plant Mix Bituminous Mixture-Commercial Grade shall only be placed when the conditions described in Section 603.06 are reached. The Engineer may waive the temperature and weather conditions if warranted.

605.06 METHOD OF MEASUREMENT.

Plant Mix Bituminous Mixture-Commercial Grade shall be measured in metric tons of material at the time of delivery to the road and no deduction shall be made for the asphalt in the mixture.

The amount of bituminous mix used in the repair and patching of the base and/or subgrade, including the existing surface course shall be paid for at the adjusted price of 1.9 times the unit price per metric ton for “Plant Mix Bituminous Mixture-Commercial Grade”.

Commercial scale tickets completed by the producer will be acceptable.

605.07 BASIS OF PAYMENT.

(a) The amount of completed work measured as provided above, shall be paid for at the Contract unit price for “Plant Mix Bituminous Mixture-Commercial Grade”, or at the adjusted price for those metric tons where a deficiency exists which requires adjustments. This price shall be full compensation for furnishing all materials, including asphalt for tack, for all labor, equipment, tools, supplies and incidentals necessary to complete the work.

(b) Price Adjustment.

When a deficiency of the bituminous mixture is determined to exist, the Contractor will adjust the mix proportions to comply with the approved Marshall design. The applicable payment as shown in Section 603.04, Table 2, Schedule of Adjusted Payment for Bituminous Mixes shall be applied to the tonnage of plant mix produced until such time that the Contractor adjusts the mix proportions to comply with the approved Marshall design.

(c) Price adjustment will be computed and shown as a lump sum dollar value on the Contractor’s payment voucher.
SECTION 606

BITUMINOUS PLANT MIX-TEMPORARY SURFACING

606.01 DESCRIPTION.

This work shall consist of aggregate and bituminous material mixed in a central plant, spread, compacted and removed in accordance with this Specification and in reasonably close conformity with the lines, grades, thickness and typical cross section shown on the Plans or established by the Engineer.

BID ITEM
Bituminous Plant Mix-Temporary Surfacing.

606.02 MATERIALS.

The bituminous mixture shall be approved by the Engineer. This approval will in general be based upon the following conditions:

(a) All materials shall be furnished by recognized producers.
(b) The hot mix plant shall be of a recognized type.
(c) The mixture produced shall be a commercial mixture in general use in the area that has a satisfactory service record.
(d) The mixture shall be workable and capable of being spread without tearing or flushing.
(e) Asphalt for tack may be any asphalt approved by the Engineer.

606.03 EQUIPMENT.

Laydown, compacting, hauling and weighing equipment shall conform to the applicable requirements specified in Division 150, except that approval of the Weights and Measures Division of the Kansas Board of Agriculture will satisfy all accuracy requirements for truck weighing equipment.

606.04 CONSTRUCTION REQUIREMENTS.

Rolling of the mixture shall be accomplished using a minimum of two rollers. On incidental and miscellaneous work the Engineer may waive the minimum roller requirements if conditions warrant. All compaction will be performed using standard and recognized techniques. Except for variations approved by the Engineer, final rolling shall be completed while
the temperature of the mixture is approximately 80°C or above. Tacking between lifts shall be as directed by the Engineer.

606.05 WEATHER LIMITATIONS.

Bituminous plant mixtures shall not be placed on any wet or frozen surface or when the weather conditions otherwise prevent the proper handling or finishing of the bituminous mixtures. The Engineer may waive the weather limitations if warranted.

606.06 METHOD OF MEASUREMENT.

Bituminous plant mix-temporary surfacing shall be measured in metric tons of material at the time of delivery to the road and no separate payment or deduction shall be made for the asphalt in the mixture. Commercial scale tickets completed by the producer will be acceptable.

606.07 BASIS OF PAYMENT.

The amount of completed work measured as provided above, shall be paid for at the Contract unit price for “Bituminous Plant Mix-Temporary Surfacing”, which price shall be full compensation for furnishing all materials, for all labor, equipment, tools, supplies and incidentals necessary to complete the work, and removal and disposition of material following use.

When the quantity of Bituminous Plant Mix-Temporary Surfacing overruns or underruns the Contract quantities, the work shall be performed at the Contract unit price and no alteration or variation in Contract unit price will be considered.
SECTION 607
ROAD MIX BITUMINOUS CONSTRUCTION

607.01 DESCRIPTION.

This work shall consist of aggregate and bituminous material mixed in place on a prepared surface in accordance with these specifications, as shown on the Plans or established by the Engineer.

BID ITEMS
Cutback Asphalt (*) for (**).
Emulsified Asphalt (*) for (**).
Aggregate for Bituminous Base Course (*).
Water.
Bituminous Base (**).
Water (Base).

* Designated Type and Grade.
** Denotes Thickness.
*** "Tack" denotes material to be used for tack. "Surface Prime" denotes material to be used for surface prime. No entry denotes material to be used in the bituminous mixture.

607.02 MATERIAL.

Materials shall conform to the requirements specified in the Materials Division.

Bituminous Materials .............................................. Section 1200
Aggregate for Bituminous Mixtures ............................ Section 1100

Aggregate acceptance will be conducted at the point of usage.

607.03 CONSTRUCTION REQUIREMENTS.

(a) Road Surface Preparation.

(1) Old Road Surface.
Prior to spreading and compacting, the surface shall be cleaned of all foreign material and broomed as necessary to remove dust.

(2) Earth Subgrade.
When the Plans call for all of the material to be hauled in, and unless other subgrade preparation is called for on the Plans, the Contractor shall as part of the work prior to the delivery of materials prepare the subgrade surface in the same manner as specified in subsection 603.03 (b) of these specifications.
(3) If called for on the Plans or Contract a prime coat of bituminous material shall be applied to the prepared subgrade. Application and maintenance of the prime coat shall conform to Section 612.03.

(b) Heating and Application Temperatures of Bituminous Materials.

Bituminous materials shall be heated and applied in accordance with the temperature requirements of Section 602.

(c) Preparation of Base Material.

If the Plans call for the existing subgrade material to be used or modified to produce the aggregate for the bituminous base, sufficient subgrade material shall be thoroughly pulverized to provide the compacted cross section shown on the Plans. The material shall be thoroughly mixed and uniformly windrowed. If additional material is required each additional material shall be pulverized if necessary and placed in separate uniform windrows. The windrows shall then be combined and thoroughly mixed prior to the addition of the bituminous material.

(d) Hauling and Mixing of Aggregate.

Hauling and distribution of the aggregate shall be controlled so the mass of the material in each uniform windrow can be determined at any time. Each material shall be placed in a uniform windrow before combining it with other material. Individual aggregates shall be placed in two or more separate windrows if the volume of that particular material exceeds 50 percent of the total material.

After the various materials have been combined, the total aggregate shall be dried to a moisture content of not to exceed four percent of the dry mass of the material when the aggregate is primarily sand and not to exceed three percent plus 1/2 the water absorption of the aggregate when other types of aggregates are used. After drying, the windrow shall be brought to a uniform cross section before any bituminous material is added. When mixing the base aggregate with an emulsified asphalt, the aggregate shall be in a damp condition. The Contractor shall add water if required, to attain the moisture content determined by the Engineer.

In lieu of the windrow mixing procedure prescribed in this subsection, the designated aggregate may be dried and blended in a stationary mixing plant. Aggregate blended by this method shall conform to all the requirements pertaining
to gradation, uniformity, pulverization and moisture for windrow mixing procedures.

(e) Mixing of Aggregate and Bituminous Material.

(1) General Requirements for all Types of Mixing.
At the end of each day's work or when work is interrupted all loose material shall be bladed into a tight windrow.

Before the material is spread, the Engineer shall determine whether mixing is complete, the bituminous content correct, and the moisture content satisfactory. When cutback asphalt is used, the maximum moisture content shall not exceed one percent of the total mass of the mixture unless otherwise designated by the Engineer. When emulsified asphalt is used the Engineer will designate the acceptable amount of moisture and volatiles. The grade and amount of bituminous material shall be designated by the Engineer.

(2) Blade Mixing.

The prepared aggregate shall be spread uniformly over a portion of the roadbed, and the bituminous material shall be distributed uniformly in as many applications as necessary to assure uniform mixing. All applications shall be of approximately equal amounts and shall total the amount determined by the Engineer.

Immediately after each application of bituminous material, the aggregate and bituminous material shall be partially mixed so as to leave as little free bituminous material as possible.

As soon as practicable, after the last application and partial mixing, final mixing by motorgraders and/or other approved mixing equipment shall begin, and continue until all particles are coated with bituminous material, and the mixture is uniform.

(3) Traveling Plant.

Approved traveling plants may be used for mixing the aggregate and bituminous material.

If the aggregate and bituminous material are to be mixed with a traveling plant, the preparation of road surfaces, heating of bituminous materials, prime coat, hauling and mixing of aggregates, shall be done as set out above.

The traveling plant shall be large enough to satisfactorily mix the entire windrow of aggregate and bituminous material in one pass of the machine. If the amount of material is too great to be mixed satisfactorily in one pass of the traveling plant, the material shall be placed in two or more windrows of equal size and uniform cross section before mixing.
If, in the opinion of the Engineer, plant mixing is insufficient, additional mixing with motorgraders may be required.

(4) Aeration.
If MC or RC cutback asphalt is used, the mixture shall be aerated until not more than seven percent of the volatile content of the bituminous material remain and the mixture becomes viscous enough to become hard and stable when spread and rolled.

(f) Laying, Compacting and Finishing.
After mixing and aeration has been approved by the Engineer, the windrow shall be equalized prior to spreading and the road surface shall be cleaned of all foreign material. A tack coat of bituminous material shall be applied to the subgrade or portions of the subgrade as directed by the Engineer. The tack coat shall consist of not over 500 milliliters per square meter and shall be of the same type and grade of bituminous material as was used in the mix except as set forth in subsection 603.03 (b) (4).

As the mixture is being spread with a blade it shall be rolled with a pneumatic tired roller, pad foot roller or sheepfoot roller until satisfactory compaction is obtained. Lifts shall be thin enough to be readily compacted. Final rolling shall be done with a steel wheeled roller weighing 7 to 10 metric tons unless otherwise specified. If a vibratory roller is used it shall be operated in the static mode.

(g) Maintenance of Base.
After final rolling and finishing of the bituminous base, it shall be protected and maintained until the final surface is placed. Maintenance shall include the repair of damaged areas.
Surface prime, if required, shall be applied immediately after final rolling and before any traffic is allowed on the final surface.
Bituminous sealing, if required, shall be applied after all shouldering is completed and before the project is accepted for traffic. Bituminous sealing shall not be applied until the base material has a moisture content of less than one percent based on the total mass of the mixture unless directed otherwise by the Engineer.

(h) Shoulders, Entrances, and Side Roads.
The side roads, entrances, and turnouts for mail boxes shall be surfaced as shown on the Plans.
If no details are shown on the Plans, the grade of entrances, side roads, turnouts for mail boxes and widening areas shall be raised to meet the edge of the roadway surface. In raising the grade of the entrance or side road, sufficient embankment materials shall be added to provide a roadway width equal to that of the approaching roadway with adequate shoulder slopes and shoulder radii adjacent to the shoulder of the project. Approach grades shall slope slightly away from the edge of the roadway surface and shall be adequately crowned, bladed, and consolidated to present a smooth surface with uniform lines and a neat appearance. The embankment material for this purpose shall be obtained from adjacent backslopes or ditches or other sources approved by the Engineer.

607.04 PLANT MIX OPTION.

With written permission of the Engineer, the Contractor may perform the work under this item by plant mix methods provided:

(a) The work shall be carried out in accordance with the requirements of Sections 601, 602, 603.01, 603.02 and 603.03.

(b) The unit price for Asphalitic Pavement Sampling will be the average bid price for this item over the entire state for the preceding year.

607.05 WEATHER AND SEASONAL LIMITATIONS.

Road mix bituminous base construction under the road mix option, shall be carried on only when the surface on which the material to be placed is free of detrimental moisture and when the ambient air temperature is above 10°C, and has not been below 5°C during the preceding 24 hours.

Road mix bituminous base construction shall be done only between May 1 and October 1. The seasonal limitations may be waived, but only when authorized in writing by the Engineer.

607.06 METHOD OF MEASUREMENT.

Bituminous materials shall be measured as specified in Division 100. Deductions shall be made for the number of metric tons which are not placed in the bituminous mixture or which are purchased by the Department.

(a) If the Plans provide for all the "Aggregate for Bituminous Base Course" to be hauled in, the aggregate used in the con-
struction of the base, aggregate used for the purpose of blotting excess material on the prime or finished surface, aggregate used as sealing and aggregates used to surface side roads, entrances, and turnouts, shall be measured by the metric ton in the vehicle at the time and place of unloading or at such other points as may be designated. The item of "Aggregate for Bituminous Base Course" shall include all the preparation of the road surface, the mixing and drying of the aggregates, the mixing of the bituminous material and the aggregates, the placing, finishing, and rolling of the mixed materials. Deductions will be made for all moisture in the materials.

Water used for subgrade preparation shall be measured by the cubic meter by means of calibrated tanks or distributors or accurate water meters. No measurement shall be made of water used to maintain the subgrade during hauling operations.

(b) If the Plans provide for the existing subgrade to be used or modified, the bituminous base shall be measured by the square meter complete in place, except that no measurement will be made of the materials placed beyond the neat lines indicated on the Plans or as directed by the Engineer. No measurement shall be made of any aggregate hauled in or combined with the subgrade soil or for the manipulation of the bituminous material and aggregates. This work shall be subsidiary to the item of "Bituminous Base" or "Aggregate for Bituminous Base Course." Water (Base) shall be measured by the cubic meter by means of calibrated tanks or distributors or accurate water meters. Only water ordered by the Engineer for mixing or laying shall be measured.

(c) If the plant mix option is used, payment for "Aggregate for Bituminous Base Course" used in the construction of the base shall be measured in metric tons of material at the time of delivery to the road minus the mass of the bituminous material in the mixture.

607.07 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price (a) per cubic meter of "Water", per cubic meter for "Water (Base)", per metric ton for the various types and grades of bituminous materials, per metric ton for "Aggregate for Bituminous Base Course", or (b) per cubic meter for "Water", per cubic meter for "Water (Base)", per metric ton for the various grades of bituminous material and per square meter for "Bituminous Base", which prices shall be full compensation for furnishing and
placing all material, for all labor, equipment, tools, and incidentals necessary to complete the work.

When the quantity of water furnished overruns or underruns the Contract quantities, the Contract unit price shall govern regardless of the total quantity furnished.

If the plant mix option is used, payment for bituminous material shall be at the unit price for the cutback or emulsified asphalt specified for the road mix option. Pay adjustments shall not apply to Road Mix Bituminous Construction.
SECTION 608
COLD RECYCLED BITUMINOUS CONSTRUCTION

608.01 DESCRIPTION.
This work shall consist of milling asphalt pavement, mixing the reclaimed asphalt pavement (RAP) material with liquid binder, then spreading and compacting the mixture in accordance with these Specifications, as shown on the Plans or directed by the Engineer.

BID ITEMS
- Cold Recycled Bituminous Material.
- Emulsified Asphalt (*).
- Asphalt Rejuvenating Agent (*).
- Blotter Sand.

* Designated Type and Grade

608.02 MATERIALS.
Processed RAP material shall conform to the following gradation:

<table>
<thead>
<tr>
<th>Sieve Size (mm)</th>
<th>Percent Retained</th>
</tr>
</thead>
<tbody>
<tr>
<td>37.5</td>
<td>0</td>
</tr>
</tbody>
</table>

Blotter sand shall be any fine sand approved by the Engineer.

Materials shall conform to the requirements specified in the Materials Division.

Emulsified Asphalt .......................................................... Section 1200
Asphalt Rejuvenating Agent ............................................... Section 1200

608.03 COLD RECYCLING EQUIPMENT.

(a) Configuration.
Cold recycling equipment shall consist of a unit or a combination of units which will satisfactorily perform the following requirements.
1. Mill the bituminous pavement and pick up the reclaimed material.
2. Process the RAP material to meet the specified gradation.
3. Mix the RAP material uniformly with liquid binder material.
(4) Deposit the mixture in a windrow, paver or load it into trucks.

(b) Performance.

(1) The milling unit shall be capable of milling the asphalt pavement at least 100 millimeters deep and 3.7 meters wide in one pass, unless otherwise specified. It shall have automatic controls capable of maintaining uniform grade and cross slope.

(2) The RAP material processing unit shall be a crusher with a scalper screen, or other approved devices capable of reducing the RAP material to the specified gradation.

(3) The mixing unit shall have a continuous weighing system for the processed RAP material, coupled with a meter to maintain the proper proportion of RAP material and liquid binder. The liquid binder pump shall shut off automatically if delivery of RAP material is stopped.

The mixing unit shall be capable of producing a homogeneous mixture of processed RAP material and liquid binder and depositing the recycled mixture in a windrow, paver or trucks, without segregation.

The liquid metering system shall deliver the specified amount of additive to within 0.2 percentage points of the desired application rate.

Positive means shall be provided for calibration of the weighing and metering devices.

Other equipment necessary to perform this work shall comply to the requirements of Division 150.

608.04 CONSTRUCTION REQUIREMENTS.

(a) Milling and Mixing Operation.

The pavement shall be milled to the required depth and width, in one or more passes. The RAP material shall be processed to the required gradation and thoroughly mixed with the specified amount of binder. Water may be added to the RAP material to facilitate mixing, provided it does not adversely affect the binder. The recycled material shall be deposited in a windrow, paver, or loaded into trucks, without segregation.

When deposited in a windrow the Contractor shall have equipment available to equalize the windrow as directed.

The disposition of material loaded into trucks shall be as shown on the Plans.
(b) Paving Operations.

(1) General.

Normally, the recycled material will be windrowed on the milled surface, spread and compacted in a continuous operation confined to the minimum practical length.

(2) Spreading and Finishing.

The recycled material shall be spread and finished in one or more lifts, reasonably true to crown and grade, with a bituminous paver meeting the requirements of Division 150. If the compacted lift thickness is greater than 100 millimeters, more than one spreading operation may be required.

(c) Compaction and Density Requirements.

(1) General.

Compaction and density requirements for each project shall be a minimum of 97 percent of the target density obtained on a test strip at least 150 meters in length and compacted under the following conditions:

(1.1) The mix temperature of the test strip shall be 32°C or higher.

(1.2) At least two test strips shall be completed to determine the target density and optimum sequence of rollers. These test strips will remain in place as part of the completed work.

(1.3) The depth of the lift shall be representative of the project.

(2) Target density shall be the highest density achieved on the test strip using the rolling procedure approved by the Engineer. The Engineer will use a nuclear meter to establish a density growth curve for each procedure. Rolling shall be discontinued whenever four consecutive passes of the roller(s) fail to increase the density 16 kilograms per cubic meter.

(3) The Contractor shall have, as a minimum, the following self propelled rollers for use on the test strips: a double drum vibratory steel roller and a pneumatic tired roller. The vibratory roller may be used in the static mode. The pneumatic tired roller shall weigh at least 22 metric tons and have a minimum tire pressure of 620 kilopascals. The Contractor shall supply a suitable tire pressure gauge.

(4) When there is a significant change in mix proportions, weather conditions or other controlling factors the Engineer may require construction of another test strip(s) to check target density.

(d) Surface Treatment or Overlay.

(1) The Engineer may require a light application of bituminous material (smoke coat) on the recycled surface, which shall be blotted with fine sand as necessary.
(2) Any subsequent surface treatment or overlay designated in the Contract shall be accomplished in accordance with the applicable section of these Specifications. In addition, they shall not be placed until the moisture content of the recycled mixture is less than 1\% unless otherwise approved by the Engineer.

(e) Maintenance of Traffic.

When traffic is to be carried through construction, traffic control shall be accomplished with the requirements of Section 603.03. In addition, material in the recycled section shall be spread and compacted, and the equipment removed from the roadway before sundown to provide two way traffic during the night.

608.05 WEATHER LIMITATIONS.

Milling, adding the liquid binder and laydown will be completed when the ambient air temperature is above 12°C and only on those days when the ambient air temperature is or is predicted to be above 21°C. Also, the weather will not be foggy or rainy. The above requirement may be waived, but only when so directed in writing by the Engineer.

608.06 METHOD OF MEASUREMENT.

Cold Recycled Bituminous Material shall be measured per one kilometer, regardless of the pavement depth or width of recycling. Measurement will be along the centerline of the lanes.

Water will not be measured and paid for separately but shall be subsidiary to other items of work.

Emulsified Asphalt and Asphalt Rejuvenating Agent of the type shown in the Contract documents will be measured by the metric ton as set out in Division 100.

Blotter sand, incorporated into the project will be measured by the cubic meter or metric ton in the truck at the point of usage.

608.07 BASIS OF PAYMENT.

The accepted quantity of “Cold Recycled Bituminous Material,” measured as provided above, will be paid for at the Contract unit price per kilometer.
The accepted quantity of "Emulsified Asphalt" or "Asphalt Rejuvenating Agent" will be paid for at the Contract unit price per metric ton.

"Blotter Sand," if required, shall be paid for at the Contract price per metric ton or cubic meter.

The above prices shall be full compensation for milling, processing, building test strip(s), mixing, spreading, compacting, furnishing and placing all material, for all labor, equipment, tools and incidentals necessary to complete the work.
SECTION 609

SURFACE RECYCLED BITUMINOUS CONSTRUCTION

609.01 DESCRIPTION.

This work shall consist of heating, scarifying, rejuvenating and recompacting existing bituminous pavements and adding a new surface treatment or, heating, scarifying and rejuvenating existing bituminous pavements, adding new bituminous surface mixture and compacting the combined material, all in compliance with these Specifications, as shown on the Plans or established by the Engineer.

BID ITEMS

Surface Recycling.
Asphalt Rejuvenating Agent (*).
Blotter Sand.

* Designated Type and Grade.

609.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Asphalt Rejuvenating Agent.......................... Section 1200

Blotter sand shall be any fine sand approved by the Engineer.

609.03 SURFACE RECYCLING EQUIPMENT.

(a) Configuration.

Surface recycling equipment shall consist of a unit or a combination of units which will satisfactorily perform the following operations:

(1) Heat the surface of the pavement.
(2) Scarify and/or hot mill the surface of the pavement.
(3) Distribute asphalt rejuvenating agent uniformly over the scarified surface or blend with the scarified material.
(4) Mix the rejuvenating agent and scarified and/or hot milled material.
(5) Lay by one of the following methods:
(5.1) Spread and finish the rejuvenated mixture.
(5.2) Spread and finish new bituminous mixture over the rejuvenated mixture.
(5.3) Blend the rejuvenated material with the new bituminous mixture and spread and finish this mixture over the existing roadway.

(b) Performance.

(1) Unless otherwise specified, the heater-scarifier combination shall be capable of uniformly heating and scarifying the pavement to a depth of not less than 20 millimeters.
(2) The rejuvenating unit shall have adequate provisions for calibration. Delivery of the rejuvenating agent shall be constant, uniform and controlled by the forward speed of the unit.
(3) The mixing unit shall consist of augers and/or other devices which will uniformly mix the scarified material and rejuvenating agent.
(4) The paving unit shall produce an evenly finished surface without tearing or shoving the mixture by means of an activated screed or strike-off assembly, heated if necessary.

Other equipment necessary to perform this work shall comply with the requirements of Division 150.

609.04 CONSTRUCTION REQUIREMENTS.

(a) Pavement Preparation.

Before commencing surface recycling all material which would be detrimental to the work shall be removed from the surface of the pavement.

(b) Heating and Scarifying Operations.

Unless otherwise specified, minimum depth of scarification shall be 20 millimeters. The depth or mass shall be sufficient to produce a minimum of 43 kilograms of scarified material per square meters as specified in Section 2500. The moving average of three consecutive tests must equal or exceed the above minimum values. The temperature of the scarified material shall not exceed 150°C.

(c) Rejuvenating and Mixing Operations.

After heating and scarifying, the asphalt rejuvenating agent shall be added uniformly and mixed thoroughly with the scarified material.
(d) Spreading and Compacting Operations.

Immediately following the completion of rejuvenating and mixing operations the Contractor shall begin work to fulfill the requirements of one of the following operations.

(1) Requirements of Operation Number 1.

(1.1) The rejuvenated mixture shall be spread and finished with a paving unit which complies with the requirements in this section.

(1.2) The compaction and density requirements shall be in accordance with subsection 603.03 (e).

(1.3) The Contractor shall be responsible for maintaining the rejuvenated pavement surface until the surface treatment shown in the Contract documents is completed. Blotter sand shall be spread on the surface if directed by the Engineer. When required a tack coat shall be applied before placing the surface treatment. Such additional surface treatment shall be started no later than two weeks after spreading and compacting the rejuvenated mixture.

(1.4) For each type of surface treatment specified, all of the requirements of the applicable sections of these specifications shall apply.

(2) Requirements of Operation Number 2.

New bituminous surface material in the amount specified shall be spread and finished with a bituminous paver equipped with automatic grade controls. All of the requirements of Sections 601, 602, and 603 shall apply to this work. If a hot mix overlay is included in the Contract, the hot mix material and surface recycle may be laid concurrently or two materials may be blended and laid as one lift, unless specified otherwise in the Contract documents.

609.05 WEATHER AND SEASONAL LIMITATIONS.

Surface recycling shall be constructed only between May 1 and September 15, when the surface is dry and when the weather is not foggy or rainy. The above requirements may be waived, but only when so directed in writing by the Engineer.

609.06 METHOD OF MEASUREMENT.

Surface recycling shall be measured per kilometer, regardless of pavement width. No additional measurements will be made for widened sections or irregular areas. Measurement will be along the centerline of the lanes.
Asphalt rejuvenating agent will be measured to the nearest one-hundredth of a metric ton as provided in Division 100. Blotter sand will be measured by the metric ton or cubic meter measured in the truck at the point of usage of the quantity incorporated in the project.

609.07 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, will be paid for at the Contract unit price per kilometer station for “Surface Recycling” which price shall be full compensation for preparation of surface prior to heating, heating and scarifying the surface, mixing and application of asphalt rejuvenating agent, compaction, and for all labor, equipment, tools and incidentals necessary to complete the work.

“Rejuvenating Agent” shall be paid for at the Contract price per metric ton which price shall include all materials, mixing, and application of the agent and for all tools, equipment, labor and incidentals necessary to complete the work.

“Blotter Sand”, if required, shall be paid for at the Contract price per metric ton or cubic meter which price shall include all material, labor, tools, equipment and incidentals necessary to complete the work.
SECTION 610
SLURRY SEAL

610.01 DESCRIPTION.

This work shall consist of spreading a properly proportioned mixture of emulsified asphalt, mineral aggregate and water on a prepared surface in accordance with this specification and as directed by the Engineer.

BID ITEMS

Aggregate for Slurry Seal.
Emulsified Asphalt (*).
Mineral Filler.

* Designated Type and Grade.

610.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Emulsified Asphalt ................................................. Section 1200
Aggregate for Slurry Seal ................................. Section 1100

Aggregate acceptance tests shall be conducted at the point of usage.

Mineral filler shall be any recognized brand of non-air-entrained Portland cement that is free from lumps. It may be accepted upon visual inspection.

Water shall meet the requirements of Section 2400.

610.03 PROPORTIONING.

The Engineer shall approve all materials and methods of mixing and stipulate the proportions of the mixture. The mixture shall have a thick, creamy consistency and shall be relatively free-flowing.

Aggregate shall be weighed on approved scales at the time and place designated by the Engineer.

610.04 CONSTRUCTION REQUIREMENTS.

(a) Surface Preparation.

Immediately prior to applying the slurry seal the surface shall be thoroughly cleaned of all foreign materials and pre-wetted as required.
(b) Application.

A sufficient amount of slurry shall be carried in the spreader box at all times to obtain complete uniform coverage. No lumping, balling or unmixed aggregate shall be permitted. The seam, where two passes join, shall be neat in appearance and all excess material shall be removed immediately from ends of each run. Approved hand tools shall be used to spread the mixture where machine spreading is not possible.

(c) Seasonal and Weather Limitations.

Slurry sealing shall be constructed between May 1 and October 15 and shall be placed only when the ambient air temperature is 15°C or above and the weather is not foggy or rainy.

610.05 MAINTENANCE OF TRAFFIC.

Maintenance of traffic shall be in accordance with Section 821 and the following.

One flagger shall be stationed immediately ahead of the application of the slurry material and one flagger immediately behind the section being cured. Suitable speed limit signs and "fresh oil" signs shall be displayed and the signs shall be moved forward with the flaggers as the work progresses.

Adequate means shall be provided to protect the slurry seal from damage by traffic until such time that the mixture has cured sufficiently so that the slurry seal will not adhere to or be picked up by the tires of vehicles. The Contractor shall provide signs, barricades and flaggers necessary to control traffic around the area under construction. Application of the slurry seal shall be suspended early enough each day to permit traffic to safely travel over the completed work before sunset. Any damage done by traffic to the slurry seal shall be repaired by the Contractor at the Contractor’s expense.

610.06 METHOD OF MEASUREMENT.

Aggregate for slurry seal shall be measured by the metric ton in the vehicle at the time and place of loading into the slurry truck or at such other points as may be designated by the Engineer. No deduction will be made for moisture in the aggregate.

Emulsified asphalt shall be measured by the metric ton as specified in Division 100.
Mineral filler shall be measured by the metric ton. When sacked Portland cement is used, one sack shall mean 42.6 kilograms.

Water used for pre-wetting the pavement surface shall not be measured but shall be subsidiary to other items of the Contract.

610.07 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per metric ton for "Aggregate for Slurry Seal", per metric ton for "Emulsified Asphalt", and per metric ton for "Mineral Filler", which price shall be full compensation for furnishing all materials, for all labor, tools, equipment and incidentals necessary to complete the work.

Contract items shall be paid for at the Contract unit price regardless of any increase or decrease in the quantities of the individual items as shown in the Contract.
SECTION 611
MODIFIED SLURRY SEAL

611.01 DESCRIPTION.
This work shall consist of spreading a properly proportioned mixture of modified emulsified asphalt, mineral aggregate, water and necessary additives on a prepared surface in accordance with these specifications and as directed by the Engineer.

BID ITEMS
Aggregate for Modified Slurry Seal.
Emulsified Asphalt (*) (Modified).
Mineral Filler.
(*) Designated Type and Grade.

611.02 MATERIALS.
Materials shall conform to the requirements specified in the Materials Division.

<table>
<thead>
<tr>
<th>Material</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Emulsified Asphalt</td>
<td>1200</td>
</tr>
<tr>
<td>Aggregate for Modified Slurry Seal</td>
<td>1100</td>
</tr>
</tbody>
</table>

Aggregate acceptance tests shall be conducted at the point of usage.

Emulsified Asphalt shall be Cationic Type CSS-1H and shall conform to the requirements specified in Section 1200, Table 5 of the Materials Division.

A minimum of 2.5 percent modifier content certified from an approved source along with special emulsifiers shall be milled into the asphalt emulsion by an approved emulsion manufacturer. The modified emulsified asphalt shall be so formulated that when the paving mixture is applied at a thickness of 25 millimeters with the relative humidity at not more than 50 percent and an ambient air temperature of at least 25°C it will cure sufficiently that rolling traffic can be allowed in one hour with no damage to the surface. It shall show no separation after mixing.

Mineral filler shall be any recognized brand of non-air-entrained Portland cement that is free of lumps. It may be accepted upon visual inspection.

Water shall be potable and free from harmful soluble salts.

The Contractor shall furnish a Type C Certification for any proposed additives.
611.03 MIX DESIGN.

(a) Job Mix Formula.

The Contractor shall develop the job mix formula and present certified test results for the Engineer's approval. The job mix formula will include aggregate type and gradation, and percentage of modified emulsion, water, and cement by weight of dry aggregate in the mix.

(b) Proportioning.

The Engineer shall approve the design mix and all materials and methods prior to use and shall designate the proportions to be used.

- Mineral aggregate (kg/sq.m dry wt.) .................. * 15 min.
- Modified Emulsion (percent residue) .................. * 6.5 min.
- Mineral Filler (percent) .......................... 2.0 Min. by weight of dry aggregate
- Additive .................................................. As required

* Or as shown in the Contract documents.

(c) Aggregate and Asphalt.

The aggregate shall be weighed before delivery to the job site. Emulsified asphalt shall be weighed or measured by volume.

Individual volume or weight controls for proportioning each item to be added to the mix shall be provided. Each material control device shall be calibrated and properly marked. They shall be accessible for ready calibration and so placed that the Engineer may determine the amount of each material used at any time.

The Contractor may add mineral filler at loading facility, provided accurate proportioning and metering devices are approved by the Engineer, and there is no detrimental effect on the final product.

611.04 CONSTRUCTION REQUIREMENTS.

(a) Surface Preparation.

Immediately prior to applying the modified slurry seal, the surface of the roadway shall be thoroughly cleaned of all foreign material and prewet as required.

(b) Mixing and Spreading.

The modified slurry seal materials shall be mixed and spread by a self propelled machine capable of accurately de-
livering and proportioning all of the necessary components. The machine shall operate continuously while loading to eliminate construction joints. A sufficient amount of mixture shall be carried in the spreader box at all times to obtain complete uniform coverage. No lumping, balling or unmixed aggregate shall be permitted. The seam where two passes join, shall be neat in appearance and all excess material shall be removed immediately from ends of each run. Approved hand tools shall be used to spread the mixture where machine spreading is not possible.

611.05 MAINTENANCE OF TRAFFIC.

Maintenance of traffic shall be in accordance with Section 610.05 with the following addition: The material used for filling of wheel ruts must cure a minimum of 24 hours before the full width coverage is applied.

611.06 SEASONAL AND WEATHER LIMITATIONS.

The modified slurry seal shall be constructed between May 1 and October 15, and shall be placed only when the ambient air temperature is 15°C or above and the weather is not foggy or raining.

611.07 METHOD OF MEASUREMENT.

Aggregate for modified slurry seal shall be measured by the metric ton. No deduction will be made for moisture in the aggregate.

Emulsified asphalt (Modified) shall be measured by the metric ton as specified in Division 100.

Mineral filler shall be measured by the metric ton. When sacked Portland cement is used, one sack shall mean 42.6 kilograms.

Water used for pre-wetting the pavement surface and mix water shall not be measured but shall be subsidiary to other bid items.

611.08 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per metric ton for "Aggregate for Modified Slurry Seal", per metric ton for "Emulsified Asphalt (Modified)" and per metric ton for "Mineral Filler", which price shall be full compensation for fur-
nishing all materials, for all labor, tools, equipment and incidental necessary to complete the work.

Contract items shall be paid for at the Contract unit price regardless of any increase or decrease in the quantities of the individual items as shown in the Contract.
SECTION 612
BITUMINOUS PRIME COAT

612.01 DESCRIPTION.

This work shall consist of treating a previously prepared surface with bituminous material, and blotter material, if required, in accordance with these specifications, as shown on the Plans or established by the Engineer.

BID ITEMS
Emulsified Asphalt (*).
Cutback Asphalt (*).

* Designated Type and Grade.

612.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Bituminous Material .................................................. Section 1200

612.03 CONSTRUCTION REQUIREMENTS.

(a) Preparation of Road Surfaces.

Prior to the distribution of bituminous materials, the Contractor shall blade the surface of the roadbed to a smooth uniform section. All loose materials shall be broomed off and the surface shall be cleaned until it is as free from dust as is practicable. Side roads to receive bituminous treatment shall be shaped, bladed and broomed at the same time as the roadbed surface. If deemed necessary by the Engineer, and if the surface to be primed is an earth subgrade, a water bound base course or subbase, the broomed surface shall be given a light application of water at the approximate rate of 0.5 liters per square meter before the bituminous material is applied.

(b) Temperature of Bituminous Material at Time of Application.

Temperature of bituminous material at time of application shall be as specified in Section 602.

(c) Prime Coat.

The prime coat shall be applied to earth subgrades, water bound base courses, and subbases, as soon as practicable after they have been prepared and are sufficiently dry.
The prime coat shall be applied to bituminous surfaces immediately after final rolling and before any traffic has been allowed or the surface has hardened and glazed so penetration of bituminous material is hindered.

Bituminous material shall be applied at the rate specified by means of an approved pressure distributor in a uniform continuous spread. The spray nozzles and spray bar shall be adjusted and checked frequently to insure uniform distribution. Should any nozzle malfunction, distribution shall cease immediately. Any deficiency shall be corrected before distribution is resumed.

Hand sprays shall be used only for areas that cannot be primed by normal operation of the distributor.

(d) Protection of Adjacent Structures.

The surfaces of all structures and other roadway appurtenances shall be protected to prevent them from being damaged or splattered with bituminous material. If any appurtenances are damaged or splattered the Contractor shall at his own expense, restore the appurtenances to their original condition.

The Contractor shall maintain the prime coat and the surface of the subgrade or base course until it has been covered by the surface course or until final acceptance of the work. All damaged areas shall be cleaned of loose material, the defective base course or subgrade satisfactorily repaired and the prime coat reapplied. Such maintenance and repair shall be done at the Contractor’s expense.

(e) Protection of Prime Coat After Application.

After 48 hours, the Engineer may require a light application of blotting material on specified areas to prevent damage from traffic. The material shall be a clean fine sand or other approved material.

612.04 SEASONAL AND WEATHER LIMITATIONS.

This work shall be constructed between May 1 and October 15 when the ambient air temperature is 15°C and rising. The Engineer may modify, in writing the seasonal and temperature limits, but in no case shall the work be done when the weather is rainy or foggy.

612.05 METHOD OF MEASUREMENT.

Bituminous material shall be measured by the metric ton as provided in Division 100.
Blotting material shall be measured either by the metric ton or by the cubic meter in the vehicle at the time and place of unloading or at other points as designated by the Engineer. Blotting material shall not be measured as such but shall be included in the quantities of cover material or aggregate for base course, provided by the Plans and Contract. The item of manipulation for prime coat shall not be measured directly but shall be subsidiary to the item of manipulation for the other phases of work. Any water for the preparation of the prime coat is subsidiary.

612.06 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per metric ton for the various types and grades of bituminous material, which price shall be full compensation for furnishing all material, for all labor, equipment, tools, and incidentals necessary to complete the work.
SECTION 613
BITUMINOUS SEALING

613.01 DESCRIPTION.

This work shall consist of an application of bituminous material followed by an application of cover material in accordance with these specifications, as shown on the Plans or established by the Engineer.

BID ITEMS
Cover Material (*).
Cutback Asphalt (*).
Emulsified Asphalt (*).
Asphalt Cement (*).
Water.
Manipulation (Bituminous Seal).
* Designated Type and Grade

613.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Aggregate for Cover Material ........................................ Section 1100
Bituminous Material .................................................... Section 1200

Aggregate acceptance tests shall be conducted at the final stockpile location.

613.03 CONSTRUCTION REQUIREMENTS.

(a) Preparation of Road Surfaces.

Before applying bituminous material, the surface to be treated shall be cleaned of all foreign material and broomed as necessary to remove dust.

(b) Temperature of Bituminous Materials at Time of Application.

Temperature of bituminous material at the time of application shall be as specified in Section 602.

(c) Application of Bituminous Material.

Bituminous material shall be applied at the rate specified by means of an approved pressure distributor in a uniform, continuous spread.
A strip of building paper, approximately one meter in width and approximately 300 millimeters longer than the spray bar, shall be used at the beginning of each spread. If the spray cutoff is not positive, the use of paper will be required at the end of each spread. The paper shall be removed and disposed of in a satisfactory manner. The distributor shall be moving forward at proper speed when the spray bar is opened, unless the distributor is equipped to apply the specified rate from a standing start. Any skipped areas or deficiencies shall be corrected. Junctions of spreads shall be carefully made to assure a smooth riding surface.

The spread length of bituminous material shall not exceed that which can be covered immediately. Under no circumstance shall the bituminous material remain uncovered long enough to impair retention of the cover material. The spread width of bituminous material shall not exceed the spread width of the cover material by more than 150 millimeters.

The distributor shall be equipped and operated to prevent bituminous material from dripping on the pavement.

Distribution of the bituminous material shall be so regulated to insure a uniform distribution of bituminous material. In no case should the distributor be allowed to “blow”.

The angle of the spray nozzles and the height of the spray bar shall be adjusted and frequently checked to insure uniform distribution. If the rise of the spray bar as the load is removed is excessive and contributes to drilling and streaking, the distributor shall be modified so it will maintain a constant spray bar height. Should any nozzle malfunction, distribution shall cease immediately. Any deficiencies shall be corrected before distribution can be resumed.

When indicated on the Plans or in the Contract, the existing intersections and/or entrances, mail box turnouts, etc. having bituminous surfaces shall be sealed as directed by the Engineer. All widened areas will be sealed. Bituminous material and cover material for this work are included in the Contract quantities and shall be paid for at the Contract unit prices.

(d) Protection of Adjacent Structures.

Protection of adjacent structures shall be as specified in subsection 612.03 (d).

(e) Application of Aggregate.

Immediately following the application of the bituminous material, cover material shall be spread with a self-propelled ag-
aggregate spreader in quantities as designated; except on county force account projects where other types of mechanical aggregate spreaders may be used.

At no time shall the tires of the trucks or aggregate spreader come in contact with the fresh bituminous material.

At the time of delivery to the roadway, the moisture content of the cover material shall not exceed three percent by mass plus 1/2 the water absorption of the aggregate. In no case shall free moisture be draining from the truck. If lightweight aggregate is used, the above moisture limitations shall not apply.

If directed, the cover material shall be moistened with water to eliminate or reduce the dust coating of the aggregate. Moistening shall be done the day before the use of the aggregate.

Any operation of equipment which results in displacement of the cover material or damage to the seal course is prohibited.

Spreading equipment shall be so equipped and operated to insure complete coverage. No brooming, dragging or blading of the cover material shall be permitted prior to initial rolling. Any rearrangement of the cover material shall be by hand methods. Overlapping applications of cover material shall be avoided and all spillage shall be removed from the surface. The bituminous material shall be uniformly covered before rolling.

(f) Rates of Application.

When alternate types of cover material are shown in the contract, the quantities of aggregate and bituminous material are for the purpose of estimating and bidding only.

Once the Contractor designates the alternate type of aggregate to be supplied, the total quantities to be used and paid for shall be determined by using the application rates in Table 1. No change in the contract unit price will be made.

If the Engineer determines that an application rate other than that shown in Table 1 is necessary, he may alter such rate in writing.

The quantity of cover material to be stockpiled shall be as follows.

(1) The amount shown on the Contract minus the amount used on the road when one type of cover material is shown in the Contract.

(2) The amount determined by using the application rates in Table 1 minus the amount used on the road when alternate types of cover material are shown in the Contract.
(3) The amount specified by the Engineer minus the amount used on the road when the Engineer changes the application rates in Table 1.

The Engineer shall designate stockpile locations along the project, or at locations requiring a haul distance no longer than the most distant end of the project for that cover material not used on the roadway for the quantity as computed from above.

Payment for the stockpiled material shall be at the Contract unit price per ton or cubic yard of cover material.

**TABLE 1**

**RATES OF APPLICATION FOR BITUMINOUS SEAL**

<table>
<thead>
<tr>
<th>Type</th>
<th>Composition</th>
<th>Aggregate Cu. M/Km 7 M Width</th>
<th>Bit. Material Litter/Sq. M. Residue (1)</th>
<th>Asphalt Type (2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CM-A</td>
<td>Sand-Gravel</td>
<td>50</td>
<td>0.91</td>
<td>CRS-1H</td>
</tr>
<tr>
<td>CM-B</td>
<td>Sand-Gravel</td>
<td>65</td>
<td>1.04</td>
<td>CRS-1H</td>
</tr>
<tr>
<td></td>
<td></td>
<td>69</td>
<td>1.22</td>
<td>CRS-1H or</td>
</tr>
<tr>
<td>CM-D</td>
<td>Sandstone</td>
<td></td>
<td></td>
<td>RS-1H</td>
</tr>
<tr>
<td>CM-E</td>
<td>Chat</td>
<td>48</td>
<td>0.77</td>
<td>CRS-1H</td>
</tr>
<tr>
<td>CM-K</td>
<td>Limestone</td>
<td>67</td>
<td>1.09</td>
<td>RS-1H</td>
</tr>
<tr>
<td>CM-L</td>
<td>Lightweight</td>
<td>55</td>
<td>1.13</td>
<td>CRS-1H</td>
</tr>
</tbody>
</table>

(1) Rates shown are estimated and may be adjusted to comply with actual field conditions.
(2) Emulsion type may be changed to any asphalt type with approval of the Engineer.

(g) **Manipulation.**

Immediately following the application of cover material it shall be embedded by pneumatic rolling. A sufficient number of pneumatic rollers shall be furnished so the initial complete roller coverage shall be completed within 15 minutes after the application of cover material. Pneumatic rolling shall continue until a total of five complete coverages are obtained. The speed of the rollers shall be such that aggregate displacement will be minimized. Mass of the rollers shall be varied as directed to obtain the most satisfactory embedment of the cover material.

On seals using CM-A, B or E, the Engineer may require the use of a steel roller for one of the coverages, provided that excessive crushing of the cover material does not occur.

The rolling sequence shall be controlled so it will be unnecessary for one roller to turn out to permit another roller to pass. Turning of rollers on the sealed surface is prohibited.

Additional cover material shall be applied and rolled with the pneumatic rollers as directed by the Engineer.

All rollers shall be self-propelled, except on County force account projects, pull-type pneumatic rollers may be used.
The loose cover material shall be broomed from the surface of the travelway as soon as the bituminous material has cured enough to prevent damage by brooming or vehicular traffic. Brooming shall continue periodically until all loose aggregate has been removed. All seals shall receive, as a minimum, one light brooming of the cover material before opening to traffic. Additional broomings may be required before opening to traffic to prevent the cover material from being picked up by moving vehicles.

To assist in handling of traffic control, the Contractor may seal in one lane for the entire day. Excess cover material shall be broomed from the shoulder.

When CM-B and cutback asphalt are specified in the Contract, a second period of manipulation shall begin on the day following the first rolling, or as soon thereafter as weather conditions permit. This manipulation shall consist of spreading the loose cover material uniformly over the surface and rolling with the type(s) of roller(s) specified by the Engineer. The rolling operation shall consist of two complete coverages of the previous day’s work. Excess cover material shall be broomed off the travelway and shoulders as directed by the Engineer following the second day’s rolling.

(b) Maintenance of Completed Work.

When ordered by the Engineer, the Contractor shall add bituminous material, and/or aggregate, to completed portions of the project. All additional bituminous material and aggregate so ordered shall be included in the pay quantities. Spreading and rolling of additional aggregate shall not be paid for separately but shall be considered as subsidiary to the item of “Manipulation”.

If the shoulder vegetation is not sufficient to define the edge of the traveled way, the excess cover material shall be broomed and bladed off the shoulder to provide a line of delineation.

(i) Working Period.

All work, including installation and removal of traffic control signs, will be completed between sunrise and sunset and under favorable weather conditions.

(j) Treatment of Adjacent Areas.

When indicated on the Plans or in the Contract, intersections, entrances, turnouts, etc. having bituminous surfaces shall be sealed as directed by the Engineer. All widened areas shall
be sealed. Bituminous material and cover material for this work are included in the Contract.

(k) Maintenance of Traffic.

Maintenance of traffic shall be in accordance with Section 821 and the following.

Detouring of highway traffic for this work will not be provided or permitted. All construction operations shall be coordinated to result in the least practicable delay of traffic. One-way traffic shall be maintained and traffic speeds restricted to speeds of not more than 50 K.P.H. on bare pavement and 30 K.P.H. on freshly applied seal. The Contractor shall provide flaggers, warning signs, barricades and pilot cars sufficient to control traffic through the sealing operations. Pilot cars shall be used to lead one-way traffic through the areas of distribution and curing. The work shall be so coordinated that the pilot car shall make a round trip in 15 minutes or less. At no time shall there be more than two locations of work on a project which delay traffic. Pilot cars shall meet the requirements stipulated in Section 821.

One flagger shall be stationed immediately ahead of the application of the bituminous material and one flagger immediately behind the section being cured. Suitable speed limit signs and other traffic control signs shall be displayed, and the signs shall be moved forward with the flaggers as the work progresses.

Mobile brooms operating outside of the pilot car area shall operate with the flow of traffic and shall be equipped with a large arrow sign (W1-6) (1220 mm × 610 mm) mounted on the rear of the broom. Brooms shall also be equipped with a rotating or flashing beacon clearly visible to traffic approaching from either direction.

On projects where bituminous sealing is constructed in connection with other work from which traffic is detoured the provisions of this subsection shall not apply. However, the Contractor shall restrict the speed of his equipment traveling the freshly applied seal to 30 kilometers per hour as shown.

613.04 WEATHER AND SEASONAL LIMITATIONS.

(a) Bituminous sealing with cutback asphalt shall be done only between May 1 and October 15 when the ambient air temperature is 15°C and rising.

(b) Bituminous sealing with emulsified asphalt shall be done only between June 1 and September 15 when the ambient air
temperature is 15°C and rising. When aggregate retention is unsatisfactory, sealing shall be suspended.

(c) The Engineer may modify, in writing, the seasonal and temperature limits, but in no case shall the work be done when the pavement is wet, or the weather is rainy or foggy.

613.05 METHOD OF MEASUREMENT.

Cover material shall be measured either by the cubic meter or by the metric ton as indicated in the Contract.

When measured by the cubic meter, the material will be measured in the vehicle at the time and place of unloading.

When measured by the metric ton, the material shall be weighed in the vehicle at the time and place of unloading or at such other points as designated by the Engineer. No deductions will be made for moisture in the cover material.

Bituminous materials shall be measured by the metric ton as specified in Division 100. Deductions shall be made for the number of metric tons which are not placed on the road surface or purchased by the Department.

Manipulation shall be measured per kilometer measured along centerline which includes all widened and irregular areas and incidental work not listed as bid items.

Water ordered by the Engineer shall be measured per cubic meter by means of calibrated tanks or water meters.

613.06 BASIS OF PAYMENT.

The amount of completed and accepted work, measured as provided above, shall be paid for at the Contract unit price per cubic meter or per metric ton for "Cover Material", per metric ton for the various types and grades of bituminous materials, per one kilometer station for "Manipulation", and at the unit price as set forth in the Contract per cubic meter for "Water", which prices shall be full compensation for furnishing all materials, labor, equipment, tools and incidentals necessary to complete the work.

When the Contract calls for Asphalt Cement for bituminous sealing the following provisions shall apply.

(1) When the work is not completed by September 1, and when ordered by the District Engineer in writing, the type of bituminous material shall be changed to cutback asphalt.

(2) When approved changes are made, the unit price for cutback asphalt shall be the Contract price plus or minus the difference in the invoice price of the two materials at the refinery at the time of application.
SECTION 614
SINGLE BITUMINOUS SURFACE TREATMENT

614.01 DESCRIPTION.

This work shall consist of the construction of a wearing surface composed of a bituminous prime coat followed by the application of a bituminous seal coat with the application of cover material in accordance with these specifications, as shown on the Plans or established by the Engineer.

BID ITEMS
- Cover Material (*).
- Cutback Asphalt (*) for (**).
- Emulsified Asphalt (*) for (**).
- Asphalt Cement (*) for (**).
- Manipulation (S.B.S.T.).
- Water.

* Designated Type and Grade.
** "Prime" denotes material to be used for prime.
"Seal" denotes material to be used for seal.

614.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Aggregates for Cover Material .................................. Section 1100
Bituminous Material ............................................ Section 1200

Aggregate acceptance tests shall be conducted at the final stockpile location.

614.03 CONSTRUCTION REQUIREMENTS.

(a) Preparation of Road Surfaces.

Preparation of the road surfaces shall be as specified in Section 612.

(b) Temperature of Bituminous Materials.

Temperature of bituminous material at the time of application shall be as specified in Section 602.

(c) Prime Coat.

The bituminous prime coat shall be applied as specified in Section 612.
The type, grade and rate of application of the bituminous material shall be as designated on the Plans or ordered by the Engineer.

(d) Seal Coat.

After the prime coat has thoroughly penetrated the subgrade the Contractor shall make a second application of bituminous material and cover material as specified in subsections 613.03 (a) through 613.03 (i).

(e) Treatment of Adjacent Areas.

Side roads, entrances, and turnouts shall be surfaced if shown on the Plans or indicated in the Contract. All widening areas will be surfaced. The main sideroads, that are to receive a bituminous treatment shall be shaped and bladed to form a satisfactory surface and crown prior to the application of the prime coat. If deemed necessary by the Engineer, the surfaces of such roads shall be scarified, moistened, shaped, bladed, and compacted to prepare the surface properly before the prime coat is applied.

The bituminous treatment of the main sideroads shall be performed in the same manner as required for the main roadway, except with the permission of the Engineer, hand methods may be employed to spread the materials.

The sideroads, entrances, and turnouts to be surfaced with aggregate only shall be shaped and bladed prior to placing the aggregate. The aggregate to be used shall be the cover material as used in the seal course.

614.04 WEATHER AND SEASONAL LIMITATIONS.

Weather and seasonal limitations for priming and sealing shall be those specified for in Section 613.04. In addition, priming shall not be done when the surface contains detrimental moisture.

614.05 METHOD OF MEASUREMENT.

Method of Measurement shall be as specified in Section 613.05.

614.06 BASIS OF PAYMENT.

Basis of payment shall be as specified in Section 613.06.
SECTION 615
DOUBLE BITUMINOUS SURFACE TREATMENT

615.01 DESCRIPTION.

This work shall consist of a wearing surface composed of a bituminous prime coat followed by two applications of bituminous seal coats in accordance with these specifications, as shown on the Plans or established by the Engineer.

BID ITEMS

Cover Material (*)
Cutback Asphalt (*) for (**) 
Emulsified Asphalt (*) for (**) 
Asphalt Cement (*) for (**) 
Manipulation (D.B.S.T.)
Water.

* Designated Type and Grade.
** "Prime" denotes material to be used for prime. "Seal" denotes material to be used for seal.

615.02 MATERIALS.

Materials shall conform to the requirements specified in the Materials Division.

Aggregate for Cover Material .................................. Section 1100
Bituminous Materials ........................................ Section 1200

Aggregate acceptance tests shall be conducted at the final stockpile location.

615.03 CONSTRUCTION REQUIREMENTS.

(a) Preparation of Road Surface.

Preparation of road surfaces shall be as specified in Section 612.

(b) Temperature of Bituminous Materials at Time of Application.

Temperature of bituminous material at the time of application shall be as specified in Section 602.

(c) Prime Coat.

The bituminous prime coat shall be applied as specified in Section 612.
The type, grade and rate of application of the bituminous material shall be as designated on the Plans or ordered by the Engineer.

(d) First Seal Coat.

After the prime coat has thoroughly penetrated the subgrade, the Contractor shall apply the first seal coat of bituminous material and cover material as specified in subsections 613.03 (a) through 613.03 (j).

(e) Second Seal Coat.

Unless otherwise designated on the Plans or in the Contract, the second seal coat shall not be applied until 60 days after the application of the first seal coat.

Immediately prior to the second seal coat application, the surface shall be cleaned of all foreign material and broomed as necessary to remove dust and excess cover material. Care shall be exercised not to dislodge any cover material which is embedded in the bituminous material. The second seal coat shall be applied in accordance with the provisions of "First Seal Coat," as specified above, unless otherwise directed by the Engineer. Brooms shall not be used to shift the cover material until the initial rolling is completed and until the bituminous material has sufficiently cured to hold the cover material. Any rearrangement of the cover material during the initial rolling shall be done by hand methods.

Rolling shall continue until the entire surface has been covered at least four times with a pneumatic roller. Rollers shall be operated at speeds which will not displace the aggregate.

(f) Maintenance of Completed Surface.

The Contractor shall maintain the completed surface for a period of five days after the project or portions of the project are open to traffic. If for reasons beyond the Contractor's control, traffic cannot be routed over the work upon completion of the project the Contractor shall maintain the surface for a period of five days after completion of the second seal coat. Maintenance shall consist of the following:

(1) A light blade equipped with broom drag followed by a pneumatic roller shall make one complete coverage each day of the five days after the project or portions of the project are open to traffic. The daily dragging and rolling may be omitted, if in the opinion of the Engineer, the weather and roadbed conditions are such that the dragging and rolling would not be beneficial to the surface.
(2) Application of additional bituminous material, aggregate, dragging and rolling or all of these operations may be required.

Bituminous material and aggregate ordered by the Engineer, used in the maintenance work, shall be included in the quantities of these materials for which payment is to be made. Additional manipulation required for the maintenance work shall not be paid for separately but shall be considered as subsidiary work pertaining to the item of "Manipulation" included in the Contract.

(g) Treatment of Adjacent Areas.

Treatment of adjacent areas shall be as specified in subsection 614.03 (e).

615.04 WEATHER AND SEASONAL LIMITATIONS.

Weather limitations for priming and sealing shall be those specified in Section 613.04. In addition, priming shall not be done when the surface contains detrimental moisture.

615.05 METHOD OF MEASUREMENT.

Method of measurement shall be as specified in Section 613.05.

615.06 BASIS OF PAYMENT.

Basis of payment shall be as specified in Section 613.06.
SECTION 616
MILLING

616.01 DESCRIPTION.

This work will consist of the removal of the existing surface to the depth and limits shown on the Plans or established by the Engineer. It shall also include the loading and stockpiling, if required, of the milled material. When the item of “Milling” is in the Contract this section shall apply.

BID ITEM
Milling.

616.02 CONSTRUCTION REQUIREMENTS.

The surface will be removed to the required grade line as established by the Engineer by means of equipment which is automatically controlled with regard to grade and slope.

The cross slope of the pavement shall be extended by milling across the shoulder to the point where this line intersects the existing shoulder surface, or to the edge of the shoulder, whichever is less. Shoulders shall be daylighted on the same day as the adjacent travelway pavement is milled.

When milling asphalt down to existing concrete pavement, the final milling operation shall be no more than three kilometers ahead of the laydown operation unless approved otherwise by the Engineer.

616.03 METHOD OF MEASUREMENT.

When shown on the Plans to be measured by the kilometer, the milling will be measured per kilometer regardless of the pavement width and will include the removal, hauling if required and stockpiling of the existing surface. Measurement will be along the centerline of the lanes.

When shown on the Plans to be measured by the square meter, the milling will be measured by the square meter of surface actually milled and will include the removal, hauling if required and stockpiling of the existing surface.

When shown on the Plans to be measured by the metric ton, the milling will be measured by the metric ton of material actually milled and will include the removal, hauling and stockpiling of the existing surface.
The quantity to be paid for will be the number of kilometers, square meter or metric tons of milled material shown on the Plans or as measured in the field.

**616.04 BASIS OF PAYMENT.**

The amount of completed and accepted work, measured as provided above, will be paid for at the Contract unit price per kilometer, square meter or metric ton for "Milling" which price will be full compensation for removal, hauling and stockpiling, if required, for all labor, tools, equipment and incidentals necessary to complete the work.