PART 00700 - WEARING SURFACES

Section 00705 - Asphalt Prime Coat and Emulsified Asphalt Fog Coat

Description

00705.00 Scope - This work consists of applying asphalt, with or without aggregate cover materials, to a prepared surface. The prime coat referred to in these Specifications is a penetration treatment to aggregate surfaces to coat and bind the material into a hard surface. The fog coat referred to in these Specifications is a treatment applied to existing asphalt concrete pavement surfaces to renew and seal the pavement surface.

Materials

00705.10 Aggregate Cover Material - When required by the Special Provisions, provide aggregate cover material consisting of crushed or uncrushed rock free of clay, loam or other harmful substances and meeting the following gradation. Sieve analysis will be determined according to AASHTO T 27. Sieve analysis may be waived and the aggregate cover material accepted visually if allowed by the Engineer.

Fine Cover		Coarse Cover	
Sieve Size	Percent Passing (by Weight)	Sieve Size	Percent Passing (by Weight)
3/8"	100	1"	100
1/4"	95 - 100	3/4"	90 - 100
No. 8	30 - 66	3/8"	55 - 75
No. 30	8 - 28	1/4"	40 - 60
No. 100	0 -5	No. 8	*

***** Of the fraction passing the 1/4 inch sieve, 40 to 60% shall pass the No. 8 sieve.

00705.11 Asphalt - Provide asphalt according to the following:

(a) General - Provide asphalt conforming to the requirement of ODOT's publication, "Standard Specifications for Asphalt Materials". Copies of the publication are available from the ODOT Pavement Services Engineer. The applicable specifications are those contained in the current publication on the date the Project is advertised. The materials may be conditionally accepted at the source or point of loading for transport to the Project.

Obtain samples of emulsified asphalt according to AASHTO T 40, prior to dilution with water, at the frequency indicated in the MFTP. Samples will be tested at the ODOT Materials Laboratory, or other laboratory as designated by the City, within 30 calendar days from the day the sample was taken.

(b) Prime Coat - Provide MC-250 asphalt or CSS-1, CSS-1h, or CMS-2S emulsified asphalt for the prime coat.

(c) Fog Coat - Provide CSS-1, CSS-1h or HFRS-P1 emulsified asphalt for the fog coat.

For every part emulsified asphalt, add not more than one part water. Add water at point of supply or point of application as directed, and mix with emulsified asphalt. The exact proportion of added water will be determined in a manner acceptable to the Engineer.

Equipment

00705.20 Equipment - Provide a pressure distributor, hauling vehicles, and other necessary equipment to ensure efficient operation and construction to meet specified results. Provide equipment in such number and capacities as will provide coordinated and uniform progress of the work.

00705.21 Asphalt Distributor - Provide an asphalt distributor designed, equipped, maintained, and operated so the emulsified asphalt material is applied uniformly at even heat. The distributor shall be capable of applying the asphalt on variable surface widths up to 16 feet, at readily determined and controlled rates from 0.05 - 2.0 gallons per square yard, and with uniform pressure. The variation allowed from any specified rate shall not exceed 0.02 gallons per square yard. Provide distributor equipment that includes a tachometer, pressure gages, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Provide distributors equipped with a positive power unit for the asphalt pump, and full circulation spray bars adjustable both laterally and vertically. Set the bar height for triple lap coverage.

00705.22 Aggregate Spreaders - When aggregate cover material is required, provide a mechanical spreading device that will spread the aggregate cover material in a manner acceptable to the Engineer.

00705.23 Power Brooms - When aggregate cover material is required, provide pickup or non-pickup type power brooms equipped with a positive means to control vertical pressure.

Construction

00705.40 Season and Weather Limitations - Do not place the prime coat or fog coat when the air temperature is below 60 °F, or when the Engineer determines that weather or surface conditions are detrimental to proper construction.

00705.41 Preparation of Foundation for Prime Coat - Bring aggregate bases and other bases or foundations, when constructed under the Contract, to the completed and finished condition according to the applicable Specifications.

Bring old bases and foundations, constructed by others, to the applicable condition according to Section 00610, and within 1/2 inch of established grade and cross section if other than a bituminous surface.

00705.42 Sequence of Operations - Construct the prime coat or fog coat with a single spread of asphalt followed immediately with a single spread of aggregate cover material, if required.

00705.43 Application of Asphalt - Apply asphalt according to the following:

(a) Prime Coats - Apply asphalt at a uniform rate, normally within a range of 0.25 - 0.75 gallons per square yard of surface. The exact rate of application will be determined by the Engineer.

(b) Fog Coats - Apply the diluted emulsified asphalt within the range of 0.07 - 0.15 gallons per square yard. The exact rate of application will be determined by the Engineer.

Discontinue application of the emulsified asphalt fog coat sufficiently early in the day to permit the termination of traffic control prior to sunset. Apply emulsified asphalt to only one designated traffic lane at a time.

00705.44 Spreading Aggregate Cover Material - When aggregate cover material is required, spread the aggregate cover material within the range of 0.004 to 0.013 cubic yards per square yard as directed.

Maintenance

00705.60 Curing, Maintaining and Opening Prime Coats to Traffic - Cure the prime coat for a minimum of three days after construction, as directed, before a succeeding course is placed upon it. If directed, traffic may be permitted to travel over the prime coat at any time after its construction. During the curing period, when in use by traffic and until it is covered by a succeeding course, maintain the prime coat to the specified shape and condition, as directed.

00705.61 Power Brooming Fog Coats - Following the application of the aggregate cover material, carefully broom the entire surface unless brooming damages the fog coat, to remove loose aggregate that could damage vehicles. Use a minimum of two power brooms.

Subsequent brooming the following two days may be directed by the Engineer to ensure that the surface is free of loose aggregate that could cause vehicle damage.

In curbed areas, use a pickup type power broom. On bridges, sidewalks and other areas off the roadway, remove all extraneous aggregates to the satisfaction of the Engineer.

Measurement

00705.80 General - The quantities of asphalt or emulsified asphalt will be measured by the ton according to 00190.10.

The quantities of aggregate cover material will be measured by the ton according to 00190.10 or by the cubic yard in the hauling vehicle.

Payment

00705.90 General - The accepted quantities will be paid for at the Contract unit price per unit of measure for the following items:

	Pay Item	Unit of Measurement
(a)	Asphalt in Prime Coat	Ton
(b)	Emulsified Asphalt in Fog Coat	Ton
(c)	Aggregate Cover Material	Cubic Yard or Ton

Payment will be payment in full for furnishing and placing all materials and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified including materials used during the maintenance period.

Item (b) includes water required to dilute the emulsified asphalt, according to 00705.11(c).

Section 00706 - Emulsified Asphalt Slurry Seal Surfacing

Description

00706.00 Scope - This work consists of applying one or more layers of slurry seal consisting of emulsified asphalt, water, aggregate, and additives on a prepared surface as shown or directed.

00706.02 Abbreviations:

ISSA - International Slurry Surfacing Association

Materials

00706.10 Emulsified Asphalt - Use CQS-1h emulsified asphalt meeting the following requirements when tested according to AASHTO T 59:

Saybolt Viscosity, seconds at 77 °F	15 - 50
Residue from Distillation, Weight %	57% minimum
Sieve Test, % Retained on No. 20 Sieve	0.1 maximum
Particle Charge, Electroplate	(informational)
Settlement (Storage Stability), 24 hour	1% maximum
Cement Mixing Test	(informational)

The residue shall pass the following specifications:

Penetration at 77 °F, 3.5 ounces, 5 sec	40-90 minimum
Solubility in CS_2 or TCE	97.5 minimum
Ductility at 77 °F, inch	15.7 Minimum

00706.11 Polymer Modified Emulsion - Use a CQS-1h polymer modified emulsion. The polymer modifier shall be either a solid synthetic rubber or latex material. Combine the polymer modifier with the base asphalt or asphalt emulsion, prior to loading at the manufacturing plant, at the minimum rate of 2.5% to 3% polymer solids by weight of asphalt. The polymer modified emulsion shall be compatible with the mix design developed for the conventional slurry seal. Each shipment of emulsified asphalt shall be accompanied by a certificate of analysis/compliance from the manufacturer.

00706.12 Aggregate - The aggregate used shall be clean, angular, durable, well graded and uniform. The aggregate shall consist of broken stone, crushed gravel, slag or a combination thereof. To assure the material is totally crushed, 100% of the parent aggregate shall be larger than the largest stone in the gradation to be used.

(a) Gradation - Aggregate gradation shall meet one of the following types:

Sieve Size	TYPE I - Parking Areas, Urban and Residential Streets, Airport Runways Percent Passing	TYPE II - Urban and Residential Streets, Airport Runways Percent Passing	TYPE III - Primary and Interstate Routes Percent Passing	Stockpile Tolerance
3/8"	100	100	100	0
No. 4	100	90 - 100	70 - 90	± 5%
No. 8	90 - 100	65 - 90	45 - 70	± 5%
No. 16	65 - 90	45 - 70	28 - 50	± 5%
No. 30	40 - 65	30 - 50	19 - 34	± 5%
No. 50	25 - 42	18 - 30	12 - 25	± 4%
No. 100	15 - 30	10 - 21	7 - 18	± 3%
No. 200	10 - 20	5 - 15	5 - 15	± 2%

The job mix gradation shall be within the gradation band for the desired type. After the target gradation has been submitted then the percent passing each sieve shall not vary by more than the stockpile tolerance and still remain within the gradation band.

00706.13 Additives and Mineral Filler - Liquid retardant and mineral fillers may only be used when their quantity can be metered. The use of additives in the slurry mix, (or individual materials), shall comply initially with the quantities predetermined by the mix design, or with field adjustments if required, after approval by the engineer.

Portland cement, hydrated lime, limestone dust, fly ash or other approved filler required by the mix design shall meet the requirements of ASTM D 242, and shall be considered as part of the dry aggregate.

00706.14 Water - Water shall be potable, free of harmful salts and contaminants, and compatible with the slurry mix. Water used in mixing or curing shall be reasonably clean and free of oil, sugar, organic matter or other substance injurious to the finished product.

00706.15 Job Mix Formula (JMF) - Prior to the pre-construction conference, submit a signed slurry seal mix design for the specific materials to be used on the Project. Show the percentages of each individual material required on the mix design report. The complete mix design shall be made with the same aggregate gradation that will be used on the Project. After the mix design has been approved no substitution will be permitted unless approved. Water, not exceeding 11% by weight to asphalt emulsion, shall be used to develop a good mix.

(a) Laboratory Evaluation - Have the mix design prepared and tested by a laboratory which has experience in designing emulsified asphalt slurry seal surfacing. Determine the proportions of component materials and perform the tests shown in 00706.15(b). The final mix design shall meet the limits shown in 00706.15(b) and (c).

(b) Mix Design Tests:

Test	Description	Specification
ISSA TB-106	Slurry Seal Consistency	
ISSA TB-139	Wet Cohesion, 30 minutes set	0.10 lb-in min.
(For quick-traffic systems)	60 minutes set	0.17 lb-in min.
ISSA TB-109	Excess Asphalt by LWT and Sand Adhesion	1 lb/yd^2 max.
(For heavy traffic areas only)		
ISSA TB-114	Wet Stripping	Pass (90% minimum)
ISSA TB-100	Wet Track Abrasion Loss One hour soak	1.5 lb/yd^2 max.
ISSA TB-113	Mix Time *	Controllable to 180 sec. Minimum

* The mixing test and set time test should be done at the highest temperatures expected during construction.

The wet track abrasion test is used to determine the minimum asphalt content.

The mixing test is used to predict how long the material can be mixed in the machine before it begins to break.

The laboratory shall also report the quantitative effects of moisture content on the unit weight of the aggregate (bulking effect). The report shall clearly show the proportions of aggregate, the minimum and maximum proportions of mineral filler and water, additive usage, and asphalt emulsion based on the dry weight of the aggregate.

All the component materials used in the mix design shall be representative of the materials proposed for use on the Project.

Show the percentages of each individual material required in the laboratory report. Adjustments may be required during the construction, based on the field conditions. The Engineer will give final approval for all such adjustments.

(c) Component Materials - The Engineer will approve the mix design, all slurry seal materials and methods prior to use. The component materials shall be within the following limits:

- **Residual Asphalt:**

  Type I - 10% - 16%
  Type II - 7.5% - 13.5%
  Type III - 6.5% - 12%
  Based on dry weight of aggregate.

- **Mineral Filler:**

  0.5% - 2.0%
  Based on dry weight of aggregate.

- **Additives** - As needed.

- **Water** - As needed to achieve proper mix consistency. Total mix liquids shall not exceed the loose aggregate voids. Use ISSA T106 to check optimum liquids.

00706.16 Tolerances and Limits - Tolerances for individual materials as well as the slurry seal mixture during production are as follows:

- After the designed residual asphalt content is determined, a plus or minus one percentage point variation will be permitted

- The percentage of aggregate passing each sieve shall be within the stockpile tolerance range as stated in 00706.12(a)

- The percentage of aggregate passing shall not go from the high end to the low end of the specified range of any two successive sieves

- The slurry consistency shall not vary more than plus or minus 2 inches from the job mix formula after field adjustments

- The rate of application, once determined by the Engineer, shall not vary more than plus or minus 2 pound per square yard while remaining within the design application rate

00706.17 Quality Control - Be responsible for quality control as required by Section 00165. Perform quality control sampling and testing as follows:

(a) QC/QA Slurry Seal Program - Test gradation, mixture, moisture, and asphalt according to the MFTP.

(b) Slurry Seal Production (Gradation):

- **Stockpile** - 60,000 square yards.

- **Tanker** - 60,000 square yards.

- **Mixture** - To be taken directly out of pugmill every 60,000 square yards.

(c) Verification Testing - If comparisons of test results are outside the allowable differences, the Contractor and Engineer will investigate the reason. The Engineer may stop production while the investigation is in progress if the potential for pavement failure is present. The investigation may include review of calculation, testing of the remaining samples, review and observation of Contractor testing procedures and equipment, and a comparison of sample test results.

Equipment

00706.20 General - Provide suitable surface preparation equipment, traffic control equipment, hand tools and any other support equipment required as necessary to perform the work.

00706.21 Mixing Equipment - The machine(s) shall be specifically designed and manufactured to lay slurry seal. Mix slurry seal in continuous pug mill mixers; a self-propelled machine specifically designed and manufactured to accurately deliver and proportion the aggregate, emulsified asphalt, mineral filler, control setting additive and water to a revolving blade mixer that discharges the thoroughly mixed product on a continuous flow basis. Concrete transit mixer trucks shall not be used. Minimum slurry seal machine size shall be 7 cubic yards. In the case of equipment failure have a minimum of two machines on site with another off site for immediate backup. The machine shall be capable of mixing materials at pre-set proportions regardless of the speed of the machine and without changing machine settings.

The mixing machine shall be equipped with an approved fine feeder that provides an accurate metering device or method to introduce a predetermined proportion of mineral filler into the mixer at the same time and location that the aggregate is fed. Use the fine feeder whenever added mineral filler is a part of the aggregate blend.

The mixing machine shall be equipped with a water pressure system and fog type spray bar adequate for complete fogging of the surface preceding spreading equipment.

(a) Proportioning Devices - Provide and properly mark individual volume or weight controls, such as revolution counters or similar devices, for proportioning each material to be added to the mix (i.e., aggregate, mineral filler, additive, emulsified asphalt and water). Instruct the Engineer how to calculate the application rate per square yard utilizing the Contractor's proportioning devices.

(b) Calibration - Calibrate, in the presence of the Engineer, each slurry mixing unit to be used on the Project prior to construction. Previous calibration documentation covering the exact materials to be used may be accepted by the Engineer provided they were made during the calendar year. The documentation shall include an individual calibration of each material at various settings, which can be related to the machines metering devices. No machine will be allowed to work on the Project until the calibration has been completed and/or accepted.

00706.22 Spreading Equipment - Spreader Box - Attach to the mixer machine a mechanical type squeegee distributor equipped with flexible material that is in contact with the pavement surface to prevent the loss of slurry from the distributor. Adjust the distributor to prevent the loss of slurry on varying grades and crown and to assure uniform spread. There shall be a steering device and a flexible strike-off. The spreader box shall have an adjustable width. Keep the spreader box reasonably clean, and do not allow buildups of asphalt and aggregate. Only one tail rubber will be allowed. Any type of drag used shall be subject to approval by the Engineer and kept in a completely flexible condition at all times.

00706.23 Rollers - Rollers shall be self-propelled, steel-wheeled or pneumatic-tired type and be equipped with a water spray system. Steel-wheeled rollers shall be capable of providing a weight of not less than 2,400 pounds per foot width of the compression roll or rolls. Pneumatic-tired rollers shall be capable of exerting a ground pressure of not less than 80 pounds per square inch of tire contact area.

Labor

00706.30 Quality Control Personnel - Provide a certified technician in the following field:

- CAT-I (Certified Asphalt Technician I)

Construction

00706.40 Weather Limitations - Do not apply the slurry seal if either the pavement or air temperature is below 50 °F and falling. The slurry seal may be applied when both the pavement and air temperature are above 45 °F and rising. Do not apply if there is a danger that the finished product will freeze before 24 hours. Do not apply when weather conditions prolong opening to traffic beyond a reasonable time. Do not apply in the rain. Replace slurry damaged by rain after application according to the Specifications, and as determined by Engineer, at no additional cost. Clean the street of all remaining slurry mix materials prior to re-application.

Adjust the rate of application of the fog spray during the day to suit temperatures, surface texture, humidity and dryness of pavement surface. Do not spray additional water into the spreader box.

00706.41 Preparation of Surface - Submit details of the proposed street cleaning for approval by the Engineer prior to the preconstruction conference.

Remove any organic materials in cracks or joints not removed during crack sealing as part of the pavement preparation.

Pavement preparation shall consist of removal of all oil spills, flushing and sweeping. Complete flushing, as needed, prior to sweeping. Finish sweeping with a vacuum sweeper no more than 24 hours prior to application of the slurry seal. If there is a delay of more than 48 hours between sweeping and slurry sealing caused by weather conditions or other unforeseen circumstances, re-sweep as determined by the Engineer, at no additional cost to the City.

Prepare the pavement on which the slurry seal is to be placed as follows, as directed.

(a) Base Repairs - Where determined by the Engineer, excavate and replace surfacing materials according to Section 00332.

(b) Surface Repairs - Where the pavement is severely cracked, rutted, deformed or otherwise distressed, place a leveling course or patch using 3/4 inch or 1/2 inch dense graded asphalt concrete. The class of mix to be used shall conform to Section 00747. Place the mixture in accordance with Section 00747.

(c) Crack Sealing - Clean and fill cracks 1/8 inch and larger inside the proposed slurry seal area.

(d) Tack Coat - On old, dry bituminous pavements and on rigid pavements, the Engineer may direct that tack coats be applied prior to placing the slurry seal. The tack coat shall be a diluted asphalt emulsion of the same type and grade specified for the slurry mix. The ratio of asphalt emulsion to water shall be 1:3. Apply the diluted material uniformly with a pressure distributor at a rate between 0.05 to 0.10 gallon per square yard, as determined by the Engineer. The tack coat shall be cured thoroughly prior to the application of the slurry seal.

(e) Street Equipment and Procedure - Immediately prior to applying the slurry seal, clear the surface of all loose material, silt spots, vegetation, oil spots and other objectionable material. Any standard cleaning method will be acceptable. If water is used, allow cracks to dry thoroughly before slurry sealing. The Engineer will approve the surface preparation prior to sealing.

(f) Utility Covers - Protect manholes, valve boxes, drop inlets and other service entrances from the slurry seal by a suitable method. Clean these covers as quickly as possible after the application of the slurry seal and definitely prior to the final set. If necessary, clean slurry residual from the interior of the utilities.

(g) Pavement Markings - Cover, or remove, all reflector buttons before slurry seal is to be applied to any area, as determined by the Engineer. Cover all thermo-tape markings and do not slurry seal over, or remove and replace as directed. Remove all paint pavement markings to prevent bleeding through the slurry seal and to allow proper adhesion.

00706.42 General - The surface may be wetted by fogging ahead of the slurry box, if required by local conditions. Apply water used in wetting the surface at such a rate that the entire surface is damp with no apparent flowing water in front of the slurry box. The slurry mixture shall be of the desired consistency upon leaving the mixer. Do not add additional elements. Carry a sufficient amount of slurry in all parts of the spreader at all times so that complete coverage is obtained. Do not allow lumping, balling or unmixed aggregate in the spreader box. Do not allow segregation of the emulsion and aggregate fines from the coarse aggregates. If the coarse aggregate settles to the bottom of the mix, remove the slurry from the pavement. Do not allow excessive breaking of the emulsion in the spreader box. Do not leave streaks, such as caused by oversized aggregate, in the finished pavement. Maximum mixing time in the pugmill shall be four minutes.

00706.43 Application Rate - The minimum rate of application of dry aggregate per square yard will be determined by the Engineer. The depth of the slurry seal shall be sufficient to correct surface conditions, fill surface voids, and provide sealing and a minimum wearing surface. The maximum allowable vehicle speed for the rate of application shall be 180 feet per minute. Failure to demonstrate the proper rate of application will result in suspension of the work until the Contractor can demonstrate otherwise, at no additional cost.

ISSA TB112 gives a method to determine expected application rates.

The slurry seal mixture shall be of proper consistency at all times to provide the application rate required by the surface condition. The average application rate, as measured by the Engineer, shall be in accordance with the following table:

SUGGESTED APPLICATION RATE

	Recommended Use	
TYPE I	Parking Areas, Urban and Residential Streets, Airport Runways	6.7 - 10.0 lbs/yd^2
TYPE II	Urban and Residential Streets, Airport Runways	10.0 - 16.7 lbs/yd^2
TYPE III	Primary and Interstate Routes	15.0 - 25.0 lbs/yd^2

00706.44 Applying Slurry Seal Sample Strip - The strip shall consist of two panels approximately 50 feet long, placed side by side to form a typical seam between them. The width of the panels shall be the same as the Contractor plans to use on the streets. Place the strip at least 24 hours prior to the beginning of the actual work. Use the strip to calculate and monitor the rate of application in relation to weight of material per area, and to define the speed of the equipment related to the rate of application. If it is determined by the Engineer on the basis of this test strip that there are deficiencies in the mix design, method of application and rate of application, the Engineer may require the Contractor to revise the mix design, or repair or modify the equipment or application. After all changes are made, lay a new sample strip.

00706.45 Joints - Construct a uniform line along the edge and a good seal at curb lines. Construct the flow line at curbs to allow storm drainage flow to catch basins without bonding along the curb line. In the case of a concrete gutter, cover the gutter line joint with the slurry seal, but do not overlap onto the gutter. Remove any overlap, as determined by the Engineer, at no additional cost. Streets that have been recently slurry sealed that cross this Project shall not be slurry sealed again.

The slurry joints and panels shall be straight, neat and uniform and follow the contour of the existing curb or concrete gutter. The width of the panels shall be the same as demonstrated in the sample strip. Floating (adding additional water other than what is required for the approved mix design) of the emulsion or slurry mixture in the pugmill and/or spreader box to cover or overlap missed areas will be prohibited. Keep lines straight at intersections to provide a good appearance.

00706.46 Handwork - Use approved squeegees to spread slurry in areas not accessible to the slurry mixer.

Limit handwork at the beginning and end of the panels to prevent segregation of the rock from the emulsion and to minimize cosmetic drag mop marks and/or defects in the finished product.

The same type finish as applied by the spreader box shall be required. Complete handwork prior to setting of the slurry.

00706.47 Curing - The rate of curing of the slurry seal shall be such that a street may be opened to traffic after application without tracking or damage to the surface. Protect the area for the full curing period with suitable barricades or markers.

The City will not be responsible for any damage to the slurry seal prior to opening the area. Repair all damage to the slurry, to the satisfaction of the Engineer, at no additional cost to the City.

00706.48 Rolling - Apply a minimum of two full coverage passes to the surfaced areas by the roller, or as directed.

00706.49 Cleanup - Remove all debris associated with the performance of the work on a daily basis.

Temporary

00706.51 Provision for Traffic - Be responsible for notifying all abutting property owners along the streets in accordance with the approved schedule, or an approved revision thereto, 48 hours prior to the specific work.

Remove all traffic control promptly when it is determined that the street may be open to traffic. Do not seal any street that requires closing overnight without the approval of the Engineer.

In the event that slurry seal does not cure in a timely manner and remains trackable overnight, apply a covering of 1/4 inch minus material to prevent tracking and related property damage prior to permitting traffic on the street. Cost for this work shall be considered as incidental to the work.

Be responsible for all damage to the uncured slurry or to private or public property due to tracking of the uncured material.

Measurement

00706.80 Slurry Seal - Slurry seal will be measured on an area basis.

00706.81 Crack Seal - Crack seal will be measured on a length basis of material in place.

00706.82 Base Repair - Base repairs will be measured according to Section 00332.

00706.83 Surface Repair - Asphalt concrete will be measured according to Section 00747. All other work associated with surface repairs is considered Incidental to slurry seal.

Payment

00706.90 Slurry Seal - The accepted quantities of slurry seal will be paid for at the Contract unit price per square yard for the item "Slurry Seal".

Payment will be payment in full for furnishing and placing all materials and furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

Unless there are pay items for crack sealing, base repair, and surface repairs, these items will be considered Incidental and included in payment made for the slurry seal item.

00706.91 Crack Seal - The accepted quantities of crack sealing will be paid for at the Contract unit price per foot for the item "Slurry Seal Crack Sealing". Payment will be payment in full for furnishing and placing all materials and for furnishing all equipment, labor and incidentals necessary to complete the work as specified. Payment also includes preparation work, sealant, routing, and backer rods.

00706.92 Base Repair - The accepted quantities of base repairs will be paid for according to Section 00332.

00706.93 Surface Repair - The accepted quantities of asphalt concrete will be paid for according to Section 00747.

00706.93 Incidental Basis - When not listed in the Schedule of Items, slurry seal, crack seal, base repair, and surface repair will be considered Incidental.

Section 00710 - Single Application Emulsified Asphalt Surface Treatment

Description

00710.00 Scope - This work consists of applying emulsified asphalt and graded aggregates as shown or directed.

The chip seal design will be designated on the plans or in the Special Provisions.

Materials

00710.10 Aggregates - Provide aggregates conforming to the following requirements:

(a) Size Designation - Provide the size of aggregate for the single application emulsified asphalt surface treatment design designated in the plans or Special Provisions according to the following:

Chip Seal Design	Size of Screenings
Fine	3/8" - No. 8
Single Size Medium	3/8" - 1/4"
Graded Medium	3/8" - No. 4
Coarse	1/2" - 1/4"

(b) Fractured Faces - Provide aggregates consisting of broken stone, crushed gravel or a combination of both. Crush aggregate such that at least 90% by weight of the total aggregate retained on the No. 8 and larger sieves is fractured on two faces, as determined according to AASHTO TP 61.

(c) Grading - Perform sieve analysis according to AASHTO T 27 and T 11. Provide grading for the designated single application emulsified asphalt surface treatment design according to the following:

Sieve Size	Coarse	Single Size Medium	Graded Medium	Fine
	1/2" - 1/4"	3/8" - 1/4"	3/8" - No. 4	3/8" - No. 4
Percent Passing (by Weight)				
3/4"	100			
1/2"	85 - 100	100	100	
3/8"	–	85 - 100	80 - 100	100
1/4"	0 - 15	0 - 15	10 - 40	–
No. 4	–	–	–	45 - 65
No. 8	0 - 4	–	0 - 6	0 - 10
No. 30	–	0 - 2	0 - 2	–
No. 200 (wet)	0 - 2	0 - 2	0 - 2	0 - 2
No. 200 (wet) *	0 - 1	0 - 1	0 - 1	0 - 1

* in gravels

(d) Unit Weight of Aggregate - Provide aggregate with a minimum unit weight of 90 pounds per cubic foot according to AASHTO T 19.

(e) Soundness - Provide coarse and fine aggregate with a weighted loss not exceeding 12% when subjected to five cycles of the soundness test using sodium sulfate salt according to AASHTO T104.

(f) Durability - Provide aggregates meeting the following durability requirements:

Test	Test Method ODOT	AASHTO	Maximum Values
Abrasion		T 96	30.0%
Degradation (Coarse Aggregate) Passing No. 20 Sieve	TM 208		30.0%
Sediment Height	TM 208		3.0"

(g) Harmful Substances - Provide aggregates meeting the following harmful substances requirements:

Test	Test Method ODOT	AASHTO	Limits
Lightweight Pieces		T113	1.0% Maximum
Wood Particles	TM225		0.1% maximum
Elongated Pieces (Coarse Aggregate at a 1 ratio of 5:1)	TM229		10.0% maximum
Cleanness Value	TM 227		75 minimum

(h) Taking Aggregates from City Stockpiles - When it is specified that aggregates are to be taken from City-controlled stockpiles, take the material in an orderly manner. Do not contaminate the materials. Salvage all material possible from the area which the material is taken. Shape unused portions of a stockpile to neat lines. The Contractor will be charged for materials wasted through negligence or used without authority.

(i) Stockpiling Contractor-Furnished Aggregates on City Property - Aggregates may be temporarily stockpiled at approved sites on City property provided the areas used are as small as practicable. Restore the site to its original condition after the materials have been removed. Any contamination during storage or from reloading operations will be cause for rejection.

00710.11 Emulsified Asphalt - Provide polymer-modified emulsified asphalt or non-polymer-modified emulsified asphalt as specified for the single application emulsified asphalt surface treatment design designated in the plans or Special Provisions. When non-polymer-modified emulsified asphalt is designated, the Contractor may elect to substitute a polymer-modified emulsified asphalt, however, selection of the polymer-modified emulsified asphalt will not be cause for additional compensation.

(a) Non-Polymer-Modified Emulsified Asphalt - When non-polymer-modified emulsified asphalt is specified, provide CRS-1, CRS-2, or HFRS-2 emulsified asphalt as the Contractor elects.

(b) Polymer-Modified Emulsified Asphalt - When polymer-modified emulsified asphalt is specified, use CRS-2P or HFRS-P1 as the Contractor elects.

(c) Acceptance of Emulsified Asphalt - Provide emulsified asphalt conforming to the requirements of ODOT's publication, "Standard Specifications for Asphalt Materials". Copies of the publication are available from the ODOT Pavement Services Engineer. The applicable Specifications are those contained in the current publication on the date the Project is advertised. The materials may be conditionally accepted at the source or point of loading for transport to the Project.

Excessive delay in the use of the emulsified asphalt or excessive pumping of the emulsified asphalt may significantly reduce the viscosity and may make the material unsuitable for chip seal use. For this reason limit pumping between the bulk storage tank, hauling transportation, field storage tanks and distributor to an absolute minimum to maintain proper viscosity. Final acceptance of emulsified asphalt will be at the point of application.

Obtain samples of emulsified asphalt according to AASHTO T 40 at the frequency indicated in the MFTP. Samples will be tested at the ODOT Materials Laboratory, or other laboratory as designated by the City. Non-polymer-modified emulsified asphalt will be tested within 30 calendar days from the date it is sampled. Polymer-modified emulsified asphalt will be tested within 14 calendar days from the date it is sampled.

00710.15 Aggregate Production Quality Control - Provide quality control during production of aggregate according to Section 00165. Sampling and Testing shall be performed by a CAgT at the minimum frequency schedule indicated in the MFTP.

(a) Quality Control Compliance - Evaluate aggregates for compliance according to the following:

(1) Gradation - Analyze gradation statistically according to Section 00165. A stockpile contains specification aggregate when the Pay Factor (PF) for each sieve size calculated according to 00165.40 is equal to or greater than 1.00. Each required sample represents a sublot.

When the results from Table 00165-2 yield a Pay Factor of less than 1.00 for any sieve size, the material is non-specification. The Engineer will reject any stockpile of aggregate containing non-specification material unless the non-specification material is removed from the stockpile. Do not add additional material to such a stockpile until enough non-specification material is removed so that the PF for each sieve size is equal to or greater than 1.00.

(2) Other Tests - Stop production, make appropriate operational adjustments, and remove all failing material from the stockpile whenever a quality control test result, other than sieve analysis, does not meet Specifications. Document operational adjustments made and notify the Engineer prior to resuming production.

(3) Preproduced Aggregate - Compliance of aggregates produced and stockpiled before the award of this Contract will be determined by either of the following:

- Continuing production records meeting the requirements of 00710.10 and 00710.15

- Sampling according to AASHTO T 2 and testing the entire stockpile at the minimum frequency schedule indicated in the MFTP. The material shall meet the requirements of 00710.10 and 00710.15.

(b) Materials on Hand - Payment for stockpiled materials on hand may be allowed as described in 00195.60 subject to meeting the requirements of 00710.10 and 00710.15.

00710.16 Acceptance of Aggregate - The Contractors quality control tests will be used for acceptance of aggregates if verified by the City's quality assurance program. The City will perform aggregate production quality assurance according to the following:

(a) ODOT Administered Projects - Quality assurance testing on ODOT administered projects will be performed according to Section 00165, the MFTP and the ODOT Quality Assurance Manual.

(b) Projects Administered by Other Agencies - The quantity of quality assurance testing on projects administered by other Agencies will be at the discretion of the City or as designated in the Special Provisions.

Equipment

00710.20 Equipment - Provide a pressure distributor, hauling vehicles, chip spreader, compactors, power brooms and other necessary equipment to ensure efficient operation and construction to meet specified results. Provide equipment in sufficient number and capacities that will provide coordinated and uniform progress of the work.

Provide two-way radio communication between the asphalt distributor and chip spreader.

00710.21 Asphalt Distributor - Provide an asphalt distributor designed, equipped, maintained and operated so the emulsified asphalt material may be applied uniformly at even heat. The distributor shall be capable of applying the asphalt on variable surface widths up to 16 feet, at readily determined and controlled rates from 0.05 - 2.0 gallons per square yard, and with uniform pressure. The variation allowed from any specified rate shall not exceed 0.02 gallons per square yard. Provide distributor equipment that includes a tachometer, pressure gages, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Provide distributors equipped with a positive power unit for the asphalt pump, and full circulation spray bars adjustable both laterally and vertically. Set the bar height for triple lap coverage.

00710.22 Chip Spreaders - Provide self-propelled chip spreaders equipped with a mechanical device that will spread the aggregate at a uniform rate across the full width of the chip spreaders. Provide chip spreaders equipped with an aggregate segregator assembly. Chip spreaders without an aggregate segregator assembly may be allowed if approved by the Engineer. Provide chip spreaders of adequate width to provide full coverage of the specified panel and without placing joints in the travel lanes.

00710.23 Compactors - Provide self-propelled pneumatic-tired or steel-wheeled rollers in good condition and capable of operating at speeds compatible with the surface treatment operation. A minimum of two pneumatic tired rollers and one steel-wheeled roller is required.

(a) Pneumatic-tired Rollers - Provide self-propelled, tandem or multiple axle, multiple wheel type pneumatic-tired rollers with smooth-tread pneumatic tires of equal size. The tires shall be staggered on the axles at such spacings and overlaps that will provide uniform compacting pressure for the full compacting width of the roller. The minimum load per tire shall be 2,800 pounds, with tire inflation pressures of 45 to 90 psi.

(b) Steel-wheeled Rollers - Provide steel-wheeled rollers with a gross static weight of at least 8 tons.

00710.24 Power Brooms - Provide pickup or non-pickup type power brooms equipped with a positive means to control vertical pressure.

Labor

00710.30 Quality Control Personnel - Provide a certified technician in the following field:

- CAgT (Certified Aggregate Technician)

Construction

00710.40 Season and Weather Limitations - Do not apply emulsified asphalt when the pavement temperature is below 70 °F, nor if the humidity is higher than 75%. Complete the application of the emulsified asphalt and the aggregate three hours before sunset. Remove by milling, or other methods approved by the Engineer, and replace at the Contractor's expense, any surface treatments damaged by weather during the first 24 hours after application. The placing of single application emulsified asphalt surface treatments will not be allowed before July 1 or after August 31.

00710.41 Rate of Progress and Scheduling - Do not apply more surface treatment in any one day than can be broomed the following morning, unless approved by the Engineer. Provide a traffic control plan for approval by the Engineer if operations exceed 3 centerline miles or 6 lane miles per day.

00710.42 Preparation of Underlying Surfaces - Immediately before applying the emulsified asphalt, clean and dry the surface to be treated in a manner approved by the Engineer.

00710.43 Sequence of Operations - Construct the single application emulsified asphalt surface treatment with a single spread of emulsified asphalt followed immediately with a single spread of aggregate and initial rolling, unless otherwise directed by the Engineer.

00710.44 Application Rates - Apply the emulsified asphalt and spread the aggregate within the following ranges of rates for the specified surface treatment design. The exact application and spread rate will be determined by the Engineer.

Chip Seal Design	Emulsified Asphalt Application Rate (gal/yd^2)	Aggregate Spread Rate (yd^3/yd^2)
Fine	0.25 - 0.40	0.004 - 0.009
Single Size Medium	0.40 - 0.65	0.005 - 0.015
Graded Medium	0.40 - 0.65	0.005 - 0.015
Coarse	0.33 - 0.70	0.009 - 0.018

00710.45 Applying Emulsified Asphalt - Apply emulsified asphalt at the rates specified in 00710.44 and according to the following:

- Apply the emulsified asphalt working toward the aggregate stockpile at all times, unless otherwise approved by the Engineer.

- Leave a minimum of 200 gallons of emulsified asphalt in the distributor tank at all times.

- Do not apply emulsified asphalt to more than one-half the width of the travel way at one time with the remaining width remaining open to traffic. Do not close the open lane until traffic controlled by pilot car is operating on the new chip seal. Apply the surface treatment, weather permitting, to both sides of the travel way so that the end of the work is squared up three hours before sunset.

- Do not apply emulsified asphalt a greater distance than can be immediately covered by aggregates before the emulsion breaks.

- Place building paper over the treated surface at the beginning of each spread to ensure that the nozzles are operating properly before the uncovered surface is reached. Remove and dispose of building paper in a manner satisfactory to the Engineer.

- If requested by the Engineer, demonstrate that the distribution of the emulsified asphalt does not vary between the individual nozzles by more than 15% transversely from the average, and no more than 10% longitudinally from the specified rate of application.

- Apply the emulsified asphalt at a temperature between 140 °F and 185 °F as recommended by the manufacturer.

00710.46 Hauling and Spreading Aggregates - Spread aggregates at the rates specified in 00710.44.

Do not operate hauling and spreading equipment on uncovered emulsified asphalt. During the first hour after application of the emulsified asphalt and aggregate, operate at speeds no more than 10 mph and after the first hour, not more than 15 mph until otherwise permitted by the Engineer. Carefully operate hauling equipment at all times, at moderate speeds that will not damage the new chip seal or create a hazard to the traveling public. Route hauling equipment and pilot lines as uniformly as possible over the full width of the new surface in place.

Calibrate the gate opening, gear selection and engine RPM of the chip spreaders for the various sizes of aggregate to be used. Following calibration, verify the rate of application by a method acceptable to the Engineer.

Immediately cover the emulsified asphalt surface with aggregate unless otherwise authorized by the Engineer. Maintain the rate of spread of this aggregate within 10% of specified rate. Using approved methods, remove or repair emulsified asphalt that has set or "broke" before being covered with aggregate, at Contractor's expense.

Aggregates shall be surface damp at the time of application. Excess free water (water not adhering to the aggregate surface) on the aggregate will not be permitted.

Do not operate the chip spreader at speeds which cause the chips to roll over after striking the emulsion covered surface.

Provide coverage without gaps or overlapping adjacent coverages. Do not construct longitudinal joints within the travel lanes.

Construct neat transverse cut off of aggregates and remove any excess aggregates from the surface prior to resuming operations.

00710.47 Shaping and Compacting - After the aggregates have been placed on the emulsified asphalt, spread or remove all piles, ridges, or uneven distribution to ensure against rough spots in the final surface.

Compact the surface with a minimum of two coverages with a pneumatic tired roller and one coverage with a steel-wheeled roller. Continue compacting until the material is interlocked, firm and partially bound with the underlying emulsified asphalt. The sequence of roller coverages may be adjusted at the discretion of the Engineer.

Operate rollers at speeds such that the rollers do not pick up aggregates from the surface. Do not exceed rolling speeds of 5 mph.

In the event aggregates begin to pick up under traffic or from the rolling operation, immediately cover and roll the area with additional quantities of aggregate.

Maintenance

00710.60 Power Brooming - Following the application of the surface treatment, carefully broom the entire surface to remove loose aggregate. Discontinue the operation if brooming damages the surface treatment. Use a minimum of two power brooms.

Subsequent brooming the following two days may be directed by the Engineer to ensure that the surface is free of loose aggregate that could cause vehicle damage.

In curbed areas, use a pick-up type power broom. On bridges, sidewalks and other areas off the roadway, remove all loose aggregates to the satisfaction of the Engineer.

Measurement

00710.80 General - The quantities of aggregate will be measured by the ton according to 00190.10, or by the cubic yard in the hauling vehicle.

The quantities of emulsified asphalt will be measured by the ton according to 00190.10.

When indicated by the appropriate pay item in the Schedule of Items, separate measurement will be made for the additional labor and other additional costs in constructing single application emulsified asphalt surface treatment on connections to public roads and streets, on approaches to private properties, and guardrail flares. Measurement will be on a unit basis, per each, by actual count of each location where the connections, approaches, and guardrail flares are constructed and accepted.

Payment

00710.90 General - The accepted quantities will be paid for at the Contract unit price per unit of measurement for the following items:

	Pay Item	**Unit of Measurement**
(a)	Aggregate in Emulsified Asphalt Surface Treatment	Ton or Cubic Yard
(b)	Asphalt in Emulsified Asphalt Surface Treatment	Ton
(c)	Extra for Emulsified Asphalt Surface Treatment Approaches	Each

Item (c) applies to the extra costs of placing the aggregates and asphalt in single application emulsified asphalt surface treatments on connections, approaches, and guardrail flares. Payment will be in addition to payment made for the materials used in the work.

Unless a pay item is included in the Schedule of Items for emulsified asphalt surface treatment of connections, approaches, and guardrail flares, the treatment will be considered Incidental with no separate or additional payment being made for this work.

Payment will be payment in full for preparing the road surface, providing all materials in final position, brooming, and for all equipment, labor, and incidentals necessary to complete the work as specified.

Section 00715 - Multiple Application Emulsified Asphalt Surface Treatment

Description

00715.00 Scope - This work consists of applying multiple layers of emulsified asphalt and graded aggregates, applied in successive spreads, to form a firm, finished surface as shown or directed.

The surface treatment design will be designated on the plans or in the Special Provisions.

Materials

00715.10 Aggregates - Provide aggregates according to the following requirements:

(a) Fractured Faces - Provide aggregates consisting of broken stone, crushed gravel, or a combination of both. Crush aggregate such that at least 90% by weight of the total aggregate retained on the No. 8 and larger sieves is fractured on two faces, as determined according to AASHTO TP 61.

(b) Grading - Perform sieve analysis according to AASHTO T 27 and T 11. Provide designated gradings for the specified multiple application emulsified asphalt surface treatment design according to the following:

	Designated Size (inch)			
Sieve Size	**1 - 1/2**	**3/4 - 1/2**	**1/2 - 1/4**	**3/8 - No. 8**
	Percent Passing (by Weight)			
1"	100	100		
3/4"	95 - 100	90 - 100	100	
1/2"	60 - 90	0 - 10	85 - 100	
3/8"	–	–	–	100
1/4"	15 - 30	0 - 2	0 - 15	–
No. 4	–	–	–	45 - 65
No. 8	0 - 7	–	0 - 4	0 - 10
No. 200 (wet)	0 - 2	0 - 2	0 - 2	0 - 2
No. 200 (wet)*	0 - 1	0 - 1	0 - 1	0 - 1

*in gravels

(c) Unit Weight of Aggregate - Provide aggregate with a minimum unit weight of 90 pounds per cubic foot according to AASHTO T 19.

(d) Soundness - Provide coarse and fine aggregate with a weighted loss not exceeding 12% when subjected to five cycles of the soundness test using sodium sulfate solution according to AASHTO T 104.

(e) Durability - Provide aggregates meeting the following durability requirements:

Test	Test Method ODOT	Test Method AASHTO	Maximum Values
Abrasopm		T96	30.0%
Degradation (coarse aggregate)			
Passing NO. 20 Sieve	TM 208		30.0%
Sediment Height	TM 208		3"

(f) Harmful Substances - Provide aggregates meeting the following harmful substances requirements:

Test	Test Method ODOT	Test Method AASHTO	Limits
Lightweight Pieces		T 113	1.0% Maximum
Wood Particles	TM 225		0.1% Maximum
Elongated Pieces (Coarse Aggregated at a ratio of 5:1)	TM 229		10.0% Maximum
Cleanness Value	TM 227		75 Maximum

(g) Taking Aggregates from City Stockpiles - When it is specified that aggregates are to be taken from City-controlled stockpiles, take the material in an orderly manner. Do not contaminate the materials. Salvage all material possible from the area which the material is taken. Shape unused portions of a stockpile to neat lines. The Contractor will be charged for materials wasted through negligence or used without authority.

(h) Stockpiling Contractor Furnished Aggregates on City Property - Aggregates may be temporarily stockpiled at approved sites on City property provided the areas used are as small as practicable. Restore the site to its original condition after the materials have been removed. Any contamination during storage or from reloading operations will be cause for rejection.

00715.11 Emulsified Asphalt - Provide polymer-modified emulsified asphalt or non-polymer-modified emulsified asphalt as specified for the multiple application emulsified asphalt surface treatment design designated in the plans or Special Provisions. When non-polymer-modified emulsified asphalt is designated, the Contractor may elect to substitute a polymer-modified emulsified asphalt, however, selection of the polymer-modified emulsified asphalt will not be cause for additional compensation.

(a) Non-Polymer-Modified Emulsified Asphalt - When non-polymer-modified emulsified asphalt is specified, provide CRS-1, CRS-2, or HFRS-2 emulsified asphalt as the Contractor elects.

(b) Polymer-Modified Emulsified Asphalt - When polymer-modified emulsified asphalt is specified, use CRS-2P or HFRS-P1 as the Contractor elects.

(c) Acceptance of Emulsified Asphalt - Provide emulsified asphalt conforming to the requirement of ODOT's publication "Standard Specifications for Asphalt Materials". Copies of the publication are available from the ODOT Pavement Services Engineer. The applicable specifications are those contained in the current publication on the date the Project is advertised. The materials may be conditionally accepted at the source or point of loading for transport to the Project.

Excessive delay in the use of the emulsified asphalt or excessive pumping of the emulsified asphalt may significantly reduce the viscosity and may make the material unsuitable for chip seal use. For this reason limit pumping between the bulk storage tank, hauling transportation, field storage tanks and distributor to an absolute minimum to maintain proper viscosity. Final acceptance of emulsified asphalt will be at the point of application.

Obtain emulsified asphalt samples according to AASHTO T 40 at the frequency indicated in the MFTP. Samples will be tested at the ODOT Materials Laboratory, or other laboratory as designated by the City. Non-polymer-modified emulsified asphalt will be tested within 30 calendar days from the date it is sampled. Polymer-modified emulsified asphalt will be tested within 14 calendar days from the date it is sampled.

00715.15 Aggregate Production Quality Control - Provide quality control during production of aggregate according to Section 00165. Sampling and Testing shall be performed by a CAgT at the minimum frequency schedule indicated in the MFTP.

(a) Quality Control Compliance - Evaluate aggregates for compliance according to the following:

(1) Gradation - Analyze gradation statistically according to Section 00165. A stockpile contains specification aggregate when the Pay Factor (PF) for each sieve size calculated according to 00165.40 is equal to or greater than 1.00. Each required sample represents a sublot.

When the results from Table 00165-2 yield a Pay Factor of less than 1.00 for any sieve size, the material is non-specification. The Engineer will reject any stockpile of aggregate containing non-specification material unless the non-specification material is removed from the stockpile. Do not add additional material to such a stockpile until enough non-specification material is removed so that the PF for each sieve size is equal to or greater than 1.00.

(2) Other Tests - Stop production, make appropriate operational adjustments, and remove all failing material from the stockpile whenever a quality control test result, other than sieve analysis, does not meet Specifications. Document operational adjustments made and notify the Engineer prior to resuming production.

(3) Preproduced Aggregate - Compliance of aggregates produced and stockpiled before the award of this Contract will be determined by either one of the following:

- Continuing production records meeting the requirements of 00715.10 and 00715.15

- Sampling according to AASHTO T 2 and testing the entire stockpile at the minimum frequency schedule indicated in the MFTP. The material shall meet the requirements of 00715.10 and 00715.15.

(b) Materials on Hand - Payment for stockpiled materials on hand may be allowed as described in 00195.50(i)(5), subject to meeting the requirements of 00715.10 and 00715.15.

00715.16 Acceptance of Aggregate - The Contractors quality control tests will be used for acceptance of aggregates if verified by the City's quality assurance program. The City will perform aggregate production quality assurance according to the following:

(a) ODOT Administered Projects - Quality assurance testing on ODOT administered projects will be performed according to Section 00165, the MFTP and the ODOT Quality Assurance Manual.

(b) Projects Administered by Other Agencies - The quantity of quality assurance testing on projects administered by other Agencies will be at the discretion of the City or as designated in the Special Provisions.

Equipment

00715.20 Equipment - Provide a pressure distributor, hauling vehicles, chip spreader, compactors, power brooms, and other necessary equipment to ensure efficient operation and construction to meet specified results. Provide equipment in sufficient number and capacities that will provide coordinated and uniform progress of the work.

Provide two-way radio communication between the asphalt distributor and chip spreader.

00715.21 Asphalt Distributor - Provide an asphalt distributor designed, equipped, maintained and operated so the emulsified asphalt material is applied uniformly at even heat. The distributor shall be capable of applying the asphalt on variable surface widths up to 16 feet, at readily determined and controlled rates from 0.05 - 2.0 gallons per square yard, and with uniform pressure. The variation allowed from any specified rate shall not exceed 0.02 gallons per square yard. Provide distributor equipment that includes a tachometer, pressure gages, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Provide distributors equipped with a positive power unit for the asphalt pump, and full circulation spray bars adjustable both laterally and vertically. Set the bar height for triple lap coverage.

00715.22 Chip Spreaders - Provide self-propelled chip spreaders equipped with a mechanical device that will spread the aggregate at a uniform rate across the full width of the chip spreaders. Provide chip spreaders equipped with an aggregate segregator assembly. Chip spreaders without an aggregate segregator assembly may be allowed if approved by the Engineer. Provide chip spreaders of adequate width to provide full coverage of the specified panel and without placing joints in the travel lanes.

00715.23 Compactors - Provide self-propelled, pneumatic-tired or steel-wheeled rollers in good condition and capable of operating at speeds compatible with the multiple application emulsified asphalt surface treatment operation. A minimum of two pneumatic-tired rollers and one steel-wheeled roller is required.

(a) Pneumatic-tired Rollers - Provide self-propelled, tandem or multiple axle, multiple wheel type pneumatic-tired rollers with smooth-tread pneumatic tires of equal size. The tires shall be staggered on the axles at such spacings and overlaps that will provide uniform compacting pressure for the full compacting width of the roller. The minimum load per tire shall be 2,800 pounds, with tire inflation pressures of 45 to 90 psi.

(b) Steel-wheeled Rollers - Provide steel-wheeled rollers with a gross static weight of at least 8 tons.

00715.24 Power Brooms - Provide pickup or nonpickup type power brooms equipped with a positive means to control vertical pressure.

Labor

00715.30 Quality Control Personnel - Provide a certified technician in the following field:

- CAgT (Certified Aggregate Technician)

Construction

00715.40 Season and Weather Limitations - Do not apply emulsified asphalt when the pavement temperature is below 70 °F, nor if the humidity is higher than 75%. Complete the application of the emulsified asphalt and the aggregate three hours before sunset. Remove by milling, or other methods approved by the Engineer, and replace at the Contractor's expense, any surface treatments damaged by weather during the first 24 hours after application. The placing of multiple application emulsified asphalt surface treatments will not be allowed before July 1 or after August 31.

00715.41 Preparation of Underlying Surfaces - Prepare underlying surfaces according to the following:

(a) Asphalt Surfaces - Immediately before applying the emulsified asphalt, clean and dry the surface to be sealed and trim the shoulders in a manner approved by the Engineer.

(b) Aggregate Surfaces - Bring aggregate bases and other bases or foundations, when constructed under the Contract, to the completed and finished condition according to the applicable Specifications.

Bring old bases and foundations, constructed by others, to the applicable condition according to Section 00610, and within 1/2 inch of established grade and cross section.

00715.42 Sequence of Operations and Application Rates - Construct the number of spreads, the size of aggregates, and the application rates for both emulsified asphalt and aggregates for the multiple application emulsified asphalt surface treatment design specified according to Table 00715-1. Vary the rates of spread as directed by the Engineer during the progress of the work to produce the best results.

Table 00715-1
Multiple Surface Treatment Design

Spreading Order and Rate of Spread*	Fine Double Chip Seal	Medium Double Chip Seal	Type E-9 Oil Mat	Type E-11 Oil Mat
First Course				
Emulsified Asphalt	.20	0.25	0.30	0.30
1" - 1/2" Aggregate				0.015
3/4" - 1/2" Aggregate			0.014	
1/2" - 1/4" Aggregate		0.010		
3/8" - No. 8 Aggregate	0.008			
Second Course				
Emulsified Asphalt	0.30	0.30	0.35	.0.35
1" - 1/2" Aggregate				0.015
1/2" 1/4" Aggregate			0.010	
3/8" - No. 8 Aggregate	0.006	0.007	0.002	0.002
Third Course				
Emulsified Asphalt				0.30
3/8" - No. 8 Aggregate				0.007
Fourth Course				
Emulsified Asphalt				0.30
3/8" - No. 8 Aggregate				0.007
Total Quantities				
Emulsified Asphalt	0.50	0.55	0.95	1.30
Aggregates	0.014	0.017	0.033	0.052

* The rates of spread are in the following units:

Emulsified Asphalt - gal/yd^2
Aggregates - yd^3/yd^2

(a) Type E-9 and E-11 Oil Mats - Use one of the following procedures as mutually agreed to by the Engineer and Contractor for Type E-9 and E-11 oil mats:

- Complete first and second course (and third course for Type E-11) of the oil mat throughout the entire section (including the dry key) to which the oil mat is to be applied. Square up these courses three hours prior to sunset each day.

  Prior to applying third course (fourth course for Type E-11), lightly broom any loose aggregates from surface. Apply third or fourth course (seal coat) throughout entire section. Square up the courses three hours prior to sunset each day.

- Square up first and second course (and third course for Type E-11) of the oil mat three hours prior to sunset.

  The following day, prior to applying third course (fourth course for Type E-11), lightly broom any loose aggregates from surface. Place the third or fourth course (seal coat) of the oil mat and square up three hours prior to sunset.

- Complete all courses the same day. Square up all courses three hours prior to sunset.

(b) Taper at Project Ends - Stop succeeding courses of each surface treatment 16 feet beyond the preceding course, or as directed by the Engineer, at Project ends to provide a smooth transition to the existing pavement.

00715.43 Applying Emulsified Asphalt - Apply emulsified asphalt at the rates specified in 00715.42 and according to the following:

- Apply emulsified asphalt, working toward the aggregate stockpile at all times, unless otherwise approved by the Engineer.

- Leave a minimum of 200 gallons of emulsified asphalt in the distributor tank at all times.

- Do not apply emulsified asphalt to more than one-half the width of the travel way at one time with the remaining width remaining open to traffic. Do not close the open lane until traffic controlled by pilot car is operating on the new surface treatment. Apply the surface treatment, weather permitting, to both sides of the travel way so that the end of the work is squared up three hours before sunset.

- Do not apply emulsified asphalt a greater distance than can be immediately covered by aggregates before the emulsion breaks.

- Place building paper over the treated surface at the beginning of each spread to ensure that the nozzles are operating properly before the uncovered surface is reached. Remove and dispose of building paper in a manner satisfactory to the Engineer.

- If requested by the Engineer, demonstrate that the distribution of the emulsified asphalt does not vary between the individual nozzles by more than 15% transversely from the average, and no more than 10% longitudinally from the specified rate of application.

- Apply the emulsified asphalt at a temperature between 140 °F and 185 °F as recommended by the manufacturer.

00715.44 Hauling and Spreading Aggregates - Spread aggregates at the rates specified in 00715.42.

Do not operate hauling and spreading equipment on uncovered emulsified asphalt. During the first hour after application of the emulsified asphalt and aggregate, operate at speeds no more than 10 mph and after the first hour, not more than 15 mph until otherwise permitted by the Engineer. Carefully operate hauling equipment at all times, at moderate speeds that will not damage the new chip seal or create a hazard to the traveling public. Route hauling equipment and pilot lines as uniformly as possible over the full width of the new surface in place.

Calibrate the gate opening, gear selection and engine RPM of the chip spreaders for the various sizes of aggregate to be used. Following calibration, verify the rate of application by a method acceptable to the Engineer.

Immediately cover the emulsified asphalt surface with aggregate unless otherwise authorized by the Engineer. Maintain the rate of spread of this aggregate within 10% of specified rate. Using approved methods, remove or repair emulsified asphalt that has set or "broke" before being covered with aggregate, at Contractor’s expense.

Aggregates shall be surface damp at the time of application. Excess free water (water not adhering to the aggregate surface) on the aggregate will not be permitted.

Do not operate the chip spreader at speeds which cause the chips to roll over after striking the emulsion covered surface.

Provide coverage without gaps or overlapping adjacent coverages. Do not construct longitudinal joints within the travel lanes.

Construct neat transverse cut off of aggregates and remove any excess aggregates from the surface prior to resuming operations. Stagger cut-offs of successive courses a minimum of 5 m (16 feet) prior to the end of a proceeding course.

00715.45 Shaping and Compacting - After the aggregates have been placed on the emulsified asphalt and spread, remove all piles, ridges or uneven distribution to ensure against rough spots in the final surface.

Compact the surface with a minimum of four complete coverages immediately behind the chip spreader. Perform additional coverages as directed by the Engineer until the material is interlocked, firm, and partially bound with the underlying emulsified asphalt. The sequence of rollers will be as directed by the Engineer.

Operate rollers at speeds that do not damage the surface. Do not exceed rolling speeds of 5 mph. In the event aggregates begin to pick up under traffic or from the rolling operation, immediately cover and roll the area with additional quantities of aggregate.

Begin rolling at the low side of the cross section and progress with passes parallel to the roadway centerline. Overlap each preceding pass by at least one half the width of the roller.

Along curbs, walls and at all other places not accessible to specified rollers, thoroughly compact the aggregate with mechanical tampers or hand tampers. Provide hand tampers with a weight of not less than 50 pounds and a tamping face of not more than 0.7 square foot.

Correct irregularities in emulsified asphalt distribution, surface smoothness, non-uniformity of texture, segregation of materials, dirt pockets, spots of excess asphalt and other deficiencies and defects. Accomplish this by the removal, replacement, addition of material, repetition of construction operations or other suitable means, as directed or approved by the Engineer.

Maintenance

00715.60 Establishment - During periods when partial construction is open to traffic and for one calendar week following original completion of the final course throughout the entire length of the Project, perform the following operations:

- Maintain the surface to correct bleeding of asphalt, keep the surface free of ravel, traffic grooves, holes and other deformations, and eliminate other defects that may appear.

- Roll and compact the surface to maintain or restore firmness and stability to the materials.

- Broom the surface to ensure that the surface is free of loose aggregate. Discontinue brooming if the operation damages the surface. In curbed areas, use a pick up type power broom. On bridges, sidewalks and other areas off the roadway, remove all loose aggregates to the satisfaction of the Engineer.

Perform the above operations under traffic and at frequencies which the Engineer determines as being necessary to develop and establish the course to uniform firmness and stability throughout.

Finishing and Cleaning Up

00715.70 Surface Tolerance - Provide a finished surface, after brooming, that does not vary by more than 1/2 inch either transverse or perpendicular to centerline when tested with a 12 foot straightedge. Furnish and operate the straightedge under the observation of the Engineer.

00715.71 Correction of Surface Deficiencies - Correct all deficiencies in surface tolerance in a manner acceptable to the Engineer. Perform all corrective work at the Contractor's expense within 10 working days following notification.

Measurement

00715.80 General - The quantities of aggregate will be measured by the ton according to 00190.10, or by the cubic yard in the hauling vehicle.

The quantities of emulsified asphalt will be measured by the ton according to 00190.10.

When indicated by the appropriate pay item in the Schedule of Items, separate measurement will be made for the additional labor and other additional costs in constructing multiple application emulsified asphalt surface treatment on connections to public roads and streets and on approaches to private properties. Measurement will be on a unit basis, per each, by actual count of each location where the connections or approaches are constructed and accepted.

Payment

00715.90 General - The accepted quantities will be paid for at the Contract unit price per unit of measurement for the following items:

	Pay Item	**Unit of Measurement**
(a)	Aggregate in Multiple Application Emulsified Asphalt Surface Treatment	Cubic Yard or Ton
(b)	Asphalt in Multiple Application Emulsified Asphalt Surface Treatment	Ton
(c)	Extra for Multiple Application Emulsified Asphalt Surface Treatment Approaches	Each

Item (c) applies to the extra costs of placing the aggregates and asphalt in emulsified asphalt surface treatment on connections and approaches. Payment will be in addition to payment made for the materials used in the work.

Payment will be payment in full for preparing the road surface, providing all materials in final position, blading and/or brooming, and for all equipment, labor, and incidentals necessary to complete the work as specified.

Section 00730 - Asphalt Tack Coat

Description

00730.00 Scope - This work consists of furnishing and placing emulsified asphalt on a prepared asphalt concrete, portland cement concrete, or other paved surface to ensure bond between lifts as specified.

Materials

00730.11 Asphalt - Use CSS-1, CSS-1h, CMS-2, CMS-2S, CMS-2h, CRS-1, CRS-2, HFRS-2, or HFMS-2 as selected by the Contractor.

Provide emulsified asphalt conforming to the requirements of ODOT's publication "Standard Specifications for Asphalt Materials". Copies of the publication are available from the ODOT Pavement Services Engineer. The applicable specifications are those contained in the current publication on the date the Project is advertised. The materials may be conditionally accepted at the source or point of loading for transport to the Project.

Excessive delay in the use of the emulsified asphalt or excessive pumping of the emulsified asphalt may significantly reduce the viscosity and may make the material unsuitable for tack coat use. For this reason limit pumping between the bulk storage tank, hauling transportation, field storage tanks and distributor to an absolute minimum to maintain proper viscosity. Final acceptance of emulsified asphalt will be at the point of application.

Dilution of the tack coat material may be performed when allowed by the Engineer. If dilution is allow, for every part emulsion, do not add more than one part water. Add water and mix with emulsified asphalt as recommended by the asphalt supplier. The exact proportion of added water will be determined in a manner acceptable to the Engineer.

Obtain samples of the asphalt according to AASHTO T 40 prior to dilution with water, if allowed, at the frequency indicated in the MFTP. Samples will be tested at the ODOT Materials Laboratory, or other laboratory as designated by the City. Emulsified asphalt will be tested within 30 calendar days from the date it is sampled.

Equipment

00730.22 Asphalt Distributor - Provide an asphalt distributor designed, equipped, maintained and operated so the emulsified asphalt material may be applied uniformly at even heat. The distributor shall be capable of applying the asphalt on variable surface widths up to 16 feet, at readily determined and controlled rates from 0.05 to 2.0 gallons per square yard, and with uniform pressure. The variation allowed from any specified rate shall not exceed 0.02 gallons per square yard. Provide distributor equipment that includes a tachometer, pressure gages, accurate volume measuring devices and a thermometer for measuring temperature of tank contents. Provide distributors equipped with a positive power unit for the asphalt pump, and full circulation spray bars adjustable both laterally and vertically. Set the bar height for triple lap coverage.

Construction

00730.40 Temperature Limitations - Apply tack coat only when the surface temperature in the shade is not less than the appropriate minimum surface temperature according to 00735.40, 00744.40, or 00747.40 as applicable.

00730.41 Traffic Control - Do not apply the tack to more than one-half the width of the travel way at one time. The remaining width shall remain open to traffic. Do not close the open lane until traffic controlled by pilot car is operating on the new surface.

00730.42 Preparation of Underlying Surfaces - Immediately before applying the tack coat, the surface to be tacked shall be clean and dry. Clean all loose material by brooming, flushing with water or other approved methods.

00730.44 Applying Tack Coat - Apply the asphalt with a pressure distributor conforming to 00730.22, unless otherwise permitted. Apply the asphalt to the prepared surface at a rate between 0.05 and 0.20 gallons per square yard as directed and with the emulsified asphalt temperature between 140 °F and 185 °F as recommended by the manufacturer.

Application rates for tack coat diluted according to 00730.11 will be increased as necessary to provide the same amount of residual asphalt as the application rates specified above.

Do not place hot mixed asphalt concrete pavement or emulsified asphalt concrete pavement on the tack coat until the asphalt separates from the water (breaks), but before it loses its tackiness.

Measurement

00730.80 Asphalt - There will be no measurement of the asphalt tack work. The estimated quantity of asphalt tack coat will be listed in the Special Provisions.

00730.81 Water - Water added to dilute the emulsified asphalt tack coat after it is manufactured will not be measured.

Payment

00730.90 Asphalt - There will be no separate payment of asphalt tack coat, as the cost will be included in the payment for the particular items of work using asphalt tack coat.

00730.91 Water - Water added to dilute the emulsified asphalt tack coat after it is manufactured will not be paid for and will be considered incidental to the item above.

Section 00744 - Hot Mixed Asphalt Concrete (HMAC) Pavement

Description

00744.00 Scope - This work consists of constructing hot mixed asphalt concrete (HMAC) pavement to the lines, grades, thicknesses, and cross sections shown or established. Typically used on low to moderate volume traffic roadways with low to moderate volume of bus or trucks.

00744.01 Abbreviations:

TSR - Tensile Strength Ratio

VFA - Voids Filled with Asphalt

VMA - Voids in Mineral Aggregate

00744.02 Definitions:

Hot Mixed Asphalt Concrete (HMAC) - A hot plant mixed, uniformly coated mixture of asphalt cement, graded aggregate and additives as required.

Level 1 HMAC - HMAC for use in applications with very low traffic and only limited exposure to trucks.

Level 2 HMAC - HMAC for use in applications with low traffic volumes and low volume truck traffic.

Level 3 HMAC - HMAC for use in applications exposed to moderate bus and truck traffic.

00744.03 Reclaimed Asphalt Pavement (RAP) Material - Reclaimed HMAC pavement (RAP) material used in the production of new HMAC is optional. No more than 30% RAP material will be allowed in the new HMAC pavement.

Materials

00744.10 Aggregate - Provide coarse and fine aggregates for HMAC meeting the following requirements:

Testing of aggregates for soundness, durability, and harmful substances will be at the discretion and expense of the City.

(a) Soundness - Provide coarse and fine aggregate with a weighted loss not exceeding 12% when subjected to five cycles of the soundness test using sodium sulfate solution according to AASHTO T 104.

(b) Durability - Provide aggregate not exceeding the following maximum values:

Test	Test Method ODOT	Test Method AASHTO	Aggregates Coarse	Aggregates Fine
Abrasion		T 96	30.0%	
Degradation				
Passing No. 20 Sieve	TM 208		30.0%	30.0%
Sediment Height	TM 208		3.0"	4.0"

(c) Harmful Substances - Do not exceed the following maximum values:

Test	Test Method ODOT	Test Method AASHTO	Aggregates Coarse	Aggregates Fine
Lightweight Pieces		T 113	1.0%	
Wood Particles	TM 225		0.10%	
Elongated Pieces (at a ratio of 5.1)	TM 229		10.0%	
Plasticity Index		T 90		0 or NP
Sand Equivalent		T 176		45 min

00744.11 Asphalt Cement and Additives - Provide the following:

(a) Asphalt Cement - Use PG 64-22 or PG 70-22 asphalt unless otherwise specified in the Contract documents. Provide asphalt cement conforming to the requirement of ODOT's publication, "Standard Specifications for Asphalt Materials". Copies of the publication are available from ODOT's Pavement Services Engineer. The applicable specifications are those contained in the current publication on the date the Project is advertised.

Testing of the asphalt cement used on this Project will be at the discretion and expense of the City.

Asphalt in RAP material, when blended with new asphalt shall provide properties similar to the above specified asphalt. When RAP material is used at a rate of less than 15%, no adjustment to the new asphalt will be required. When utilizing RAP at a rate at or above 15%, the combined RAP and new asphalt shall provide blended properties equivalent to the specified grade. Determine the blended properties according to ASTM D 4887. Determine asphalt cement properties for the RAP material from asphalt cement recovered from the RAP according to AASHTO T 170.

(b) Asphalt Cement Additives - When required by the JMF, add antistripping additives meeting the requirements below and satisfying the Tensile Strength Ratio (TSR) specified in 00744.13.

Additives to prevent stripping or separation of asphalt coatings from aggregates, and admixtures used to aid in the mixing or use of asphalt mixes or for experimental purposes, shall be standard recognized products of known value for the intended purpose and approved for use on the basis of laboratory tests. They shall have no deleterious effect on the asphalt material and be completely miscible. Do not use silicones as an additive.

00744.12 Mix Type and Broadband Limits - Mix type and broadband limits shall meet the following:

(a) Mix Type - Furnish the type(s) of HMAC shown or as directed. The broadband limits for each of the mix types are specified in (b) below. When the plans allow an option of two types for a course of pavement, use only one type throughout the course.

(b) Broadband Limits - Provide a JMF for the specified mix type within the control points listed below:

Dense Grades Mixes

Sieve Size	1" Dense		3/4" Dense		1/2" Dense		3/8" Dense	
	Control Points (% passing by Weight)		Control Points (% passing by Weight)		Control Points (% passing by Weight)		Control Points (% passing by Weight)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1 1/2"	99	100						
1"	90	100		100				
3/4"	90	90	90	100		100		
1/2"	–	–	–	90	90	100		100
3/8"	–	–	–	–	–	90	90	100
No. 4	–	–	–	–	–	–	–	90
No. 8	19	45	23	49	28	58	32	67
No. 200	1.0	7.0	2.0	8.0	2.0	10.0	2.0	10.0

Open Graded Mixes

Sieve Size	1/2" Open		3/4" Open		3/4" ATPB	
	Control Points (% passing by Weight)		Control Points (% passing by Weight)		Control Points (% passing by Weight)	
	Min.	Max.	Min.	Max.	Min.	Max.
1"			99	100	99	100
3/4"	99	100	85	96	85	95
1/2"	90	98	55	71	35	68
No. 4	18	32	10	24	2	10
No. 8	3	15	6	16	0	5
No. 200	1.0	5.0	1.0	6.0	0.0	2.0
Asphalt Cement	*	*	*	*	2.5	3.5

00744.13 Job Mix Formula (JMF) Requirements - Provide a JMF for the mixture to be used on the project meeting the criteria set forth below. The JMF shall have been performed or verified according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete within 5 years of the date the Contract was advertised. Perform a new TSR when the source of the asphalt cement changes.

(a) Contractor Provided JMF - The CMDT shall prepare, sign and submit a JMF to the Engineer for each mixture required at least 10 calendar days prior to the anticipated use in HMAC, and according to the latest copy of the ODOT Contractor Mix Design Guidelines for Asphalt Concrete. If requested, submit material samples 10 calendar days prior to use.

(b) JMF Requirements - The JMF shall meet the following mixture requirements:

Dense Graded Mixture

	Level 1	Level 2	Level 3
Design Method	Superpave	Superpave	Superpave
Compaction Level	65 Gyrations	75 Gyrations	100 Gyrations
Air Voids, %	3.5	4.0	4.0
VMA, % minimum	1/2" - 14.0 3/8" - 15.0	3/4" - 13.0 1/2" - 14.0 3/8" - 15.0	3/4" - 13.0 1/2" - 14.0 3/8" - 15.0
P No. 200/ Eff AC ratio	0.8 to 1.6	0.8 to 1.6	0.8 to 1.6
TSR, % minimum	80	80	80
VFA, %	70 - 80	65 - 78	65 - 75

Open Graded Mixture

	3/4" Open and 1/2" Open	3/4" ATPB
Design Method	ODOT	ODOT
Air Voids, %	13.5 - 16.0	---
Draindown, %	70 - 80	---
TSR*, minimum	80	---
Coating, %, minimum	---	90
VFA, %	40 - 50	

00744.14 Tolerances and Limits - Produce and place HMAC within the following JMF tolerances and limits:

Gradation Constituent	Dense-Graded HMAC Type				Open-Graded HMAC Type		
	1 "	3/4"	1/2"	3/8"	3/4"	1/2"	ATPB
1 1/2"	JMF ±5%*						
1"	90 - 100%	JMF ±5%*			99 - 100%		99 - 100%
3/4"	JMF ±5%	90 - 100%	JMF ±5%*		85 - 96%	99 - 100%	85 - 95%
1/2"	JMF ±5%	JMF ±5%	90 - 100%	JMF ±5%*	55 - 71%	90 - 98%	35 - 68%
3/8"	–	–	–	90 - 100%	–	–	–
No. 4	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%
No. 8	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%
No. 30	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	–
No. 200	JMF ±2.0%	JMF ±2.0%	JMF ±2.0%	JMF ±2.0%	JMF ±2.0 %	JMF ±2.0%	JMF ±2.0%

* Maximum not to exceed 100%

Constituent of Mixture	HMAC All Types
Asphalt Cement - ODOT TM 321 (Cold Feed/Meter)	JMF ±0.20%
Asphalt Cement - AASHTO T 308 (Ignition) and ODOT TM 323	JMF ±0.50%
RAP Content - ODOT TM 321	JMF ±2.0%
Moisture content at time of discharge from the mixing plant - WAQTC TM 6	0.80% max.

When a JMF tolerance applies to a constituent, full tolerance will be given even if it exceeds the Control Points established in 744.12(b).

00744.15 Pre-Approved Mix Designs - Contact the Project Manager for list of pre-approved HMAC mixes.

00744.16 HMAC Acceptance - .A CAT-1 shall perform a minimum of one asphalt content, gradation, mix moisture, and Maximum Specific Gravity (AASHTO T 209) test per day and provide results to the Engineer by the middle of the following work shift. The Contractor shall also provide split samples to the Engineer when requested. Testing may be waived upon written notice and accepted visually by the Engineer according to Section 4(B) of the MFTP.

When three or more tests are performed on a project, a price adjustment will be calculated according to 00744.95.

00744.17 Small Quantity Acceptance - When less than three test results are obtained on a project and testing has not been waived by the Engineer, the HMAC will be accepted according to the following:

(a) Within Specification Limits - If all sublot sample test results are within specification limits for all constituents (including compaction) the material will be accepted and the full bid price will be paid for the material represented by that test.

(b) Outside Specification Limits - If a sublot sample test result for any constituent is outside the specification limit the Engineer will have the backup sample tested.

(1) Backup Within Specifications - If the backup sample test results for all constituents are within specification, the material will be accepted and the full bid price will be paid for the material represented by that test.

(2) Backup Out of Specifications - If the backup sample test results are out of specification, the Contractor may choose to accept the price adjustment calculated according to 00744.95 or may choose to sample the in-place material for further testing. The price adjustments will be computed using all original test results as well as all backup test results. (If there are less than three tests, average the two tests you have and use the average as the third test result). In no case will the composite pay factor (CPF) be greater than 1.0.

(3) In-Place Samples - If the in-place material is sampled, the Engineer will select and sample from three random locations from the area represented by the lot in questions. Those samples will be tested and if found to be within specification the material will be accepted and paid for at the full bid price. If the material proves to be outside of the specification limits, the material will be accepted and paid for at an adjusted price according to 00744.95. In no case will the CPF be above 1.0.

00744.18 Tack Coat - Tack coat for sealing the edges of asphalt concrete paving shall be as specified in 00495.11.

00744.19 Edge Sealing Sand - Sand used for edge sealing shall be as specified in 00495.12.

Equipment

00744.24 Compactors - Provide self propelled rollers capable of reversing without backlash as follows:

(a) Steel-Wheeled Rollers - Steel-wheeled rollers shall have:

- A gross static weight of at least 8 tons

If steel-wheeled rollers are used for finish rolling, they shall have:

- A gross static weight of at least 6 tons

(b) Vibratory Rollers - Vibratory rollers shall be:

- Equipped with amplitude and frequency controls
- Specifically designed to compact HMAC
- Capable of at least 2000 vibrations per minute
- Have a gross static weight of at least 8 tons

Do not operate in vibratory mode for lifts thinner than two times the maximum aggregate size for the type of HMAC being compacted.

00744.30 Quality Control Personnel - Provide certified technicians in the following fields:

- CAgT (Certified Aggregate Technician)
- CAT-1 (Certified Asphalt Technician I)
- CDT (Certified Density Technician)

Construction

00744.40 Season and Temperature Limitations - Place HMAC when the temperature of the surface that is to be paved is not less than the temperature indicated:

Nominal Compacted Thickness of Individual Lifts and Courses as shown on the typical section of the plans	**All Levels All Courses ***
	Surface Temperature **
Dense Graded Mixes	
Less than 1 1/2"	60 °F
1 1/2" to 2 1/2"	50 °F
2 1/2" and over	40 °F
Open Graded Mixes	
Less than 2"	60 °F
2" and Over	50 °F
ATPB	40 °F
Temporary	40 °F

* If placing HMAC between March 15 and September 30, temperature requirement may be lowered 5 °F.

** Do not use field burners or other devices to heat the pavement surface to the specified minimum temperature.

00744.43 HMAC Mixing Temperatures - Produce HMAC within the temperature ranges recommended by the asphalt cement supplier for the grade of asphalt being used on the Project.

00744.44 Tack Coat - Construct a tack coat prior to placing each lift of HMAC according to Section 00730. A tack coat is not required prior to placing HMAC on aggregate base.

00744.49 Compaction - Immediately after the HMAC has been spread, struck off, and surface irregularities and other defects remedied, roll it uniformly with rollers meeting the requirements of 00744.24 until compacted to a minimum of 91% MAMD. Perform finish rolling and continue until all roller marks are eliminated. Determine the density of each sublot by averaging five QC tests performed at random locations by a CDT with the nuclear gauge operated in the backscatter mode according to WAQTC TM 8. Calculate MAMD according to ODOT TM 305. When less than three sublot test results are obtained on a project, the HMAC will be accepted according to 00744.17. Perform a minimum of one sublot density test per day. The Engineer may waive compaction testing upon written notice.

Maintenance

00744.61 Longitudinal Joints - Construct longitudinal joints according to 00747.61.

00744.62 Transverse Joints - Construct transverse joints according to 00747.62.

Finishing and Cleaning Up

00744.70 Pavement Smoothness - Furnish a 12 foot straightedge. Test with a 12 foot straightedge parallel to and in each wheel path of each travel lane. Test other lane wheel paths and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than 1/4 inch. Mark areas not meeting the surface tolerance.

00744.71 Edge Sealing Tack Coat Application - Seal all adjoining asphalt concrete pavement surfaces as specified in 00495.40(e).

00744.75 Correction of Pavement Roughness - Immediately correct equipment or paving operation procedures when tests show the pavement smoothness does not comply with 00744.70. In addition, do the following:

(a) Methods - Correct surface roughness to the required tolerances, using one of the following methods as approved by the Engineer:

- Remove and replace the wearing surface lift
- Grind the pavement surface with a diamond blade to a maximum depth of 0.3 inch, and apply an emulsion fog seal as directed

(b) Time Limit - Complete correction of all surface roughness within 14 calendar days following pavement placement, unless otherwise directed.

(c) Pavement Markings - If pavement correction is done after installation of the pavement markings, repair any damaged markings as directed.

Measurement

00744.80 General - The accepted quantities of HMAC will be measured by the ton according to Section 00190.

No deductions and no separate measurement will be made for asphalt cement, mineral filler, lime, anti-strip, or any other additive used in the mixture.

No separate measurement will be made for asphalt tack coat. An estimated amount of asphalt in tack coat will be listed in the Special Provisions under Section 00730.

Payment

00744.90 General - The accepted quantities of HMAC incorporated into the Project, whether or not recycled materials are used, will be paid for at the Contract price per ton for the item "Level ___, _____, HMAC Mixture, _____".

The following will be inserted in the blanks:

- The level(s) of HMAC (1, 2, 3) will be inserted in the first blank
- The type(s) of HMAC (1 inch Dense, 3/4 inch Dense, 1/2 inch Dense, 3/8 inch Dense, 3/4 inch Open, 1/2 inch Open, 3/4 inch ATPB) will be inserted in the second blank
- The words "in Leveling", "in Temporary", or "in Leveling and Temporary" will be inserted in the third blank when applicable

No separate payment will be made for the asphalt tack coat. Payment for this work will be included in the above item.

Payment will be payment in full for furnishing and placing the materials and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

00744.95 HMAC Price Adjustments - The Composite Pay Factor (CPF), calculated according to 00165.40 will be applied to the Contract unit price for the pay items of 00744.90 and to the application lot quantities. The CPF will be made available to the Contractor within 24 hours of receipt of the required quality control test results. If less than three samples are tested, the CPF will be computed as outlined in 00744.17. The maximum CPF for any case will be 1.0.

Use the following table to determine price adjustments in the CPF for constituents of HMAC.

Gradation Constituents	Dense Graded HMAC Type Weighting Factor (f)		
All Aggregate Passing	**3/4"**	**1/2"**	**3/8"**
1"	1		
3/4"	1	1	
1/2"	1	1	1
3/8"	---	---	1
No. 4	5	5	5
No. 8	5	6	6
No. 30	3	3	3
No. 200	10	10	10
Other Constituents			
Asphalt Content	26	26	26
Moisture Content	8	8	8
Compaction	40	40	40

Those HMAC constituents statistically evaluated will be eligible for a maximum PF of 1.00 (see 00165.50(b-1), unless otherwise specified.

If these specifications do not require measurement of a constituent, its individual PF will be considered 1.00 in calculating the CPF according to 00165.40.

A price adjustment will be determined by the following formula:

(CPF - 1) x HMAC Unit Price x (LQ) = _____

Where: LQ is the quantity of mixture in the lot

Section 00746 - Crack Sealing Flexible Pavements

Description

00746.00 Scope - This work consists of repairing and resealing cracks in flexible pavements at locations designated by the Engineer.

Materials

00746.10 Sealants - All sealant materials for crack repair of flexible pavements shall be approved by the Engineer before being incorporated into the work. Before beginning work, furnish a complete written statement of the origin, composition and manufacturer of materials that are to be used.

Provide hot-poured sealants of the type intended for use in sealing cracks in asphalt concrete pavement that meet the requirements of 02440.30.

Equipment

00746.20 General - Use proper sealing equipment for the specific material listed according to the manufacturer's recommendations. The equipment for sealing compounds shall be a melting kettle of the double boiler, indirect heating type, using oil as a heat-transfer medium. The kettle shall be an effective, mechanically operated agitator equipped with a positive, thermostatic temperature control.

Construction

00746.40 General - Provide traffic control according to Sections 00220 and 00225.

00746.41 Mixing and Heating - Follow the manufacturer's recommendations for application. Mix and heat the sealant materials to a minimum temperature of 280 °F. Do not heat the material above 400 °F.

00746.42 Installation Procedure - Where installation procedures, or any part of the procedures are required to be done according to the recommendations of the manufacturer of the sealing compound, submit catalogue data and copies of the recommendations before installing the materials.

Clean all cracks designated for sealing of loose and foreign matter. Use a hot lance to perform this cleaning. Use this wand to both clean and dry the crack just prior to sealing.

Do not place any sealant without the prior approval of the Engineer. The Engineer will inspect all cracks.

The face of the crack shall be surface dry, and the ambient and pavement temperatures shall both be at least 45 °F and rising at the time of application of the sealant.

Install the sealant so that the in-place sealant is well bonded to the pavement and free of voids or entrapped air.

Seal the cracks from the bottom up in a neat manner, so that upon completion of the work the surface of the sealant material is flush to 3/16 inch below the adjacent pavement surface. Refill or "spot" all low areas before continuing work.

Level sealant material flush to the surface with a 'V' shaped squeegee device. Squeegee the excess material so it does not exceed 1 1/2 inch on either side of the crack. If any sealant remains in the squeegee when the end of the crack is reached, distribute this excess material over the crack in a return motion.

Rout out cracks narrower than 1 1/2 inch to provide an opening with a minimum width of 1 1/2 inch and a minimum depth of 1/2 inch.

00746.43 Cleaning and Sanding - Perform the following work when crack sealing prior to a hot mix asphalt overlay or to prevent traffic damage and "pickup":

- Completely cover the sealed cracks with a clean sanding material, then sweep the pavement surface and leave in a clean condition

- Do not allow any traffic or construction equipment on the newly sealed cracks for at least one hour after placement of the sealant and refilling has been completed

Measurement

00746.80 Measurement - The quantities of sealed cracks will be measured by the foot according to 00190.10.

Payment

00746.90 Payment - The accepted quantities of sealed cracks will be paid for at the Contract unit price per foot for the item "Crack Sealing".

Payment will payment in full for furnishing and placing all material, including cleaning and routing as required, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

Section 00747 - Hot Mixed Asphalt Concrete (HMAC)

Description

00747.00 Scope - This work consists of constructing one or more courses of hot mixed asphalt concrete pavement, plant mixed into a uniformly coated mass, hot laid on a prepared foundation, compacted to specified density, and finished to a specified smoothness to the lines, grades, thickness, and cross sections shown or established. Typically used for high volume vehicle, bus or high volume truck roadways.

00747.01 Abbreviations:

TSR - Tensile Strength Ratio

MDV - Mix Design Verification

GMM - Maximum Specific Gravity of Mixture

VFA - Voids Filled with Asphalt

VMA - Voids in Mineral Aggregate

00747.02 Definitions:

Hot Mixed Asphalt Concrete (HMAC) - A hot plant mixed, uniformly coated mixture of asphalt cement, graded aggregate and additives as required.

Level 1 HMAC - HMAC for use in applications with very low traffic and only limited exposure to trucks.

Level 2 HMAC - HMAC for use in applications with low traffic volumes and low volume truck traffic.

Level 3 HMAC - HMAC for use in applications exposed to moderate truck traffic.

Level 4 HMAC – HMAC for use in applications exposed to very heavy traffic volumes, bus traffic, or heavy truck traffic.

Lot Size - A lot is the total quantity of material or work produced per JMF per project. The following circumstances will require a different lot.

- A new JMF is used.
- The method for measuring compaction is changed
- A new compaction specification limit is required
- A change from one test procedure for measuring asphalt content to another test procedure for measuring asphalt content occurs

The Engineer may allow material for irregular areas not completed during the main paving operations, such as driveways or guardrail flares to be evaluated as a separate lot.

Sublot Size – A Sublot is 1000 tons of HMAC.

00747.03 Reclaimed Asphalt Pavement (RAP) Material - Reclaimed HMAC pavement (RAP) material used in the production of new HMAC is optional. No more than 30% RAP material will be allowed in the new HMAC pavement.

00747.05 Pre-paving Conference – Supervisory personnel of the Contractor and any subcontractor, who are to be involved in the paving work, shall meet with the City at a mutually agreed time to discuss means and methods of accomplishing all phases of the paving work.

Materials

00747.10 Aggregate - Provide coarse and fine aggregates for HMAC meeting the following requirements:

(a) Soundness - Provide coarse and fine aggregate with a weighted loss not exceeding 12% when subjected to five cycles of the soundness test using sodium sulfate solution according to AASHTO T 104.

(b) Durability - Provide aggregate not exceeding the following maximum values:

Test	Test Method ODOT	Test Method AASHTO	Aggregates Coarse	Aggregates Fine
Abrasion	T 96			30.0%
Degradation				
Passing No. 20 Sieve	TM 208		30.0%	30.0%
Sediment Heights	TM 208		3.0"	4.0"

(c) Harmful Substances - Do not exceed the following maximum values:

Test	Test Method ODOT	Test Method AASHTO	Aggregates Coarse	Aggregates Fine
Lightweight pieces	TM 225	T 113	1.0%	
Wood Particles			0.10%	
Elongated Pieces (at a ratio of 5:1)	TM 229		10.0%	
Plasticity Index		T 90		0 or NP
Sand Equivalent		T 176		45 min

Conformation testing of aggregates for soundness, durability, and harmful substances will be at the discretion and expense of the City.

00747.11 Asphalt Cement and Additives - Provide the following:

(a) Asphalt Cement - Unless otherwise approved in writing by the Engineer use the grade of asphalt that is specified in the Contract documents. Provide asphalt cement conforming to the requirements of ODOT's publication titled, "Standard Specifications for Asphalt Materials". Copies of the publication are available from ODOT's Pavement Services Engineer. The applicable specifications are those contained in the current publication on the date the Project is advertised.

Testing of the asphalt cement used on this Project will be at the discretion and expense of the City.

Asphalt in RAP material, when blended with new asphalt shall provide properties similar to the above specified asphalt. When RAP material is used at a rate of less than 15%, no adjustment to the new asphalt will be required. When utilizing RAP at a rate at or above 15%, the combined RAP and new asphalt shall provide blended properties equivalent to the specified grade. Determine the blended properties according to ASTM D 4887. Determine asphalt cement properties for the RAP material from asphalt cement recovered from the RAP according to AASHTO T 170.

(b) Asphalt Cement Additives -When required by the JMF, add antistripping additives meeting the requirements below and satisfying a minimum Tensile Strength Ratio (TSR) of 80.

Additives to prevent stripping or separation of asphalt coatings from aggregates, and admixtures used to aid in the mixing or use of asphalt mixes or for experimental purposes, shall be standard recognized products of known value for the intended purpose and approved for use on the basis of laboratory tests. They shall have no deleterious effect on the asphalt material and be completely miscible. Do not use silicones as an additive.

00747.12 Mix Type and Broadband Limits - Mix type and broadband limits shall meet the following:

(a) Mix Type - Furnish the type(s) of HMAC shown or as directed. The broadband limits for each of the mix types are specified in (b) below. When the plans allow an option of two types for a course of pavement, use only one type throughout the course.

(b) Broadband Limits - Provide a JMF for the specified mix type within the control points listed below:

Dense Graded Mixes

Sieve Size	1" Dense		3/4" Dense		1/2" Dense		3/8" Dense	
	Control Points (% passing by Weight)		Control Points (% passing by Weight)		Control Points (% passing by Weight)		Control Points (% passing by Weight)	
	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
1 1/2"	99	100						
1"	90	100		100				
3/4"	–	90	90	100		100		
1/2"	–	–	–	90	90	100		100
3/8"	–	–	–	–	–	90	90	100
No. 4	–	–	–	–	–	–	–	90
No. 8	19	45	23	49	28	58	32	67
No. 200	1.0	7.0	2.0	8.0	2.0	10.0	2.0	10.0

Open Graded Mixes

Sieve Size	1/2" Open		3/4" Open		3/4" ATPB	
	Control Points (% passing by Weight)		Control Points (% passing by Weight)		Control Points (% passing by Weight)	
	Min.	Max.	Min.	Max.	Min.	Max.
1"			99	100	99	100
3/4"	99	100	85	96	85	95
1/2"	90	98	55	71	35	68
No. 4	18	32	10	24	2	10
No. 8	3	15	6	16	0	5
No. 200	1.0	5.0	1.0	6.0	0.0	2.0
Asphalt Cement	*	*	*	*	2.5	3.5

00747.13 Job Mix Formula (JMF) Requirements - . For mixes not covered under section 00747.15 provide the JMF for the project meeting the criteria set forth herein. JMF shall be developed according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete and performed or verified within 5 years of the date the contract was advertised. JMF must also be verified according to the ODOT Mix Design Verification process.

Submit the proposed JMF and supporting data to the Engineer for review and acceptance at least 10 calendar days prior to anticipated use. If acceptable, written acceptance will be provided. Perform a new TSR if the source of asphalt cement changes.

	Level 1	Level2	Level 3	Level 4
Design Method	Marshall	Superpave	Superpave	Superpave
Compaction Level	50 Blow	75 Gyrations	80 Gyrations	100 Gyrations
Air Voids, %	3.5	4.0	4.0	Base: 4.0 Wearing: 4.0 -4.5
VMA, % minimum	1/2" - 14.0 3/8" - 15.0	3/4" - 13.0 1/2" - 14.0 3/8" - 15.0	3/4" - 13.0 1/2" - 14.0 3/8" - 15.0	3/4" - 13.0 1/2" - 14.0 3/8" - 15.0
P No. 200/ EFF AC ratio		0.8 to 1.6	0.8 to 1.6	0.8 to 1.6
TSR, % Minimum	80	80	80	80
VFA, %	70 - 80	65 - 78	65 - 75	65 - 75

	Open Graded Mixture 3/4" Open and 1/2" Open	3/4" ATPB
Design Method	ODOT	ODOT
Air Voids, %	13.5 - 16.0	---
Draindown, %	70 - 80	---
TSR *, Minimum	80	---
Coating, % Minimum	---	90
VFA, %	40 - 50	

00747.14 Tolerances and Limits - Produce and place HMAC within the following JMF tolerances and limits:

Gradation Constituent	Dense-Graded HMAC Type				Open-Graded HMAC Type		
	1 "	3/4"	1/2"	3/8"	3/4"	1/2"	ATPB
1 1/2"	JMF ±5%*						
1"	90 - 100%	JMF ±5%*			99 - 100%		99 - 100%
3/4"	JMF ±5%	90 - 100%	JMF ±5%*		85 - 96%	99 - 100%	85 - 95%
1/2"	JMF ±5%	JMF ±5%	90 - 100%	JMF ±5%*	55 - 71%	90 - 98%	35 - 68%
3/8"	–	–	–	90 - 100%	–	–	–
No. 4	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%	JMF ±5%
No. 8	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%
No. 30	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	JMF ±4%	–
No. 200	JMF ±2.0%	JMF ±2.0%	JMF ±2.0%	JMF ±2.0%	JMF ±2.0 %	JMF ±2.0%	JMF ±2.0%

Maximum not to exceed 100%

Constituent of Mixture	HMAC All Types
Asphalt Cement - ODOT TM 321 (Cold Feed/Meter)	JMF ±0.20%
Asphalt Cement - AASHTO T 308 (Ignition) and ODOT TM 323	JMF ±0.50%
RAP Content – ODOT TM 321	JMF ±2.0%
Moisture content at time of discharge from the mixing plant – WAQTC TM 6	0.80% max.

00747.15 Pre-Approved Mix Designs - The City maintains a list of pre-approved HMAC mixes. Contact the Project Manager for a list and submit to the Engineer the mix design to be used.

00747.16 HMAC Acceptance, QC/QA – Unless otherwise directed in the Special Provisions test the HMAC mixture for gradation, asphalt content, moisture, and RAP content (if applicable) according to appropriate procedures in the MFTP. Take corrective action when testing shows that HMAC is not within the tolerances and limits shown in 00747.14.

(a) Quality Assurance and Acceptance – Quality assurance (QA) testing will be done by and at the discretion of the Engineer. When performed, QA testing will be according to Section 00165. Regardless of QA testing, the Contractor's quality control test results will be used for acceptance provided they are within acceptable limits of the QA test results as defined by ODOT's Quality Assurance Program outlined in the MFTP.

00747.17 Quantity Acceptance – When less than three test results are required on a project, the HMAC will be accepted according to the following:

(a) Within Specification Limits – If all sublot sample test results are within specification limits for all constituents and compaction the material will be accepted for the full bid price of the material represented by the test. In no case will the CPF be above 1.0.

(b) Outside Specification Limits – If a sublot sample test result for any constituent is outside the specification limit, the Engineer will have the backup sample tested.

(1) Backup Within Specification – If the backup sample test results for all constituents are within specification, including compaction, the material will be accepted for full bid price for the material represented by the test.

(2) Backup Out of Specification – If the backup sample test results are out of specification, the Contractor may choose to accept a price adjustment, or choose to sample the in-place material for further testing. The price adjustment will be computed using all original test results as well as all backup test results. If there are less than three tests, average the two tests you have and use the average as the third test result. In no case will the composite pay factor (CPF) be greater than 1.0.

(3) In-Place Samples – Sample the in-place material at three random locations from the area represented by the Sublot in question. Samples will be tested by the Engineer. If the test is found to be within specification, the material will be accepted and paid for at the full bid price. If the material proves to be outside the specification limits, the Engineer may elect to accept and pay for it at an adjusted price or have it removed and replaced at the Contractors expense. In no case will the CPF be above 1.0.

(c) Compaction - Compaction will be required for each sublot tested by averaging the QC tests performed at random locations with a calibrated nuclear gauge operated in the backscatter mode. Perform at least one density test each day of production and compact the HMAC to at least the percent of the MAMD applicable for the mix type and lift indicated.

00747.18 Tack Coat - Tack coat for sealing the edges of asphalt concrete paving shall be as specified in 00495.11.

00747.19 Edge Sealing Sand - Sand used for edge sealing shall be as specified in 00495.12.

Equipment

00747.22 Hauling Equipment - Provide hauling vehicles in good operating condition with tight, clean, smooth beds. Hauling vehicles shall be equipped with the ability to tarp or cover the load as required or when directed. Coat the beds with a minimum amount of an approved material to keep the HMAC from sticking to the beds. Do not use diesel oil. Drain and properly dispose of any excess coating material before loading.

00747.23 HMAC Pavers - Pavers shall comply with the following:

(a) Power and Support - Self-contained, self-propelled, supported on tracks or wheels, none of which contact the mixture being placed.

(b) Augers and Screed - Equipped with augers and a screed or strike-off assembly, heated if necessary, which:

- Can spread and finish the HMAC to a uniform texture, in the specified widths, thicknesses, lines, grades and cross sections
- Will not segregate, tear, shove or gouge the HMAC

(c) Control System - Equipped with a paver control system which:

- Controls the HMAC placement to specified slope and grade
- Maintains the paver screed in proper position
- Provides the specified results through mechanical sensors and sensor-directed devices actuated from independent line and grade control references

(d) Illumination - Provide adequate lighting to illuminate the paver and the roadway in front of and behind the paver during the period from 30 minutes after sunset to 30 minutes before sunrise, or as deemed necessary by the Engineer. Shield lighting from adjacent traffic as necessary. Provide a minimum light level of 10 footcandles as measured by the Engineer on the roadway surface at a distance of 16 feet from the front and back edges of the paver.

00747.24 Compactors - Provide the specified self-propelled rollers capable of reversing without backlash, as follows:

(a) Steel-Wheeled Rollers - Steel-wheeled rollers shall have:

- A gross static weight of at least 8 tons

If steel-wheeled rollers are used for finish rolling, they shall have:

- A gross static weight of at least 6 tons

(b) Vibratory Rollers - Vibratory rollers shall be:

- Equipped with amplitude and frequency controls
- Specifically designed to compact HMAC
- Capable of at least 2000 vibrations per minute
- Have a gross static weight of at least 8 tons

Do not operate in vibratory mode for lifts thinner than two times the maximum aggregate size for the type of HMAC being compacted.

If vibratory rollers are used for finish rolling, they shall:

- Have a gross static weight of at least 6 tons
- Not be operated in the vibratory mode

(c) Pneumatic-tired Rollers - Pneumatic-tired rollers shall:

- Be tandem, or multiple axle, multiple wheel type
- Have smooth-tread, pneumatic tires of equal size
- Have tires staggered on the axles, spaced and overlapped to provide uniform compacting pressure for the full compacting width
- Have a minimum total load of 2,800 pounds per tire with tire inflation pressures of 45 to 90 psi
- Be fully skirted to reduce tire heat loss and mixture pick up

Do not use pneumatic-tired rollers to break-down or compact the wearing course or final lift of HMAC.

(d) Illumination - Provide adequate lighting to illuminate each compactor and the roadway in front of and behind each compactor during the period 30 minutes after sunset to 30 minutes before sunrise, or as deemed necessary by the Engineer. Shield lighting from adjacent traffic as necessary. Provide a minimum light level of 10 footcandles as measured by the Engineer on the roadway surface at a distance of 60 feet from the front and back edges of each compactor.

Labor

00747.30 Quality Control Personnel - Provide certified technicians in the following fields:

- CAgT (Certified Aggregate Technician)
- CAT-1 (Certified Asphalt Technician I)
- CAT-II (Certified Asphalt Technician II)
- CDT (Certified Density Technician)
- CMDT (Certified Mixture Design Technician)

Construction

00747.40 Season and Temperature Limitations - Place HMAC when the temperature of the surface that is to be paved is not less than the temperature indicated:

Nominal Compacted Thickness of Individual Lifts and Courses as shown on the typical section of the plans	All Levels *	Level 1 and Level 2	Level 3 and Level 4	
		All Courses	Travel Lane Wearing Course	All Other Courses
	Surface Temperature*	From to Inclusive	From to Inclusive	From to Inclusive
Open Graded Mixes				
Less than 2"	60 °F	3/15 9/30	3/15 9/30	3/15 9/30
2" and Over	50 °F	3/15 9/30	3/15 9/30	3/15 9/30
ATPB	40 °F	All Year	N/A N/A	All Year
Dense Graded Mixes				
Less than 1 1/2"	60 °F	All Year**	3/15 9/30	All Year**
1 1/2" to 2 1/2"	50 °F	All Year**	3/15 9/30	All Year**
2 1/2" and over	40 °F	All Year**	3/15 9/30	All Year**
Temporary	40 °F	All Year**	All Year**	All Year**

* If placing HMAC between March 15 and September 30, temperature requirement may be lowered 5 °F.

** Do not use field burners or other devices to heat the pavement surface to the specified minimum temperature.

00747.41 Prepaving Conference - Supervisory personnel of the Contractor, including any subcontractors who are to be involved in the paving work, shall meet with the Engineer at a mutually agreed time to discuss methods of accomplishing all phases of the paving work. A representative of the Contractor responsible for quality control on the project shall also attend for all Level 3 and Level 4 mixes where quantities exceed 5,000 tons.

00747.43 HMAC Mixing Temperatures - Produce HMAC within the temperature ranges recommended by the asphalt cement supplier for the grade of asphalt being used on the Project.

00747.44 Tack Coat - Construct a tack coat prior to placing each lift of HMAC according to Section 00730. A tack coat is not required prior to placing HMAC on aggregate base.

00747.49 Compaction, QC/QA - Provide a technician certified in density testing (CDT)

(a) General - Immediately after the HMAC has been spread, struck off, and surface irregularities and other defects remedied, perform breakdown and intermediate rolling of the entire surface with rollers meeting the requirements of 00747.24 until compacted as specified. Test each lift of HMAC for compaction according to the MFTP.

(1) Temperature - Complete breakdown and intermediate compaction before HMAC temperature drops below 180 °F, unless otherwise directed or required per the control strip. When the rolling causes tearing, displacement, cracking or shoving, make necessary changes in compaction temperatures, type of compaction equipment, and rolling procedures.

(2) Rolling – Compact the HMAC with rollers conforming to section 00747.24. Provide sufficient rollers of the types appropriate to compact the mixture while it is still within the specified temperatures. Do not displace the line and grade of edges. Moisten steel roller wheels with a minimum amount of water, or other approved material as necessary to prevent the HMAC from sticking to them and spotting or defacing the HMAC.

Operate rollers at a slow, uniform speed recommended by the manufacturer. Drive rolls or wheels shall be nearest the paver unless otherwise approved. Operate vibratory rollers at frequencies of at least 2000 vibrations per minute.

Do not make sharp turns or park rollers on hot HMAC. Stop each pass at least 5 feet longitudinally from proceeding stops.

Perform finish rolling with rollers meeting the requirements of 747.24(a) or 747.24(b), and continue until all roller marks are eliminated.

(b) Normal Pavement (Nominal Thickness 2 Inches or Greater):

(1) General – Compliance with the density specifications for dense graded HMAC shall be determined by random testing of the compacted road surface with calibrated nuclear gauges. Use the MAMD method of compaction measurement unless the Engineer agrees to the control strip method.

The CDT shall notify the Engineer and CAT II when the average density for a sublot exceeds 95% of MAMD. The Cat II shall initiate an investigation to determine if the results indicate that a problem with the mix is developing. An adjustment to the JMF will not be allowed unless MDV testing supports a required change.

(2) Random Testing – Determine the density of each sublot by averaging five QC tests performed at random locations determined by the Random Sample Location worksheet with the calibrated nuclear gauge operated in the backscatter mode. Lots and sublots shall correspond with those defined in 00747.02. In addition, perform at least one density test each day of production.

a. Testing – After completion of the finish rolling, test according to WAQTC TM 8. Do not locate the center of a density test within 1 foot of the panel edge. Complete density testing before traffic is allowed on the new mat.

b. Core Correlation of Nuclear Gauge Reading – When requested by either the Contractor or Engineer, correlation of nuclear gauge readings shall be according to WAQTC TM 8.

If correlations are requested, correlate each nuclear gauge used on the project. New correlations are required if the aggregate source or asphalt cement source changes. Apply correlation factors to all nuclear gauge readings for all dense graded HMAC. Determine the core correlation factor according to WAQTC TM 8 and provide the results to the engineer. The requesting party will pay the costs of the core correlation.

(3) Moving Average Maximum Density (MAMD) Method – The MAMD is the average of the current MDT and, if available, the four previous MDT's for the JMF used. Determine each MDT using the GMM determined according to AASHTO T 209 and calculate the MAMD according to ODOT TM 305.

When this method is used, compact the HMAC to at least the percent of the MAMD applicable for the mix type and lift as follows:

Course of Construction	Level 1, Level 2, and Level 3 HMAC	Level 4 HMAC
First Lift	91.0*	92.0
Single	91.0	92.0
All Other	92.0	92.0

* If any part of a lift requires 91%, the entire lift shall be 91%.

When using the MAMD method, a new control strip will be required when there is a new JMF. The Engineer may waive the control strip for irregular areas too small to establish a reasonable roller pattern.

(4) Control Strip Method – Construct and test a designated strip to establish optimum rolling procedures and target density. The target density will be used as a basis for acceptance of compaction of the HMAC.

a. Construction of a Control Strip – When beginning work on each lift of pavement, construct one or more control strips that are:

- The length of the rolling pattern (maximum 500 feet)
- Part of the roadway
- Placed to the specific width and thickness
- Composed of the same materials as the rest of the lift
- Compacted with the same equipment as the rest of the lift

The first valid target density for each lift of pavement shall be applied to sublot density tests for previously placed pavement with the same JMF.

A target density is not valid if it is less than the percent of the MAMD in 00747.49(b)(3) for the applicable mix type and lift.

Construct a new control strip when:

- There is a new JMF
- 10 days of production have been accepted without construction of a new control strip
- A new lift of pavement is started

b. Establishing Target Density – Determine the target density of the control strip according to ODOT TM 306 and WAQTC TM 8 by averaging the final results of five density tests taken with a calibrated nuclear gauge at random sites within the control strip selected according to ODOT TM 306.

c. Compaction Requirement – Compact the HMAC mixture to a density of at least 98.0% of target density.

d. Control of Operations – Stop paving if three consecutive control strips fail to achieve the target density. Take all necessary actions to resolve compaction problems. Do not resume paving without the approval of the Engineer.

(5) Test Results – Provide density results for the completed sublots to the Engineer by the middle of the following working shift.

(c) Thin Pavement:

(1) General - Compaction to a specified density will not be required for leveling, patches, or where the nominal compacted thickness of a course of dense graded mixture will be less than 2 inches.

(2) Projects with Less Than 500 Tons of HMAC – For all levels of HMAC, perform breakdown and intermediate rolling until the entire surface has been compacted by at least four coverage's of the roller(s). Perform additional coverage's, as directed, to obtain finish rolling of the HMAC.

Temporary

00747.50 Temporary Surfacing Course – Provide HMAC for temporary surfacing that is a well graded, uniform, durable commercial mix. All new materials, or a combination of new material and reclaimed materials, may be used, according to 00747.03. The Contractor is responsible for the quality of material furnished according to Section 00165. Mix used for temporary surfacing will not be eligible for price adjustment under 00747.95.

Maintenance

00747.60 Correction of Defects – Correct any defect in material a`nd work, as directed, at the Contractor's expense. These include segregation of materials, non-uniform texture, fouled surfaces preventing full bond between successive spreads of mixture, and (a) through (d) below. No adjustment in Contract time will be made for corrective work.

(a) Boils and Slicks – Immediately remove and replace boils and slicks with suitable materials.

(b) Roller Damage to Surface – Immediately correct any displacement with the addition of fresh mixture, or by other approved methods regardless of thickness or course.

(c) Nonspecification Compaction - Immediately take corrective measures when it is determined that specified compaction density is not achieved.

(d) Other Defects – Remove and replace any HMAC that:

- Is loose, broken, or mixed with dirt
- Shows visually too much or too little asphalt
- Is defective in any way

Remove and replace HMAC defects, excesses or deficiencies at the Contractor's expense.

00747.61 Longitudinal Joints - At longitudinal joints, bond, compact and finish the new HMAC equal to the HMAC against which it is placed.

(a) Location - Place the HMAC in panel widths which hold the number of longitudinal joints to a minimum. Offset the longitudinal joints in one panel by at least 6 inches from the longitudinal joints in the panel immediately below.

(1) Base Course - Place base course longitudinal joints within 12 inches of the edge of a lane, or within 12 inches of the center of a lane, except in irregular areas, unless otherwise shown.

(2) Wearing Course - Longitudinal joints shall not occur within the width of a traffic lane. They shall be located at either skip lines or fog lines unless approved by the Engineer. On median lanes and on shoulder areas the joints shall occur only at lane lines or at points of change in the transverse slopes, as shown or as directed.

(b) Drop-offs:

- Provide warning signs and markings according to Section 00225 where abrupt or sloped edge drop-offs 1 inch or more in height occur
- Protect edges from being broken down

If unable to complete the pavement without drop-offs according to 00747.61(c) do the following:

- Construct and maintain a wedge of HMAC at a slope of 1V:10H or flatter along the exposed longitudinal joint
- Remove and dispose of the wedge before continuing paving operations
- Construct, maintain, remove and dispose of the temporary wedge at no expense to the City, except that HMAC for the temporary wedge will be paid for at the pay item price

(c) Placing HMAC Under Traffic - When placing HMAC pavement under traffic, schedule work for the nominal thickness being laid as follows:

(1) More Than 2 Inches - Schedule work so at the end of each working shift the full width of the area being paved, including shoulders, is completed to the same elevation with no longitudinal drop-offs.

(2) Less Than or equal to 2 Inches - Schedule work so that at the end of each working shift one panel of new travel lane pavement does not extend beyond the adjoining panel of new travel lane pavement more than the distance normally covered by each shift. At the end of each workweek complete the full width of the area to be paved, including shoulders, to the same elevation with no longitudinal drop-offs.

00747.62 Transverse Joints:

(a) Travel Lanes - Construct transverse joints on the travel lane portion of all specified pavement courses, except leveling courses, as follows:

(1) Temporary End Panel - Maintain pavement depth, line and grade at least 4 feet beyond the selected transverse joint location, and from that point, wedge down on the appropriate slope until the top of the course being laid meets the underlying surface (assuming a pavement course thickness of 2 inches) as follows:

- For wedges that will be under traffic for less than 24 hours, construct a 8 foot long wedge (1V:50H taper rate)
- For wedges that will be under traffic for 24 hours or longer, construct an 25 foot long wedge (1V:160H taper rate)
- Construct, maintain, remove and dispose of the temporary wedge at no expense to the City. HMAC for the temporary wedge will be paid for at the pay item price.

When the pavement course thickness is different than the above 2 inch example, use the appropriate taper rate to compute the length of the wedge. The wedge length plus the 4 feet or longer panel form the "temporary end panel".

(2) Vertical Face - After the mixture has reached the required density:

- Provide a smooth, vertical face the full depth of the course being laid at the location selected for the joint by sawing, cutting or other approved method
- Remove the HMAC material from the joint to the end of the panel. If removed before resuming paving beyond the joint, reconstruct the temporary end panel immediately by placing a bond-breaker of paper, dust, or other suitable material against the vertical face and on the surface to be occupied by the temporary end panel. Construct a full-depth panel at least 4 feet long, beginning at the sawed or cut joint, and taper it on a 1V:50H slope to zero thickness.

(3) Excess HMAC - After completing a temporary end panel as specified, dispose of unused, remaining HMAC as directed. Payment will be made for the entire load of HMAC, but will be limited to only one load per joint per panel.

(4) Resume Paving - When permanent paving resumes, remove the temporary end panel and any bond-breakers. Clean the surface of all debris and apply a tack coat to the vertical edge and the surface to be paved.

(5) Joint Requirements - Compact both sides of the joint to the specified density. When tested with a straightedge placed across the joint, the joint surface shall conform to the specified surface tolerances.

(b) Abutting Bridge Ends - Compact the HMAC abutting bridge ends and other rigid type structures in the transverse and/or diagonal direction, as well as longitudinally, as directed.

(c) Bridge Deck Overlays - Saw cut the wearing course of pavement directly over the joints in bridge decks, bridge end joints and end panel end joints as soon as practical but within 48 hours of paving each stage of the wearing course, unless otherwise directed. The saw cut shall be 3/8 inch wide, plus or minus 1/8 inch, and 1/2 inch less than the thickness of the panel of pavement, to a maximum depth of 1 1/2 inches.

Flush the saw cut thoroughly with a high-pressure water stream immediately after the cut has been made. Before the cut dries out, blow it free of water and debris with compressed air. Fill the joint with a poured filler from the CPL. No separate payment will be made for this work.

Finishing and Cleaning Up

00747.70 Pavement Smoothness - Furnish a 12 foot straightedge. Test with a 12 foot straightedge parallel to and in each wheel path of each travel lane. Test other wheel paths and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than 1/4 inch. Mark areas not meeting the surface tolerance.

00747.75 Correction of Pavement Roughness - Immediately correct equipment or paving operation procedures when tests show the pavement smoothness does not comply with 00747.70. In addition, do the following:

(a) Methods - Correct surface roughness to the required tolerances, using one of the following methods as approved by the Engineer:

- Remove and replace the wearing surface lift
- Grind the pavement surface with a diamond blade to a maximum depth of 3/8", and apply an emulsion fog seal as directed

(b) Time Limit - Complete correction of all surface roughness within 14 calendar days following pavement placement, unless otherwise directed.

(c) Pavement Markings - If pavement correction is done after installation of the pavement markings, repair any damaged markings as directed.

Measurement

00747.80 General – Unless otherwise defined in the Special Provisions the accepted quantities of HMAC will be measured to the nearest 0.01 ton. No deductions or separate measurement will be made for asphalt cement, mineral filler, lime, anti-strip, or any other additive used in the mixture. No separate measurement will be made for asphalt tack coat. An estimated amount of asphalt in tack coat will be listed in the Special Provisions under Section 00730.

Payment

00747.90 General - The accepted quantities of HMAC incorporated into the Project, whether or not recycled materials are used, will be paid for at the Contract price per ton for the item "Level ___, _____, HMAC Mixture, _____". The level(s) of HMAC (1, 2, 3, 4) will be inserted in the first blank. The type(s) of HMAC (1 inch Dense, 3/4" Dense, 1/2" Dense, 3/8" Dense, 3/4 inch Open, 1/2 inch Open, 3/4 inch ATPB), will be inserted in the second blank. The words "in Leveling", "in Temporary", or "in Leveling and Temporary" will be inserted in the third blank when applicable.

No separate payment will be made for the asphalt tack coat. Payment for this work will be included in the above item. Payment under the listed bid item will be full and complete compensation for furnishing and placing the materials and for furnishing all labor, equipment, materials, and incidentals necessary to complete the work as specified.

00747.95 HMAC Price Adjustments - The Composite Pay Factor (CPF), calculated according to 00165.40 will be applied to the Contract unit price for the pay items of 00747.90 and to the application lot quantities. The CPF will be made available to the Contractor within 24 hours of receipt of the required quality control test results. If less than three samples are tested, the CPF will be computed as outlined in 00744.17. The maximum CPF for any case will be 1.0.

Use the following table to determine price adjustments in the CPF for constituents of HMAC.

Gradation Constituents	**Dense Graded HMAC Type Weighting Factor (f)**		
All Aggregate Passing	**3/4"**	**1/2"**	**3/8"**
1"	1		
3/4"	1	1	
1/2"	1	1	1
3/8"	---	---	1
No. 4	5	5	5
No. 8	5	6	6
No. 30	3	3	3
No. 200	10	10	10
Other Constituents			
Asphalt Content	26	26	26
Moisture Content	8	8	8
Compaction	40	40	40

Those HMAC constituents statistically evaluated will be eligible for a maximum PF of 1.00 (see 00165.50(b-1), unless otherwise specified.

If these specifications do not require measurement of a constituent, its individual PF will be considered 1.00 in calculating the CPF according to 00165.40.

A price adjustment will be determined by the following formula:

(CPF - 1) x HMAC Unit Price x (LQ) = _____

Where: LQ is the quantity of mixture in the lot

Section 00749 - Miscellaneous Asphalt Concrete Structures

Description

00749.00 Scope - This work consists of furnishing and placing asphalt concrete in road approaches, street connections, driveways, guardrail flares, mailbox turnouts, raised traffic islands, sidewalks, footpaths, gutters, ditch linings, spillways, dikes, and other miscellaneous or minor items of asphalt concrete except asphalt curbs as shown, specified, or directed. These items in this Section will be collectively referred to as "structures." See Section 00480 for asphalt curbs.

This work does not include asphalt concrete construction on traffic lanes, auxiliary lanes, shoulders, median areas, tapers, widenings, parking areas, exit and entrance ramps, patching and leveling on similar areas.

00749.02 Limited Application - This Section applies only when separate pay items for the work appears in the Schedule of Items according to 00749.91 and 00749.92, or when called for by the special provisions.

Materials

00749.11 Aggregate Base - Provide aggregate base materials for base, foundation courses, leveling courses, or bedding conforming to Section 02630. If a designated size is not shown, or given, provide 1" - 0 or 3/4" - 0, as the Contractor elects.

00749.12 Asphalt Tack Coat - Provide asphalt tack coat material according to Section 00730.

00749.13 Asphalt Concrete - Unless another class is shown, provide Level 2, 1/2 inch Dense HMAC according to Section 00747. When conditions justify, the mixture may be varied, if approved. Acceptance will be based on testing the Engineer deems appropriate. Statistical analysis will not apply.

Equipment

00749.20 General - Equipment shall conform to Section 00747.

Construction

00749.41 Earthwork - Make excavations and backfills for the structures according to Section 00330 and to the depths, widths and cross-sections shown, specified, or directed.

00749.42 Foundations - Construct foundations or other bedding using selected granular backfill material according to Section 00330 or using aggregate base when shown or directed.

For aggregate base, do one of the following:

- When existing aggregate base materials of the kind specified in 00749.11 are already in place, salvage and reuse

- Use new aggregate base materials conforming to 00749.11

00749.43 Foundation Preparation - Bring areas on which structures are to be constructed to established grade, and make firm, dry and free of unsuitable material before placing asphalt concrete.

Tack contact areas where asphalt concrete is to come in contact with previously placed portland cement concrete, asphalt concrete, or bituminous surfaces according to Section 00730.

00749.44 Placing Asphalt Concrete - Place asphalt concrete according to 00745.48(c), except place asphalt concrete structures of uniform width by either mechanical extrusion methods or between suitable forms, as the Contractor elects. Other structures may be constructed without the use of forms unless otherwise directed.

The Engineer may allow small or special pavers, spreader boxes, or blade graders for placing asphalt concrete. Where warranted the Engineer may allow mixture to be placed by hand methods.

Construct all structures within the following lines and grades:

- 1 inch of true line

- 0.04 foot of established surface grade, cross section and slope

- 0.04 foot of specified thickness

00749.45 Compacting Asphalt Concrete - Compact asphalt concrete according to 00745.49(e) or as directed.

00749.46 Pavement Smoothness - Finish asphalt concrete to a uniform texture.

Test top surfaces with a 12 foot straightedge furnished and operated by the Contractor under the Engineer's direction. The surface shall not vary more than 1/4 inch from the straightedge except at grade changes.

Measurement

00749.80 General - Work covered under this Section will be measured for payment by one of the methods provided in 00749.81 and 00749.82. Street connections which occur at the beginning or end of the Project, or which have a line designation, typical section and profile, and are not noted on the plans as being pay items will not be measured for payment.

The quantities of structures will be measured on the following basis:

- **Unit Basis** - The actual count of each location where the structure is constructed and accepted.

- **Area Basis** - Surface measurement of the neat lines of the structure.

- **Length Basis** - From end to end of the pertinent structure along its longitudinal axis for each separate item or continuous run.

00749.81 Method "A" - Weight and Extras Basis - Under this method, asphalt concrete actually incorporated into the structure will be measured for payment according to 00745.80. In addition, measurement will be made for extra costs of placing asphalt concrete in the structures if pay items are included in the Schedule of Items.

00749.82 Method "B" - Complete in Place Basis - Under this method, measurement will be of the structure complete in place and accepted.

Payment

00749.90 General - The accepted quantities measured according to 00749.81 and 00749.82 will be paid for at the Contract unit price per unit of measurement for each of the particular pay items listed in the Schedule of Items.

The Contract unit prices under this Section will not include payment for:

(a) Earthwork - When earthwork is covered for payment under separate pay items, payment will be made according to Section 00330.

(b) Aggregate Base - Aggregate base used according to 00749.42 will be paid for under Section 00641.

(c) Street Connections - Payment for street connections, or the extra costs for them, which meet the criteria outlined in 00749.80 will be included in payment for the pavement items.

Earthwork required under 00749.41 not covered for payment under Section 00330, will not be paid for directly but will be considered as Incidental to other Contract items.

00749.91 Method "A" - Weight and Extras Basis - The pay items to be paid for under Method "A" are as follows:

	Pay Item	Unit of Measurement
(a)	Extra for Asphalt Approaches	Each
(b)	Extra for Asphalt Drains	Each
(c)	Extra for Pedestrian Landings	Each
(d)	Extra for Asphalt Dikes	Foot
(e)	Extra for Asphalt Islands	Square Foot
(f)	Extra for Asphalt Walks	Square Foot
(g)	Extra for Asphalt Ditch Lining	Square Foot
(h)	Extra for Asphalt Slope Paving	Square Foot
(i)	Extra for Pavement Repair	Square Foot

Item (a) includes road approaches, street connections, alley approaches, driveways, guardrail flares, and mailbox turnouts.

Item (d) is for dikes.

Item (e) includes raised traffic islands and raised traffic separators.

Item (f) includes sidewalks, footpaths, and narrow strips of asphalt concrete abutting curbs not intended for vehicular use.

Item (g) includes gutters, ditch linings, spillways, and other such structures specifically designed and provided for conveyance of surface water.

Payment will be payment in full for all extra or additional costs involved in placing asphalt concrete in the respective structures as specified. These costs are in addition to those which are included in the payment made for the asphalt concrete incorporated into the structures.

00749.92 Method "B" - Complete in Place Basis - The pay items to be paid for under Method "B" are as follows:

	Pay Item	Unit of Measurement
(a)	Asphalt Approaches	Each
(b)	Asphalt Dikes	Foot
(c)	Asphalt Islands	Square Foot
(d)	Asphalt Walks	Square Foot
(e)	Asphalt Ditch Lining	Square Foot
(f)	Asphalt Slope Paving	Square Foot

Item (a) includes road approaches, street connections, alley approaches, driveways, guardrail flares, and mailbox turnouts.

Item (b) is for dikes.

Item (c) includes raised traffic islands and traffic separators.

Item (d) includes sidewalks, footpaths, and narrow strips of asphalt concrete abutting curbs, not intended for vehicular use.

Item (e) includes gutters, ditch linings, spillways and other such structures specifically designed and provided for conveyance of surface water.

Payment will be payment in full for furnishing and placing all materials, including asphalt concrete and asphalt tack coat, and including all equipment, labor, and incidentals necessary to complete the respective structures in place as specified.

Section 00756 - Plain Concrete Pavement

Description

00756.00 Scope - This work consists of constructing portland cement concrete pavement as shown and specified.

00756.01 Abbreviations:

GPT - Graphic Profile Test

LSL - Lower Specification Limit

PI - Profile Index

PCC - Portland Cement Concrete

SSD - Saturated Surface-Dry

SSFC - Stationary Side Form Construction

SSTV - Sublot Strength Test Value

USL - Upper Specification Limit

00756.04 Aggregate Production and Pre-paving Conference:

(a) Aggregate Production Conference - Supervisory personnel of the Contractor and any subcontractor's or supplier's who are to be involved in the aggregate production work shall meet with the Project Manager, at a mutually agreed time, to discuss methods of accomplishing aggregate production.

(b) Pre-paving Conference - Supervisory personnel of the Contractor and any subcontractor's who are to be involved in the concrete paving work shall meet with the Project Manager, at a mutually agreed time, to discuss methods of accomplishing all phases of the paving work.

Materials

00756.10 General - Materials shall meet the following requirements:

Bar Reinforcement	02510
Concrete Materials	02001
Curing Materials	02050
Epoxy and Non-epoxy Bonding Agents	02070
Epoxy and Non-epoxy Grouts	02080
Galvanizing	02530.70
Poured Joint Fillers	02440.30
Preformed Expansion Joint Filler	02440.10
Structural Steel	02530
Welded Wire Fabric	02510.40

00756.11 Classes of Concrete - Unless otherwise noted in the plans or Special Provisions, provide Class 4350 - 1 1/2 paving concrete.

00756.13 Concrete Mix Designs - Prepare and submit either new mix designs or current mix designs for each class of concrete required according to Section 02001. The Engineer will review the mix design for compliance with the Specifications.

00756.14 Concrete Mix Tolerances and Limits - Provide a workable concrete mixture that is uniform in composition and consistency and conforms to the properties and limits of 02001.30 and 02001.50.

00756.15 Quality Control - Perform quality control according to Section 00165 and the following.

(a) Aggregates - Provide a CAgT to perform sampling and testing of aggregates during production. Sample and test each stockpiled size according to the test procedures and at the frequencies shown in the Field Tested Materials Guide section of the MFTP. Record and evaluate test results according to Section 00165.

(b) Concrete Mixture - Provide a QCT to sample and test concrete for all classes of concrete and for trial batches when required. Provide a CCT to prepare new mix designs and to make adjustments in current mix designs for all paving concrete. Provide a CCT, as required in Table 02001-1 for all paving concrete during concrete placements, who is authorized to control the production of concrete.

If the results of any test are outside of the specification limits, stop the placement of the load. Correct the load or reject it and do not incorporate it into the work. Test subsequent loads before any further concrete placement. Correct the subsequent loads if any of the tests are still outside the specification limits. If the load cannot be corrected, reject it and do not incorporate it into the work. Testing of subsequent loads may return to the specified frequency when the test results from two consecutive loads are shown to meet the specification limits.

Reject the concrete mix if it has not been placed within one hour after being mixed, or it has begun to take initial set before placement, or it has been re-tempered with water.

(c) Records - Deliver all batch tickets, water-cement ration calculations, and all other records required in (b) above to the Engineer upon availability but no later than the morning of the next day.

00756.16 Acceptance of Concrete:

(a) General - Acceptance of concrete will be based on the results of the Contractor's quality control testing according to Section 00165.

(b) Aggregate - Acceptance will be based on the Contractor's quality control testing, if verified by the City according to Section 00165.

(1) Aggregate Gradation - A stockpile contains specification aggregate gradation when the quality level for each sieve size calculated according to 00165.40 is equal to or greater than the quality level indicated in Table 00165-2 for a PF of 1.00. Each required sample represents a sublot. When the quality level indicated in Table 00165-2 yields a PF of less than 1.00 for any constituent, the material is non-specification.

(2) Non-specification Aggregate Gradation - Stockpiled aggregates that contain non-specification aggregate gradation will be rejected by the Engineer unless non-specification material is removed from the stockpile. Do not add additional material to the stockpile until enough non-specification material is removed so that the quality level for each constituent is equal to or greater than the quality level in Table 00165-2 for a 1.00 PF.

(c) Plastic Concrete - Acceptance of the plastic concrete will be based on the tests performed by the Contractor's QCT, according to the tolerances and limits of 02001.50 and Table 02001-1.

(d) Hardened Concrete - Cast and cure the test specimens according to AASHTO T 23 in 6" x 12" single-use plastic molds and test at 28 days according to AASHTO T 22.

(1) General - For all classes of concrete, acceptance of hardened concrete will be based on an analysis of compressive strength tests of cylinders cast by the QCT. Test the cylinders at an ODOT certified laboratory.

(2) Actual Strength Test Value (28 day) - The ASTV is the average compressive strength of the three cylinders tested. If the compressive strength of a single test specimen varies by more than 10% from the average of the other two specimens, that compressive strength value will be discarded. The average compressive strength test of the two remaining specimens will be the ASTV.

(3) Sampling and Testing - Sampling and testing shall be according to the MFTP.

(4) Acceptance - The ASTV shall exceed the f'c (specified strength) for the mix design. If a set of cylinders has an ASTV less than f'c, the Engineer will review the results to determine if the concrete represented by the cylinders shall be removed. In any case, concrete that has an ASTV of less than 85% of the specified strength shall be removed unless otherwise authorized, in writing, by the Engineer. The cost of removal, replacement and all related work shall be the Contractor's responsibility, subject, if the concrete is allowed to remain in place, to a price adjustment according to 00150.80(g).

If an ASTV falls below the f'c, the Contractor may submit a written plan within three days of the test for review by the Engineer. The plan shall outline a proposed alternate method of evaluating compressive strength. The plan shall provide evidence that a reasonable f'cr (over-design) was maintained and that there is credible evidence (besides low strength) which warrants consideration of this option. If the Engineer determines that the compressive strength test results are suspect from definable external factors, the Engineer may allow an alternate method of acceptance.

00756.17 Temporary Plating - Temporary plating shall conform to Section 00275.

Equipment

00756.20 Batch Plant - Provide batch plants according to 00540.20.

00756.21 Mixers - Provide mixers according to 00540.21 except mix concrete in the batch plant mixer. Truck mixers may be used only as permitted in 00756.45.

00756.22 Hauling Equipment - Transport concrete in non-agitating equipment. Truck mixers may be used to transport concrete only as permitted in 00756.45. Hauling equipment shall conform to AASHTO M 157.12 or M 157.11.6 when permitted.

00756.23 Paving Equipment - Place the PCC with either a slip form paving machine, a paving machine riding on stationary side forms, or both as the Contractor elects. Provide self-propelled paving machines that conform to the following:

(a) Placer/Spreader - Provide a Placer/Spreader that will:

- Receive the concrete mixture in its hopper on the shoulder area
- Deliver the concrete mixture to the slipform paver and uniformly spread at the proper thickness for the full width of the area being paved
- Not segregate the concrete mixture or displace the reinforcing steel

(b) Slipform Paver - Provide a Slipform Paver that is:

- Equipped with electronic or hydraulic controls to automatically control line and grade from both sides
- Able to vibrate, consolidate and finish the slab to proper grade and cross section for the full width and depth of the concrete being placed

- Equipped with vibrating tubes or arms to work in the concrete
- Equipped with sliding forms held together rigidly to prevent them from spreading
- Equipped with sliding forms long enough so that slumping of the concrete does not exceed 1/4 inch, according to 00756.49(a)

(c) Paving Machine - If a paving machine riding on stationary side forms is used, conform to the following:

- The machine used for initial strike-off and consolidation of PCC shall be self-propelled, screening type and shall ride on and be guided by steel side forms or the edge of contiguous PCC pavement. The machine shall be designed and operated to strike-off, consolidate and compact the PCC to prescribed line, grade and cross section. Make provision to prevent chipping or marring previously placed PCC.
- Vibratory equipment shall be of the surface pan type or internal type with immersed tube or multiple spuds. The vibrator shall provide full slab width vibration to the concrete at frequencies of not less than 3,500 impulses per minute and as necessary for proper consolidation and compaction.
- Floating and finishing machines shall be self-propelled and shall ride on and be guided by steel side forms or the edge of contiguous PCC pavement. The machine shall provide floating action to the PCC surface by means of screeds, floats, rollers or combinations thereof. Screed type machines shall have at least two oscillating type transverse screeds. The machines shall have sufficient wheel base length, weight, float surface and adjustments to true up the PCC surface to accurate cross section and grade without dragging, marking or defacing the surface.

00756.24 Concrete Saws - Provide power driven concrete saws for sawing joints, adequate in number of units and power to complete the sawing at the required rate. Also provide a standby saw on the jobsite.

00756.25 Smoothness Testing Equipment - Provide all equipment and supplies for determining smoothness according to 00756.55.

(a) Straightedge - Provide two 12-foot straightedges.

(b) Profilometer - Provide a profiling device that employs an accelerometer established inertial profiling reference and a laser height sensing instrument to produce a true profile of the pavement surface. The device shall be capable of reporting elevations with a resolution of 0.004 inch or finer at an interval of 6 inches or less. The unit must also be able to generate the equivalent California-type profilograph plot and values according ODOT TM 770 as well as the locations and heights of bumps and dips as required in this specification. The profilometer shall be calibrated, in good working condition, and ready for operation prior to performing smoothness measurements.

Labor

00756.30 Quality Control Personnel - Provide certified technicians in the following fields:

- CAgT (Certified Aggregate Technician)
- CCT (Concrete Control Technician)
- QCT (Quality Control Technician)
- CSTT (Concrete Strength Testing Technician)

(a) CCT's Duties:

- Before batching is started and when there is a significant change in the slump of the concrete due to variations in aggregate moistures, test the fine and coarse aggregates for total moisture content according to AASHTO T 255. Moisture testing may be by an alternate method if approved by the Engineer.
- Visually inspect the coarse aggregate for changes in moisture content throughout the day. Perform necessary testing for total moisture and make adjustments if necessary.
- Calculate the amount of free water present in the fine and coarse aggregates and adjust the batch proportions accordingly.
- Calculate the total allowable amount of water, including liquid admixtures and free water in the aggregate, for each batch; determine the amount of water added during batching; determine the allowable maximum amount of water that can be added after batching; and record these on the ticket.
- Make sure all water is removed from the transit-mix trucks before each loading.
- Send a ticket with each load on which the Contractor's batch person records and attests to the Engineer the mix design number, day, time of batch, size of load and quantity of individual constituents in the load.
- Instruct the plant control personnel how to adjust the batch weights to maintain the proper water-cement, cement content, air content and aggregate proportions to produce the specified mix.
- Be present at the plant or at the jobsite unless otherwise approved by the Engineer.
- Monitor the mix properties and compressive strength test results throughout the Project.
- Make recommendations or adjustments to maintain a satisfactory over-design (f'cr).

- Perform an analysis and make adjustments if necessary whenever the density (unit weight) of the fresh concrete varies from the mix design by more than plus or minus 50 3 lb/ft^3. Submit a written analysis along with any recommendations to the Engineer by noon of the following workday.

- Submit to the Engineer, in writing, adjustments made to the mix design.

- Perform an analysis and verify the accuracy of coarse and fine aggregate moistures whenever the water-cement ratio varies from the mix design target by more than plus or minus 0.03 and submit to the Engineer by noon of the following workday.

(b) QCT's Duties:

- Attend prepaving conference meetings.

- Be at the concrete sampling and testing site when placement is in progress.

- Have a copy of the mix design on site and available during concrete placements.

- Check each batch ticket on arrival at the jobsite for the correct mix design for the placement.

- Sample and test the concrete for ambient air and fresh concrete temperatures, slump, air content, density, water/cement ratio, yield, and cement content as required and according to the tests listed in the MFTP, and at such times as requested by the Engineer to validate compliance with the Specifications.

- Notify the Contractor and the Engineer immediately when the concrete is not in compliance with the Specifications.

- Be in direct contact with the CCT by telephone, radio or other means necessary to convey important mix information.

- Notify the CCT of loads rejected by the QCT and the reason for rejection.

- Notify the CCT immediately whenever the density of the fresh concrete varies from the mix design target by more than 3 lb/ft^3.

- Notify the CCT immediately whenever the water-cement ratio varies from the mix design target by more than plus or minus 0.03.

(c) Additional Quality Control Duties Required By The Contractor:

- Provide and designate an individual who shall be present at the placement site at all times during concrete placements, and who is authorized and responsible for acceptance and rejection of materials.

- Reject loads which arrive at the jobsite without a batch ticket.

- Reject the load if the materials in any load are outside the specified limits of the mix proportions.
- Require the truck driver to record on the batch ticket and initial the amounts of water added in transit and at the jobsite.
- Reject plastic concrete that is outside of the specified limits.

00756.31 Profilometer Operator - Provide competent and experienced operators for the equipment. The profilometer shall meet with the Engineer at a mutually agreed upon time prior to beginning smoothness measurements to discuss all aspects of the smoothness measurement on the Project.

Construction

00756.40 Weather Limitations - Coordinate all operations involved in constructing the pavement so the work will result in a finished pavement conforming to the Specifications regardless of the daily or seasonal variations in weather, temperature and humidity under which the work is permitted to proceed.

Do not place PCC during periods of rain. Do not place PCC on frozen bases, or when descending air temperature falls below 35 °F. Placement shall not resume until ascending air temperature reaches 35 °F. Measure air temperature in the shade and away from artificial heat.

Protect the pavement from weather damage. Protect unhardened PCC from precipitation with protective material. When PCC is being placed during cold weather, and the air temperature is forecast to drop below 33 °F, prevent the PCC from freezing for a minimum of seven days after placing.

Remove and replace weather-damaged pavement at no expense to the City.

00756.41 Preparation of Base - Before paving operations begin, bring the base to the finished condition required by the Specifications. If the equipment used by the Contractor requires additional width for support, provide the support necessary to assure the equipment maintains proper grade and cross section.

Manholes, inlets and other such structures shall be completed, adjusted, cured and otherwise prepared, as applicable. Make and ready to have concrete placed in contact with them. Prepare manhole frames and other independent metal structures in the pavement area with an approved bond-preventing agent.

00756.42 Construction Widths - When the pavement consists of two or more traffic lanes, construct at least two traffic lanes in one strip panel unless shown otherwise.

If the Contractor proposes a method of placement other than that shown or specified, the Contractor shall bear all costs to implement the change. Any changes require the Engineer's approval.

00756.43 Placing Dowel Bars - Provide smooth, round dowel bars. Coat with plastic, grease, heavy oil, or other approved material that will neither bond with nor be harmful to the PCC. Place dowels in a supporting framework that holds the dowels parallel with each other, parallel with the surface of the pavement and perpendicular to the joint. Maximum alignment tolerance shall be 5° or 3/16 inch in the length of the dowel. Place dowels within 3/8 inch of the center of the slab vertically.

00756.44 Handling, Measuring, and Batching Materials - The plant site, layout, equipment and provisions for transporting material shall be adequate to assure a continuous supply of material to the worksite.

(a) Aggregates - Stockpile and remove the aggregate from stockpiles in a manner that holds segregation to a minimum.

Do not use aggregates that become segregated, mixed with earth or foreign material or contain lumps of hardened material. Thaw frozen aggregates or aggregates containing frozen lumps before use.

(b) Batching - Separately weigh into the hoppers the fine aggregate, each separated size of coarse aggregate, cement and fly ash in the respective proportions set by the mix design. Provide a device to indicate positively that the full amount of cement and fly ash was discharged into the batch box or container. Measure water and admixtures either by volume or by weight.

Conduct batching so that the individual weights of each material required are within the following tolerances:

Aggregates	± 2%
Cement	- 1% to + 4%
Fly Ash	- 1% to + 4%

00756.45 Mixing Concrete:

(a) General - Mix the concrete in a batch plant mixer, except truck mixers may mix and deliver concrete only to areas inaccessible to paving equipment. Also mix as follows:

- Charge the batch into the receiving drum so some water enters before the solids and continues to flow uniformly for a portion of the mixing time
- Keep the skip and the throats of drums free of accumulations
- Mix the concrete only in the quantity required for immediate use
- Do not intermix batches
- Do not re-temper concrete by adding water or by other means

(b) Batch Plant Mixers - The mixing time for batch plant mixers shall be at least 60 seconds unless the Contractor's CCT documents meeting "Concrete Uniformity", according to AASHTO M 157, Annex A1 for concrete produced at the batch plant mixer set up for this Project, to the satisfaction of the Engineer. The mixing time may then be reduced to the extent the test permits but not less than 45 seconds.

(c) Truck Mixers - The mixing time for truck mixers shall be 70 to 100 revolutions at a mixing speed recommended by the manufacturer of the truck mixer.

00756.46 Placing Concrete - Place concrete by either the slip form method as described in (a), (b), (c) and (d) below, or by the stationary side form method as described in (e) below.

(a) Delivery To Spreader - Deliver the concrete from the hauling vehicles to the placer/spreader hopper on the shoulder area. Do not permit equipment hauling concrete on the subgrade or on the base, except for a minimum number of approved right angle or near right angle crossings. Correct any damage to the subgrade or base due to the Contractor's operations, at the Contractor's expense, to the satisfaction of the Engineer. Keep the surface of the subgrade or base moist in front of the paving operation.

(b) One Lift - Place the concrete in final position by the slipform method in one lift, so a minimum of finishing will be necessary to provide a dense, homogenous pavement conforming to true grade and cross section.

(c) Two Separate Machines - Except for concrete pavement to be placed and finished near obstructions, place the concrete with two separate machines, one a placer/spreader and one a slipform paver. The machines shall operate in tandem and spread, consolidate, screed and float-finish the freshly placed concrete in one pass with a minimum of hand finishing. Where impractical to use, a placer/spreader is not required.

(d) Continuous Forward Motion - Coordinate all operations of mixing, delivering and spreading concrete to provide uniform progress. Operate the slipform paver with as nearly continuous forward movement as possible. Hold stopping and starting the paver to an absolute minimum. If, for any reason, it is necessary to stop the forward motion of the paver, immediately stop the vibratory and tamping elements. Apply no external force to the paver.

(e) Stationary Side Form Method - Place the PCC between stationary side forms by means that will prevent segregation of constituents of the PCC, displacement or deformation of the forms or base, forming of piles, and unequal consolidation.

Spread and distribute the PCC with a mechanical concrete spreader which will fill all corners and spaces with PCC and leave it at such height that after consolidation and finishing it will be at specified grade and cross section. Spread and vibrate the PCC against and along the forms, and in the vicinity of joints comprising load transfer devices, with care to avoid displacement of the forms or devices.

Use shovels or muckrakes, not rakes, for hand spreading and distributing. Do not foul the PCC with foreign matter.

After being placed, strike-off, vibrate and consolidate the PCC with equipment conforming to the requirements of 00756.23. If more than one machine is required to properly handle production, the vibrating of PCC shall normally precede or accompany the first or leading machine only.

Perform the operations above within 15 minutes after the PCC is placed. The operations shall be continuous until the surface has been worked the equivalent of not less than two passes of a single screed machine. In each pass of the machine, maintain a roll of PCC ahead of the screed for the entire width of pavement being placed. The strike-off, vibrating and consolidating shall leave a surface of uniform texture, true to grade and cross section.

Equipment shall be in good mechanical condition at all times and be adjusted for wear at the direction of the Engineer. Keep forms and other controls of line and grade clean and true to line and grade.

(f) Provision for Joints and Other Devices - While placing concrete, make provision for constructing joints, placing dowels, tie bars, and other devices as shown and directed, and as provided in 00756.43 and 00756.48.

(g) Reject Concrete Material - Reject concrete if it:

- Is not in place within one hour after being mixed (90 minutes when delivered in ready mix truck)
- Has begun to take an initial set before placement
- Has been retempered with water

(h) Protect Surface - Equip supports of the slipform paver, and other equipment which ride on previously placed pavement to meet the requirements of 00756.60, to prevent marring, edge breaking, or chipping of the previously placed pavement.

(i) Hand Operated Equipment - Use shovels and muckrakes, not rakes, for hand spreading and distributing. Do not foul the concrete with foreign matter, nor disturb joint devices during such operations. Furnish hand operated mechanical vibrators satisfactory to the Engineer. Use these vibrators to consolidate the concrete pavement at least 6 feet on each side of construction and expansion joints and any other areas as directed.

(j) Illumination - During hours of darkness, adequately illuminate work areas at the Contractor's expense.

00756.47 Test Strip - At the beginning of paving operations, construct one initial test strip of concrete pavement at least 0.1 mile long at the specified paving width. Do not perform further paving until the test strip is evaluated according to 00756.55. An additional test strip will be required when:

- The Contractor proposes using different paving equipment
- Any portion of a test strip fails to meet the smoothness requirements of 00756.55

Change methods and/or equipment and construct additional test strips until a test strip meets smoothness requirements without grinding or other corrective work. Limit these additional test strips to 0.1 mile in length.

If three test strips fail to meet smoothness requirements before grinding, remove all three strips at the Contractor's expense and construct additional test strips.

00756.48 Joints:

(a) General - Construct joints of the kinds shown and where shown or directed. Joint types in the concrete pavement will be contraction, construction or expansion. They shall be transverse or longitudinal, as shown or directed. Extend all joints and joint filler to pavement edges or to each other.

Joints shall not vary from specified or indicated line by more than 1/4 inch. The tops of joint filler, when required, shall be slightly, but not more than 1/8 inch, below and paralleling finished pavement grade and cross section. Protect top edges of filler from damage by paving operations.

All joints which contain preformed filler are to be constructed before the final floating and surface finishing of the concrete, unless otherwise directed.

(b) Longitudinal Joints - If the Contractor elects to pour the entire width of pavement at one time, construct the longitudinal joint as shown. Longitudinal joints shall be the contact type or weakened plane type as shown:

(1) Longitudinal Contact Joints - Construct longitudinal contact joints when concrete is placed against hardened concrete regardless of age, between strips of pavement or between a strip of pavement and a concrete gutter.

(2) Longitudinal Weakened Plane Joints - Construct weakened plane joints by sawing to the depths and maximum width shown. Perform sawing as soon as the concrete has set enough to permit sawing without tearing or raveling. Saws may be single or tandem, as the Contractor elects, and be controlled by guides to true line. Restore curing agents broken or damaged by the sawing operations.

If the top width of sawed joints exceeds 1/4 inch, fill the joint with a poured joint filler.

(c) Construction Joints - Construct construction joints when there is an interruption of 20 minutes in the concrete placing operations.

The new concrete placed against the joint shall conform closely to the proportions and consistency of the previously placed concrete except vibrate and consolidate it to a greater degree and with more care than normal. Unless otherwise shown, do not construct construction joints within 10 feet of a transverse expansion or contraction joint. If sufficient concrete has not been mixed at the time of interruption to form a slab at least 10 feet long, remove the concrete back to the last joint and dispose of as directed.

(d) Contraction Joints - Construct all contraction joints by sawing. Create contraction joints at intervals shown on drawings.

00756.49 Surface Finishing - After the concrete has been given a preliminary finish, check the surface of the fresh concrete in the longitudinal and transverse direction with a 12-foot straightedge. Correct surface deviations more than allowed by 00756.55(a). Check at intervals as required. This longitudinal checking and correction on areas to be graphically profiled will be waived if it is successfully demonstrated that required pavement profile surface is otherwise produced which conforms to 00756.55(b)(1)(a).

Following hand floating, use a 12-foot proof (grout) rod. Each pass of the proof rod in the longitudinal direction, over the entire surface of the pavement placement, shall overlap the previous pass by half of its width. Use of the proof rod in an obfuscating manner will not be allowed. Check the transverse direction as required. Use of a proof rod on areas to be profiled will be waived if it is successfully demonstrated that required pavement profile surface is otherwise produced which conforms to 00756.55(b)(1)(a).

(a) Edge Slump - Correct any edge slump of the concrete in excess of 1/4 inch before the concrete hardens.

(b) Textured Finish - Upon completion of the machine floating, straightedge testing, edge tooling and, if necessary, hand floating, and before initial set of the surface concrete, give the surface of the concrete a textured finish.

Accomplish the textured finish with a steel-tine tool with 1/8 inch tines that will mark the finished concrete to a depth of 1/16 to 1/8 inch. Randomly space the markings from 1/2 to 1 1/4 inch as approved. Avoid overlaps of the texturing. Markings shall be transverse to the roadway centerline and full roadway width. With approval of the engineer an astroturf or broom finish may be used in place of tining on roads with a posted speed limit of 35 mph or less.

00756.51 Modification of Strike-off, Consolidation, Final Floating and Surface Finishing Requirements - Where the width of pavement is narrow, tapering or of irregular pattern, not lending itself to being constructed by prescribed machine methods, the Contractor will be permitted to perform the strike off, consolidation, final floating, and surface finishing with equipment, tools, means, labor and methods other than those specified, provided the work meets with the approval of the Engineer and the following requirements:

- Without causing segregation, vibrate throughout the concrete being placed until it is uniformly consolidated.

- Strike-off the concrete with templates or screeds designed and manipulated to shape the concrete to the specified cross section between the forms, carrying a slight excess of concrete in front of the leading edge of templates or screeds at all times.

- Following the vibrating and strike-off operations, float the concrete. Include transverse floating or other smoothing and finishing actions as necessary. Check and correct the surface according to 00756.49. Keep the surface free from laitance, soupy mortar, marks or irregularities.

- Finish the surface according to 00756.49.

00756.52 Edge Tooling and Filling - Tool edges at construction joints of new pavement and clean joints of previously placed concrete to remove laitance and mortar resulting from finishing operations, and to provide clean rounded edges without ridges on the surface. Perform tooling of edges at construction joints so that no more than a 1/8 inch radius is produced.

Fill any areas of minor honeycomb or other minor defect in composition of the concrete along the exposed sides of concrete with a stiff mortar of cement and fine aggregate, and apply to the moistened concrete to the satisfaction of the Engineer. Remove and replace areas showing serious defects in composition of the concrete with specified quality concrete for full panel width between longitudinal joints or edges, and for a length not less than 10 feet. Low spots exceeding 1/4 inch in depth, if in hardened concrete, may be filled with an Epoxy Grout from the CPL provided the area is prepared according to grout manufacturer's directions and the filling is neat and blends inconspicuously with adjoining concrete.

00756.53 Curing Concrete - Immediately after the final floating, surface finishing and edging have been completed, and while the concrete surface is still moist, cure the entire exposed surface of the newly placed concrete for at least 72 hours. If the Specifications require opening to traffic in less than 72 hours, curing may be removed just prior to opening. Use one of the following:

(a) Liquid Membrane-Forming Compounds - Apply liquid membrane-forming compound uniformly to the concrete by pressure-spray methods at a rate of at least 1 gallon per 150 square feet. Mix the liquid membrane-forming compound thoroughly before and during use.

(b) Other Coverings - Apply clear or white polyethylene film to damp concrete as soon as it can be placed without marring the surface. Place the membrane in contact with the surface, extend beyond the sides or edges of the slabs or forms, and weight down as required to hold it in position as a waterproof and moisture-proof covering. Laps shall be sufficient to maintain tightness.

00756.54 Pavement Cracks - Within 28 days after concrete placement and before opening the pavement to public traffic, the Engineer will perform a pavement crack survey. Clean the pavement before the crack survey. Pavement with uncontrolled longitudinal or transverse cracks which are visible without magnification will be considered unacceptable and will be repaired or removed as determined by the Engineer. All remedial work shall be at the Contractor's expense.

00756.55 Surface Tolerance, Testing, and Correction - Perform straightedge testing according to 00756.55(a). Except as specified, when the Project exceeds 0.6 mile of continuous pavement construction or when specified in the Special Provisions, conduct graphic profile testing according to 00756.55(b). Furnish and operate the equipment as soon as the hardness of the concrete permits.

(a) Straightedge Testing and Tolerance - Perform longitudinal and transverse smoothness testing of the pavement surface with a 12-foot straightedge. The extent of the testing will be as the engineer determines necessary or expedient. The pavement surface shall not deviate from the straightedge at any point by more than 1/8 inch for all areas that are constructed by the prescribed machine methods and for all traffic lanes and ramps. Other areas shall not deviate by more than 1/4 inch. Longitudinal 12-foot straightedge testing will not be required for pavement accepted under 00756.55(b).

(b) Graphic Profile Testing (GPT) and Tolerance:

(1) General - Test the longitudinal surface of all traffic lanes and bridges for smoothness by the graphic profile method according to ODOT TM 770. Before paving commences on the Project, demonstrate the profilometer operation by conducting a calibration test according to ODOT TM 770 and running the machine twice over a 0.1 mile section of pavement with repeating results.

a. Graphic Profile Tolerance - The pavement shall have a profile index of 7.0 inches per mile or less for each wheel path in each 0.1 mile segment or partial segment, and shall have no individual deviation of 0.3 inch or more. On shoulders and auxiliary lanes the profile index shall be 12.0 inches per mile subject to the above criteria. Bonus payment for smoothness will be made according to 756.95.

b. Daily GPT - If the average profile index exceeds 7.0 inches per mile for all segments and partial segments of pavement constructed in any day's production, discontinue paving operations and construct one or more test strips as described in 00756.47. The test strip may be comprised of pavement placed during the shift that the shutdown is ordered, but in no case shall it be less than 0.1 mile in length.

(2) Surface Test - Run the profilometer over the full length of the Project and 50 feet beyond the Project ends to provide a complete graphic profile. This includes all concrete traffic lanes and auxiliary lanes.

Obtain profiles on the pavement surface along lines parallel to and approximately 3 feet from each edge and longitudinal joint(s) for 12-foot wide lanes and 4 feet from each edge and longitudinal joint(s) for 14-foot wide lanes. The intent is to provide a profile in each vehicle wheel path. Take profile(s) on transition areas as close to the wheel path as practical.

Start the profiles that represent a day's production 50 feet before the beginning of that day's production and stop 50 feet before the end of that day's production.

Run the profiles for each day's production as soon as possible without damaging the surface. Analyze the daily GPT profiles according to 00756.55 (b)(3), and give the profiles and results to the Engineer within 24 hours of the conclusion of the day's production.

(3) Determining Profile Index:

a. General - Determine the profile index of pavement in 0.1 mile segments and partial segments. Segments shall begin 13 feet into the Project and run consecutively in either the direction of travel or the concrete placement, as determined by the Engineer. A segment will end as a partial segment and a new segment will begin when the segment sequence is interrupted by stage construction or by profiled areas excluded from the GPT smoothness requirements.

The following profiled areas of pavement are excluded from the GPT smoothness requirements:

- Profiles extending beyond the Project ends
- Bridge decks and bridge panels
- First and last 13 feet at the Project ends and bridge end panels
- Pavement on horizontal curves with radii less than 1,000 feet

Include and analyze separately those areas in the profile charts that are not subject to the GPT smoothness profile index requirements.

b. Method of Analysis - Determine the profile index and individual deviations of 0.3 inch or more by analyzing the profile charts according to ODOT TM 770 and provide the profile charts and results to the Engineer for review.

c. Profile Index - The profile index is the inches per mile in excess of the 0.2 inch blanking band. The formula for converting counts to profile index is:

$$\text{Profile Index} = \frac{\text{Total Count} \times 0.10}{\text{Length of Full 0.10 Mile Segment or of Partial } \underline{\ *\ } \text{ Mile Segment}}$$

* Report to the nearest 0.01 mile

(c) Correcting Deficiencies - Should testing described in 00756.49, 00756.51, and 00756.55 show the pavement does not conform to the prescribed limits of deviation, the following shall apply:

(1) Failure to Meet Straightedge Requirements:

a. Plastic Concrete - If the requirements of 00756.49 or 00756.51 are not met, stop the paving operations until revised methods, changes in equipment, or correction of procedures are made or proposed for trial, and are approved by the Engineer for trial. Also stop those revisions, changes and corrections if they do not produce a specified surface.

b. Hardened Concrete - If the requirements of 00756.51 or 00756.55(a) are not met, correct according to 00756.55(c)(2)(a) or 00756.55(c)(2)(b) and retest.

(2) Failure To Meet Graphic Profile Requirements - Correct any segment or partial segment that exceeds the requirements of 00756.55(b) in either wheel path by one of the methods listed below to the specified limits except correct deviations of 0.3 inch or more at least to the edge of the blanking band:

a. Remove the non-specification concrete pavement as determined by the Engineer and replace with specification concrete pavement.

b. Profile with abrasive grinder(s), equipped with a cutting head comprised of multiple diamond blades. The Engineer will determine and mark the areas to be profiled. For all areas corrected by grinding, restore the required surface texture as specified in 00756.49(b) by transverse sawing with diamond blade saws.

Retest their entire length, according to 00756.55(b), all segments requiring corrective work with the profilometer under the supervision of the Engineer. Perform all corrective work and graphic profiling at the Contractor's expense, including traffic control.

00756.56 Pavement Thickness - Construct the pavement to the thickness shown. Pavement not so constructed will be subject to replacement according to 00756.57, or to payment at adjusted prices according to 00756.93.

(a) Survey Method - Determine conformance with minimum thickness requirements by random survey measurements of the concrete under the Engineer's observation.

Divide the panel into units and partial units equivalent to a maximum of 200 lane feet. Normally, unit lengths will be 200 feet for one lane, 100 feet for two lanes, 70 feet for three lanes and as appropriate for transition areas. Take survey measurements within 10 feet longitudinally and 1 foot transversely from the calculated random location as determined by the Engineer in each unit and partial unit. Establish the horizontal location in such manner that it can be re-established in the same location to within 1 inch of the original location. Record vertical elevations to the nearest 0.1 inch. Take the measurements as follows:

- On the finished base course before paving and at the same location on the finished PCC pavement
- No closer than 2 feet from the panel edges
- With survey instruments capable of producing repeatable accuracy within the required survey limits

Determine the pavement thickness by subtracting the elevation of the finished base course from the elevation of the finished PCC pavement. If surveyed depth is not obtained for a unit or partial unit, or is not available to represent the area of pavement remaining after the limits of pavement over 1 inch deficient is determined, the depth will be assumed to be the same as the preceding or following surveyed depth that is nearest in distance.

(b) Thickness 0.5 Inch Deficient - If a survey depth measurement indicates the pavement is 0.5 inch or more deficient in thickness, stop forward paving progress until appropriate adjustments are made or corrective action is taken.

(c) Coring Requirements - Perform required coring, or coring requested by the Engineer, at the Contractor's expense and according to AASHTO T 24. Repair core holes as directed at the Contractor's expense. Cores will be measured by the Engineer according to AASHTO T 148 and the measurements reported to the nearest 0.1 inch. Core measurements will replace survey methods.

(1) Corrective Grinding Areas - If corrective grinding required by 00756.55(c) is performed at a 00756.56(a) depth measurement site, a core shall be obtained at the surveyed measurement site according to the following:

a. Profile Indexes 7.0 Inches Per Mile or Less - If the original profile indexes for a segment or partial segment determined by 00756.55 is 7.0 inches per mile or less in each wheel path, a core is not required after corrective grinding is performed at a depth measurement site within the segment or partial segment represented by the profile indexes.

b. Profile Index Greater Than 7.0 Inches Per Mile - If an original graphic profile index for a segment or partial segment determined by 00756.55 is more than 7.0 inches per mile for a wheel path, obtain a core, after corrective grinding has been performed, at a depth measurement site within the segment or partial segment represented by the profile indexes if the depth measurement is the specified depth or less.

(2) Cores Requested By Contractor - If the Contractor believes that a depth measurement determined according to 00756.56(a), or a core obtained according to 00756.56(c), is not representative of the actual pavement thickness, the Contractor may take a replacement core. Take replacement cores at a location as directed, 10 feet from the depth measurement or core site in question and the same distance from centerline. The replacement core measurement will replace the original depth or core measurement.

(d) Thickness Over 1.0 Inch Deficient - If a depth measurement determined according to 00756.56(a) shows pavement over 1.0 inch deficient, obtain a core at the depth measurement site. If this core, or a core determined by 00756.56(c), shows pavement over 1.0 inch deficient, obtain additional cores. Take these additional cores at the same distance from the centerline and at 25 foot intervals each direction from the first core until a core in each direction shows pavement 1.0 inch deficient or less. These two core locations will be considered the limits of the pavement more than 1.0 inch deficient. The pavement panel between these two cores will represent the area of pavement subject to removal and replacement under 00756.57 or no payment under 00756.93.

When it is suspected by the Engineer that the pavement in the adjacent travel lane(s) in the panel may be more than 1.0 inch deficient for a greater distance than determined by the above procedure, core the pavement in the adjacent travel lane(s) in the nearest wheel track (3 feet) from the nearest edge) opposite both limit cores. If these cores are more than 1.0 inch deficient, the above procedure shall be followed to determine the limits.

00756.57 Deficient Pavement - Remove and replace pavement deficient in thickness by more than 1.0 inch as determined in 00756.56(d), at the Contractor's expense. If permitted by the Engineer, the pavement may be left in place without payment. Replacement pavement shall be of the specified design, quality and thickness as follows:

- Be the full width of the pavement panel involved
- Extend far enough to replace at least a 20 foot length
- Extend to the construction joint if closer than 20 feet to a construction joint

Maintenance

00756.60 Protection of Concrete - Erect and maintain suitable barriers to protect the concrete from traffic or other detrimental trespass until the pavement is opened to traffic. If necessary provide watchmen. Repair or replace any part of the pavement damaged by traffic or damaged from any other cause before its official acceptance, according to 00170.80.

00756.61 Opening to Construction Equipment or Traffic - Do not operate construction equipment on newly placed concrete until the requirements of (a), (b), and (c) are met. Do not allow public traffic on newly placed concrete until all of the following requirements are met:

(a) The Contractor complies with 00150.60.

(b) The concrete attains a compressive strength of at least 70% of the specified 28 day strength as determined by at least three cylinders cured according to AASHTO T23 Section 9.2 (field cure) and tested according to AASHTO T22.

(c) The surface of the concrete is protected from scarring or abrasion and kept free of stones, loose mortar and other matter apt to be deleterious to the concrete in the paths of equipment.

(d) The pavement meets all of the requirements of 00756.55.

Measurement

00756.80 Pavement - The accepted quantities of concrete pavement will be measured by the square yard. The area will be determined by measuring the width and length of each separately constructed panel of pavement. The width is the design width or measured edge-to-edge width on the surface of the pavement whichever is less. The length is the horizontal measurement from end to end of pavement along the center line of the strip.

The measurement of extra thickness of pavement, as shown or as ordered, will be determined by conversion on a proportionate volume basis to an equivalent number of square yards of specified thickness pavement.

Payment

00756.90 Pavement - The accepted quantities of plain concrete pavement will be made at the Contract unit price per square yard for the following items:

Pay Item	Unit of Measurement
(a) Plain Concrete Pavement, Undowelled, ____ Inches Thick	Square Yard
(b) Plain Concrete Pavement, Dowelled, ____ Inches Thick	Square Yard

The thickness of pavement will be inserted in the blank.

Payment will be payment in full for furnishing and placing all materials including construction joint reinforcement bars, tie bars, dowel bars, curing materials, and saw cutting, including all equipment, labor, and incidentals necessary to complete the work as specified.

No separate payment will be made for providing trial and test batches as they will be Incidental to the other pay items.

00756.92 Price Adjustment for Strength - For each lot of concrete for which a PF is determined, the following will apply:

- In no case will the actual payment exceed the Contract Unit Price
- When the PF is less than 1.00, the price adjustment will be determined as follows:

Price Adjustment = 0.3 x (PF - 1) x Unit Price

00756.93 Price Adjustment for Variation in Thickness - No additional payment over the Contract unit price will be made for pavement having a thickness greater than shown or ordered by the Engineer. When the pavement is found deficient in thickness by more than 0.2 inch, but not more than 1.0 inch, as determined according to 00756.56, payment will be made at an adjusted price according to the following table:

Deficiency in Thickness (inch)	Proportional Part of Contract Unit Price Allowed
0.00 to 0.20	100%
0.21 to 0.30	83%
0.31 to 0.40	76%
0.41 to 0.50	73%
0.51 to 0.75	63%
0.76 to 1.00	59%

No payment will be made for any area of pavement found deficient in thickness by more than 1.0 inch even though such pavement is permitted by the Engineer to remain in place under the provisions of 00756.57.

00756.95 Bonus Payment for Smoothness - If a profilometer is used according to 00756.55 a bonus payment of up to 1.5% will be made to the Contractor for each 0.1 mile segment or partial segment of pavement except shoulders, as determined in 00756.55(b) if:

- The profile index for each wheel path is 7.0 inches per mile or less
- No individual deviation is 0.3 inch or more
- The average of the two profile indexes is less than 5.0 inches per mile
- These requirements are met without any corrective action specified in 00756.55(c)

The bonus payment for each segment and partial segment meeting the above requirements will be computed as follows:

$$\text{Bonus} = 0.006 \times (5.0 - \text{PI}) \times \text{Quantity} \times \text{Unit Price}$$

PI = Average of the two profile indexes in the segment or partial segment (inches per mile)
Quantity = The quantity (square yards) represented by the segment or partial segment
Unit Price = The unit price for the concrete pavement as shown in the Schedule of Items

Section 00759 - Miscellaneous Portland Cement Concrete Structures

Description

00759.00 Scope - This work consists of furnishing, placing and finishing commercial grade concrete curbs, islands, traffic separators, driveways, walks, monolithic curb and sidewalks, miscellaneous surfaces, and stairs with metal handrail in close conformity to the lines, grades and dimensions shown or established. These items in this Section will be collectively referred to as "structures".

Materials

00759.10 General - Materials shall meet the requirements of the following:

Bar Reinforcement 02510
Commercial Grade Concrete 00440
Dowels 02510.50
Epoxy Bonding Agent.....02070
Metal Pipe Handrail.....02830
Poured Joint Fillers 02440.30
Preformed Expansion Joint Filler 02440.10
Sand.....00360.10
Welded Wire Fabric.....02510.40

00759.11 Aggregate Base - Provide aggregate base materials for base, foundation courses, leveling courses or bedding conforming to Section 02630. If a designated size is not shown or given, provide 1" - 0 or 3/4" - 0, as the Contractor elects.

00759.12 Sidewalk Ramp Treatment - Supply truncated dome detectable warning surfaces for sidewalk ramps and accessible route island as indicated in the Special Provisions.

Use only adhesives recommended or supplied by the manufacturer.

00759.13 Temporary Plating - Temporary plating shall conform to Section 00275.

Equipment

00759.21 Concrete Extruding Machine - Concrete extruding machines shall operate under sufficient restraint to forward motion to produce a well consolidated mass of concrete.

Construction

00759.41 Earthwork - Make excavations and backfills for the structures according to Section 00330 and to the depths, widths, and cross-sections shown, specified, or directed.

00759.42 Foundations - Construct foundations or other bedding using selected granular backfill material according to Section 00330 or using aggregate base when shown or directed.

For aggregate base, do one of the following:

- When existing aggregate base materials of the kind specified in 00759.11 are already in place, salvage and reuse
- Use new aggregate base materials conforming to 00759.11

Construct bases under sidewalks and driveways using a minimum of 2 inches of sand.

00759.43 Foundation Preparation - Bring areas on which structures are to be constructed to established line, and make firm, dry and free of all unsuitable material before placing concrete. Existing concrete surfaces shall be clean and moist at the time of placing new concrete.

When placing concrete by the extrusion method, vertical dowel fastening to underlying concrete may be eliminated if the bond between surfaces is developed by applying epoxy bonding agent. Apply epoxy bonding agent according to the manufacturer's recommendations.

00759.44 Joining New To Existing Concrete - Construct suitable connections between new and existing concrete where existing driveways, walks, and other structures are cut back to permit the new construction or where the new construction abuts the existing concrete. Unless shown or directed otherwise, furnish and place minimum 1/2 inch thick preformed expansion joint filler between new and existing concrete.

00759.45 Reinforcement, Dowels and Tie Bars - Furnish and place reinforcement, dowels, and tie bars according to 00755.43 and as shown or directed.

Provide dowels with "slip sleeves" and place as load transfer devices where shown. Place dowels without "slip sleeves" as fastenings or ties between new and existing underlying concrete when shown.

00759.46 Concrete - Construct the structures between suitable forms or by the extrusion method. Place concrete according to Section 00440 subject to this Section.

00759.48 Expansion Joints - Construct expansion joints of the preformed filler type in concrete structures as shown and the following:

- Not less than 1/2 inch wide, except where abutting or underlying concrete joints are larger, then the width shall match those joints
- At right angles to the structure alignment and normal to the structure surface
- Which completely separate the concrete segments
- Placed flush or no more than 1/8 inch below the concrete surface

(a) Curbs, Islands, and Traffic Separators - Provide expansion joints:

- Opposite abutting expansion joints in abutting concrete
- Over existing expansion joints in concrete underlying the new concrete structure
- At each point of tangency in the structure alignment
- Not over 200 foot spacing

(b) Driveways, Walks, Monolithic Curbs and Sidewalks, and Surfacings - Provide expansion joints:

- Between driveways and concrete pavement
- Transversely in walks opposite expansion joints in adjoining curbs and elsewhere so the distance between joints does not exceed 45 feet
- Transversely in walks at a distance of 6 feet to 8 feet from ends of walks which abut curbs
- Around poles, posts, boxes, and other fixtures which protrude through or against the structures

(c) Stairs - Provide expansion joints for stairs at the top and bottom landings as shown.

00759.49 Contraction Joints - Construct transverse contraction joints of the weakened plane or dummy type in the exposed surfaces of the concrete structures as shown and the following:

(a) Locations - Locate contraction joints:

- Over contraction joints in concrete underlying the new concrete structure
- Opposite contraction joints in abutting concrete
- At locations to confine joint spacing to a maximum of 15 feet

(b) Methods - Construct contraction joints by:

- Inserting and removing plates, or other devices
- Inserting and leaving in place preformed expansion joint filler even and flush with the concrete surface
- Sawing as soon as practical after concrete placement but before any uncontrolled cracking occurs
- Tooling
- Other approved methods

(c) Requirements - Contraction joints shall:

- Be not less than 1/8 inch nor more than 1/4 inch wide
- Be a depth of one-third the thickness of the concrete
- Have clean, unfilled grooves, (if preformed expansion joint filler is not used)

00759.50 Surface Finishing :

(a) General - Remove forms, if any, from structures after the concrete has taken its initial set and while the concrete is still green. Repair minor defects with mortar containing one part portland cement and two parts sand. Do not plaster exposed surfaces.

The top and face of structures shall be true and straight, free from humps, sags, or other irregularities. The surface shall not vary more than 1/4 inch from the edge of 12 foot long straightedge laid on the top or face of the structure, except in curves. Furnish the straightedge and operate it as directed. Unless otherwise shown or directed, tool edges to 1/4 inch radius.

(b) Curbs, Islands, and Stairs - While the concrete is still green, finish the exposed surfaces as required to produce a smooth surface and uniform texture.

(c) Driveways, Walks, and Surfacings - Finish concrete surfaces to smooth and uniform texture by troweling, floating and cross brooming. Lightly groove or mark surfaces into squares or other shapes to match markings on similar existing surfaces in the vicinity, as directed.

On all sidewalk ramps and accessible route islands, install truncated domes as shown. Place according to the manufacturer's recommendation.

(d) Historic Dates and Names - Historic dates and street names in existing sidewalk corners will be preserved or re-stamped into the new concrete. Stamp the dates and/or names in the curb as close to the original location as practical. Re-stamp the dates and names exactly as they existed in the sidewalk corner. This includes miss-spelled words and names that are no longer used for the street name. However for dates, the original date with a slash and the current date are required to be re-stamped into the new corner curb. Do not preserve or re-stamp Contractor names.

A set of stamping tools is available for loan through the Street Construction Office on a first-come, first-serve basis.

00759.51 Curing - Cure and protect concrete after placing and finishing according to Section 00440.

Keep the concrete structure free from contact, strain and public traffic for at least seven calendar days or longer as directed.

Do not apply curing compounds to the designated truncated dome areas of sidewalk ramps and accessible route islands.

00759.52 Joint Filler - If curb is separately constructed next to sidewalks or driveways, pour joint filler in the joint between the curb and sidewalk or driveway.

Measurement

00759.80 General - The quantities of structures will be measured on the following basis:

- **Volume Basis** - The volume calculated to the neat lines of the structure.
- **Area Basis** - Surface measurement of the neat lines of the structure.
- **Length Basis** - Along the face of the structure, from end to end including curb tapers or depressed lengths at driveways and ramps.
- **Unit Basis** - Per each, by actual count in place and accepted.

00759.81 Sand Base - There will be no separate measurement of the sand base under sidewalks and driveways. The estimated quantity of sand base will be shown in the Special Provisions.

00759.82 Historic Dates and Names - There will be no measurement for preservation or re-stamping of dates and/or names into curbs at sidewalk corners.

Payment

00759.90 General - The accepted quantities of structures will be paid at the Contract price per unit of measurement for the following:

	Pay Item	Unit of Measurement
(a)	Concrete Curbs, _____	Foot or Cubic Yard
(b)	Concrete Islands	Square Foot
(c)	Concrete Driveways	Square Foot
(d)	Concrete Driveways, Reinforced	Square Foot
(e)	Monolithic Curb and Driveways	Square Foot
(f)	Monolithic Curb and Driveways, Reinforced	Square Foot
(g)	Concrete Walks	Square Foot
(h)	Monolithic Curb and Sidewalks	Square Foot or Foot
(i)	_____Concrete Surfacing	Square Foot
(j)	Concrete Stairs	Cubic Yard
(k)	Concrete Driveway Connections	Square Foot
(l)	Concrete Bus Shelter Pads	Each

In item (a) the type of curb will be inserted in the blank, if appropriate.

Item (b) includes traffic separators. It also includes all work associated with applying truncated domes.

Items (c), (d), (e), (f), (g) and (h) include the sand base.

Items (c), (d), and (g) include the joint filler in the joint between the sidewalk or driveway and the curb if applicable.

Item (g) includes sidewalk ramps. It also includes all work associated with applying truncated domes.

Item (h) includes sidewalk ramps. It also includes all work associated with applying truncated domes.

In item (i) the specified thickness, or type, of concrete surfacings will be inserted in the blank, if appropriate.

Item (j) includes pipe handrail.

The preservation or re-stamping of dates and/or names into sidewalk corner curbs will be incidental to the curb work for which no separate payment will be made.

The Contract unit prices under this section will not include payment for:

(a) Earthwork - When earthwork is covered for payment under separate pay items, payment will be made according to Section 00330.

(b) Aggregate Base - Aggregate base used according to 00759.42 will be paid for under Section 00640.

Earthwork required under 00759.41, not covered for payment under Section 00330, will not be paid for directly but will be considered as Incidental to other Contract items.

Payment will be payment in full for furnishing and placing all materials, including all equipment, labor, and incidentals necessary to complete the work as specified.

Section 00760 - Unit Pavers

Description

00760.00 Scope - This work consists of furnishing and installing standard or permeable segmental concrete pavers, clay segmental pavers or clay mortar set pavers at locations shown on the plans or as directed.

00760.02 Definitions:

Bedding sand - A layer of coarse, washed sand screeded smooth for bedding the pavers.

Bedding layer - a layer of clean crushed aggregate screeded smooth for bedding the pavers.

Brick pavers - Clay paving units, rectangular or square capable of being placed with one hand into a laying pattern

Chamfer - A 45° beveled edge around the top of a paver unit to help prevent edge chipping.

Concrete pavers - Concrete paving units, rectangular, square or dentated, capable of being placed with one hand into a laying pattern or with mechanical equipment.

Dentated paver - A unit that is not rectangular or square in shape.

Edge restraint - A curb, edging, building, or other stationary object that contains the sand and pavers so they do not spread or lose interlock.

Interlock - Frictional forces between paving units that prevent them from rotating or moving horizontally or vertically in relation to each other. Also defined as the inability of a paver to move independent of its neighbor.

Joint - The space between paving units typically filled with either sand or grout.

Joint sand stabilizer - Liquid penetrating or dry mix applied or materials that provide early stabilization of joint sand, reduces its permeability, sand loss and helps prevent weeds.

Permeable concrete pavers - Concrete interlocking pavers with wide joints from 3/8" to 1/2" or a shape that creates openings in which rainfall and runoff can infiltrate. The openings are typically filled with open-graded aggregate.

Segmental Pavement - A pavement whose surface consists of discrete units typical made of concrete, clay or stone.

Spacer Bars/Lugs, Spacers or Nibs - Small protrusions on each side of the paver that maintain a minimum space so sand can fill into the joints.

Materials

00760.10 General - Materials shall meet the requirements of the following:

Backer Rod	02440.14
Bedding sand	02620
Brick pavers	ASTM C 1272-04a, Type R, Application PX
Commercial Grade Concrete	00440
Concrete pavers	ASTM C 936
Drainage blanket	00360
Joint sand	02620
Joint sand stabilizers	02440.23
Joint grout	02080.60
Geotextile	02320
Mortar bed	02080.60
Poured Joint Filler	02440.30

00760.11 Aggregate Base - Provide aggregate base materials for base, foundation courses conforming to Section 02630. If a designated size is not shown or given, provide 1"-0 or 3/4"-0 as the Contractor elects.

00760.12 Unit Paver Type, Size and Color - Provide paver type, size and color as indicated in the Special Provisions.

00760.13 Temporary Plating - Temporary plating shall conform to Section 00275.

Construction

00760.40 Earthwork - Make excavations and backfills for the pavers according to Section 00330 and to the depths, widths, and cross-sections shown, specified, or directed.

00760.41 Foundations:

(a) Aggregate Base - Construct bedding layer using aggregate base materials according to 00760.11.

(b) Sand Bedding – Construct foundations using sand conforming to 02620.

(c) Mortar Base – Construct foundations using mortar conforming to 02080.60

(d) Concrete Base – Construct foundations using commercial grade concrete according to 00440.

00760.42 Foundation Preparation:

(a) Aggregate Base – Bring areas on which structures are to be constructed to established line, and make firm, dry and free of all unsuitable material before placing concrete.

(b) Sand Bedding - Place a 1 1/2 inch leveling bed. Screed to grade and saturate with water to ensure a firm and smooth grade.

(c) Mortar Base - Install mortar setting bed on concrete base according to manufactures instructions.

(d) Concrete Base - Cure and clean concrete base before placing mortar bed. The surface shall not vary more than 3/8 inch from the edge of a 12-foot long straightedge laid on the top of the surface.

00760.43 Paver Units - Install pavers according to the manufacturer's instructions. Lay out rows so they are straight and parallel to the surrounding lines. Cut pavers with masonry saw where necessary to fit pattern to edges. The edge gap of the paver is to be no wider than 3/8 inch. The adhesion surface of the paver is to be clean of dust and foreign material. The texture of the pavers shall be a non-smooth standard finish (mission).

00760.44 Joint Fill and Compaction - After placing pavers, sweep joint sand into the joints. Use a vibrating mechanical tamper to compact.

00760.45 Joint Grout – Joints shall not exceed one half inch in width and may be buttered or poured and tamped to provide one hundred percent contact with all mating surfaces. The joint shall be thoroughly filled and finished flush with the surface of the concrete paver. The slurry or squeegee methods of filling the joints between the pavers shall not be used.

00760.46 Joint Sand Stabilizer – For pavers used for vehicle traffic, stabilize sand joints using a liquid stabilizer that is water or solvent based. The primary resin or bonding agent shall be an acrylic, epoxy or other polymer as solids by volume of 18 to 28 percent. Use of a dry stabilizer shall be allowed for pavers subjected only to pedestrian traffic.

00760.47 Laying Pattern – Use basket weave or running band pattern when shown or directed in areas for pedestrian traffic. Use 45° or 90° Herringbone pattern when shown or directed for pedestrian or vehicle traffic.

00760.48 Expansion Joints – Construct expansion joints according to 00759.48

00760.49 Contraction Joints – Construct contraction joints according to 00759.49

00760.50 Paver Edge Restraints – Use metal or plastic edge restraints as specified. The use of wood, either treated or untreated, is not allowed.

00760.51 Surface Tolerance - Do not deviate from the longitudinal and transverse surface grades by more than 1/4 inch in 12 feet.

Maintenance

00760.60 Re-Filling of Joints – One month after initial installation of pavers and at the completion of the Project, sweep additional sand into joints as needed.

00760.61 Paver Settlement – One month after initial installation of pavers and at the completion of the Project, check surface of pavers for settlement and re-set pavers as needed.

Finishing and Cleanup

00760.70 Clean Up - Remove excess sand, grout and broken paving material from the site when complete.

Measurement

00760.80 General - The quantities of unit pavers will be the surface measurement of the neat lines of the structure.

Payment

00760.90 General - The accepted quantities of pavers will be paid for at the Contract price per square foot for the following:

	Pay Item	Unit of Measurement
(a)	Brick Pavers	Square Foot
(b)	Concrete Pavers	Square Foot
(c)	Permeable Pavers	Square Foot

Item (a) includes the concrete pad, mortar bed and grouted joints. Aggregate base will be paid according to Section 00640.

Item (b) includes sand bedding. Aggregate base will be paid according to Section 00640.

Item (c) includes the sand material for the bedding and joints. Drainage blanket will be paid according to Section 00360.

Items (a), (b), and (c) includes the sidewalk ramps. It also includes all work associated with applying truncated domes.

The Contract unit prices under this section will not include payment for:

(a) Earthwork - When earthwork is covered for payment under separate pay items, payment will be made according to Section 00330.

(b) Aggregate Base - Aggregate base specified in the plans and conforming to 00760.11 will be paid under Section 00640.

(c) Drainage Blanket - Drainage blanket specified in the plans and conforming to Section 00360 will be paid under Section 00360.

Earthwork required under 00760.40, not covered for payment under 00330, will not be paid for directly but will be considered as incidental to other Contract items.

Payment will be payment in full for base preparation and for furnishing all materials, equipment, labor, and incidentals necessary to complete the work as specified.

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