

SECTION 400

FLEXIBLE SURFACE COURSES

SECTION 401 – AC PATCH, LEVELING AND SURFACE COURSES

401-1 DESCRIPTION

This item shall consist of a patch, leveling, and/or surface course composed of mineral aggregate and bituminous material, mixed in a central mixing plant and placed on a prepared base course in accordance with these specifications and in conformity with the dimensions and typical cross sections shown on the plans and with the lines and grades established by the ENGINEER.

The AC patch, leveling, and/or surface course shall be constructed as shown on the plans in lifts not to exceed 3 1/2 inches in thickness. The 3 1/2-inch maximum lift thickness will be waived if the CONTRACTOR is able to demonstrate by means of a test section that compaction, texture, and surface tolerance can be obtained for a thicker lift. If the result of the test is satisfactory, the ENGINEER will authorize the CONTRACTOR in writing to construct the thicker lift.

401-2 MATERIALS

401-2.3 AGGREGATE. The aggregate shall consist of crushed stone, crushed gravel, gravel, sand gravel, sand, or other natural granular and approved material which have essentially the same qualities and meet all requirements when combined within the limits for gradation.

The aggregate shall be tough, durable, and sound and shall consist of angular fragments reasonably uniform in density and quality. The aggregate shall be free of soil, roots, and other organic matter. The physical characteristics and quality of the materials shall be conditionally approved by the ENGINEER, in stockpile, at the plant site.

Aggregate (fine and coarse) shall be sampled in accordance with ASTM Standard D75 for aggregate sampling.

Aggregate for all gradation shall not contain more than 5 percent (maximum allowable percentage) by weight of lightweight particles in accordance with ASTM Standard C123 for lightweight pieces in aggregate.

The coarse aggregate (that portion retained on the No. 8 sieve) for all gradations shall not show more than 40 percent wear when abraded in accordance with ASTM Standard C131 for Resistance to Degradation by the Los Angeles Abrasion Method. In addition, the coarse aggregate when subjected to five (5) cycles of the soundness test (ASTM

Standard C88) shall have a weighted loss not greater than 12 percent when sodium sulfate is used or 18 percent when magnesium sulfate is utilized.

The minimum weight percentage allowable for that portion of the aggregate retained on the No. 4 sieve shall have at least one fractured face for all mix classes.

401-2.4 FILLER. Filler, if required, shall consist of finely divided mineral matter such as rock dust, slag dust, hydrated lime, hydraulic cement, fly ash, loess, or other suitable material matter and shall conform to ASTM Standard Specification D242 for mineral fillers.

401-2.5 BITUMINOUS MATERIAL. The bitumen shall be 58-28 performance-graded asphalt cement or as approved by the ENGINEER. A certificate of asphalt cement material shall be submitted for each mixture supplied, for each load of asphalt cement delivered to the hot mix plant.

The asphalt cement shall conform to ASTM D946 and shall be mixed at a temperature falling within the range of 250°F to 325°F.

401-2.6 JOB MIX FORMULA. The CONTRACTOR shall submit for the ENGINEER's written approval, a job mix formula for each mixture to be supplied for the project. The job mix formula with the allowable tolerances shall be within the master range specified for the particular type of bituminous material. The job mix formula for each mixture shall establish a single percentage of aggregate passing each required sieve size and a single percentage of bituminous material to be added to the aggregate.

The mineral aggregate for the surface course shall be of such size that the percentage composition by weight as determined by laboratory sieves shall conform to the gradations specified. The final gradations shall be within the designated limits and shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on adjacent sieves or vice versa. The bituminous content of the mixture shall be calculated on a percentage basis by weight of the total mix.

The tabulated composition limits shall govern, but a closer control appropriate to the job materials will be required for the specific project in accordance with the established job mix formula. The following job mix tolerances shall be applied to the job mix formula to establish a job control grading band. The full range of tolerances will still apply if application of the job mix tolerances results in a job control grading band outside the master grading band.

MATERIAL	TOLERANCE
Aggregate passing No. 50 or larger sieves	+ or - 6%
Aggregate passing No. 200 sieves	+ or - 2%
Bitumen Content	+ or - 0.4%
Mixing Temp.	+ or - 20°F

Should a change be made in sources of materials, a new job mix formula shall be established prior to any new materials being used. Should unsatisfactory results or unforeseen conditions make it necessary, a new job mix formula may be established at the discretion of the ENGINEER.

The job mix formula for each mixture shall be in effect until modified in writing by the ENGINEER.

The aggregate shall be accepted in stockpile at the plant site. The bituminous material shall be conditionally accepted at the source. The plant mixed material shall be accepted after blending and mixing at the plant.

When directed by the ENGINEER, the gradation of aggregates for AC Leveling Course, 1 inch or less in thickness, shall be class B with the exception of 100 percent passing the 1/2-inch sieve.

401-3 COMPOSITION OF MIXTURE

The mineral aggregate for the AC leveling and/or surface course shall be of such size that the percentage composition by weight as determined by laboratory sieves will conform to the gradation specified. The percent by weight for the bituminous material shall be within the limits given. The bituminous content of the mixture shall be calculated on a percentage basis by weight of the total mix.

The composition limits tabulated shall govern, but a closer control appropriate to the job materials will be required for the specified project in accordance with job mix formula. The final gradations decided on within the limits designated in the table shall be well graded from coarse to fine and shall not vary from the low limit on one sieve to the high limit on the adjacent sieves or vice versa.

For each appropriate job mix, the mixture shall meet the following requirements according to ASTM Standard D1559 for Marshall Stability plus the stated limitations of voids filled and flow.

	MIX CLASSES		
	Class C	Class B	Class A
No. of Blows (per side)	50	50	50
Stability	750	1200	1650
Flow (hundredth of an inch)	8-18	8-18	8-16
Percent Air Voids			
Base Course	3-8	3-8	3-8
Surface Course	3-5	3-5	3-5
Percent Voids Mineral Aggregate	13 Min	13 Min	13 Min

Determine the maximum theoretical density of each sample taken which shall be used to calculate air voids.

The aggregate shall conform to the following gradations as specified and all requirements contained therein:

AGGREGATE GRADATION

Percent by Weight Passing			
Mix Classes			
Square Mesh Sieve Size	Class C	Class B	Class A
5/8"	100	100	100
1/2"	70-100	70-100	70-100
No. 4	40-70	40-70	40-70
No. 8	33-55	33-55	33-55
No. 16	25-45	25-45	25-45
No. 30	15-35	15-35	15-35
No. 50	10-30	10-30	10-30
No. 200	2-9	2-9	2-9
Shale	5%	5%	5%
LA Abrasion (max)	40%	40%	40%
Plasticity Index (max)	3	3	Non Plastic per AASHTO T-90
Fractured Faces (+No.4)	min. 55%	min. 65%	min. 95%
Crushed Fines (-No.4)	min. 10%	min. 40%	min. 60%

A sample of the coarse and fine aggregates shall be washed to determine the percentage of the total material passing the No. 200 mesh sieve; of the amount of the material passing the No. 200 mesh sieve, at least one-half shall pass the No. 200 mesh sieve by dry sieving.

The percentage of bituminous material by weight to be added to the aggregate shall be specified by the ENGINEER on the basis of preliminary laboratory tests and field sieve analysis.

The minimum percentage of crushed fines material passing a No. 4 sieve shall be composed of fractured material produced by a crushing process. The CONTRACTOR shall demonstrate that the crushing operation produces this result.

The mixture of the AC Leveling Course shall contain a bituminous oil content 0.2 percent more than the job mix formula for AC Surface Course (Class B).

401-4 EQUIPMENT

401-4.1 EQUIPMENT AND ORGANIZATION. All methods and equipment tools, plants, and machinery used for handling materials and executing any part of the work shall be subject to the approval of the ENGINEER before the work is started. If unsatisfactory, they shall be changed and improved as required.

401-4.2 BITUMINOUS MIXING PLANT. GENERAL. Adequate storage space shall be provided to prevent intermingling of the stockpiles containing separated aggregate sizes until the aggregates are delivered into the plant. The various units of the plant shall be designed and coordinated to permit uniform, uninterrupted production under the normal operating conditions. The plant shall be provided with means for readily obtaining representative samples and for calibrating and checking the proportions of each ingredient used in the mixture.

(a) Requirements for all Plants. Mixing plants shall be of sufficient capacity and coordinated to adequately handle the proposed bituminous construction.

(1) Plant Scales. Scales shall be accurate to within 0.5 percent of the required maximum load. Poises shall be designated to be locked in any position to prevent unauthorized change of position. In lieu of plant and truck scales, the CONTRACTOR may provide an approved automatic printer system to print the weights of the material delivered, provided the system is used in conjunction with an approved automatic batching and mixing control system. Such weights shall be evidenced by a weigh ticket for each load. Scales shall be inspected and sealed as often as the ENGINEER may deem necessary to assure their continued accuracy. The CONTRACTOR shall have on hand not less than ten 50-pound weights for testing the scales.

(2) Equipment for Preparation of Bituminous Material. Tanks for the storage of bituminous material shall be equipped to heat and hold the material at the required temperatures. Heating shall be accomplished by steam coils, electricity, or other approved means so that flame(s) will not contact the tank. The circulating system for the bituminous material shall be designed to assure proper and continuous circulation during the operating period. Provision shall be made for measuring and sampling storage tanks.

(3) Feeder for Dryer. The plant shall be provided with accurate mechanical means for uniformly feeding the aggregate into the dryer to obtain uniform production and temperature.

(4) Dryer. The plant shall include a dryer(s) which continuously agitates the aggregate during the heating and drying process.

(5) Screens. Plant screens, capable of screening all aggregate to the specified sizes and proportion and having normal capacities in excess of the full capacity of the mixer, shall be provided.

(6) Bins. The plant shall include storage bins of sufficient capacity to supply a mixer operating at full capacity. Bins shall be arranged to assure separate and adequate storage of appropriate fractions of the mineral aggregates. When used, separate dry storage shall be provided for filler or hydrated lime, and the plant shall be equipped to feed such material into the mixer. Each bin shall be provided with overflow pipes of such size and at such location to prevent backup of material into other compartments or bins. Each compartment shall be provided with its own individual outlet gate constructed so as to prevent leakage. The gates shall cut off quickly and completely. Bins shall be so constructed that samples may be obtained readily. Bins shall be equipped with adequate telltale devices which indicate the position of the aggregates in the bins at the lower quarter points.

(7) Bituminous Control Unit. Satisfactory means, either by weighing or metering, shall be provided to obtain the specified amount of bituminous material in the mix. Means shall be provided for checking the quantity or rate of flow of bituminous material into the mixer.

(8) Thermometric Equipment. Dual armored thermometers of adequate range shall be fixed in the bituminous feed line at a suitable location near the charging valve of the mixer unit.

The plant shall also be equipped with an approved thermometric instrument placed at the discharge chute of the dryer to indicate the temperature of the heated aggregates. The ENGINEER may require replacement of any thermometer by an approved temperature recording apparatus for better regulation of the temperature of aggregates.

(9) Dust Collector. The plant shall be equipped with a dust collector to waste or return uniformly to the hot elevator all or any part of the material collected.

(10) Truck Scales. The bituminous mixture shall be weighed on an approved scale furnished by the CONTRACTOR or on public scales at the CONTRACTOR's expense. Scales shall be inspected and sealed as often as the ENGINEER deems necessary to assure their accuracy.

(11) Safety Requirements. Adequate and safe stairways to the mixer platform and sampling points shall be provided, and guarded ladders to other plant units shall be placed at all points where accessibility to plant operations is required. Accessibility to the top of truck bodies shall be provided by a suitable device to enable the ENGINEER to obtain samples and mixture temperature data. Means shall be provided to raise and lower scale calibration equipment, sampling equipment, and other similar equipment between the ground and the mixer platform. All gears, pulleys, chains, sprockets, and other dangerous moving parts shall be thoroughly guarded. Ample and unobstructed passage shall be maintained at all times in and around the truck loading area. This area shall be kept free of dripping from the mixing platform.

(b) Cold Feed Control. The CONTRACTOR may elect to operate the hot plant without plant screens. The basic requirements of this method of operation are to remove all

plant screens with the exception of the scalping screen. Permission to continue under this option may be rescinded upon failure to maintain production within the specified gradation limits.

The volume or tonnage placed in each of the two or more stockpiles shall be such a significant portion of the whole tonnage produced as to enable adequate control of the gradation within the job mix formula.

Each individual aggregate shall be fed through a separate feeder that has a positive feed and that can be easily and accurately calibrated. The feed shall be quick adjusting and shall maintain a constant and uniform flow throughout the range of its calibration.

(1) Batch Plants and Continuous Mix Plants. The point of acceptance for the physical properties of the aggregates will be in the stockpiles at the plant site. Acceptance testing for aggregate gradation will be performed just prior to the addition of bituminous material to the mixture.

In batch mix plants, a surge bin shall be provided between the dryer and the batch plant and the discharge into the weigh hopper shall be from one bin only which shall discharge into the center of the weigh hopper. The amount of aggregate stored in the bin at any one time shall not exceed one batch in weight and shall be fed into the bin in a manner that will prevent sluffing and segregation.

In continuous mix plants, a surge bin and mechanical feeder shall be provided. The storage in each bin used shall be limited in amount so that sluffing and segregation will not occur. If more than one bin is used, separation shall be accomplished in such a manner as to insure flow to each bin and preclude segregation of the total material as obtained from the individual bins.

(c) Dryer Drum Plants. An approved dryer drum mixing process will be permitted in lieu of pugmill mixing. The system shall provide positive weight control of the cold aggregate feed by use of a belt scale or other device which will automatically regulate the feed gate and permit instant correction of variations in load. The cold feed flow shall be automatically coupled with the bitumen flow to maintain the required proportions. Proportioning shall be within the tolerances specified in the job mix formula. The system shall be equipped with automatic burner controls and shall provide for temperature sensing of the bituminous mixture at discharge.

The moisture contents of the bituminous mixture at discharge from the mixer shall not exceed 3 percent. The temperature of the bituminous mixture at discharge from the mixer shall not exceed 300°F. The temperature of the mix at laydown shall be not less than 180°F. The actual mixing temperature shall be adjusted as directed by the ENGINEER within the allowable limitations to best suit construction conditions.

401-4.3 HAULING EQUIPMENT. Trucks used for hauling bituminous mixtures shall have tight, clean, smooth metal beds which have been lightly coated with a minimum amount of paraffin oil, lime solution, or other approved material to prevent the mixture

from adhering to the beds. In adverse weather, each truck shall have a suitable cover to protect the mixture.

401-4.4 BITUMINOUS PAVERS. Bituminous Pavers shall be self-contained, power-propelled units, provided with an activated screed or strike-off assembly, heated if necessary. It shall be capable of spreading and finishing courses of bituminous plant mix material which will meet the specified thickness, smoothness, and grade. The paver shall be capable of spreading and finishing courses of bituminous plant mix material in lanes not less than 10 feet in width and shall be capable of operating at forward speed consistent with satisfactory laying of the mixture.

The paver shall have a receiving hopper of sufficient capacity for a uniform spreading operation. The hopper shall be equipped with a distribution system to place the mixture uniformly in front of the screed.

The screed or strike-off assembly shall effectively produce a finished surface of the required evenness and texture without tearing, shoving or gouging the mixture.

401-4.5 ROLLERS. Rollers shall be in good condition, capable of reversing without backlash, and shall operate at slow speeds to avoid displacement of the bituminous mixture. The number, type, and weight of rollers used shall be sufficient to compact the mixture to the required density while the mixture is still in a workable condition. The use of equipment which results in excessive crushing of the aggregate will not be permitted.

401-5 CONSTRUCTION REQUIREMENTS

401-5.1 WEATHER AND SEASONAL LIMITATIONS. The AC Patch, Leveling or Surface Course shall be constructed only when the surface is dry, the atmospheric temperature is above 40°F, and the weather is not foggy or rainy. The temperature requirement may be waived, but only when so directed by the ENGINEER.

401-5.2 PREPARATION OF BITUMINOUS MATERIAL. The bituminous material shall be heated to the mixing temperature specified in Subsection 401-2.3 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.

401-5.3 PREPARATION OF MINERAL AGGREGATE. The aggregate for the mixture shall be dried and heated at the paving plant before entering the mixer. When introduced into the mixer, the combined aggregate shall not contain more than 0.5 percent moisture. Water in the aggregate shall be removed by heating to the extent that there is no subsequent foaming in the mixture prior to the placing of material. The aggregate shall be heated to temperature as designated by the job formula within the job tolerance specified. The maximum temperature and rate of heating shall be such that no permanent damage occurs to the aggregates. Particular care shall be taken that aggregates high in calcium or magnesium content are not damaged by heating. The aggregate shall be screened to specified sizes and conveyed into separate bins ready for mixing with bituminous material.

401-5.4 PREPARATION OF BITUMINOUS MIXTURE. Before delivery, the aggregate shall be mixed with the bituminous material at a central mixing plant. The mixture shall be prepared at a temperature as shown in Subsection 401-2.3.

The dry aggregates, prepared as specified in Subsection 401-5.3, shall be combined in the plant in proportionate amounts of each fraction of aggregate required to meet the specified gradation. The quantity of aggregate for each batch shall be determined, measured, and conveyed into the mixer. In case of volumetric proportioning, the size of the grate openings shall be determined and the gates locked in position.

The quantity of bituminous material for each batch of calibrated amount shall be determined by the ENGINEER. The bituminous material shall be measured by weight or volume and introduced into the mixer at the specified temperature using the lowest range possible for adequate mixing and spreading. For batch mixers, all mineral aggregates shall be in the mixer before the bituminous material is added. The exact temperature within the specified range shall be fixed by the ENGINEER. As determined by the ENGINEER, the mixing shall continue for the time necessary to coat all particles uniformly. This time is dependent upon the mix designs and the type of mixing equipment used.

401-5.5 TRANSPORTATION AND DELIVERY OF THE MIXTURE. The mixture shall be transported from the mixing plant to the point of use in vehicles such as described in Subsection 401-4.3.

The mixture shall be placed at a minimum temperature of 180°F. When mixture is being placed during warm weather, and the ENGINEER has determined that satisfactory results can be obtained at lower temperatures, he may direct that the mixture be mixed and delivered at the lower temperatures.

Loads shall not be sent out so late as to interfere with spreading and compacting the mixture during daylight unless artificial light satisfactory to the ENGINEER is provided. The mixture shall be delivered at a temperature within the tolerance specified in the approved job formula.

401-5.6 SPREADING AND LAYING

(a) Preparation for Placing. Immediately before placing the bituminous mixture, the existing underlying course shall be cleaned of loose or deleterious materials and tacked in accordance with Section 402.

The mixture shall be laid only upon an approved underlying course which is dry and only when weather conditions are suitable. No mixture shall be placed when air temperature away from the artificial heat is 40°F or lower, unless so directed by the ENGINEER. The ENGINEER may, however, permit work of this character to continue when overtaken by sudden rains up to the amount which may be in transit from the plant at the time provided the mixture is within the temperature limits specified.

Placing shall commence at the point(s) farthest from the mixing plant and progress continuously toward the plant unless otherwise ordered by the ENGINEER. Hauling over material already placed shall not be permitted until the material has been thoroughly compacted as specified and allowed to cool to atmospheric temperature.

(b) Machine Spreading AC Leveling Course. The AC Leveling Course material that has been processed in a plant shall be placed on the prepared underlying course and compacted in layers of the thickness shown on the plans. The depositing and spreading of the material shall commence where designated and shall progress continuously without breaks. The material shall be deposited and spread in lanes in a uniform layer and without segregation of size to such loose depth that when compacted, the layer shall have the required thickness.

The leveling course material shall be spread in a uniform layer of required depth and width and to the typical cross section. The spreading shall be by a self-powered blade grader, mechanical spreader, or other approved method. In spreading, care shall be taken to prevent cutting into the underlying layer. The material shall be bladed until a smooth, uniform surface is obtained, true to line and grade.

When a self-powered blade grader is used, the policy is to not permit the application of the AC Leveling Course when the atmospheric temperature is less than 75°F. The self-powered blade grader must also be equipped with radial or smooth tires when used for the application of the AC Leveling Course.

When the depth leveled is greater than 1 inch, AC Surface Course shall be applied to a depth within 1 inch or less of finished grade and the remaining portion filled with AC Leveling Course. The AC Leveling Course Material as spread shall be of uniform grading with no pockets of fine or coarse materials. The material, unless otherwise permitted by the ENGINEER, shall not be spread more than 1,000 square yards in advance of the rolling. Any necessary sprinkling shall be kept within these limits.

When more than one layer is required, the construction procedure described herein shall apply similarly to each layer.

(c) Machine Spreading AC Surface Course. Upon arrival, the AC Surface Course shall be dumped into an approved bituminous paver and immediately spread to the full width required. It shall be struck off in a uniform layer of such depth that when the work is completed, it will have the required thickness and will conform to the grade and surface contour required. The speed of the paver shall be regulated to eliminate the pulling and tearing of the bituminous mat.

The mixture shall be placed in strips of a minimum width of 10 feet. To insure proper drainage, the spreading shall begin along the centerline of the pavement on a crowned section or on the high side of the pavement with a one-way slope. After the first strip or width has been compacted, the second width shall be placed, finished, and compacted in the same manner as the first width. After the second strip has been placed and

rolled, a 10-foot straightedge shall be placed across the longitudinal joint to determine if the surface conforms to grade and contour requirements.

Exposed vertical edges of paved strips shall be free of all accumulations of dirt or other foreign material before any mixture is spread in an adjacent lane. If joint faces become dry or dusty, the contact surfaces shall be given a brush coat of asphalt. In lieu of painting the contact surfaces, the CONTRACTOR may use a joint heater approved by the ENGINEER. If the spreading machine should drift from an adjacent lane during construction, the unfilled space shall be carefully filled with fresh hot mixture obtained from trucks or the hopper of the spreading machine. Stealing mixture from that already spread to fill up these areas shall not be permitted.

In limited areas where due to irregularities or unavoidable obstacles the use of mechanical spreading and finishing equipment is not practical, the mixture may be hand spread.

When hand spreading is permitted, the mixture shall be dumped on approved dump sheets outside the area upon which it is to be spread and then distributed into place immediately using hot shovels. It shall be spread with hot rakes in a uniformly loose layer to the full width required and of such depth that when the work is completed, it will have the required thickness and will conform to the grade and surface contour shown on the plans.

(d) AC Patch. AC Patch cuts will be designated and marked by the ENGINEER. The CONTRACTOR shall make all cuts with a saw or other approved method so as to obtain a vertical face on the remaining asphalt. The cuts shall be made to a depth so as not to disturb the remaining asphalt during removal of the patch area.

Removal of the patch area on joint failures shall be done by means of a pavement milling machine.

The type of failure shall be determined after the asphalt has been removed and the base inspected. After the base has been inspected, the CONTRACTOR may be required to enlarge the cut area if the subbase conditions warrant doing so.

Areas of AC pavement or subbase failures shall be repaired to the following dimensions per attached details:

AC Pavement Failure

- A minimum of 4½ inches deep, or the depth of the existing pavement (whichever is greater).
- A maximum of 4 inches wide along traverse and longitudinal cracks. Pavement removed shall be disposed of by the CONTRACTOR and the cost considered incidental to the unit price per ton for 401-6.3 AC Patch. Replacement of the patch

area shall be done as per Standard Detail No. 1305 Typical Joint Failure Repair in accordance with 401-6.3 Patch.

- Areas larger than 4 inches wide or as large as necessary to correct other failed areas. Pavement removed shall be done in accordance with 406-4.1 Asphalt Removal and disposed of by the CONTRACTOR. Replacement of the patch area shall be done as per Standard Detail No. 1305 AC Pavement Failure in accordance with 304-6.1B AC Stabilized Base (Class B) and 401-6.21B AC Surface Course (Class B).

AC Pavement Surface Failure

The CONTRACTOR may be required to remove the Surface Course only in areas of surface failures to a maximum depth of 2 inches. Removal of the pavement failure shall be done by means of a pavement milling machine and in accordance with 404-4.1 Milling Pavement Surface. Replacement of the milled area shall be done in accordance with 401-6.21B AC Surface Course (Class B).

Subbase Failure

- Excavate to 12 inches minimum or 36 inches maximum depth.
- **On areas less than 4 feet wide** - The excavation shall be done as per Standard Detail No. 1305 Subbase Failure in accordance with Section 202 Excavation and Embankments and the cost considered incidental to the unit price per ton for 302-4.1 Stabilized Gravel Base.
- After excavating the subbase failure, the area shall be backfilled with stabilized gravel base, as specified under Section 302 within 6 inches of finished grade and the remaining portion of the excavation backfilled with 3½ inches AC Stabilized Base and 2½ inches AC Surface Course.
- Pavement removed shall be disposed of by the CONTRACTOR and the cost considered incidental to the unit price per ton for 401-6.3 AC Patch. Replacement of the patch area shall be done in accordance with 304-6.1B AC Patch.
- **On areas 4 feet wide or larger** - The excavation shall be done as per Standard Detail No. 1305 Subbase Failure in accordance with Section 202 Excavation and Embankments and the cost considered incidental to the unit price per ton for 302-4.1 Stabilized Gravel Base.
- Pavement removed shall be made in accordance with 406-4.1 Asphalt Removal.
- After excavating the subbase failure, the area shall be backfilled with stabilized gravel base, as specified under Section 302 within 6 inches of finished grade and the remaining portion of the excavation backfilled with 3½ inches AC Stabilized Base and 2½ inches AC Surface Course.

- Replacement of the patch area shall be done in accordance with 304-6.1B AC Stabilized Base (Class B) and 401-6.21B AC Surface Course (Class B).

The asphalt pavement of streets which have an asphalt overlaying on a concrete base shall be repaired in accordance with AC Pavement Failure to a minimum depth of overlay. When the concrete base requires repair, removal shall be done in accordance with 602-4.3 Driveway Removal. Replacement of the concrete shall be done in accordance with 602-4.1 6-inch Concrete Driveway. The replacement depth shall be equal to the existing concrete pavement thickness with a minimum thickness of 4 inches.

401-5.7 COMPACTION OF MIXTURES. After spreading, the mixture shall be thoroughly and uniformly compacted with power rollers as directed by the ENGINEER. Rolling of the mixture shall begin as soon after spreading as it will bear the roller without undue displacement or hair checking. On the first strip spread, rolling shall start in the center and continue toward either edge. On subsequent strips laid, rolling shall start on the edge adjacent to previously laid material and continue toward the opposite edge.

Initial rolling shall be done longitudinally. The rollers shall overlap on successive trips. Alternate trips of the roller shall be of slightly different lengths and cross rolling shall not exceed more than one-half the width of the pavement or crowned sections. The speed of the roller shall at all times be slow to avoid displacement of the hot mixture. Any displacement occurring as a result of reversing the direction of the roller or from any other cause shall be corrected at once by rakes and fresh mixture.

Sufficient rollers shall be furnished to handle the output of the plant. Rolling shall continue until all roller marks are eliminated, the surface is of uniform texture and true to grade and cross section, and a density of at least 95 percent of the laboratory density specified in the job mix formula per Subsection 401-2.6 is obtained.

To prevent adhesion of the mixture to the roller, the wheels shall be kept properly moistened, but excessive water will not be permitted.

In areas not accessible to the roller, the mixture shall be thoroughly compacted with hot hand tampers.

Any mixtures which become loose and broken, mixed with dirt, or in any way defective prior to the application of the finish coat shall be removed and replaced with fresh hot mixture and immediately compacted to conform with the surrounding area. This shall be done at the CONTRACTOR's expense.

401-5.8 JOINTS

(a) General. The mixture at the joints shall comply with the surface requirements and present the same uniformity of texture, density, smoothness, etc., as other sections of the course. In the formation of all joints, provision shall be made for proper bond with

the adjacent course for the specified depth on the course. Joints shall be formed by cutting back on the previous day's run to expose the full depth of the course. The exposed edge shall then be given a light paint coat of asphalt as required by the ENGINEER and the fresh mixture raked against the joint, thoroughly tamped with tampers and rolled.

(b) Transverse. The placing of the course shall be as continuous as possible. The roller shall pass over the unprotected end of the freshly laid mixture only when discontinuing the laying of the course.

(c) Longitudinal. The placing of the course shall be as specified and in such a manner that the joint is exposed for the shortest period possible. The joint shall be placed so that it will not coincide with that in the base, binder, or existing surface course by at least 1 foot.

401-5.9 SHAPING EDGES. While the surface is being compacted and finished, the CONTRACTOR shall carefully trim the outside edges of the pavement to the proper alignment. The edges so formed shall be beveled while still hot with the back of the rake or a smoothing iron and thoroughly compacted by tampers or by other satisfactory methods.

401-5.10 SURFACE TESTS. Tests for conformity with the specified crown and grade shall be made by the CONTRACTOR immediately after initial compression. Any variation shall be corrected by the removal or addition of materials and by continuous rolling.

The finished surface shall not vary more than 3/8 inch when tested with a 10-foot straight edge applied parallel with or at right angles to the centerline. The surface tolerance for blade laying shall be 3/8 inch in 10 feet.

After the completion of final rolling, the smoothness of the course shall again be tested; the humps or depressions exceeding the specified tolerances or that retain water on the surface shall be corrected immediately as directed by the ENGINEER; this shall be done at the CONTRACTOR's expense.

401-5.11 DENSITY AND TESTING REQUIREMENTS FOR BITUMINOUS PAVEMENTS. The CONTRACTOR shall engage an independent testing laboratory approved by the ENGINEER to test the composition of the mixtures, the mineral aggregates, and the in-place density of the mixture.

(a) Density. AC Surface Course shall be compacted to 95 percent of Marshall Density. The density of the compacted bituminous pavement shall be determined in sublots of 1,500 square yards per each lift.

Each day's haul will be considered a "lot," and each "lot" shall be divided into acceptance sublots not to exceed 1,500 square yards, unless the control strip method outlined below is used. Densities per subplot will be taken at random with a minimum of

one (1) nuclear density per subplot, and the mean density in each subplot shall equal or exceed the specified density. A minimum of 10 percent of the sublots shall be cored.

Sublots for AC Patch shall not exceed 150 square yards for areas that are a minimum of 4 feet x 4 feet in size. Areas less than 4 feet x 4 feet in size, sublots shall not exceed 75 square yards. Density tests shall be required for AC Surface Course when the depth leveled is greater than 1 inch. Frequency of tests shall be one (1) per 250 tons AC Surface Course.

Densities shall be taken by a Nuclear Gauge Tester in accordance with ASTM D2950 or by the Coring Method.

Compaction methods and equipment used shall be approved by the ENGINEER.

During the course of bituminous pavement construction, it may be deemed necessary by the ENGINEER to verify pavement composition and/or the results obtained by the Nuclear Density Tester. This will be accomplished by removing suitable sized samples of the completed pavement. The CONTRACTOR shall remove the samples and replace the pavement at no extra charge. If the pavement is deficient in composition, compaction, or thickness, satisfactory correction shall be made immediately.

Should the CONTRACTOR require any of the above verification sampling, he may do so provided he agrees to assume all costs incurred including the testing of the sample.

(b) Control Strip Method. If the ENGINEER determines that through the CONTRACTOR's efforts and the test results the specified percent of Marshall Density cannot be obtained, a control strip shall be used to establish the density criteria for the particular pavement area involved.

The subbase on which the control strip is to be constructed shall be approved by the ENGINEER prior to the construction of said strip. The ENGINEER may abandon the control strip criteria or require a new control strip when a change in materials or a change in construction methods is observed.

The control strip shall be constructed with blended materials meeting specifications and approved by the ENGINEER. The control strip shall cover not less than 300 square yards at the specified pavement depth and shall remain in place as part of the completed work.

Compaction of the control strip shall begin as soon as possible after the mixture is placed. Compaction shall be uniform over the entire surface. During compaction, pavement densities will be determined by the CONTRACTOR with a portable nuclear device. When the ENGINEER determines density increases less than 1 lb. per cubic foot per roller pass, the rolling shall cease provided a minimum of three (3) roller coverages have been completed. Roller or rollers shall be approved by the ENGINEER. The mean density shall be determined by ten (10) random density tests

within the control strip. The control strip density determination shall be the responsibility of the CONTRACTOR.

The remainder of the work in which the control strip is to govern shall be divided into acceptance strips containing no more than 1,500 square yards. The density of each acceptance strip shall be obtained by the results of five (5) nuclear densities, the mean density of which shall not be less than 98 percent of the control strip density accepted by the ENGINEER. No individual test shall be less than 95 percent of the control strip density.

If the mean density of the acceptance strip does not conform to the requirements stated herein, or if an individual test value does not meet the requirements stated herein, the CONTRACTOR shall continue its compactive effort until the required density is obtained.

It is intended that acceptance density testing will be accomplished while the bituminous mixture is hot enough to permit further densification if such is shown to be necessary.

After the required density has been attained in the acceptance strips, further finish rolling may be necessary to remove roller marks or other surface irregularities.

The ENGINEER reserves the right to require testing of individual areas which are apparently defective based upon visual examination and to reject any area that does not have at least 95 percent of the mean density of the control strip.

All other testing shall be in accordance with the Standard Specifications, Special Provisions contained herein, and the project plans.

(c) Testing of Aggregate and Bituminous Mixture. One (1) dry belt sample shall be taken in accordance with ASTM D75 for each increment of 1,000 tons of bituminous pavement produced with a minimum of one (1) dry belt sample taken and tested per day. The dry sample shall be tested for gradation in accordance with Section 401-3 of the Standard Specifications. One (1) dry belt sample shall be taken for each increment of 50 tons of AC Patch and one (1) for each increment of 100 tons of AC Leveling Course produced, with a minimum of one (1) dry belt sample taken and tested per day on each material produced.

A minimum of one (1) bituminous mixture sample shall be taken per day in accordance with ASTM D979 for each increment of 1,000 tons of bituminous pavement produced. The bituminous mixture shall be tested in accordance with ASTM D1559 for marshall properties of unit weight, stability, flow, voids - total mix and voids filled. The bituminous mixture shall also be tested to determine the bitumen content by an extraction in accordance with ASTM D2172. The gradation of the mineral aggregate shall also be determined after the extraction is made. One (1) bituminous mixture sample shall be taken for each increment of 50 tons of AC Patch and one (1) for each increment of 100 tons of AC Leveling Course.

The CONTRACTOR must keep track of daily tonnages of each material produced and a total tonnage to date quantity. This tonnage information along with the asphalt cement (cutoff) percentage must be completed on a form which can be acquired at the City of Mandan Engineering Department, and sent to the testing laboratory before 9:00 a.m. the next day. The testing laboratory SHALL then test the material properties, fill out the remainder of the form, then forward it back to the CONTRACTOR and then to the CITY OF MANDAN. Communication between the CONTRACTOR, testing laboratory, and the CITY is essential. The testing laboratory must be notified at least one (1) hour prior to any paving activities. If the CONTRACTOR's paving activities extend beyond 5:00 p.m. or on weekends, the CITY and the testing laboratory shall be notified prior to 4:00 p.m. that day.

Test for percent of fractured faces will be determined by the percentage of fractured faces for each dry belt sample taken.

(d) Payment and Reports. The cost of all said testing shall be considered incidental to other bid items.

The time, locations, depths, and frequency of testing shall be at the discretion of the ENGINEER during construction. Should it become necessary to require an additional number of initial tests over and above the frequency specified herein, the CITY OF MANDAN will assume the responsibility to perform said additional testing, except as outlined herein under "Compaction."

The CONTRACTOR, however, will be required to assume the cost of all testing to determine the limits of an area not meeting specifications and subsequent retesting of said area after corrections have been completed.

Written reports of all results shall be supplied to the ENGINEER and the CONTRACTOR by the testing laboratory as soon as possible. To expedite construction progress, it is necessary that the CONTRACTOR and ENGINEER be furnished with the results of all tests as soon as testing is completed.

The availability of the independent testing laboratory when needed and speed of testing and reporting are to be considered the responsibility of the CONTRACTOR.

401-5.12 BITUMINOUS AND AGGREGATE MATERIAL CONTRACTOR'S RESPONSIBILITY. Samples of the bituminous and aggregate materials that the CONTRACTOR proposes to use, together with a statement of their source and character, shall be submitted to the ENGINEER; approval must be obtained before the use of such material begins. The CONTRACTOR shall require the manufacturer or producer of the bituminous and aggregate materials to furnish material subject to this and all other pertinent requirements of the contract. Only those materials that have demonstrated performance under the proposed design requirements will be accepted.

The ENGINEER or his authorized representative shall have access at all times to all parts of the paving plant for the purpose of inspecting equipment, conditions, and

operation of the plant for verification of weights or proportions and character of materials and to determine temperature maintained in the preparation of the mixtures.

The CONTRACTOR shall furnish vendor's certified test reports for each tanker, carload, or equivalent of bitumen shipped to the project. The report shall be delivered to the ENGINEER before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing samples of material received for use on the project.

401-5.13 AC TRANSVERSE CRACK LEVELING. The AC Transverse Crack Leveling is to be applied only to displaced or settled transverse cracks that require leveling. The ENGINEER will mark locations for AC transverse crack leveling. The crack leveling will be completed only after the crack sealing or filling operations are completed. The leveling course shall be applied along the entire crack (if required) with a minimum width of 2.0' or the width of the existing settlement, whichever is greater. A Bituminous Tack Coat must be applied prior to the transverse crack leveling. The material used for AC Transverse Crack Leveling shall be AC Leveling Course.

401-6 MEASUREMENT AND PAYMENT

401-6.1 AC LEVELING COURSE (CLASS). The AC Leveling Course material shall be measured by the ton of bituminous mixture and paid for at the unit price bid for "AC Leveling Course (Class)" complete in place and accepted by the ENGINEER. No deduction will be made for the weight of the asphalt cement in the mixture. Batch weights will not be permitted for method of measurement.

401-6.2 AC SURFACE COURSE (CLASS). The AC Surface Course material shall be measured by the ton of bituminous mixture and paid for at the unit price bid for "AC Surface Course (Class)" complete in place and accepted by the ENGINEER. No deduction will be made for the weight of the asphalt cement in the mixture. Batch weights will not be permitted for method of measurement.

401-6.3 AC PATCH (CLASS). The AC Patch material shall be measured by the ton of bituminous mixture and paid for at the unit price bid for "AC Patch (Class)" complete in place and accepted by the ENGINEER. No deduction will be made for the weight of the asphalt cement in the mixture. Batch weights will not be permitted for method of measurement.

401-6.4 ASPHALT CEMENT. The Asphalt Cement shall be measured by weighing which shall then be converted to gallons at 60°F based on the unit weight shown on the certified analysis report of each tanker shipped. Payment shall be made at the unit price bid per gallon (GAL) for "Asphalt Cement."

401-6.5 AC TRANSVERSE CRACK LEVELING. The AC Transverse Crack Leveling material shall be measured by the ton of bituminous mixture and paid for at the Unit Price Bid for "AC Transverse Crack Leveling" complete in place and accepted by the

ENGINEER. No deduction will be made for the weight of the asphalt cement in the mixture. Batch weights will not be permitted for methods of measurements. Bituminous Tack Coat shall be paid under a separate bid item.

SECTION 402 – BITUMINOUS PRIME OR TACK COAT

402-1 DESCRIPTION

This item shall consist of supplying and applying bituminous material to a previously prepared, bonded, and/or bituminized binder, leveling, or base course or existing pavement in accordance with these specifications and to the width shown on the typical cross section on the plans.

402-2 MATERIALS

402-2.1 QUANTITY OF MATERIAL. The approximate amount of bituminous material per square yard for Prime or Tack Coat shall be as provided in the following table. The exact amount shall be as ordered by the ENGINEER.

<u>Material</u>	<u>Amount</u>
Bituminous Prime Coat	0.25 to 0.05 Gal./sq. yd.
Bituminous Tack Coat	0.05 to 0.20 Gal/sq. yd.

402-2.2 BITUMINOUS MATERIAL. The types, grades, controlling specifications, and application temperatures for the bituminous materials are shown in the following table. The specific material to be used shall be designated by Special Provision or by the ENGINEER. The supplier of the bituminous material shall supply asphalt viscosity charts for the material delivered.

PRIME COATS

<u>Type and Grade</u>	<u>Specification</u>	<u>Application Temperature</u>
MC-30	ASTM D2027 (MC)	85°-140°F
MC 70	ASTM D2027 (MC)	120°-175°F

TACK COATS

<u>Type and Grade</u>	<u>Specification</u>	<u>Application Temperature</u>
SS-1, SS-1h	ASTM D977	75°-130°F

402-3 CONSTRUCTION REQUIREMENTS

402-3.1 WEATHER LIMITATIONS FOR PRIME COAT. The prime coat shall be applied only when the existing surface is dry or contains sufficient moisture to get uniform distribution of the bituminous material when the atmospheric temperature is above 60°F and when the weather is not foggy or rainy. The temperature requirements may be waived, but only when so directed by the ENGINEER.

402-3.2 WEATHER LIMITATION FOR TACK COAT. The tack coat shall be applied only when the existing surface is dry, the weather is not foggy or rainy, and the atmospheric temperature is above 40°F. The temperature requirements may be waived, but only when so directed by the ENGINEER with the use of an approved alternate bituminous material.

402-3.3 EQUIPMENT. The equipment used by the CONTRACTOR shall include a self-powered pressure bituminous material distributor and equipment for heating bituminous material.

The distributor shall have pneumatic tires of such width and number that the load produced on the surface shall not exceed 650 pounds per inch of tire width and shall be designed, equipped, and operated so that bituminous material at even heat can be applied uniformly on variable widths of surface at readily controlled rates from 0.05 to 0.5 gallons per square yard. The material shall be applied within a pressure range from 25 to 75 pounds per square inch and with an allowable variation from any specified rate not to exceed 5 percent. Distributor equipment shall include a thermometer for reading temperatures of tank contents, a tachometer, pressure gauges, and volume measuring devices.

402-3.4 APPLICATION OF BITUMINOUS MATERIAL. Immediately before applying the tack or prime coat, the full width of surface to be treated shall be swept with a power broom to remove all loose dirt and other objectionable material.

The application of the bituminous material shall be made by means of a pressure distributor at the pressure, temperature, and in the amounts directed by the ENGINEER.

During all applications, the surfaces at adjacent structures shall be protected in such a manner as to prevent their being spattered, marred, or tacked.

Tack coat shall be applied to all cold joints including concrete edges prior to asphaltic pavement construction.

Following the application, the surface shall be allowed to cure without being distributed for such period of time as may be necessary to permit drying out and setting of the tack or prime coat. This period shall be determined by the ENGINEER. The surface shall then be maintained by the CONTRACTOR until the next course has been placed. Suitable precautions shall be taken by the CONTRACTOR to protect the surface against damage during this interval, including any sand necessary to blot up excess bituminous material.

402-3.5 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY. Samples of the bituminous material that the CONTRACTOR proposes to use, together with a statement as to its source and character, must be submitted and approved before use of such material begins. The CONTRACTOR shall require the manufacturer or producer of the bituminous material to furnish material subject to this and all other

pertinent requirements of the contract. Only satisfactory materials so demonstrated by service tests shall be acceptable.

The CONTRACTOR shall furnish vendor's certificate test reports for each carload or equivalent of bituminous material shipped to the project. The report shall be delivered to the ENGINEER before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance. All such test reports shall be subject to verification by testing samples of material received for use on the project.

402-3.6 FREIGHT AND WEIGH BILLS. Before the final estimate is allowed, the CONTRACTOR shall file with the ENGINEER receipted bills when railroad shipments are made, and certified weight bills when materials are received in any other manner of the bituminous materials actually used in the construction covered by the contract.

Copies of the freight bills and weigh bills shall be furnished to the ENGINEER during the progress of the work.

402.4 MEASUREMENT AND PAYMENT

402-4.1 BITUMINOUS PRIME COAT. Bituminous Prime Coat shall be measured by weighing which shall then be converted to gallons at 60°F based on the unit weight shown on the certified analysis report on each car. Payment shall be made at the unit price bid per gallon (GAL) for "Bituminous Prime Coat" complete in place and accepted by the ENGINEER.

402-4.2 BITUMINOUS TACK COAT. Bituminous Tack Coat shall be measured by weighing which shall then be converted to gallons at 60°F based on the unit weight shown on the certified analysis report on each car. Payment shall be made at the unit price bid per gallon (GAL) for "Bituminous Tack Coat" complete in place and accepted by the ENGINEER.

SECTION 403 – BITUMINOUS SEAL

403-1 DESCRIPTION

This item shall consist of a bituminous surface treatment as a wearing course composed of single or multiple applications of bituminous material and aggregate cover placed on the prepared primed base or properly cured wearing surface in accordance with these specifications and shall conform to the dimensions and typical cross section shown on the plans and with lines and grades established by the ENGINEER.

403-2 MATERIALS

403-2.1 QUANTITY OF MATERIAL. The approximate amounts of bituminous material and aggregates per square yard for the bituminous seal shall be as provided in the following table. The exact amount shall be determined by the CONTRACTOR as necessary to obtain a finished product in conformity with the plans and specifications.

<u>Material</u>	<u>Amount</u>
Bituminous Material	As needed
Cover Aggregate	As needed
Blotter Sand	As needed

403-2.2 COVER AGGREGATE. This material shall consist of sound, durable particles of gravel and sand, either crushed or uncrushed or a combination of both, and shall be in accordance with the requirements for gradation shown in the following table:

<u>Square Mesh Sieve Size</u>	<u>Percent by Weight Passing</u>	<u>Square Mesh Sieve Size</u>	<u>Percent by Weight Passing</u>
SEAL AGGREGATE		BLOTTER SAND	
1/2"	100	1/2"	
3/8"	95-100	3/8"	100
No. 4	20-85	No. 4	85-100
No. 10	0-12	No. 10	
No. 16		No. 16	40-80
No. 50		No. 50	5-30
No. 100		No. 100	0-10
No. 200	0-4	No. 200	
% Shale & Rock Total Sample	8 (max)	% Shale & Rock Total Sample	8 (max)
% L.A. Abrasion Loss	40 (max)		

The aggregate shall be flushed with clear water but not so wet that free water will be draining from aggregate or truck bed before applying.

The sieve analysis will be determined by a wash screening in accordance with ASTM C136.

The CONTRACTOR shall provide results of tests from an approved testing facility of an adequate sized sample of aggregate and bituminous material as determined by the ENGINEER to be tested in accordance with ASTM 1664 for Coating and Striping of Bitumen-Aggregate Mixtures, fifteen (15) days prior to applying the seal coat.

If bituminous material is changed during construction, the CONTRACTOR shall perform another coating and stripping test prior to utilizing a different cover aggregate blend.

403-2.3 BITUMINOUS MATERIAL. The types, grades, and controlling specifications for the bituminous materials are given below. The bituminous material shall be selected from the table below.

Type and Grade	Specification
MC3000 OR 3000P	ASTM D2027
AE150	ASHTO M140 & ASTM D977
CRS-1, CRS-2, CRS-2P	ASTM D977 & D2397

All bituminous materials shall meet the requirements of the latest version of the North Dakota Department of Transportation Standard Specifications for Road and Bridge Construction, Section 818. The CONTRACTOR may submit a bituminous material not contained in the above list to the ENGINEER and the ENGINEER may approve or deny the use of the proposed bituminous material.

403.3 CONSTRUCTION REQUIREMENTS

403-3.1 WEATHER LIMITATIONS. Bituminous material shall not be applied to a wet surface or during sand or dust storms.

In general, it will be the policy not to permit the application of any bituminous material when the atmospheric temperature is less than 70°F, and the CONTRACTOR must delay the application of bituminous material until the atmospheric and pavement surface conditions are satisfactory. No bituminous material shall be placed which cannot be cared for during daylight hours. Materials not placed in compliance with this section will not be paid for.

Seal coats shall not be applied after August 1 of any calendar year except replacement sealing.

403-3.2 EQUIPMENT AND ORGANIZATION. Each unit required in the execution of these specifications shall be under the continuous supervision of a competent superintendent thoroughly experienced in this type of work. Experienced operators will be required on all equipment used in hauling and applying bituminous material and aggregates.

All equipment necessary to perform this work properly shall be on the project in first-class working condition before construction is permitted to start. The CONTRACTOR shall furnish, while applying the seal coat, all barricades, lights, flagmen, or other traffic control devices as necessary to protect crews, equipment, and the public from damage.

The following equipment will be the minimum required for this type of construction, and additional machinery shall be secured if in the opinion of the CONTRACTOR it is necessary to fulfill the conditions of these specifications or to complete the item within the time specified:

(a) The distributor shall have pneumatic tires of such width and number that the load produced on the pavement surface shall not exceed the legal gross vehicle weight, and it shall be designed and operated so that bituminous material at even heat may be applied uniformly on variable widths of surface at readily controlled rates from 0.05 to 2.0 gallons per square yard.

(b) The mechanical spreader shall be capable of depositing the designated amount of aggregate in a smooth, uniform layer or on the freshly deposited bitumen and in such a manner that the wheels of the equipment will not contact any bitumen which has not been covered by the aggregate. The rate of aggregate discharge shall be uniform over the full application width, and whenever necessary, cut-off plates or other approved means shall be provided to reduce the width of spread in suitable increments to meet the job requirements. The spread shall be so adjusted by individual gates over the wheel tracks to allow additional aggregate to be deposited to prevent tracking by the spreader and the trucks.

(c) The blotter sand spreader shall be capable of spreading a thin, uniform layer of sand such as a mechanical truck mounted type.

(d) The steel-wheel rollers shall be of the self-propelled tandem or three-wheel type rollers. The wheels on the rollers shall be equipped with adjustable scrapers which shall be used when necessary to clean the wheel surfaces. Rollers shall be equipped with tanks and sprinkling apparatus which shall be used to keep the wheels wet and prevent the surfacing materials from sticking.

(e) The pneumatic roller shall consist of pneumatic tires arranged in a manner to provide a satisfactory compacting unit. The roller shall have an effective rolling width of at least 60 inches and shall give a compression of at least 275 pounds per inch of tread width when fully loaded. The wheels shall be staggered on the front and rear axles to provide complete coverage of the area over which the roller travels.

The CONTRACTOR shall have a minimum of two (2) pneumatic rollers available. The rollers shall be the self-propelled type capable of starting, stopping, and reversing direction smoothly, without jerking or backlash, and shall be equipped with positive, accurate steering control.

(f) A power broom or power blower, broom dragging equipment, and equipment for heating aggregate shall be included, when needed.

The CONTRACTOR shall supply such auxiliary equipment as needed.

Bituminous binder and aggregate shall not be spread over a greater yardage than can be rolled and finished in one day's operation.

403-3.3 APPLICATION OF BITUMINOUS MATERIAL. Bituminous material shall be applied upon the properly prepared surface at the rate and temperature selected by the CONTRACTOR using a distributor to obtain uniform distribution at all points. The yardage over which the binder is spread in advance of placing the aggregate shall be as determined by the CONTRACTOR. During all applications, the surfaces of the-adjacent structures, including curbs, shall be protected in such a manner as to prevent their being splattered, marred, or damaged in any other manner. Splatters shall be removed and mars repaired at the CONTRACTOR's expense. Coverage shall be complete, uniform, and free of "Drilling" or "Streaking."

The bituminous material shall not be applied to a dusty surface. If normal sweeping methods do not remove dust, the surface shall be flushed with water incidental to this bid item. If water is taken from city hydrants, the CONTRACTOR must contact the Public Works Department for a hydrant meter to be installed prior to any water usage. The water usage and meter installation is charged directly to the CONTRACTOR. The CONTRACTOR must supply their own hookup to the meter and hose.

Before beginning application, building paper shall be spread over the surface, from the construction joint back, for a sufficient distance for the spray bar to begin spraying and be operating at full force when the surface to be treated is reached.

A construction joint shall be placed at the start or stop of seal operations which will be continued from or to the joint. This also includes at concrete valley gutters. After the asphalt is applied, the building paper shall be removed and disposed of by the CONTRACTOR.

Aggregates shall not be allowed to cover any appurtenances such as manhole covers, valve box covers, and valley gutters.

The spray bar shall be shut off instantaneously at each intersection joint to ensure a straight line and the full application of asphalt binder up to the joint.

A hand spray shall be used to apply asphalt binder necessary to touch up all spots missed or inaccessible by the distributor.

The longitudinal joint between the asphalt and the concrete gutter must be included when the bitumen is applied. A maximum overspray of 1 inch will be allowed on the

concrete gutter. All vegetation and loose debris shall be removed from the longitudinal joint prior to the bitumen application.

The bitumen shall be applied so that when covered, transverse and longitudinal joints of successive applications will not result in ridges or depressions and will be smooth and consistent with the adjacent surface of the completed treatment.

403-3.4 APPLICATION OF AGGREGATE MATERIAL - GENERAL METHODS. The CONTRACTOR shall determine when to place the cover aggregate on the applied bituminous material. The timing of when the cover aggregate is placed on the applied bituminous material varies with the type and grade of bituminous material. The CONTRACTOR shall perform test strips and include this timing parameter. Cover aggregate shall be spread uniformly over the bituminous material with the aggregate equipment specified. Trucks spreading aggregate shall be operated backward so that the bituminous material will be covered before the truck wheels pass over it. The aggregate shall be spread in the same width of application as the bituminous material and shall not be applied in such thickness as to cause blanketing. Backspotting or sprinkling of additional aggregate material and spraying additional bituminous material over areas that show up having insufficient cover of bitumen shall be done by hand whenever necessary. Additional spreading of aggregate material shall be done by means of a broom drag or other approved method.

Power rollers shall be used immediately after the aggregate is spread. Following the rolling with the pneumatic roller, the course shall be further rolled with a steel-wheel roller to insure proper imbedding into the bitumen. The blotter sand shall be applied as necessary, and rolling shall be continued until no more aggregate material can be worked into the surface. Further brooming and rolling on the strip being placed on adjacent strips previously placed shall be done as often as necessary to keep the aggregate material uniformly distributed. These operations shall be continued until the surface is evenly covered and cured. Steel roller shall not be of such weight which crushes the aggregate particles.

Succeeding applications shall not be applied until the preceding application has set and excess aggregate has been removed. If dust, dirt, or other foreign matter accumulates on the surface between the applications, the CONTRACTOR shall be required to sweep and clean the surface as specified herein. The bituminous material and the aggregate shall be spread upon the clean and properly cured surface and handled as required. Extreme care shall be taken in all applications to avoid brooming or tracking dirt or any foreign matter on any portion of the pavement surface under construction. Traffic shall be signed for a restricted speed limit of fifteen (15) miles per hour during the rolling and for twenty-four hours (24) after the rolling has been completed. The CONTRACTOR may sign the streets for No Parking provided the City of Mandan Engineering Dept. approved signs are placed forty-eight (48) hours prior to the beginning of operations. The CONTRACTOR must document daily which streets are signed and during what time period. The CONTRACTOR must also notify the Police Department, Fire Department, and ambulance service prior to street closures.

It shall be the CONTRACTOR's responsibility to contact the Police Department about vehicles that are in violation of the forty-eight (48) hour parking.

Coordination between the CONTRACTOR and the Police Department is essential. The CONTRACTOR shall notify the Police Department at least two (2) hours before vehicles need towing, so the Police Department has adequate time to make arrangements.

No towing of vehicles shall be permitted unless authorized by the Police Department.

Signs shall be removed within twenty-four (24) hours after rolling is complete or whenever construction operations cease for more than twenty-four (24) hours except as directed by the ENGINEER. A recommended No Parking sign is on file at the Engineering Department.

A small crew and proper equipment shall be available to control bleeding of seal oil for a period of thirty (30) days after the date of application. If bleeding occurs during the maintenance period and after final sweeping, the CONTRACTOR shall control bleeding by spreading light coats of blotter sand, which will be paid for under Bid Item 403-4.3 Blotter Sand. Blotter sand shall not be applied in anticipation of bleeding, but only after bleeding actually occurs. The crew and equipment for controlling bleeding shall be available during the thirty (30) day period at all times including weekends and nights.

Alternate materials, approved by the ENGINEER, may be used as a substitute in lieu of blotter sand to control the bleeding.

All surplus aggregate shall be swept off the surface and removed prior to acceptance of the work. The removal of excess cover aggregate shall be accomplished by the CONTRACTOR using a "pickup" type of sweeper. Appurtenances such as manhole covers, valve box covers, and valley gutters shall not be covered with the bituminous seal. Any appurtenance covered shall be cleaned to the satisfaction of the ENGINEER prior to acceptance of the project.

Removal of the excess cover aggregate shall begin seven (7) days after the seal coat is applied unless a different time is approved by the ENGINEER. The cover aggregate picked up shall become the property of the CITY OF MANDAN and shall be stockpiled by the end of each work day. Arterial roadways may require sweeping or removal of excess aggregate prior to seven (7) days after application as directed by the ENGINEER. The CONTRACTOR's responsibility for adherence of an acceptable amount of the aggregate in the bituminous material shall not be waived at any time. The stockpile site for excess aggregate shall be at the CITY OF MANDAN Public Works Facility located at 411 6th Avenue SW, or other site as designated by the ENGINEER or authorized Public Works contact.

403-3.5 CORRECTION OF DEFECTS. Any defects, such as raveling, low centers, lack of uniformity, or other imperfections shall be corrected to the satisfaction of the ENGINEER.

All defective materials resulting from overheating, improper handling, or application shall be removed by the CONTRACTOR and replaced with approved materials as provided for in these specifications.

Damage by a third party such as vehicle tracking or skidding after the seal coat has been applied and appropriate traffic control measures, including flag persons, are in place shall be corrected to the satisfaction of the ENGINEER at the cost of the CITY. All replacement sealing must be done by August 15 of any calendar year except by written permission by the ENGINEER. The replacement of Bituminous Seal Coat damaged by a third party shall be measured in place and paid for by the square yard at double the unit price bid for "Bituminous Seal Coat."

403-3.6 BITUMINOUS MATERIAL CONTRACTOR'S RESPONSIBILITY. Samples of the bituminous materials that the CONTRACTOR proposes to use, together with a statement as to their source and character, shall be submitted to the ENGINEER.

The CONTRACTOR shall furnish vendor's certified test reports for each carload, or equivalent, of bitumen shipped to the project. The report shall be delivered to the ENGINEER before permission is granted for use of the material. The furnishing of the vendor's certified test report for the bituminous material shall not be interpreted as a basis for final acceptance nor shall it relieve the CONTRACTOR from responsibility for any failures in the project. All such test reports shall be subject to verification by sample testing. The CONTRACTOR shall provide tests, per the appropriate ASHTO and/or ASTM section for bituminous material for each ten thousand (10,000) gallon lot or portion of lot supplied for the project. Tests shall be by an approved independent testing facility. The CONTRACTOR shall provide aggregate gradations for each type of aggregate provided for each five hundred (500) ton lot or portion of lot provided for the project. Tests shall be performed by an approved independent testing facility.

403-3.7 TEST SECTION. The CONTRACTOR shall determine a suitable sized area within the project to use to calibrate the equipment and determine the best method of rolling. It shall be anticipated to have some delays in the operation at this point to evaluate the results. There shall be no additional compensation for these delays.

403-3.8 ACCEPTANCE OF SEAL COAT - WARRANTY. The CONTRACTOR warrants a completed seal coat project that complies with the specifications and that remains in place and performs as intended at the time of acceptance and during the one-year warranty period. Compliance with these specifications and/or acceptance of the completed bituminous seal coat for final payment as being constructed in accordance with these specifications does not relieve the CONTRACTOR from the responsibility to repair any portions where the bituminous seal coat has failed or not remained in place during the term of the contract and its one-year warranty period. The warranty provided by the CONTRACTOR shall be a "performance warranty" and shall guarantee a completed project in accordance with the plans and specifications at the time of acceptance and final payment and for one year after the time of acceptance and final payment. The CONTRACTOR shall provide this warranty regardless of fault or the cause of such failure except for damage caused by a third party through no fault of the

CONTRACTOR. The ENGINEER's representative and a representative of the CONTRACTOR shall review this project prior to the one (1) year warranty period expiration and determine any areas to be repaired. Acceptance of the project shall be deemed to be "final" at the expiration of the warranty period.

403.4 MEASUREMENT AND PAYMENT

403-4.1 BITUMINOUS SEAL COAT. Bituminous material and cover aggregate shall be measured and paid by the square yard (SY) as "403-4.1 Bituminous Seal Coat" or "403-4.1a Polymer Seal Coat" complete in place and accepted by the ENGINEER.

403-4.2 BLOTTER SAND. Blotter sand shall be measured by the ton and paid for at the unit price bid for "Blotter Sand" complete in place and accepted by the ENGINEER.

SECTION 404 – MILLING PAVEMENT SURFACE

404-1 DESCRIPTION

This work consists of improving the profile, cross slope, and surface texture of an existing pavement surface.

404-2 EQUIPMENT

The equipment for milling and texturing the pavement shall be a power operated, self-propelled planning machine or grinder capable of removing pavement surface to the required depth, profile, cross slope, and surface texture. The machine shall be capable of accurately establishing profile grades by reference to the existing pavement or from an independent grade control, and shall positively control the cross slope. The machine shall be of size, shape, and dimensions which do not interfere with safe traffic passage adjacent to the work. The milling head shall have a minimum width of 8 feet. The machine shall have a control system to automatically control the elevation and transverse slope of the milling head. A 15-foot minimum length skid, rolling straight edge, or other approved device shall be used to establish the grade reference for control of the milling head. The system shall permit the grade preference device to operate on either side of the milling machine and shall maintain the desired transverse slope regardless of changes in the elevation of the milling head.

Conveyors capable of side, rear, or front loading shall be provided with the necessary equipment to transfer the milled material from the roadway to a truck.

404-3 CONSTRUCTION REQUIREMENTS

The milling shall be started at the centerline of the pavement and proceed on a longitudinal line parallel to the centerline. Succeeding passes shall progress toward the outer edge of the pavement unless a different sequence of operation is permitted by the ENGINEER. The CONTRACTOR shall make every effort to complete the milling operations on the full width of each street so that it is open to traffic at the end of each day, unless otherwise approved by the ENGINEER. The milled depth shall be gradually tapered to the original pavement surface prior to opening to traffic. Before overlaying, the gradual taper to the original pavement surface shall be milled out transversely to produce a vertical cut.

The completed milled surface shall be free from transverse and longitudinal irregularities exceeding 1/4 inch when measured with a 10-foot straightedge.

In areas that have existing detector loops or micro probes, these loops or probes may be damaged or removed by the milling operations.

The CONTRACTOR shall clean the milled surface by brooming and remove all equipment and materials prior to opening to traffic.

The CONTRACTOR shall salvage the milled material for the CITY and stockpile as indicated on the plans. All equipment necessary for stockpiling milling material will be furnished by the CONTRACTOR.

Machine exhaust shall not damage or scorch any parts of trees.

The CONTRACTOR shall mill around appurtenances such as manhole and valve box castings without removing those appurtenances. If any asphalt remains on the face of the exposed curb and gutter section or radii around appurtenances, it must be removed to a depth of the milled surface. Appurtenances in the driving lanes shall be wedged with asphalt millings which shall be removed prior to the overlay. Appurtenances not wedged shall be marked with a Type II barricade. The measurement and payment will be in conjunction with the milling pavement surfacing.

404-4 MEASUREMENT AND PAYMENT

404-4.1 MILLING PAVEMENT SURFACE. Milling Pavement Surface shall be measured to the nearest 0.1 ton of material weighed and placed in an approved stockpile complete, in place and accepted by the ENGINEER. Loading, hauling, and stockpiling will not be measured and will be considered incidental to "Milling Pavement Surface." The labor, equipment, brooming, and cleaning before and after milling, water used in milling, and deposit of the milled material in a hauling unit will not be measured for payment, but will be considered incidental to "Milling Pavement Material."

SECTION 405 CRACK TREATMENTS

405-1 DESCRIPTION

This work shall consist of applying a crack sealant material into or above existing cracks to prevent the intrusion of water and incompressible material into the cracks and to reinforce the adjacent pavement. There are two methods of crack treatments, crack sealing and crack filling. The ENGINEER shall determine which cracks are candidates for which method of crack treatment.

405-2 METHODS

405-2.1 CRACK SEALING. This method of crack treatment shall be utilized when the crack shows significant signs of vertical or horizontal movement, where crack edges may exhibit edge deterioration or displacement.

405-2.2 CRACK FILLING. This method of crack treatment shall be utilized when the crack shows very little sign of vertical or horizontal movement.

405-3 MATERIALS

The types of materials essentially comprise three material groups according to their composition and manufacturing process. The principal material groups and types are as follows:

1. Cold-applied thermoplastic bituminous materials.
 - a. Liquid asphalt (emulsion).
 - b. Polymer-modified liquid asphalt.
2. Hot-applied thermoplastic bituminous materials.
 - a. Asphalt cement.
 - b. Fiberized asphalt.
 - c. Rubberized asphalt.
 - d. Low-modulus rubberized asphalt.
3. Chemically cured thermosetting materials.
 - a. Self-leveling silicone.

Asphalt cutbacks, mineral-filled asphalts, and sand-asphalt mixtures will not be accepted.

The following table shows the material types that possess most of the above properties. It also shows the recommended application methods and requirements for each type of material used.

Material Type	Applicable Specifications	Recommended Application
Asphalt Emulsion	ASTM ^b D977, AASHTO ^c M140, ASTM D2397, AASHTO M208	Filling
Asphalt Cement	ASTM D3381, AASHTO M20, AASHTO M226	Filling
Fiberized Asphalt	Manufacturer's recommended specs	Filling
Polymer-Modified Emulsion	ASTM D977, AASHTO M140, ASTM D2397, AASHTO M208	Filling
Asphalt Rubber	State specs, ASTM D5078	Sealing
Rubberized Asphalt	ASTM D1190, AASHTO M173, Fed SS-S-164	Sealing
	ASTM D3405, AASHTO M302, Fed SS-S-1401	Sealing
Low-Modulus Rubberized Asphalt	State-modified ASTM D3405 specs	Sealing
Self-Leveling Silicone	ASTM D5893	Sealing

A. Emulsion and Asphalt Cement Sealants. This material shall be placed flush in an unrouted, non-working crack.

B. Rubberized Asphalt Sealants. This material shall be placed flush or overbanded in routed, working cracks.

C. Self-Leveling Silicone Sealants. This material shall be placed recessed in routed working cracks.

D. Fiberized Asphalt Sealants. This material shall be placed overbanded in unrouted working cracks.

405-4 PLACEMENT CONFIGURATION

Sealant and filler materials can be placed in numerous configurations. These placement configurations are grouped into four categories.

1. Flush Fill. This configuration places the material into the existing unrouted crack and the excess material is struck off. Standard Detail No. 1306A (A) illustrates the flush fill method.

2. Reservoir. This configuration places the material only within the confines of the routed crack. The material placed is either flush with or slightly below the pavement surface. Standard Detail No. 1306A (C) & (E) illustrate the reservoir-type method.

3. Overband. This configuration places the material into and over an unrouted crack. The excess material shall then be squeegeed to straddle the crack to a minimum width of 1 1/2 inches on either side. Standard Detail No. 1306A (B) illustrates the overband method.

4. Combination (Reservoir and Overband). This configuration places the material into and over a routed crack. The excess material shall then be squeegeed to straddle the crack to a minimum width of 1 1/2 inches on either side. Standard Detail No. 1306A (D) & (F) illustrate the combination method.

5. Bond Breaker Material. If the crack continues below the routed crack, a bond breaker material, nonabsorbent closed cell, such as polyethylene foam backer rod, shall be placed at the reservoir bottom of a working crack prior to the sealant application. The backer rod prevents the sealant material from running down into the crack during application. The backer rod material must be a minimum of 25 percent wider than the width of the crack reservoir for it to maintain its vertical position and to provide shape for the material. Standard Detail No. 1306A (E) & (F) illustrate the placement of the backer rod material.

6. Routed/Sawn Cracks. Working cracks that are relatively straight and are accompanied by edge deterioration are candidates for crack cutting. Crack cutting shall be performed in such a manner so as not to create any additional damage to the existing pavement. High-production machines that follow cracks well and produce minimal spalls or fractures shall be equipped with controls for varying the depth of the cut and the width settings. Standard Detail No. 1306A (C) through (F) illustrate crack cutting dimensions.

405-5 MATERIAL REQUIREMENTS

The crack sealant compound shall be packaged in sealed containers. Each container shall be clearly marked with the name of the manufacturer, the trade name of the sealant, the type of sealant, the weight, the manufacturer's batch and lot number, the pouring temperature, and the safe heating temperature.

Prior approval of any specific sealant material shall be required before it can be used on the Project.

A copy of the manufacturer's recommendations pertaining to the heating and application of the joint sealant material shall be submitted to the ENGINEER before the commencement of work. These recommendations shall be adhered to and followed by the CONTRACTOR. The temperature of the sealer in the field application equipment

shall not exceed the safe heating temperature recommended by the manufacturer. Any given quantity of material shall not be heated at the pouring temperature for more than six hours and shall never be reheated. Material shall not be placed if the temperature is below the manufacturer's recommended minimum application temperature.

Mixing of different manufacturer's brands or different types of sealant shall be prohibited.

Sealant materials may be placed during a period of rising temperature after the air temperature in the shade and away from artificial heat has reached 40°F and indications are for a continued rise in temperature. During a period of falling temperature, the placement of sealant material shall be suspended when the air temperature, in the shade and away from artificial heat, reaches 40°F. Sealants shall not be placed when the weather or roadbed conditions are unfavorable.

405-6 CRACK TREATMENT PROCEDURES AND EQUIPMENT

The following table shows the required crack treatment equipment characteristics and recommendations.

Operation	Type of Equipment	Recommendations
Crack Cutting (if required)	Vertical-Spindle Router	Use only with sharp carbide-tipped or diamond router bits.
	Rotary-Impact Router	Use only with sharp carbide-tipped router bits.
	Random Crack Saw	Use only on fairly straight cracks. Diamond blade saw, 200-mm maximum diameter.
Crack Cleaning/ Drying	Blowers (Backpack & Power-Driven)	Not recommended —Insufficient blast velocity (60 to 100 m/s).
	Air Compressor	Equipped with oil and moisture filters. Pressure—690 kPa minimum. Flow—0.07 m ³ /s minimum. Velocity—990 m/s minimum.
	Hot-Air Lance	Velocity—610 m/s minimum. Temperature—1370°C minimum. No direct flame on pavement. <u>Highly Recommended</u> Velocity—915 m/s minimum. Temperature—1650°C minimum.

	Sandblaster	Acceptable air compressor (minimum 690 kPa pressure and 0.07 m ³ /s flow). Minimum 25-mm-inside-diameter lines and 6-mm-diameter nozzle.
	Wirebrush	Do not use with worn brushes. Not recommended for cleaning previously treated cracks, as there is a tendency to smear material.
Material Installation	Pour Pots	Not recommended for production operations.
	Asphalt Distributor	Not suitable for fiber- or rubber-modified asphalt materials.
	Melter-Applicator	Direct-heat kettles not suitable for fiber- or rubber-modified asphalt materials. Indirect-heat kettles should be equipped with: * Double-boiler, mechanical agitator with separate automatic temperature controls for oil and melting chamber. * Sealant heating range to 230°C. * Full-sweep agitator. * Accurately calibrated material and heating oil temperature gauges.
	Backer Rod Installation Tools	Maintains proper recess. Does not damage backer rod.
	Silicone Pump & Applicator	Flow Rate—0.25 L/s minimum. Hose line with Teflon; all seals and packing made from Teflon
Material Finishing	Squeegee	Heavy-duty, industrial U- or V-shaped.
Blotting (if required)	Paper Wand	To prevent tracking.

If tracking of the sealant is present, blotting or tissing will be required. Blotting may consist of sand limestone dust or crusher dust placed directly on top of the treatment material.

405-7 TRAFFIC CONTROL PLAN AND QUALITY OF DEVICES

The CONTRACTOR shall be responsible for all traffic control devices needed for the completion of the crack treatment operation.

Traffic Control Devices used on the project will be rated according to the American Traffic Safety Services Association's (ATSSA) **Quality Standards for Work Zone Traffic Control Devices**. The definitions of "acceptable," "marginal," and "unacceptable" and the evaluation guidelines shall be defined in ATSSA's **Quality Standards for Work Zone Traffic Control Devices**.

All traffic control devices shall be retroreflective.

An approved traffic control plan shall be submitted three days prior to its use. Traffic control plan and devices shall be considered incidental to other bid items. The CONTRACTOR shall broom off the excess debris and remove the traffic control devices after the crack treatment operations are completed.

405-8 MEASUREMENT AND PAYMENT

405-8.1 EMULSION AND ASPHALT CEMENT SEALANTS. The emulsion and asphalt cement sealants shall be measured by the linear foot (LF) and paid for at the unit price for "Emulsion and Asphalt Cement Sealants" complete in place and accepted by the ENGINEER.

405-8.2 RUBBERIZED ASPHALT SEALANTS. The rubberized asphalt sealants shall be measured by the linear foot (LF) and paid for at the unit price for "Rubberized Asphalt Sealants" complete in place and accepted by the ENGINEER.

405-8.3 SELF-LEVELING SILICONE SEALANTS. The self-leveling silicone sealants shall be measured by the linear foot (LF) and paid for at the unit price for "Self-Leveling Silicone Sealants" complete in place and accepted by the ENGINEER.

405-8.4 FIBERIZED ASPHALT SEALANTS. The fiberized asphalt sealants shall be measured by the linear foot (LF) and paid for at the unit price for "Fiberized Asphalt Sealants" complete in place and accepted by the ENGINEER.

405-8.5 BOND BREAKER MATERIAL. Bond Breaker Material shall be measured by the linear foot (LF) and paid for at the unit price for "Bond Breaker Material" complete in place and accepted by the ENGINEER.

405-8.6 ROUTED/SAWN CRACKS. The Routed/Sawn Cracks shall be measured by the linear foot (LF) and paid for at the unit price for "Routed/Sawn Cracks" complete in place and accepted by the ENGINEER.

SECTION 406 – ASPHALT REMOVAL

406-1 DESCRIPTION

This work consists of removing, and disposing of, existing AC pavement surfacing.

406-2 EQUIPMENT

The CONTRACTOR shall use a saw, milling wheel, or asphalt cutting wheel to make all pavement cuts. The CONTRACTOR shall furnish all equipment for cutting, removing, loading, and hauling removed asphalt to the designated unloading site.

406-3 CONSTRUCTION REQUIREMENTS

All asphalt cuts shall be made to maintain a vertical face on the remaining asphalt which shall be maintained until the pavement is replaced and accepted by the ENGINEER. Pavement cuts shall be as designated on plans or as marked by the ENGINEER. Any removal and replacement beyond the area specified on plans or marked by the ENGINEER shall be the responsibility of the CONTRACTOR to replace.

Pavement removed shall be salvaged as clean as practical, delivered to the "City of Mandan Municipal Solid Waste Facility" located east of 52nd Street and north of Divide Avenue, and stockpiled in large piles and shall be considered incidental to the price bid for "Pavement Removal." Landfill fees shall be waived for clean asphalt.

Protection of adjacent pavements shall be the responsibility of the CONTRACTOR. A mutual inspection of the surrounding pavements shall be made and any damages shall be repaired by the CONTRACTOR at no additional cost.

406-4 MEASUREMENT AND PAYMENT

406-4.1 ASPHALT REMOVAL. Asphalt Removal shall be measured and paid by the square yard (SY) complete, disposed of properly, and accepted by the ENGINEER. Replacement shall not be part of this bid item.