

PART 00700 - WEARING SURFACES

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Section 00705 - Emulsified 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, furnish 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"	90 - 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 percent shall pass the No. 8 sieve.

00705.11 Emulsified Asphalt - Furnish asphalt meeting the following requirements:

(a) General - 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.

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 Agency, within 30 calendar days from the day the sample was taken.

(b) Prime Coat - Provide 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 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 gauges, 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 0.20 to 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 0.10 to 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 3 calendar days after construction, as directed, before a succeeding course is placed upon it. If directed, traffic may be allowed 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 applications of all 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 2 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 Measurement - The quantities of emulsified asphalt will be measured on the weight basis.

The quantities of aggregate cover material will be measured on the weight basis or on the volume basis in the hauling vehicle.

Payment

00705.90 Payment - The accepted quantities of work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

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

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

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.

No separate or additional payment will be made for materials used during the maintenance period.

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 - Furnish 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 - Furnish 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 percent 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 or certificate of 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 of them. To assure the material is totally crushed, 100 percent of the parent aggregate shall be larger than the largest stone in the gradation to be used.

Aggregate gradation shall meet one of the following types:

	TYPE I - Parking Areas, Urban and Residential Streets, Airport Runways	TYPE II - Urban and Residential Streets, Airport Runways	TYPE III - Primary and Interstate Routes	Stockpile Tolerance
Sieve Size	Percent Passing	Percent Passing	Percent Passing	
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	10.0 - 20.0	5.0 - 15.0	5.0 - 15.0	± 2.0%

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 - 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 allowed unless approved. Water, not exceeding 11 percent 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 described in 00706.15(b). The final mix design shall meet the limits described in 00706.15(b) and 00706.15(c).

(b) Mix Design Tests:

Test	Description	Specification
ISSA TB-106	Slurry Seal Consistency	
ISSA TB-139 (For quick-traffic systems)	Wet Cohesion, 30 minutes set 60 minutes set	0.10 lb.-in. min. 0.17 lb.-in. min.
ISSA TB-109 (For heavy traffic areas only)	Excess Asphalt by LWT and Sand Adhesion	1 lb./sq. yd. max.
ISSA TB-114	Wet Stripping	Pass (90% minimum)
ISSA TB-100	Wet Track Abrasion Loss One hour soak	1.5 lb./sq. yd. 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 allowed.
- The percentage of aggregate passing each sieve shall be within the stockpile tolerance range as stated in 00706.12.
- 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** - Every 60,000 square yards.
- **Tanker** - Every 60,000 square yards.
- **Mixture** - To be taken directly out of pug mill 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 Equipment - 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 machines 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 (for example; 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 - If required by Special Provision, 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 technician having a CAT-I technical certification.

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 to the Agency. 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 Agency.

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 00748.

(b) Surface Repairs - Where the pavement is severely cracked, rutted, deformed or otherwise distressed, place a leveling course or patch using 3/4" or 1/2" ACP. The class of mix to be used shall conform to Sections 00744 and 00745, as applicable. Place the mixture according to Sections 00744 and 00745, as applicable.

(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 pug mill shall be 4 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 to the Agency.

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 according to the following table:

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

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 to the Agency. 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 pug mill 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 Agency 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 Agency.

00706.48 Rolling - If required by Special Provision, 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 according to the approved schedule, or an approved revision of the schedule, 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.

If the 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 at no additional cost to the Agency.

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 Measurement - Crack sealing will be measured on the length basis, of material in place.

Slurry seal will be measured on the area basis.

Asphalt concrete pavement repair will be measured according to 00748.80.

Payment

00706.90 Payment - The accepted quantities of work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Slurry Seal Crack Sealing	Foot
(b) Slurry Seal	Square Yard

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.

Asphalt concrete pavement repair will be paid for according to 00748.90.

When the Contract Schedule of Items does not indicate payment for work under this Section, no separate or additional payment will be made. Payment will be included in payment made for the appropriate items under which this work is required.

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

Materials

00710.10 Aggregates - Furnish aggregates meeting 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 percent by weight of the total aggregate retained on the No. 8 and larger sieves is fractured on two faces, as determined according to AASHTO T 335.

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

Sieve Size	Coarse 1/2" - 1/4"	Single Size Medium 3/8" - 1/4"	Graded Medium 3/8" - No. 4	Fine 3/8" - No. 8
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)	0.0 - 2.0	0.0 - 2.0	0.0 - 2.0	0.0 - 2.0
No. 200 (wet) *	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0

* 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 percent when subjected to five cycles of the soundness test using sodium sulfate solution according to AASHTO T 104.

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

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

(h) Taking Aggregates from Agency Stockpiles - When it is specified that aggregates are to be taken from Agency-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 Agency Property - Aggregates may be temporarily stockpiled at approved sites on Agency 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 - Furnish 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, use 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 surface

treatment 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 Agency. 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 subplot.

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 Agency's quality assurance program. The Agency 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 Program.

(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 Agency 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 gauges, 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 psi 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 technician having a CAgT technical certification.

Construction

00710.40 Season and Weather Limitations - Do not apply emulsified asphalt when the pavement temperature is below 70 °F, or if the humidity is higher than 75 percent. Complete the application of the emulsified asphalt and the aggregate 3 hours before sunset. Remove by milling, or other methods approved by the Engineer, and replace all surface treatments damaged by weather during the first 24 hours after application at no additional cost to the Agency. 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 1 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. Surface treatment is not required for guardrail flares, driveways, or other irregular areas as directed.

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./sq. yd.)	Aggregate Spread Rate (cu. yd./sq. yd.)
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 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 3 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 percent transversely from the average, and no more than 10 percent 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 allowed by the Engineer. Carefully operate hauling equipment at all times, at moderate speeds that will not damage the new surface treatment 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 percent of specified rate. Using approved methods, remove or repair emulsified asphalt that has set or "broke" before being covered with aggregate, at no additional cost to the Agency.

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 allowed.

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 2 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 Measurement - The quantities of aggregate will be measured on the weight basis or on the volume basis in the hauling vehicle.

The quantities of emulsified asphalt will be measured on the weight basis.

The quantities of asphalt surface treatment of approaches will be measured on the unit basis for each street connection and road approach.

Payment

00710.90 Payment - The accepted quantities of work performed under this Section 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 only on street connections and road approaches. Payment will be in addition to payment made for the materials used in the work.

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.

No separate or additional payment will be made for preparing the road surface, placing materials in final position, or brooming.

Section 00711 - Pre-Coated Aggregate Asphalt Surface Treatment

Description

00711.00 Scope - This work consists of applying a surface treatment using a modified hot asphalt binder and precoated graded aggregate as shown.

Materials

00711.10 Aggregates - Furnish aggregate meeting the following requirements:

(a) Grading - Perform sieve analysis according to AASHTO T 27 and AASHTO T 11. Provide aggregate meeting the following gradation:

Sieve Size	3/8" - No. 4 Percent Passing (by Weight)
1/2"	100
3/8"	85 - 100
No. 4	0 - 15
No. 8	0 - 5
No. 200 Wet	0 - 1.5

(b) Fractured Faces - Provide aggregate consisting of broken stone, crushed gravel, or a combination of both. Crush aggregate such that at least 90 percent by weight of the total aggregate retained on the No. 8 and larger sieves is fractured on two faces, as determined according to AASHTO T 335.

(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 aggregate with a weighted loss not exceeding 12 percent when subjected to five cycles of the soundness test using sodium sulfate according to AASHTO T 104.

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

Test	Test Method		Maximum Values
	ODOT	AASHTO	
Abrasion		T 96	30.0%
Degrade (Plus No. 4) Passing No. 20 Sieve	TM 208		30.0%
Sediment Height	TM 208		3.0"

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

Test	Test Method		Limit
	ODOT	AASHTO	
Lightweight Pieces		T 113	1.0% maximum
Wood Particles	TM 225		0.1% maximum
Elongated Pieces (5:1 ratio)	TM 229		10.0% maximum
Cleanness Value	TM 227		75 minimum

00711.11 Asphalt Binder - Furnish AC15-5TR or AC-15P asphalt for the binder meeting the following requirements:

Test	Test Method	AC15-5TR		AC-15P	
		Min.	Max.	Min.	Max.
Absolute Viscosity at 140F, poise	ODOT TM 430	1500		1500	
Kinematic Viscosity at 275F, cSt	AASHTO T 201		2000		2000
Penetration at 25C, 100g, 5 sec, dmm	AASHTO T 49	90	140	100	150
Elastic Recovery, %	ODOT TM 429	55		55	
Cleveland Open Cup Flash Point, C	AASHTO T 48	260		260	

Obtain asphalt binder samples according to AASHTO T 40 at a frequency of one sample for each 50 tons of asphalt binder used. Samples will be tested at the ODOT Materials Laboratory, or other laboratory as designated by the Agency.

00711.12 Asphalt and Additives for Pre-Coated Aggregate - Furnish PG64-22 grade asphalt to pre coat the aggregate meeting 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.

Obtain samples of asphalt according to AASHTO T 40 when requested by the Engineer. Samples may be tested at the discretion of the Engineer at the Agency's expense.

00711.15 Aggregate Production Quality Control - Provide quality control during production of aggregates according to Section 00165. Have a CAgT sample and test according to the MFTP section 4(D), for section 00710 materials. Statistically evaluate the aggregates according to Section 00165.

00711.16 Acceptance of Aggregate - The Contractors quality control tests will be used for acceptance of aggregates if verified by the Agency's quality assurance program. The Agency will perform aggregate production quality assurance according to Section 00165, the MFTP, and section 00710.16 of the ODOT Quality Assurance Program.

Obtain asphalt binder samples according to AASHTO T 40 at a frequency of one sample for each 50 tons of asphalt binder used. Samples will be tested at the ODOT Materials Laboratory, or other laboratory as designated by the Agency.

00711.17 Pre-Coated Aggregate Mixture - Pre-coat, cure, store, and maintain the pre-coated aggregate mixture according to the following:

- Waste all bag house dust during production of the pre-coated aggregate mixture.
- Use an asphalt hot plant to coat the aggregate with asphalt.
- Achieve at least a 90 percent coating on all the material retained on the No. 4 sieve by applying between 0.7 and 1.0 percent liquid asphalt of the total weight of the material. Establish the target value and obtain the Engineer's approval before beginning the coating process. The acceptable liquid asphalt tolerance is ± 0.2 percent. Test according to ODOT TM 321 at a frequency of one test for every 500 tons of mixture. Coated aggregate that is not within the acceptable tolerance will be rejected.
- Maintain the plant dryer temperature between 190 °F and 230 °F. Maintain the liquid asphalt temperature at the liquid asphalt supplier's recommended temperature.

- The maximum moisture content of the pre-coated aggregate mixture is limited to 1.3 percent. Test according to AASHTO T 329 at a frequency of one test for every 500 tons of mixture.
- After pre-coating, stockpile, cool, and cure the aggregate mixture for at least 7 calendar days before using it.
- Use multiple stockpiles to store the pre-coated aggregate mixture. Do not place additional pre-coated aggregate mixture into an existing stockpile until the temperature of the additional pre-coated aggregate mixture is no more than 140 °F.
- Turn the pre-coated aggregate mixture with a loader or other means to accelerate cooling, to increase uniformity of the coating on the aggregates, to avoid heat buildup, and to prevent burning of the asphalt coating. Excessive clumping may require re screening of the mixture before acceptance. If excessive dust is encountered when placing the pre-coated aggregate mixture, re-screen it at the stockpile site.
- Final acceptance of the pre-coated aggregate mixture will be completed at the stockpile staging site.

Equipment

00711.20 Equipment - Provide pressure distributors, hauling vehicles, chip spreader, compactors, power brooms and other necessary equipment to insure 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.

00711.21 Asphalt Distributors - Provide asphalt distributors that are:

- Designed, equipped, maintained, and operated so the asphalt material may be applied uniformly at even heat, and in a continuous operation.
- 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.
- Equipped with a tachometer, pressure gages, accurate volume measuring devices, and a thermometer for measuring temperature of tank contents.
- Equipped with a Computer Rate Control device.
- 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.

Demonstrate to the Engineer that the asphalt distributors are properly calibrated before beginning work.

00711.22 Chip Spreaders - Provide chip spreaders that are:

- Self-propelled, computerized chip spreaders, and with a screenings hopper in the rear and a belt conveyor to carry the screenings to the front of the spreader hopper. Rear screens may be removed at the direction of the engineer if excess build-up occurs.
- Capable of providing a uniform spread rate over the entire width of the traffic lane in one application.
- Equipped with an aggregate segregator assembly unless otherwise allowed by the Engineer.

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- Of adequate width to provide full coverage of the specified panel without placing joints in the travel lanes.
- Equipped with a surface temperature thermometer which reads the surface temperature in advance of rock placement, and be visible to the chip spreader operator.

Provide verification to the Engineer that the chip spreaders are properly calibrated before beginning work.

00711.23 Compactors - Provide at least three rollers for multiple pass operations and at least five rollers for continuous operations meeting the following requirements:

- Be self-propelled pneumatic-tired in good condition and capable of operating at speeds compatible with the surface treatment operation.
- Be tandem or multiple axle, multiple wheel type pneumatic-tired rollers with smooth-tread pneumatic tires of equal size.
- Have staggered tires on the axles at spacing and overlaps that will provide uniform compaction pressure for the full compacting width of the roller.
- Have minimum load per tire of 2,800 pounds, with tire inflation pressures of 45 to 100 psi.
- Maintained air pressure to not vary more than ± 5 psi in each tire per machine.

00711.24 Power Brooms - Provide at least four pickup or non-pickup type power brooms equipped with a positive means to control vertical pressure.

00711.25 Asphalt Storage Tank - Provide a heated asphalt storage tank in close proximity to Project.

Labor

00711.30 Quality Control Personnel - Provide a technician having a CAgT technical certification.

00711.31 Technical Representative - Provide a qualified technical representative from the asphalt binder supplier, on site, during all surface treatment operations. The technical representative duties are to assist the Engineer in establishing the asphalt binder and pre-coated aggregate mixture application rates and to provide input on the temperatures for the application of the asphalt binder coat.

Construction

00711.40 Season, Weather and Temperature Limitations - Construct the surface treatment in warm dry weather. Apply the hot asphalt binder only when the ambient temperature is 70 °F or higher and the pavement surface temperature, in the sun and shade is 75 °F or higher. Do not apply if the road surface is wet or if rain is predicted. If unexpected rain does occur during application, shut off the asphalt distributor but continue with pre-coated aggregate mixture placement until all newly sprayed asphalt binder has been covered. Do not resume the surface treatment operation for at least 2 days and when allowed by the Engineer.

00711.41 Rate of Progress and Scheduling - Do not apply more surface treatment in any one day than can be broomed the same day.

00711.42 Preparation of Underlying Surfaces - At the beginning of the shift, clean the surface to be treated of all loose material by brooming.

00711.43 Sequence of Operations - Construct the surface treatment as follows:

- Apply the binder.
- Distribute the pre-coated aggregate mixture.
- Compact it with pneumatic tired rollers.

When applying the asphalt binder at intersections, turn pockets, gore points, and other irregular areas do not apply the asphalt binder in excess of what can be covered with the pre-coated aggregate mixture within the appropriate temperature range of the asphalt binder.

00711.44 Application Rates - Apply the asphalt binder and spread the pre-coated aggregate mixture within the following ranges of rates. The exact application and spread rate will be determined by the Engineer.

Asphalt binder application rate0.35 to 0.45 gallon per square yard

Pre coated aggregate mixture spread rate10 to 20 pounds per square yard

00711.45 Applying Asphalt Binder Coat - Place asphalt binder to the road surface with a pressure distributor at the rates specified and according to the following:

- Apply to no more than one-half the width of the travel way at one time.
- Apply so the longitudinal joint between adjacent applications of asphalt binder and pre-coated aggregate mixture coincides with the line between designated traffic lanes.
- Apply asphalt binder at a distance that allows the pre-coated aggregate mixture to be applied at the binder surface temperature listed in 00711.46. Do not operate hauling and spreading equipment on uncovered asphalt binder.
- Apply at a temperature between 330 °F and 370 °F or as recommended by the asphalt binder supplier. Do not elevate the asphalt binder above 330 °F for more than a 4 hour period or a temperature or time period recommended by the asphalt binder supplier.
- Clean all joints of excess loose material before applying the asphalt binder.
- Construct joints without ridges and depressions and have uniform appearance consistent with the adjacent sealed surface. Correct all defects at no cost to the Agency.
- Place building paper over the treated surface at the beginning of each spread for each distributor to insure that the nozzles are operating properly before the uncoated surface is reached. Remove and dispose of building paper according to Section 00290.

00711.46 Hauling and Spreading Aggregates - Haul and spread the pre-coated aggregate mixture at the rates specified and the following:

- Periodically verify the gate opening to be sure a consistent spread rate is maintained. Maintain the pre-coated aggregate mixture spread rate within $\pm 5\%$ of the established rate.
- Operate hauling equipment at speeds that will not damage the new surface treatment. Route hauling equipment and pilot car traffic as uniformly as possible over the full width of the new surface.
- Cover the asphalt binder surface with pre-coated aggregate mixture when the asphalt binder surface temperature is between 130 °F and 180 °F.
- Uniformly spread pre-coated aggregate mixture to provide coverage without gaps or overlapping adjacent coverages. Do not construct longitudinal joints within the travel lanes.

Construct neat transverse cut off of pre-coated aggregate mixture and remove all excess aggregate from the surface before resuming operations.

00711.47 Shaping and Compacting - After the pre-coated aggregate mixture has been spread on the asphalt binder surface, remove all piles, ridges, and uneven surfaces.

Make the initial compaction pass behind the spreader as soon as the pre-coated aggregate mixture is spread. Hauling equipment may be used to assist in compaction immediately behind the spreader. Use sufficient pneumatic rollers to cover the width of the pre-coated aggregate mixture spread in one pass. Roll in a staggered pattern. Operate rollers to maintain close proximity to the spreader but do not exceed 5 mph. Complete at least three roller passes within 30 minutes of spreading pre-coated aggregate mixture. If rollers are unable to keep up with the spreader, stop application of asphalt binder and pre coated aggregate mixture until to rollers catch up or furnish additional rollers. If pre coated aggregate mixture spreading is stopped for more than 2 minutes, move the spreader ahead of or off the surface so that cover material may be immediately rolled.

Maintenance

00711.60 Power Brooming - After rolling the pre-coated aggregate mixture, remove loose aggregate by brooming the entire surface. Delay brooming if the brooms damage the surface. Broom one pass in the opposite direction in which the pre-coated aggregate mixture was placed. Do not allow uncontrolled traffic on the surface until all brooming of excess aggregate is completed.

Subsequent brooming may be required for up to 2 days after placement as directed.

Seven calendar days after completion of a section of surface treatment, remove all loose aggregate from the shoulder area by brooming.

On bridges, barrier areas, minimum width median areas, and 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. Dispose of loose aggregate at least 150 feet from the nearest waterway in areas identified for this purpose.

Measurement

00711.80 Measurement - The quantities of work performed under this Section will be measured on the weight basis.

Payment

00711.90 Payment - The accepted quantities for work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Pre-coated Aggregate in Asphalt Surface Treatment.....	Ton
(b) Asphalt Binder Coat in Asphalt Surface Treatment.....	Ton
(c) PG64-22 in Pre-coated Aggregate.....	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.

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 - Furnish aggregates meeting 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 percent by weight of the total aggregate retained on the No. 8 and larger sieves is fractured on two faces, as determined according to AASHTO T 335.

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

Sieve Size	Designated 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)	0.0 - 2.0	0.0 - 2.0	0.0 - 2.0	0.0 - 2.0
No. 200 (wet) *	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0	0.0 - 1.0

* 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 percent 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		Maximum Values
	ODOT	AASHTO	
Abrasion		T 96	30.0%
Degradation (coarse aggregate)			
Passing No. 20 Sieve	TM 208		30.0%
Sediment Height	TM 208		3.0"

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

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

(g) Taking Aggregates from Agency Stockpiles - When it is specified that aggregates are to be taken from Agency-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 Agency Property - Aggregates may be temporarily stockpiled at approved sites on Agency 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 - Furnish 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, use 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 surface treatment 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 Agency. 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 subplot.

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 00195.60 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 Agency's quality assurance program. The Agency 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 Program.

(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 Agency 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 gauges, 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 psi 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 non-pickup type power brooms equipped with a positive means to control vertical pressure.

Labor

00715.30 Quality Control Personnel - Provide a technician having a CAgT technical certification.

Construction

00715.40 Season and Weather Limitations - Do not apply emulsified asphalt when the pavement temperature is below 70 °F, or if the humidity is higher than 75 percent. Complete the application of the emulsified asphalt and the aggregate 3 hours before sunset. Remove by milling, or other methods approved by the Engineer, and replace all surface treatments damaged by weather during the first 24 hours after application at no additional cost to the Agency. 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 during the progress of the work to produce the best results. Surface treatment is not required for guardrail flares, driveways, or other irregular areas as directed.

**Table 00715-1
Multiple Surface Treatment Design**

Spreading Order and Rates of Spread*	Fine Double Chip Seal	Medium Double Chip Seal	Type E-9 Oil Mat	Type E-11 Oil Mat
First Course				
Emulsified Asphalt	0.20	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	0.35
1/2" - 1/4" Aggregate	—	—	—	0.010
3/8" - No. 8 Aggregate	—	—	0.007	0.003
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 - gallons per square yard
Aggregates - cubic yards per square yard

(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 3 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 3 hours prior to sunset each day.

- Square up first and second course (and third course for Type E-11) of the oil mat 3 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 3 hours prior to sunset.
- Complete all courses the same day. Square up all courses 3 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 3 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 percent transversely from the average, and no more than 10 percent 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 allowed by the Engineer. Carefully operate hauling equipment at all times, at moderate speeds that will not damage the new surface treatment 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 percent of specified rate. Using approved methods, remove or repair emulsified asphalt that has set or "broke" before being covered with aggregate, at no additional cost to the Agency.

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 allowed.

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 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 1 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 within 14 calendar days following notification at no additional cost to the Agency.

Measurement

00715.80 Measurement - The quantities of aggregate will be measured on the weight basis or on the volume basis in the hauling vehicle.

The quantities of emulsified asphalt will be measured on the weight basis.

The quantities of asphalt surface treatment of approaches will be measured on the unit basis for each street connection and road approach.

Payment

00715.90 Payment - The accepted quantities of work performed under this Section 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 only on street connections and road approaches. Payment will be in addition to payment made for the materials used in the work.

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.

No separate or additional payment will be made for preparing the road surface, placing material in final position, or blading and brooming.

Section 00730 - Emulsified 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 Emulsified Asphalt - Furnish CSS-1, CSS-1h, CMS-2, CMS-2S, CMS-2h, CRS-1, CRS-2, HFRS-2, or HFMS-2 as selected by the Contractor.

Furnish emulsified asphalt meeting 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 allowed to a maximum 1:1 ratio. Determine the proportion of water to be added to the emulsified asphalt. Do not dilute the emulsified asphalt until the Engineer approves the dilution ratio. Add the water to the emulsified asphalt and mix according to the asphalt supplier.

Obtain samples 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 Agency. 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 gauges, 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, and 00745.40, as applicable.

00730

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 emulsified asphalt with a pressure distributor conforming to 00730.22, unless otherwise allowed. Apply the emulsified 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 emulsified asphalt separates from the water (breaks), but before it loses its tackiness.

Measurement

00730.80 Measurement - The quantities of emulsified asphalt cement used as tack will be measured on the weight basis.

Payment

00730.90 Payment - The accepted quantities of emulsified asphalt cement used as tack coat will be paid for at the Contract unit price, per ton, for the item "Emulsified Asphalt for Tack Coat".

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

No separate or additional payment will be made for water added to dilute the emulsified asphalt used as tack coat.

Section 00735 - Emulsified Asphalt Concrete Pavement

Description

00735.00 Scope - This work consists of constructing an emulsified asphalt concrete (EAC) pavement composed of aggregate and emulsified asphalt, plant mixed into a uniformly coated mixture, spread on a prepared base, covered with choke aggregate, and compacted to the lines, grades, thicknesses, and cross sections shown or established.

00735.05 Precrushing and Prepaving Conferences:

(a) Precrushing Conference - Supervisory personnel of the Contractor and any subcontractors who are to be involved in aggregate crushing of EAC aggregates shall meet with the Engineer at a mutually agreed time, to discuss methods of accomplishing all phases of the crushing work. The Crusher Supervisor and the Contractor's CAgT shall attend the meeting.

(b) Prepaving Conference - Supervisory personnel of the Contractor, including the CAT-I and 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.

Materials

00735.10 Aggregates - Furnish aggregates for EAC meeting the following requirements:

(a) General - Scalp the rock material used to produce aggregates on a 3/4 inch sieve covering the entire screen deck (after it has passed through the primary crusher if quarry rock is used). The material remaining may be accepted for use by visual inspection. The Engineer may perform verification testing of the gradation. The material shall meet the following:

Sieve Size	Percent Passing (by Weight)
4"	95 - 100
3/4"	5 Max.

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

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

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

(d) Fractured Faces - Determine fracture of aggregates according to AASHTO T 335. Crush aggregate to provide at least two fractured faces on 90 percent of the material retained on a 1/4 inch sieve, and one fractured face on 75 percent of the material retained on a No. 8 sieve.

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

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

(f) Grading - Perform sieve analysis according to AASHTO T 27 and AASHTO T 11. Provide grading of EAC aggregate conforming to the following:

Sieve Size	Percent Passing (by Weight)	Leveling or Patching
		Percent Passing (by Weight)
1"	100	
3/4"	95 - 100	100
1/2"	60 - 90	95 - 100
1/4"	15 - 30	15 - 40
No. 8	0 - 7	0 - 10
No. 200	0.0 - 2.0	0.0 - 2.0
No. 200 *	0.0 - 1.0	0.0 - 1.0

* in gravels

If the aggregates are produced in two or more separate sizes, the gradation of the blended sizes shall conform to the above grading requirements.

(g) Stockpiling - Prepare the ground for the stockpile site to prevent contamination. Prevent segregation, as much as possible, when stockpiling and removing the aggregate.

00735.11 Emulsified Asphalt - Furnish CM-2, CMS-2S, or HFMS-2 emulsified asphalt meeting 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. Acceptance of the selected emulsified asphalt is subject to the production of a suitable JMF.

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 EAC use. Limit pumping between the bulk storage tank, hauling transportation, field storage tanks, and plant to an absolute minimum to maintain viscosity.

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 Agency, within 30 calendar days from the day the sample was taken.

00735.13 Job Mix Formula - Provide a mixture comprised of aggregate and emulsified asphalt in the proportions established in the job mix formula (JMF). The emulsified asphalt content shall be between 5.0 and 8.0 percent, by weight, of the total aggregate. Vary the proportions of materials as directed.

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

Furnish representative samples of material to be used in the mixture as follows:

Material	Amount
New Coarse Aggregate	55 pounds
Emulsified Asphalt Cement	4 quarts in 1 quart plastic containers

Provide a JMF meeting the following mixture requirements:

EAC Mixture

Air Voids, %	15 - 30 according to AASHTO T 269*
IRS	Report according to ODOT TM 313*
Percent Coating	90% minimum

* AASHTO T 269 and ODOT TM 313 procedures available from ODOT Materials Laboratory.

00735.14 Choke Aggregate - Furnish choke aggregate meeting the gradation below. Perform sieve analysis according to AASHTO T 27. Use crushed or uncrushed rock free of clay, loam or other harmful substances.

Sieve Size	Percent Passing (by Weight)
3/8"	100
1/4"	90 - 100
No. 8	30 - 66
No. 30	8 - 28
No. 100	0 - 5

00735.15 Aggregate Production Quality Control - Provide quality control during production of EAC aggregate according to Section 00165. Sampling and testing shall be performed by a CAgT at the minimum frequency indicated in the MFTP.

(a) Quality Control Compliance - Evaluate EAC aggregates for conformance 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 subplot.

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 methods:

- Continuing production records meeting the requirements of 00735.10, 00735.14, and 00735.15.
- 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 00735.10, 00735.14, and 00735.15.

00735.16 Acceptance of Aggregate - The Contractors quality control tests will be used for acceptance of EAC aggregates if verified by the Agency's quality assurance program. The Agency 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 Program.

(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 Agency or as designated in the Special Provisions.

00735.17 EAC Mixture Production Quality Control - Provide quality control during production of EAC mixture according to Section 00165 and the following:

(a) Personnel Requirements - Maintain quality control by:

- Providing at least one CAT-I full-time at each plant site used to furnish mixture to the Project.
- Obtaining samples under the direct supervision of a CAT-I.
- Having all testing, data analysis and reporting of test results performed by a CAT-I.

(b) Laboratory Requirements - Furnish and maintain an ODOT certified laboratory at the plant site furnished with the necessary equipment and supplies for performing Contractor quality control testing.

The laboratory shall be on-site and operational prior to the beginning of EAC production. Provide laboratory equipment meeting the requirements of the test methods identified in these Specifications.

Calibrate all testing equipment according to the required test methods. The Engineer may inspect measuring and testing devices to confirm both calibration and condition.

(c) Plant Calibration - Calibrate the plant according to ODOT TM 322. The plant calibration shall be witnessed and documented by a CAT-I. Do not begin production until calibration tests indicate that the specified proportions can be obtained.

(d) Required Tests - Randomly sample and test the aggregate and emulsified asphalt during EAC mixture production according to Section 00165 and the MFTP.

(e) Quality Control Compliance - Evaluate EAC mixture for compliance according to Section 00165 and the MFTP.

00735.18 Acceptance of EAC Mixture - The Contractor's quality control tests will be used for acceptance of EAC mixture if verified by the Agency's quality assurance program. The Agency will perform EAC mixture 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 Program.

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

Equipment

00735.20 EAC Mixing Plant - Mix the EAC at a plant capable of providing a mix of aggregate and emulsified asphalt of uniform proportions and consistency as designated.

Provide mixing plants with the following operating equipment:

- A positive control linking the aggregate and emulsified asphalt feed so that a constant ratio of emulsified asphalt to aggregate is maintained.
- Totalizers for the emulsified asphalt metering device and the aggregate scales.
- A metering device that can determine percent of emulsified asphalt in mixture at any time the plant is in operation.
- An adjustable emulsified asphalt spray bar.
- Provide and operate a mechanical sampling device that produces a representative sample of the quantity of material required for the appropriate tests, when sampling at or around crushing, screening, mixing plants, conveyors, or other similar mechanical equipment.

Proportion the aggregate by weight. Proportion the emulsified asphalt by either weight or metering. Provide equipment capable of feeding and maintaining a constant rate of aggregate within a tolerance of plus or minus 5 percent, by weight, of the designated amount, and feeding a constant rate of emulsified asphalt within ± 0.5 percent, by weight, of the designated amount.

00735.21 Hauling Equipment - Provide hauling vehicles in good operating condition with tight, clean, metal beds and a cover. Equip beds of hauling vehicles with a positive system to prevent materials from leaking onto the surfaces over which the hauling vehicle travels. If leakage occurs, remove any spilled material and repair any damage according to 00170.85.

Coat the beds with a minimum amount of an approved material to keep the EAC from sticking to the beds. Do not use diesel oil. Drain excess coating material before loading by raising the truck bed, opening belly dump gates, or operating the conveyor belt, as appropriate.

Do not use vehicles that cause segregation or delay operations.

00735.22 EAC Pavers - Provide EAC pavers meeting the following requirements:

(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:

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- Can spread and finish EAC to a uniform texture, in the specified widths, thicknesses, lines, grades, and cross sections.
- Will not segregate, tear, shove, or gouge EAC.
- Produce a finished surface to specified evenness and texture.

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

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

00735.23 Compactors - Provide self-propelled, steel-wheeled and pneumatic-tired rollers capable of reversing without backlash according to the following:

(a) Steel-Wheeled Rollers - Provide steel-wheeled rollers with:

- A gross static weight of at least 8 tons.
- A gross static weight of at least 6 tons for finish rolling.

(b) Pneumatic-tired Rollers - Provide pneumatic-tired rollers meeting the following:

- 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 load of 2,800 pounds per tire with tire inflation pressures of 45 psi to 90 psi.

00735.24 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 of adequate width to provide full coverage of the specified panel.

00735.25 Power Brooms - Provide pickup and/or non-pickup power brooms that have a positive means to control vertical pressure.

00735.26 Release Agents - Do not use diesel oil as a release agent to coat or clean equipment at the mixing plant, or on hauling equipment beds or compactors.

Labor

00735.30 Quality Control Personnel - Provide technicians having CAgT, CAT-I, and CMDT technical certifications.

Construction

00735.40 Season and Weather Limitations - Place EAC from May 1 to August 31, inclusive, when the pavement temperature is 60 °F or above. Seasonal limitations for EAC will not supersede seasonal limitations for emulsified asphalt surface treatments on the Project.

Do not place EAC:

- When the underlying layer is frozen.
- During rain or other adverse weather conditions.

Correct mixtures damaged by weather by milling and replacement or other approved methods at no additional cost to the Agency.

00735.41 Rate of Progress and Scheduling - Do not begin work until there is enough mixing, hauling, spreading and compacting equipment on the Project to assure that the paving machine can place the EAC without stopping, as nearly as possible.

00735.42 Preparation of Underlying Surfaces - Clean all deleterious material, dirt and dust from existing and new bases, surfacings, and pavements in a manner acceptable to the Engineer.

Bring the existing surface to uniformity by patching irregular or depressed surfaces and potholes with EAC thoroughly compacted until it conforms with the surrounding surface. Prepare individual potholes for patching by cutting the edges vertically to the depth of the deepest portion of the hole.

When designated in the plans or Special Provisions, place leveling courses of EAC on existing pavements before constructing the final paving course. Perform the leveling work to the lines and grades established. Place leveling material with either a paving machine or motor grader as directed.

Apply a tack coat to the existing surface according to Section 00730 prior to placing EAC.

00735.43 Mixing:

(a) General - Mix the aggregate and emulsified asphalt until a uniform consistency is obtained. Use the temperature of the emulsified asphalt cement recommended by the supplier.

(b) Moisture - At the time it is mixed with the emulsified asphalt, provide aggregate with a moisture content adequate to allow distribution of the emulsion, but not so great that moisture or emulsion runs from the mixture. Provide special processing necessary to attain an acceptable moisture content at no additional cost to the Agency.

(1) No Moisture Problem - A visual moisture content determination by the Engineer will suffice when there are no apparent moisture problems.

(2) Moisture Problems - If there are unresolved moisture problems, the maximum allowable moisture shall be the saturated surface dry (SSD) moisture content for the aggregate submitted for the JMF, as determined by AASHTO T 84 and AASHTO T 85.

00735.44 Control of Grade - Use a floating beam device of adequate length and sensitivity on either or both sides of the paver to provide adequate reference to control the grade of the paver.

Where this method is impractical, manual control of grade for the paver will be allowed when approved.

00735.45 Hauling, Depositing, and Placing:

(a) Hauling - Deliver the mixture to the paving machine at a rate that provides continuous operation of the paving machine, except for unavoidable delay or breakdown. If excessive stopping of the paving machine occurs during paving operations, the Engineer may suspend

paving operations until the Contractor matches the delivery rate of mixture with the capacity of the paving machine.

If rain or cold weather conditions are encountered any time between loading and placement:

- Suspend mixing operations.
- Cover the mixture in transit.
- Do not place mixture that is in transit until conditions improve, unless placed at Contractor's risk according to 00735.40.
- Take action to prevent emulsion run-off from entering drainage channels or facilities.

The EAC will be rejected before placing if it is found to be:

- Segregating or separating.
- Solidifying or crusting.

Work with the Engineer to make appropriate adjustments if an excessive amount of emulsified asphalt is leaking from trucks.

No more EAC will be accepted until corrective action has been taken.

Dispose of rejected loads at no additional cost to the Agency.

(b) Depositing - Deposit the EAC material in windrows from the hauling vehicles so segregation is prevented. Alternate methods of depositing may be used if specified in the Special Provisions or allowed by the Engineer.

Provide pick-up equipment that can:

- Pick up substantially all of the material deposited on the roadway.
- Be self-supporting, not exert any vertical load on the paving machine, or cause vibrations or other motions which could have a detrimental effect on the riding quality of the completed pavement.

(c) Placing - Place the EAC on dry, prepared surfaces with pavers meeting the requirements of 00735.22. Spread and finish to established widths, thickness, line, grade and cross section.

When approved, the EAC may be spread with other equipment and means where irregularities or obstacles make the use of specified equipment impractical.

00735.46 Compaction - Compact the EAC as follows:

(a) General - After the EAC has been spread, struck off, and surface irregularities or other defects remedied roll it uniformly until compacted as specified.

(b) Rolling - Compact the EAC with rollers conforming to 00735.23. Provide sufficient rollers of type and weight to compact the mixture while it is in a workable condition. Operate rollers at a uniform speed not more than 3 mph, with the drive roll or wheels nearest the paver.

Begin rolling at the sides and proceed longitudinally, parallel to the road centerline, and gradually progressing towards the center, unless otherwise directed. On superelevated curves, begin rolling at the low side and progress to the high side. When paving in echelon, or when abutting a previously paved lane, roll the longitudinal joint first, followed by the regular rolling pattern.

Do not make sharp turns or park rollers on the EAC. Stop each pass at least 5 feet longitudinally from preceding stops. Do not displace the line and grade of edges. Prevent the EAC from sticking to the wheels and spotting or defacing the EAC by wetting them with a minimum of water or other approved material.

(1) Breakdown Rolling - Use non-vibratory, three-wheel steel, or tandem-wheeled-steel rollers. Make at least three complete roller coverages.

(2) Intermediate Rolling - Use a self-propelled, pneumatic-tired roller following the placement of choke aggregate according to 00735.47. Make at least two complete roller coverages with the pneumatic-tired roller immediately following application of choke aggregate.

(3) Finish Rolling - Use non-vibratory, tandem-wheeled steel rollers, and continue until roller marks are eliminated.

Compact areas inaccessible to rollers with mechanical tampers as directed.

00735.47 Choke Aggregate - Provide at least two choke aggregate trucks. After breakdown compaction and before intermediate compaction, place choke aggregate with a chip spreader capable of obtaining a rate between 0.003 to 0.006 cubic yard per square yard.

If aggregate ravel or picks from the fresh EAC pavement during rolling operations or after opening to traffic, cover immediately with additional choke aggregate and roll with a tandem-wheeled steel roller, unless otherwise directed.

Be prepared to place additional choke aggregate for a period of 48 hours after the fresh EAC pavement is open to traffic. Spread excess aggregate uniformly across the fresh EAC pavement by brooming or other suitable means.

00735.48 Longitudinal Joints - Bond, compact and finish the new EAC at longitudinal joints equal to the EAC against which it is placed.

(a) Location - Place EAC 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 - Do not construct longitudinal joints in the wearing course within the area or width of a traffic lane. On median lanes and on shoulder areas, construct joints 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 00735.48(c):
 - Construct and maintain a wedge of EAC 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 additional cost to the Agency. EAC for the temporary wedge will be paid for at the pay item price.

(c) Placing EAC Under Traffic - When placing EAC pavement under traffic, schedule work for the nominal thickness being laid as follows or as required by the Special Provisions:

(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) More Than 1 inch But Not More Than 2 inches - Schedule work so 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.

00735.49 Transverse Joints - Construct transverse joints according to the following:

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

(1) Project Ends - Construct transverse joints at Project ends as shown or as directed.

(2) Temporary End Panel - Maintain pavement depth, line and grade at least 5 feet beyond the selected transverse joint location, and from that point wedge down on the appropriate slope until it meets the surface beneath the EAC, assuming a pavement course thickness of 2 inches, as follows:

- For wedges that will be under traffic for less than 24 hours, the wedge length shall be 8 feet (1V:50H taper rate).
- For wedges that will be under traffic for 24 hours or longer, the wedge length shall be 25 feet (1V:160H taper rate).

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 5 feet or longer panel form the "temporary end panel".

(3) 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 methods.
- Remove EAC 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 5 feet long, beginning at the sawed or cut joint, and taper it according to 00735.49(a-2) to zero thickness.

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

(5) 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.

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

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

Maintenance

00735.60 Correction of Defects - Correct all defects in material and work, as directed, at no additional cost to the Agency. Defects include segregation of materials, non-uniform texture and fouled surfaces preventing full bond between successive spreads of mixture. No adjustment in Contract time will be made for corrective work.

(a) Slicks - Remove and replace slicks immediately with suitable materials.

(b) Roller Damage Surface Repair - Correct all displacements of any course at once, with rakes and addition of fresh mixture when required, regardless of thickness.

(c) Other Defects - Remove, replace with fresh EAC, and compact to conform to the surrounding area all EAC that:

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

If a seal coat is required by the Special Provisions, or if directed, remove and replace the EAC that contains defects, excesses, or deficiencies prior to placing the seal coat at no additional cost to the Agency.

00735.61 Brooming - Remove loose choke aggregate by carefully brooming the entire surface. Do this as directed by the Engineer, unless brooming damages the new EAC pavement.

Subsequent brooming the following 2 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.

00735.62 Curing - After each lift of EAC has been placed, allow the EAC to cure a minimum of 72 hours after laydown or as directed, before placing the next lift of EAC.

Finishing and Cleaning Up

00735.70 Pavement Smoothness - Furnish a 12 foot straightedge and/or a 12 foot rolling straightedge and test as specified. Additional testing may be required. Mark areas not meeting the surface tolerance.

Perform pavement smoothness testing immediately after initial brooming of choke aggregate.

(a) Single Course Construction - Test with the 12 foot straightedge parallel to and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than 1/4 inch.

(b) Multiple Course Construction - Test the surface of the course on which the wearing course is placed according to 00735.70(a).

Test the wearing course of EAC with the rolling straightedge in the designated wheel path of a 0.1 mile strip of each travel lane per mile, where directed, and on each transverse joint throughout the Project. Operate the rolling straightedge parallel to the centerline. The surface shall not vary more than 0.015 foot.

Also test the wearing course of EAC with a 12 foot straightedge placed perpendicular to the centerline at least once within the above-mentioned 0.1 mile strip. It shall not vary by more than 1/4 inch.

If the 0.1 mile testing strip meets the Specifications, no further testing of the mile represented by the testing strip will be required, except at the transverse joints. If any part of the testing strip does not meet the Specifications, both wheel paths of the entire mile shall be tested.

00735.71 Correction of Pavement Roughness - Correct equipment or paving operation immediately when tests show the pavement smoothness is not meeting the tolerance in 00735.70.

Correct the surface roughness to the required tolerances by a means acceptable to the Engineer.

Complete correction of all surface roughness within 14 calendar days following notification unless otherwise directed at no additional cost to the Agency.

00735.72 Fog Coat - After the EAC has cured at least 14 calendar days, apply a fog coat to the EAC surface according to Section 00705. Place the fog coat at least 1 day prior to placing a single or multiple application surface treatment if a surface treatment is required by the Special Provisions.

00735.73 Emulsified Asphalt Surface Treatment - After the EAC has been placed and has cured at least 14 calendar days, apply a single or multiple application emulsified asphalt surface treatment according to Section 00710 or Section 00715 if required by the Special Provisions.

Measurement

00735.80 Measurement - The quantities of EAC will be measured on the weight basis. No deduction will be made for the weight of the emulsified asphalt used in the EAC.

The quantities of emulsified asphalt in the EAC will be measured on the weight basis.

The quantities of choke aggregate will be measured on the weight basis, or on the volume basis in the hauling vehicle.

Payment

00735.90 Payment - The accepted quantities of work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Emulsified Asphalt Concrete Mixture	Ton
(b) Emulsified Asphalt in Mixture	Ton

- (c) Choke Aggregate Ton or Cubic Yard
- (d) Emulsified Asphalt Concrete in Leveling and/or Patching Ton
- (e) Haul and Place Emulsified Asphalt Concrete Mixture Ton
- (f) Haul and Place Choke Aggregate Ton

Item (d) applies when EAC is used in leveling, patching, or leveling and patching.

Item (e) applies to EAC that is furnished by the Agency and hauled and placed by the Contractor.

Item (f) applies to choke aggregate that is furnished by the Agency and hauled and placed by the Contractor.

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.

No separate or additional payment will be made for water used in brooming operations.

Section 00740 - Commercial Asphalt Concrete Pavement (CACP)

Description

00740.00 Scope - This work consists of furnishing and placing commercial asphalt concrete pavement (CACP) to the lines, grades, thicknesses, and cross sections shown or established.

Materials

00740.10 Materials - Furnish CACP that is a well-graded, uniform, durable commercial mix. All new materials, or a combination of new materials and reclaimed materials, may be used. If requested, provide a copy of the JMF to the Engineer before paving.

00740.12 Asphalt Cement - Use PG 64-22 or PG 64-28 unless otherwise specified in the Contract Documents or approved. 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 website. The applicable specifications are those contained in the current publication on the date the Project is advertised.

00740.13 Tack Coat - Furnish tack meeting the requirements of Section 00730.

00740.14 Acceptance - All material will be accepted by visual inspection by the Engineer.

Construction

00740.44 Placing Asphalt Concrete - 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. The Engineer may allow mixture to be placed by hand methods.

00740.45 Compacting Asphalt Concrete - Compaction of the asphalt concrete to a specified density will not be required, regardless of thickness. Perform breakdown and intermediate rolling until the entire surface has been compacted with at least four coverages by the rollers. Perform additional coverages, as directed, to obtain finish rolling of the CACP.

Along curbs and walls, on walks, irregular areas, and other areas not practically accessible to rollers, compact the mixture with small, self-propelled rollers, mechanical tampers, hot hand tampers, or hand rollers. On depressed areas a trench roller may be used, or cleated compression strips may be used under the roller to transmit compression to the depressed area.

Measurement

00740.80 Measurement - The quantities of commercial asphalt concrete pavement will be measured on the weight basis.

Payment

00740.90 Payment - The accepted quantities of commercial asphalt concrete pavement will be paid for at the Contract unit price, per ton, for the item "Commercial Asphalt Concrete Pavement".

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.

No separate or additional payment will be made for reclaimed asphalt pavement, reclaimed asphalt shingles, and asphalt cement.

Section 00743 - Porous Asphalt Concrete (PAC)

Description

00743.00 Scope - This work consists of constructing one or more courses of porous asphalt concrete (PAC) pavement for drainage or storm water infiltration, plant mixed into a uniformly coated mixture, placed on a prepared foundation, compacted and finished to a specified smoothness to the lines, grades, thickness, and cross sections shown or established.

00743.01 Abbreviations:

PAC - Porous Asphalt Concrete
TSR - Tensile Strength Ratio
VFA - Voids Filled with Asphalt
VMA - Voids in Mineral Aggregate

00743.02 Definitions:

Porous Asphalt Concrete - A plant mixed, uniformly coated mixture of asphalt cement, open graded aggregate and additives as required.

Asphalt Treated Permeable Base - A plant mixed, uniformly coated mixture of asphalt cement, open graded aggregate and additives as required. All references to PAC will also apply to ATPB unless otherwise specified.

Wearing Course - The top lift of PAC, regardless of thickness.

Materials

00743.10 Aggregate - Furnish new aggregates meeting the following requirements:

(a) New Coarse and Fine Aggregates - Produce and stockpile coarse and fine aggregate from crushed rock or other inert material of similar characteristics.

No natural or uncrushed blend sand will be allowed in PAC.

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

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

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

(3) Fractured Faces - Provide crushed aggregate with not less than the minimum number of fractured faces as determined by AASHTO T 355 as follows:

Percent of Fracture (by Weight)

Type of Mix	Material Retained on 1", 3/4", 1/2", and No. 4 Sieve (two fractured faces)	Material Retained on No. 8 sieve (one fractured face)
ATPB	75	75
PAC	90	75

(4) Harmful substances - Do not exceed the following values:

Test	Test Method		Aggregates	
	ODOT	AASHTO	Coarse	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.

(b) Reclaimed Asphalt Pavement - Reclaimed asphalt pavement (RAP) material used in the production of new PAC is optional. No more than 30 percent RAP material will be allowed in the new PAC pavement. Use RAP aggregates in the PAC that are no larger than the specified maximum allowable aggregate size before entering the cold feed. Blend the RAP material with new aggregate to provide a mixture conforming to the JMF within the tolerances specified.

00743.11 Asphalt Cement, Additives, and Aggregate Treatment - Furnish the following asphalt cement and additives:

(a) Asphalt Cement - Use the grade of asphalt that is specified in the Contract Documents. A polymer modified asphalt cement is required in the wearing course. Provide asphalt cement conforming to the requirement of ODOT's publication "Standard Specifications for Asphalt Materials". Copies of the publication are available on ODOT's website. The applicable specifications are those contained in the current publication on the date the project is advertised.

(b) Asphalt Cement Additives - Use standard recognized asphalt cement additive products that are of known value for the intended purpose and approved for use on the basis of laboratory tests and capable of being thoroughly mixed. Do not use asphalt cement additives that have deleterious effects on the asphalt material. Do not use silicones as an additive. Add the following asphalt cement additives when required by the JMF:

- Anti-stripping asphalt cement additives to prevent stripping or separation of asphalt coatings from aggregates to satisfy the TSR specified in 00743.13.
- Asphalt cement admixtures used to aid in the mixing.

00743.12 Mix Type and Broadband Limits - Furnish the mix type specified in the Contract Documents within the broadband limits according to the following:

(a) Mix Type - Furnish the types of PAC shown or as directed.

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

Sieve Size	3/8" PAC		1/2" PAC		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
3/4"			99	100	85	95
1/2"	99	100	90	98	35	68
3/8"	90	100	–	–	–	–
No. 4	22	40	18	32	2	10
No. 8	5	15	3	15	0	5
No. 200	1.0	5.0	1.0	5.0	0.0	2.0
Asphalt Cement	*	*	*	*	2.5	3.5

* Per JMF

00743.13 Job Mix Formula Requirements - Do not begin production of PAC for use on the project until the JMF is reviewed by the Engineer and written consent is provided to proceed. The JMF proposed for use on the project will be evaluated based on the criteria identified in 00743.13(b) and the latest ODOT Contractor Mix Design Guidelines for Asphalt Concrete. For all mixes, complete TSR testing at least once per calendar year. A new JMF is required if the asphalt cement grade or source, any additives, or the source of the aggregate change during production.

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

(b) Job Mix Formula Requirements - Provide a JMF meeting the following mixture requirements:

	3/8" and 1/2" PAC	3/4" ATPB
Design Method	ODOT	ODOT
Air Voids, %	16.0 - 20.0	–
Draindown, %	70 - 80	–
TSR *, % minimum	80	–
Coating, % minimum	–	90
VFA, %	30 - 50	–

* Run the TSR for open graded mixtures on a surrogate dense graded mixture. If a dense graded JMF has been prepared for the same material sources in the last year, the results for the most recent TSR may be applied to the porous asphalt mixture. If not, prepare the TSR test samples for a dense graded mix using the equivalent top size stone and materials from the same sources, which will represent the porous asphalt mixture.

00743.14 Tolerances and Limits - Produce and place PAC within the following JMF tolerances and limits:

Gradation Constituent	PAC Type		
	1/2"	3/8"	ATPB
1"			99 - 100%
3/4"	99 - 100%		85 - 95%
1/2"	90 - 98%	99-100%	35 - 68%
3/8"	–	90-100%	–
No. 4	JMF ± 5%	JMF ± 5%	JMF ± 5%
No. 8	JMF ± 4%	JMF ± 4%	JMF ± 4%
No. 30	JMF ± 4%	JMF ± 4%	–
No. 200	JMF ± 2.0%	JMF ± 2.0%	JMF ± 2.0%

Constituent of Mixture	PAC 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 - AASHTO T 329*	1.10% max.

* Does not apply to 3/4" ATPB

When a JMF tolerance applies to a constituent, full tolerance will be given even if it exceeds the control points established in 00743.12(b).

00743.16 Sampling and Testing - For each 1,000 tons of placement, have a CAT-1 perform a minimum of one of each of the following test methods as modified in the MFTP:

- Asphalt Content:
 - Mixes with RAP - AASHTO T 308 with ODOT TM 323 determined Calibration Factor
 - Mixes without RAP - AASHTO T 308 with ODOT TM 323 determined Calibration Factor or ODOT TM 321
- Gradation:
 - Mixes with RAP - AASHTO T 30
 - Mixes without RAP - AASHTO T 30 or AASHTO T 27/11
- Mix Moisture - AASHTO T 329

When less than 1,000 tons of mix is placed in a day, perform a minimum of one series of tests per day. Provide test results to the Engineer by the middle of the following work shift.

If less than three samples are obtained on a project, the Contractor may supplement test results with the Engineer's approval by:

- Accelerating testing.

- Provide test results from other projects with the same JMF within the past 120 days of first date of JMF production.
- Test back up samples.

Provide a minimum of three test results. Provide samples or split samples to the Engineer when requested.

00743.17 Acceptance - If the average for each mix gradation constituent and asphalt content is within the specification limits, the material will be accepted. If the average asphalt content or one or more gradation constituents is not within the specification limits, the material will be accepted according to 00150.25.

Equipment

00743.20 Pavers - Provide pavers specifically designed to spread and finish asphalt concrete pavement to a uniform texture in the widths, thicknesses, lines, grades, and cross-sections specified. When approved, alternate equipment may be used for areas where the use of a paver is impractical.

00743.21 Compactors - Provide self-propelled steel-wheeled rollers specifically designed to compact asphalt concrete pavement and capable of reversing without backlash. Provide a sufficient number of appropriately weighted rollers to compact the mixture.

Labor

00743.30 Quality Control Personnel - Provide technicians having CAT-I, CMDT, and CAgT technical certifications.

Construction

00743.40 Season and Temperature Limitations - Place PAC when the temperature of the surface that is to be paved is not less than 50 °F.

00743.41 Prepaving Conference - Have a prepaving conference with all Contractor Supervisory personnel, all subcontractors who are to be involved in the paving work, and the Engineer. Meet at a mutually agreed time to discuss all methods of accomplishing all phases of the paving work.

00743.42 Preparation of Underlying Surfaces - All bases and foundations on which the pavement is to be constructed shall meet the applicable Specifications and be approved before beginning paving operations. Recondition existing bases and foundations according to Section 00610. Trim broken or ragged edges to firm material when directed.

The pavement surface shall be dry before the preparation work and paving.

00743.43 Mixing and Placement Temperatures - Establish the allowable mixing and placement temperature ranges by the JMF. Measure the mixture temperature at the discharge of the mixer. Measure the placement temperature behind the paver. The maximum mixture temperature of the PAC at the mixer is 350 °F. The minimum placement temperature of the PAC behind the paver is 205 °F

00743.44 Hauling, Depositing, and Placing - Haul, deposit, and place PAC according to the following:

- (a) **Hauling** - Cover PAC if rain or cold air temperatures are encountered any time between loading and placement.

If excessive stopping of the paving machine occurs during paving operations, the Engineer may suspend paving operations until the mixture delivery rate matches the paving machine operation.

(b) Depositing - Deposit PAC from the hauling vehicles so segregation is prevented.

(c) Placing - Place the mixture in the number of lifts and courses, and to the compacted thickness for each lift and course, as shown. Place each course in one lift unless otherwise specified. Do not exceed a compacted thickness of 4 inches for any lift unless approved. Limit the minimum lift thickness to twice the maximum aggregate size in the mix.

Uncompacted mixture behind the paver with temperatures below the minimum specified in 00743.43 will be rejected unless otherwise allowed by the Engineer.

Do not place PAC during rain or other adverse weather conditions, unless allowed by the Engineer. PAC in transit at the time adverse conditions occur may be placed if:

- It has been covered during transit.
- The PAC temperature is satisfactory.
- It is placed on a foundation free from pools or flow of water.

00743.45 Longitudinal Joints - At longitudinal joints, bond, compact and finish the PAC equal to the Pavement against which it is placed.

(a) Location - Place the PAC 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 - Do not construct longitudinal joints within the width of a traffic lane. Construct longitudinal joints at either skip lines or fog lines unless approved. On median lanes and on shoulder areas construct longitudinal joints 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.

00743.49 Compaction - After the PAC has been spread, struck off, and surface irregularities and other defects remedied, roll it uniformly until compacted. Compaction of PAC to a specified density will not be required. Continue the breakdown and intermediate rolling until the entire surface has been compacted with at least four coverages by the rollers. Perform additional coverages to complete finish rolling of the PAC.

Maintenance

00743.60 Correction of Defects - Correct all defects in material and work, as directed, at no additional cost to the Agency, according to the following:

(a) Fouled Surfaces - Repair and clean fouled surfaces that would prevent full bond between successive lifts of mixture.

(b) Boils, Slicks, and Oversized Material - Replace boils, slicks, and oversized material with fresh mixture. If problems with boils and slicks continue to occur, stop production until a plan for eliminating the boils and slicks is approved by the Engineer.

(c) Roller Damage to Surface - Correct surface damage from rollers with additional fresh mixture or by other means approved by the Engineer.

Finishing and Cleaning Up

00743.70 Pavement Smoothness - Furnish a 12 foot straightedge and test as specified. Additional testing may be required. Mark areas not meeting the surface tolerance.

(a) Travel Lanes - Test wearing course with the 12 foot straightedge in travel lanes parallel to and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than 1/4 inch.

(b) Utility Appurtenances - If the Contractor constructs or adjusts utility appurtenances the tolerances of 00743.70(a) apply. If the utility appurtenances are adjusted by others, these tolerances do not apply.

(c) Shoulders, Paved Medians, Parking Lanes, and Parking Lots - Straightedge testing in shoulders, paved medians, parking lanes, and parking lots is not required.

00743.71 Correction of Pavement Roughness - Correct equipment or paving operation procedures when tests show the pavement smoothness does not comply with 00743.70. In addition, do the following:

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

- Remove and replace the wearing surface lift.
- Profile to a maximum depth of 0.3 inch with abrasive grinders equipped with a cutting head comprised of multiple diamond blades.

(b) Time Limit - Complete correction of all surface roughness within 14 calendar days of completion of paving.

00743.72 Opening to Traffic - Allow PAC to cure at least 72 hours before opening to traffic, unless otherwise directed.

Measurement

00743.80 Measurement - The quantities of PAC will be measured on the weight basis.

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

Payment

00743.90 Payment - The accepted quantities of PAC incorporated into the Project, whether or not recycled materials are used, will be paid for at the Contract unit price, per ton, for the item " _____ Mixture".

The types of PAC (1/2 inch PAC, 3/8 inch PAC, 3/4 inch ATPB) will be inserted in the blank.

00743

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.

No separate or additional payment will be made for leveling work, QC testing, asphalt cement, mineral filler, lime, and anti-stripping or other additives.

Section 00744 - Asphalt Concrete Pavement

Description

00744.00 Scope - This work consists of constructing asphalt concrete pavement (ACP) to the lines, grades, thicknesses, and cross sections shown or established.

00744.01 Abbreviations:

HMAC - Hot Mix Asphalt Concrete
MAMD - Moving Average Maximum Density
RAM - Recycled Asphalt Material
TSR - Tensile Strength Ratio
VFA - Voids Filled with Asphalt
VMA - Voids in Mineral Aggregate
WMAC - Warm Mix Asphalt Concrete

00744.02 Definitions:

Asphalt Concrete Pavement - Uniformly coated mixture of asphalt cement, graded aggregate, and additives as required. The use of ACP in this section refers to either hot mix or warm mix asphalt concrete.

Hot Mix Asphalt Concrete - A hot plant mixed ACP.

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

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

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

Recycled Asphalt Material - The combination of reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS).

Warm Mix Asphalt Concrete - An asphalt concrete mix following all requirements of HMAC, except that through use of approved additives or processes, it is mixed, placed, and compacted at lower temperatures.

Materials

00744.10 Aggregate - Furnish new aggregate, RAP aggregate, and RAS aggregate meeting the following requirements:

(a) New Coarse and Fine Aggregates - Produce coarse and fine aggregate from crushed rock or other inert material of similar characteristics.

Blend sand is allowed for Levels 1, 2, and 3 mixes. Do not use more than 6 percent natural or uncrushed blend sand, by weight, in the total aggregate. Provide a means of verifying and documenting the amount of blend sand added to the aggregate.

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

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

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

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

(3) Fractured Faces - Provide crushed aggregate with not less than the minimum number of fractured faces as determined by AASHTO T 335 as follows:

Type of Mix	Percent of Fracture (by Weight)	
	Material Retained on 1", 3/4", 1/2" and No. 4 Sieve (two fractured faces)	Material Retained on No. 8 sieve (one fractured face)
All ACP	75	75

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

Test	Test Method		Aggregates	
	ODOT	AASHTO	Coarse	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.

(b) Reclaimed Asphalt Pavement - RAP material used in the production of new ACP is optional. No more than 30 percent RAP material will be allowed in the new ACP pavement. Use RAP aggregates in the ACP that are no larger than the specified maximum allowable aggregate size before entering the cold feed. Blend the RAP material with new aggregate to provide a mixture conforming to the JMF within the tolerances specified.

(c) Recycled Asphalt Shingles - RAS used in the production of new ACP is optional. Either manufacturer waste (post-manufacturer) RAS or tear-off (post-consumer) RAS may be used. Manufacturer waste RAS is processed asphalt shingle material derived from manufacturer's shingle scrap. Tear-off RAS is processed asphalt shingle material derived from shingle scrap removed from structures. All percentages are based upon dry weights for calculations.

(1) Processing Shingles - Process the RAS by grinding at ambient temperature so that 100 percent of the shredded pieces are less than 1/2 inch in any dimension and that 90 percent are less than 3/8 inch in any dimension when sampled according to AASHTO T 2 and tested according to AASHTO T 27. Sample and test the processed RAS for gradation at a frequency of one test for every 50 tons of RAS processed.

(2) Harmful Substances - Certify that the RAS does not contain asbestos fibers according to the policies and procedures established by the Department of Environmental Quality. Test deleterious materials according to ODOT TM 335 at a frequency of one test for every 50 tons of RAS material. Limit the percentage of deleterious materials to 1.0 percent. If fine aggregate is added as an anti-clumping agent, sample and test processed RAS for harmful substances before adding the fine aggregates.

(3) Anti-Clumping Additive - Fine aggregate meeting the requirements of 00744.10(a) may be added to the RAS in a quantity not to exceed 4 percent by weight of RAS to keep the material workable and to prevent conglomeration of the shingle particles in the stockpile. Include these added fine aggregates in the mix design. RAS may also be blended with RAP in controlled percentages to preclude clumping. Do not contaminate stockpiled RAS with dirt or other foreign materials.

(4) Allowable Percentages - No more than 5.0 percent RAS by total weight of aggregate is allowed in ACP mixtures. Restrict the maximum allowable percentage of asphalt binder replacement to 20.0 percent for base courses and 15.0 percent for wearing courses in ACP containing only RAS.

When RAS is used in conjunction with RAP, restrict the maximum allowable percentage of binder replacement to 30.0 percent for base courses and 25.0 percent for wearing courses.

(5) Establishing Mix Design Inputs - For ACP mixtures containing RAS or RAM, following any addition of fine aggregate as an anti-clumping agent, test the material according to ODOT TM 319 to establish the asphalt content, material specific gravities, and gradation. Develop mixture designs according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete.

Blend the RAS or RAM with new aggregate to provide a mixture conforming to the JMF within the tolerances specified.

00744.11 Asphalt Cement and Additives - Furnish the following asphalt cement and additives:

(a) Asphalt Cement - 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 website. The applicable specifications are those contained in the current publication on the date the Project is advertised. Use the grade of asphalt that is specified in the Special Provisions.

(b) Asphalt Cement Additives - Use standard recognized asphalt cement additive products that are of known value for the intended purpose and approved for use on the basis of laboratory tests and capable of being thoroughly mixed. Do not use asphalt cement additives that have detrimental effects on the asphalt material. Do not use silicones as an additive. Add the following asphalt cement additives when required by the JMF:

- Anti-stripping asphalt cement additives to prevent stripping or separation of asphalt coatings from aggregates to satisfy the TSR specified in 00744.13.
- Asphalt cement admixtures used to aid in the mixing or use of asphalt mixes or for experimental purposes.

When WMAC is used, select one of the WMAC technologies and process and additive types identified on ODOT's publication "Approved WMAC Technologies".

Submit the proposed WMAC technology to be used and a plan for its implementation at the pre-construction conference.

Comply with the manufacturer's recommendations for incorporating additives and WMAC technologies into the mix. Comply with manufacturer's recommendations regarding receiving, storing, and delivering the additives.

00744.12 Mix Type and Broadband Limits - Furnish the mix type specified in the Contract Documents within the broadband limits according to following:

(a) Mix Type - Furnish the types of ACP shown or as directed. 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:

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

00744.13 Job Mix Formula Requirements - Provide a JMF for the Project meeting the following criteria and that was either developed or verified within 3 years of the date the Contract was advertised:

	Level 1	Level 2	Level 3
Design Method	Superpave	Superpave	Superpave
Compaction Level	65 Gyration	65 Gyration	80 Gyration
Air Voids, %	3.5	4.0	4.0
VMA, % minimum	1/2 inch - 14.0 3/8 inch - 15.0	3/4 inch - 13.0 1/2 inch - 14.0 3/8 inch - 15.0	3/4 inch - 13.0 1/2 inch - 14.0 3/8 inch - 15.0
VMA, % maximum	min + 2.0%	min + 2.0%	min + 2.0%
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 3/8 inch: 70 - 80	65 - 78 3/8 inch: 70 - 80	65 - 75 3/8 inch: 70 - 80

Develop the JMF according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete; or verify according to the ODOT Mix Design Verification process. Submit the proposed JMF and supporting data to the Engineer for review at least 10 calendar days before anticipated use. If acceptable, written acceptance will be provided. Perform a new TSR if the source of the asphalt cement changes.

For Level 3 wearing course mixes, include the results of the performance testing as outlined in the latest ODOT Contractor Mix Design Guidelines for Asphalt Concrete in the mix design submittal.

Issue a separate JMF for WMAC. Do not use RAS in WMAC mixes with minimum compaction temperatures less than 260 °F.

When WMAC is used, provide the following information in addition to the requirements listed for ACP:

- WMAC technology and WMAC additives information.
- WMAC technology manufacturer's established recommendations of usage.
- WMAC technology manufacturer's established target rate for water and additives, the acceptable variation for production, and documentation showing the impact of excessive production variation.
- WMAC technology material safety data sheets if applicable.
- Temperature range for mixing.
- Temperature range for compacting.
- Except for foaming technology, asphalt binder performance grade test data of the asphalt binder and chemical additive at the manufacturer's recommended dosage rate.
- Except for foaming technology, WMAC mixture performance test results. Perform testing for foaming technology on the production mix on specimens compacted at WMAC compaction temperatures.

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

Gradation Constituent	ACP Type		
	3/4"	1/2"	3/8"
1"	JMF ± 5% *		
3/4"	90 - 100%	JMF ± 5% *	
1/2"	JMF ± 5%	90 - 100%	JMF ± 5% *
3/8"	—	—	90 - 100%
No. 4	JMF ± 5%	JMF ± 5%	JMF ± 5%
No. 8	JMF ± 4%	JMF ± 4%	JMF ± 4%
No. 30	JMF ± 4%	JMF ± 4%	JMF ± 4%
No. 200	JMF ± 2.0%	JMF ± 2.0%	JMF ± 2.0%

* Maximum not to exceed 100%

Constituent of Mixture	ACP All Types
Asphalt Cement - AASHTO T 308 (Ignition) and ODOT TM 323	JMF ± 0.50%
RAP Content - ODOT TM 321	JMF ± 2.0%
RAS Content - ODOT TM 321	JMF ± 1.0%
RAM Content - ODOT TM 321	JMF ± 2.0%
Moisture content at time of discharge from the mixing plant - AASHTO T 329	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 00744.12(b). Full tolerance will be given for RAP, RAS, or RAM content even if it exceeds the limits established in 00744.10.

00744.16 Sampling and Testing - For each 1,000 tons of placement, have a CAT-I perform a minimum of one of each of the following test methods as modified in the MFTP:

- Asphalt Content - AASHTO T 308 with ODOT TM 323 determined Calibration Factor
- Gradation - AASHTO T 30
- Mix Moisture - AASHTO T 329
- Maximum Specific Gravity - AASHTO T 209

When less than 1,000 tons of mix is placed in a day, perform a minimum of one series of tests per day. Provide test results to the Engineer by the middle of the following work shift.

If less than three samples are obtained on a project, the Contractor may supplement test results with the Engineer's approval by:

- Accelerating testing.
- Providing test results from other projects with the same JMF within the past 120 days of first date of JMF production.
- Testing back up samples.

Provide a minimum of three test results. Provide samples or split samples to the Engineer when requested.

00744.17 Acceptance - If the average for each mix gradation constituent and asphalt content is within the specification limits, the material will be accepted. If the average asphalt content or one or more gradation constituents is not within the specification limits, the material will be accepted according to 00150.25.

Equipment

00744.23 Pavers - Provide pavers that are:

- Self-contained, self-propelled, supported on tracks or wheels, none of which contact the mixture being placed.
- Equipped with augers and a screed or strike-off assembly, heated if necessary, which:
 - Can spread and finish the ACP to a uniform texture, in the specified widths, thicknesses, lines, grades and cross sections.
 - Will not segregate, tear, shove or gouge the ACP.
- Equipped with a paver control system which:
 - Controls the ACP 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.

00744.24 Compactors - Provide self-propelled steel-wheeled or vibratory rollers specifically designed to compact ACP and capable of reversing without backlash. Provide a sufficient number of appropriately weighted rollers to compact the mixture. Equip vibratory rollers with amplitude and frequency controls. Do not operate in vibratory mode for lifts thinner than two times the maximum aggregate size for the type of ACP being compacted.

Labor

00744.30 Quality Control Personnel - Provide technicians having CAgT, CAT-I, CDT, and CMDT technical certifications.

Construction

00744.40 Season and Temperature Limitations - Place ACP 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	
		All Courses	Travel Lane Wearing Course	All Other Courses
	Surface Temperature*	From To Inclusive	From To Inclusive	From To Inclusive
Less than 2 inches	60 °F	All Year**	3/15 9/30	All Year**
2 inches - 2 1/2 inches	50 °F	All Year**	3/15 9/30	All Year**
Greater than 2 1/2 inches	40° F	All Year**	3/15 9/30	All Year**
Temporary	40 °F	All Year**	All Year**	All Year**

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

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

00744.41 Mixing Temperatures - Produce ACP within the temperature ranges recommended by the asphalt cement supplier for the grade of asphalt being used on the Project.

Establish the allowable mixing and placement temperature ranges by the JMF. Measure the mixture temperature at the discharge of the mixer. Measure the placement temperature behind the paver. The allowable production temperatures may be adjusted based on the asphalt cement supplier's recommendation if approved by the Engineer. The maximum mixture temperature and the minimum placement temperature shall be as follows:

Type	Temperature, °F	
	Maximum at Mixer	Minimum Behind Paver
HMAC	350	240
WMAC	275	215

Within the above limits, the Contractor with approval of the Engineer, or the Engineer may adjust this temperature in 10 °F increments from the JMF as follows:

- **Up** - If the aggregate coating, moisture content, workability or compaction requirements are not attained.
- **Down** - If the aggregate coating, moisture content, workability and compaction requirements are attained.

00744.42 Tack Coat - Construct a tack coat before placing each lift of ACP according to Section 00730. A tack coat is not required before placing ACP on aggregate base.

Treat all paved surfaces on and against which ACP is to be placed with an asphalt tack coat according to Section 00730. Before applying the tack coat, clean and dry the surface to be tacked.

Remove all loose material that will reduce adhesion of the tack by brooming, flushing with water, or other approved methods.

00744.43 Hauling, Depositing, and Placing - Haul, deposit, and place ACP according to the following:

(a) Hauling - Cover ACP if rain is encountered any time between loading and placement.

ACP will be rejected before placing if one or more of the following occurs:

- Below temperature limit specified in 00744.41.
- Slumping or separating.
- Solidifying.

Dispose of rejected loads at no additional cost to the Agency.

Deliver the mixture to the paving machine at a rate that provides continuous operation of the paving machine, except for unavoidable delay or breakdown. If excessive stopping of the paving machine occurs during paving operations, the Engineer may suspend paving operations until the mixture delivery rate matches the paving machine operation.

(b) Depositing - Deposit ACP from the hauling vehicles so segregation is prevented.

(c) Placing - Alternative equipment and means may be allowed by the Engineer if the use of a paver is impractical.

Do not place ACP during rain or other adverse weather conditions, unless allowed by the Engineer. ACP in transit at the time adverse conditions occur may be placed if:

- It has been covered during transit.
- The ACP temperature is satisfactory.
- It is placed on a foundation free from pools or flow of water.

Place the mixture in the number of lifts and courses, and to the compacted thickness for each lift and course, as shown. Place each course in one lift unless otherwise specified. Do not exceed a compacted thickness of 4 inches for any lift. Limit the minimum lift thickness to twice the maximum aggregate size in the mix.

00744.44 Longitudinal Joints - At longitudinal joints, bond, compact and finish the new ACP equal to the ACP against which it is placed.

(a) Location - Place the ACP 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 - Construct longitudinal joints at either lane lines or fog lines, or as shown or 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 00744.44(c) do the following:

- Construct and maintain a wedge of ACP 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 additional cost to the Agency. ACP for the temporary wedge will be paid for at the pay item price.

(c) Placing Under Traffic - When placing ACP 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, unless approved.

(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 week complete the full width of the area to be paved, including shoulders, to the same elevation with no longitudinal drop-offs.

00744.45 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 an 8 foot long wedge (1V:50H taper rate).
- For wedges that will be under traffic for 24 hours or longer, construct a 25 foot long wedge (1V:160H taper rate).
- Construct, maintain, remove, and dispose of the temporary wedge at no additional cost to the Agency. ACP 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 ACP 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 Asphalt Concrete Pavement - After completing a temporary end panel as specified, dispose of unused, remaining ACP as directed. Payment will be made for the entire load of ACP, but will be limited to only one load for each joint of each 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 00744.70.

(b) Abutting Bridge Ends - Compact the ACP abutting bridge ends and other rigid type structures in the longitudinal direction and either transverse or diagonal direction, 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. Saw cut a 3/8 inch wide, $\pm 1/8$ inch, by 1/2 inch less than the thickness of the panel of pavement depth or 1 1/2 inches deep, whichever is less.

Flush the saw cut thoroughly with a high-pressure water stream 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 QPL.

00744.49 Compaction - After the ACP has been spread, struck off, and surface irregularities and other defects remedied, roll it uniformly until compacted to a minimum of 91 percent of MAMD. Perform finish rolling and continue until all roller marks are eliminated.

Determine compliance with density specifications by random testing of the compacted surface with calibrated nuclear gauges. Determine the density by averaging QC tests performed by a CDT with the nuclear gauge operated in the backscatter mode according to WAQTC T 8 at one random location for each 100 tons of asphalt concrete placed, but take no less than 10 tests each shift. Do not locate the center of a density test less than 1 foot from the panel edge. Calculate MAMD according to ODOT TM 305. The Engineer may waive compaction testing upon written notice.

Compaction to a specified density will not be required for the following:

- **Thin Pavements** - Leveling, patches, or where the nominal compacted thickness of a course of ACP will be less than 2 inches.
- **Other Areas** - Temporary surfacing, guardrail flares, mailbox turnouts, road approaches, and areas of restricted width of less than 8 feet wide or limited length, regardless of thickness.

Compact thin pavements and other areas according to 00749.45.

Maintenance

00744.60 Correction of Defects - Correct all defects in materials and work, as directed, at no additional cost to the Agency, according to the following:

(a) Fouled Surfaces - Repair, clean, and retack fouled surfaces that would prevent full bond between successive lifts of mixture.

(b) Boils, Slicks, and Oversized Material - Replace boils, slicks, and oversized materials with fresh mixture.

(c) Segregation - Take corrective measures when segregation or non-uniform surface texture is occurring in the finished mat. If segregation continues to occur, stop production until a plan for providing uniform surface texture is approved.

(d) Roller Damage to Surface - Correct surface damage from rollers with additional fresh mixture or by other approved means.

(e) Longitudinal Joints - Take corrective measures when open longitudinal joints are being constructed or when the elevation of the two sides of a longitudinal joint does not match. If problems with the longitudinal joint continue to occur, stop production until a plan for providing tight, equal elevation longitudinal joints is approved.

(f) Other Defects - Remove and replace any ACP that:

- Is loose, broken, or mixed with dirt.
- Shows visually too much or too little asphalt.

Finishing and Cleaning Up

00744.70 Pavement Smoothness - Furnish a 12 foot straightedge. Test with a 12 foot straightedge parallel to 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.

00744.75 Correction of Pavement Roughness - 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.
- Profile to a maximum depth of 0.3 inch with abrasive grinders equipped with a cutting head comprised of multiple diamond blades, and apply an emulsion fog seal as directed.

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

Measurement

00744.80 Measurement - The quantities of ACP will be measured on the weight basis.

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

Payment

00744.90 Payment - The accepted quantities of ACP incorporated into the project, whether or not recycled materials are used, will be paid for at the Contract unit price, per ton, for the item "Level ____, _____ ACP Mixture _____".

The following will be inserted in the blanks:

- The level of ACP (1, 2, 3) will be inserted in the first blank.
- The type of ACP (3/4 inch, 1/2 inch, 3/8 inch), 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.

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.

No separate or additional payment will be made for:

- asphalt cement, mineral filler, lime, and anti-stripping or other additives
- sawing, cleaning, and filling joints on bridge deck overlays

Section 00745 - Asphalt Concrete Pavement - Statistical Acceptance

Description

00745.00 Scope - This work consists of constructing one or more courses of hot mix or warm mix asphalt concrete pavement, plant mixed into a uniformly coated mixture, 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.

00745.01 Abbreviations:

HMAC	-	Hot Mix Asphalt Concrete
MAMD	-	Moving Average Maximum Density
MDT	-	Maximum Density Test
MDV	-	Mix Design Verification
Gmm	-	Maximum Specific Gravity of Mixture
HMAC	-	Hot Mix Asphalt Concrete
Pbe	-	Effective Asphalt Content
RAM	-	Recycled Asphalt Material
RAS	-	Recycled Asphalt Shingles
SDC	-	Surface Damp Condition
TSR	-	Tensile Strength Ratio
Va	-	Air Voids in Compacted Mixture
VFA	-	Voids Filled with Asphalt
VMA	-	Voids in Mineral Aggregate
WMAC	-	Warm Mix Asphalt Concrete

00745.02 Definitions:

Asphalt Concrete Pavement - Uniformly coated mixture of asphalt cement, graded aggregate, and additives as required. The use of ACP in this section refers to either hot mix or warm mix asphalt concrete

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

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

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

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

Level 4 ACP - ACP for use in applications exposed to very heavy traffic volumes 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. A JMF adjusted according to 00745.16 is not considered a new JMF.

- The method for measuring compaction is changed.
- A new compaction specification limit is required according to 00745.49(b-3).
- A change from one test procedure for measuring asphalt content to another test procedure for measuring asphalt content occurs.
- WMAC technology is used.

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.

Recycled Asphalt Material - The combination of reclaimed asphalt pavement (RAP) and recycled asphalt shingles (RAS).

Sublot Size - A subplot is 1,000 tons of ACP.

Surface Damp Condition - When the outside of the aggregates are damp with moisture, but little or no free water is present.

Warm Mix Asphalt Concrete - An asphalt concrete mix following all requirements of HMAC, except that through use of approved additives or processes, it is mixed, placed, and compacted at lower temperatures.

Wearing Course - The top lift of ACP, regardless of thickness.

Materials

00745.10 Aggregate - When requested by the Engineer, supervisory personnel of the Contractor and any subcontractors who are to be involved in ACP aggregate crushing shall meet with the Engineer at a mutually agreed upon time to discuss accomplishing all phases of the crushing work.

(a) New Coarse and Fine Aggregates - Provide and stockpile new aggregates according to the following requirements:

(1) General - Produce and stockpile aggregate as follows:

a. Separated Sizes - Advise the Engineer of the separated sizes of coarse and fine aggregate that will be used and the proposed targets for each individual sieve size for each stockpile. A minimum of one coarse aggregate and one fine aggregate stockpile is required. If the Contractor proposes to produce coarse and fine aggregates in separated sizes other than those specified, request the proposed size changes in writing, and state the proposed target value and specified tolerance for each of the individual sieve sizes of the proposed materials.

The number of fine aggregate separated sizes selected by the Contractor does not relieve the Contractor of providing a JMF and producing ACP meeting the air voids, VMA, and VFA requirements of 00745.13(b) and 00745.16(b-1-a). Perform recrushing, rescreening, or other special processing of the fine aggregates necessary to achieve the air voids, VMA, or VFA requirements at no additional cost to the Agency.

b. Scalping - Scalp the rock on a 3/4 inch sieve screen deck. For quarry rock, scalp the rock after it has passed through the primary crusher. The material remaining may be accepted for use by visual inspection. The Engineer may perform verification testing of the gradation. The material shall meet the following:

Sieve Size	Percent Passing (by Weight)
8"	95 - 100
3/4"	5 max.

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

d. Durability - Provide aggregate not exceeding the following maximum values:

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

e. Fractured Faces - Provide crushed aggregate with not less than the minimum number of fractured faces as determined by AASHTO T 335 as follows:

Type of Mix	Percent of Fracture (by Weight)	
	Material Retained on 1 1/2", 1", 3/4", 1/2" and No. 4 Sieve (two fractured faces)	Material Retained on No. 8 Sieve (one fractured face)
All ACP	75	75

f. Harmful substances - Do not exceed the following values:

Test	Test Method		Aggregates	
	ODOT	AASHTO	Coarse	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. ¹

¹ 50 min. for Level 4 ACP

(2) Coarse Aggregate - Provide coarse aggregate meeting the following:

a. General Requirements - Produce coarse aggregate from crushed rock or other inert material of similar characteristics.

b. Separated Sizes - Allowable separated sizes of coarse aggregate are as follows:

Type of Asphalt Concrete Mixture	Allowable Separated Sizes			
	1 1/4" - 3/4"	3/4" - No. 4	3/4" - 1/2"	1/2" - No. 4
1" ACP	Yes	Yes	Yes	Yes
3/4" ACP	-	Yes	Yes	Yes
1/2" ACP	-	-	-	Yes

c. Grading - Determine sieve analysis according to AASHTO T 27 and AASHTO T 11. Establish the target values for each allowable separated size after a maximum of 10 percent of planned stockpile quantity has been produced. Produce the aggregate within the following listed tolerances (T):

Sieve Size	Separated Sizes			
	1 1/4" - 3/4"	3/4" - No. 4	3/4" - 1/2"	1/2" - No. 4
	Percent Passing (by Weight)			
	T	T	T	T
1 1/2"	- 1	-	-	-
1 1/4"	± 5	-	-	-
1"	± 10	- 1	- 1	-
3/4"	± 5	± 5	± 7	- 1
1/2"	-	± 8	± 8	± 5
3/8" *	-	-	-	-
No. 4	± 3	± 8	± 8	± 8
No. 8	-	± 5	± 5	± 5
No. 16 *	-	-	-	-
No. 30	± 1	± 3	± 3	± 3
No. 50 *	-	-	-	-
No. 100 *	-	-	-	-
No. 200	-	± 1.0	± 1.0	± 1.0

* Report percent passing sieve when no tolerance is listed

(3) Fine Aggregate - Provide fine aggregate meeting the following:

a. General - Produce fine aggregate from crushed rock or other inert material of similar characteristics and if allowed, blend sand.

b. Separated Sizes - Allowable separated sizes for fine aggregates are:

No. 4 - 0
 No. 4 - No. 8
 No. 8 - 0

c. Grading - Determine sieve analysis according to AASHTO T 27 and AASHTO T 11. Establish the target values for each allowable separate size after a maximum of 10 percent of planned stockpile quantity has been produced. Produce the aggregate within the following listed tolerances (T):

Sieve Size	Separated Sizes		
	No. 4 - 0	No. 4 - No. 8	No. 8 - 0
	Percent Passing (by Weight)		
	T	T	T
3/8"	- 1	- 1	-
No. 4	± 7	± 10	- 1
No. 8	± 7	± 7	± 10
No. 16 *	-	-	-
No. 30	± 7	± 5	± 8
No. 50 *	-	-	-
No. 100 *	-	-	-
No. 200	± 3.0	± 2.0	± 4.0

* Report percent passing sieve when no tolerance is listed

d. Combination of Fine Aggregate for Testing - Blend together fine aggregate produced in two separate sizes at a 1:1 ratio when testing for sand equivalent.

e. Blend Sand - No natural or uncrushed blend sand will be allowed in Level 4 ACP. Blend sand is allowed for Levels 1, 2, and 3 mixes. For these mixes, establish the target gradation and produce all material within the following tolerances (T):

Sieve Size	Percent Passing (by Weight)
	T
3/8"	- 1
No. 4	± 5
No. 8	± 15
No. 30	± 20
No. 200	± 5.0

Determine sieve analysis according to AASHTO T 27 and AASHTO T 11. Do not use more than 6 percent natural or uncrushed blend sand, by weight, in the total aggregate. Provide a means of verifying and documenting the amount of blend sand added to the aggregate.

(b) Reclaimed Asphalt Pavement - RAP material used in the production of new ACP is optional. No more than 30 percent RAP will be allowed in Level 1, Level 2, and Level 3 ACP. No more than 30 percent RAP will be allowed in Level 4 base courses. No more than 20 percent RAP will be allowed in Level 4 wearing courses.

Establish the amount of asphalt cement in the RAP in the mixture design phase according to ODOT TM 319 and the ODOT Contractor Mix Design Guidelines for Asphalt Concrete or other method if approved by the Engineer. Additional testing may be requested at any time by the Agency or the Contractor during the production of the RAP mixture to verify the amount of asphalt cement in the RAP. Conduct new tests by a laboratory mutually agreed upon by the Agency and the Contractor. The party requesting the additional testing pays the cost of the additional testing.

(c) Recycled Asphalt Shingles - RAS used in the production of new ACP is optional. Either manufacturer waste (post-manufacturer) RAS or tear-off (post-consumer) RAS may be used. Manufacturer waste RAS is processed asphalt shingle material derived from manufacturer's shingle scrap. Tear-off RAS is processed asphalt shingle material derived from shingle scrap removed from structures. All percentages are based upon dry weights for calculations.

(1) Processing Shingles - Process the RAS by grinding without adding moisture so that 100 percent of the shredded pieces are less than 1/2 inch in any dimension and that 90 percent are less than 3/8 inch in any dimension when sampled according to AASHTO T 2 and tested according to AASHTO T 27. Sample and test the processed RAS according to the MFTP.

(2) Harmful Substances - Certify that the RAS does not contain asbestos fibers according to the policies and procedures established by the Department of Environmental Quality. Test deleterious materials according to ODOT TM 335 according to the MFTP. Limit the percentage of deleterious materials to 1.0 percent. If fine aggregate is added as an anti-clumping agent, sample and test processed RAS for harmful substances before adding the fine aggregates.

(3) Anti-Clumping Additive - Fine aggregate meeting the requirements of 00745.10(a-3-c) may be added to the RAS in a quantity not to exceed 4 percent by weight of RAS to keep the material workable and to prevent conglomeration of the shingle particles in the stockpile. RAS

may also be blended with RAP in controlled percentages to preclude clumping. Do not contaminate stockpiled RAS with dirt or other foreign materials.

(4) Allowable Percentages - No more than 5.0 percent RAS by total weight of aggregate is allowed in ACP mixtures. Restrict the maximum allowable percentage of asphalt binder replacement to 20.0 percent for base courses and 15.0 percent for wearing courses in ACP containing only RAS.

When RAS is used in conjunction with RAP, restrict the maximum allowable percentage of binder replacement to 30.0 percent for base courses and 25.0 percent for wearing courses.

(5) Establishing Mix Design Inputs - For ACP mixtures containing RAS or RAM, following any addition of fine aggregate as an anti-clumping agent, test the material according to ODOT TM 319 to establish the asphalt content, material specific gravities, and gradation. Develop mixture designs according to the ODOT Contractor Mix Design Guidelines for Asphalt Concrete.

(d) Reclaimed Asphalt Pavement and Recycled Asphalt Shingle Aggregate - Blend the RAP, RAS, or RAM material with new aggregate to provide a mixture conforming to the JMF within the tolerances specified. Have a CAT-I perform sampling and testing of RAP and RAS aggregates according to Section 00165 and the MFTP.

(e) Stockpiling - Prepare the ground for the stockpile site to prevent contamination. Prevent segregation and contamination, as much as possible, when stockpiling and removing the aggregate.

(f) Aggregate Production Quality Control - Have a CAgT perform sampling and testing of aggregates according to Section 00165 and the MFTP. Statistically evaluate the aggregates according to Section 00165 and the MFTP. Sample before treating with hydrated lime, when lime is required.

(g) Preproduced Aggregate - Compliance of aggregates produced and stockpiled before the award date or notice to proceed of this Contract will be determined by (1) or (2) below. The material shall meet the requirements of 00745.10.

(1) Continuing production records meeting the requirements of Section 00165 and the MFTP.

(2) Sampling and testing of the entire stockpile according to Section 00165 and the MFTP.

00745.11 Asphalt Cement, Additives, and Aggregate Treatment - Furnish the following asphalt cement, additives and aggregate treatments:

(a) Asphalt Cement - Use the grade of asphalt 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.

PG 64-22 or PG 64-28 asphalt cement may be substituted for the grade of asphalt cement specified in the Contract for guardrail flares, mailbox turnouts, road approaches, driveways, and non-travel lane areas of restricted widths that are less than 8 feet wide, excluding shoulders. Use of substitute asphalt cement for these areas will not require a new JMF.

(b) Asphalt Cement Additives - Use standard recognized asphalt cement additive products that are of known value for the intended purpose and approved for use on the basis of laboratory

tests and capable of being thoroughly mixed. Do not use asphalt cement additives that have deleterious effects on the asphalt material. Do not use silicones as an additive. Add the following asphalt cement additives when required by the JMF:

- Anti-stripping asphalt cement additives to prevent stripping or separation of asphalt coatings from aggregates to satisfy the TSR specified in 00745.13.
- Asphalt cement admixtures used to aid in the mixing.

When WMAC is used, select one of the WMAC technologies and process and additive types identified on ODOT's publication "Approved WMAC Technologies".

Submit the proposed WMAC technology to be used and a plan for its implementation at the pre-construction conference.

Comply with the manufacturer's recommendations for incorporating additives and WMAC technologies into the mix. Comply with manufacturer's recommendations regarding receiving, storing, and delivering the additives.

(c) Aggregate Treatment - When lime treated aggregate is specified in the Contract Documents or required to satisfy the TSR specified in 00745.13, treat new crushed aggregates, except those in RAP, RAS, or RAM materials, with dry hydrated lime meeting the requirements of ASTM C 1097. Treat aggregate as follows:

(1) General:

- a. Mix the hydrated lime, water, and aggregate thoroughly in a pug mill.
- b. Determine the quantity of lime in aggregate for each subplot according to ODOT TM 321. If the rates of application specified in 00745.11(c-2-b) are not met, take corrective action. Document the corrective action and notify the Engineer.

(2) Treatment During Production:

- a. Mix dry lime, water (if necessary to achieve SDC), and aggregates thoroughly in a pug mill before they enter the paving plant dryer.
- b. Proportions of hydrated lime (percent by dry weight of dry aggregates) and aggregate moisture:

Hydrated Lime (%)	1.0
Lime Tolerance (%)	- 0.2/+ 0.5
Moisture Content of Aggregate	SDC

00745.12 Mix Type and Broadband Limits - Furnish the mix type specified in the Contract Documents within the broadband limits according to the following:

(a) Mix Type - Furnish the types of ACP shown or as directed. 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:

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

00745.13 Job Mix Formula Requirements - Do not begin production of ACP for use on the project until the JMF is reviewed by the Engineer and written consent is provided to proceed. The JMF proposed for use on the project will be evaluated based on the criteria identified in 00745.13(b) and 00745.13(c) and the latest ODOT Contractor Mix Design Guidelines for Asphalt Concrete. A new JMF is required if the asphalt cement grade, any additives, or the source of the aggregate change during production. A change in the source of asphalt cement requires a new passing TSR.

Provide a range of proposed JMF targets to the CMDT. The CMDT will select targets from within the proposed range if all of the JMF requirements of 00745.13(b) are met.

A separate JMF will be issued for WMAC. Do not use RAS in WMAC mixes with minimum compaction temperatures less than 260 °F.

When WMAC is used, provide the following information in addition to the requirements listed for HMAC:

- WMAC technology and WMAC additives information.
- WMAC technology manufacturer's established recommendations of usage.
- WMAC technology manufacturer's established target rate for water and additives, and the acceptable variation for production.
- WMAC technology material safety data sheets if applicable.
- Temperature range for mixing.
- Temperature range for compacting.
- Except for foaming technology, asphalt binder performance grade test data of the asphalt binder and chemical additive at the manufacturer's recommended dosage rate.
- Except for foaming technology, WMAC mixture performance test results. Perform testing for foaming technology on the production mix on specimens compacted at WMAC compaction temperatures.

Have a CMDT prepare, sign and submit a JMF to the Engineer for each mixture required at least 10 calendar days before the anticipated use in ACP, and according to the latest copy of the ODOT Contractor Mix Design Guidelines for Asphalt Concrete. If requested, submit material samples 10 calendar days before use.

(a) Job Mix Formula Requirements - Provide a JMF meeting the following mixture requirements:

	Level 1	Level 2	Level 3	Level 4
Design Method	Superpave	Superpave	Superpave	Superpave
Compaction Level	65 Gyration	65 Gyration	80 Gyration	100 Gyration
Air Voids, %	3.5	4.0	4.0	4.0
VMA, % minimum	1/2 inch - 14.0 3/8 inch - 15.0	3/4 inch - 13.0 1/2 inch - 14.0 3/8 inch - 15.0	3/4 inch - 13.0 1/2 inch - 14.0 3/8 inch - 15.0	3/4 inch - 13.0 1/2 inch - 14.0 3/8 inch - 15.0
VMA, % maximum	min + 2.0%	min + 2.0%	min + 2.0%	min + 2.0%
P No. 200 / Eff. AC ratio	0.8 to 1.6	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
	3/8 inch: 70 - 80	3/8 inch: 70 - 80	3/8 inch: 70 - 80	3/8 inch: 70 - 80

(b) Performance Test - For Level 3 wearing course mixes and all Level 4 mixes, the mix design submittal shall include the results of performance testing as outlined in the latest ODOT Contractor Mix Design Guidelines for Asphalt Concrete.

00745.14 Tolerances and Limits - For gradation, measure the sieves with a weighting factor of one or more according to 00745.95. Produce and place ACP within the following JMF tolerances and limits:

Gradation Constituent	3/4"	1/2"	3/8"
1"	JMF ± 5% *		
3/4"	90 - 100%	JMF ± 5% *	
1/2"	JMF ± 5%	90 - 100%	JMF ± 5% *
3/8" **	—	—	90 - 100%
No. 4	JMF ± 5%	JMF ± 5%	JMF ± 5%
No. 8	JMF ± 4%	JMF ± 4%	JMF ± 4%
No. 16 **	—	—	—
No. 30	JMF ± 4%	JMF ± 4%	JMF ± 4%
No. 50 **	—	—	—
No. 100 **	—	—	—
No 200	JMF ± 2.0%	JMF ± 2.0%	JMF ± 2.0%

* Maximum not to exceed 100 %

** Report percent passing sieve when no tolerance is listed

Constituent of Mixture	ACP
Asphalt Cement - AASHTO T 308 (Ignition) and ODOT TM 323	JMF ± 0.50%
RAP Content - ODOT TM 321	JMF ± 2.0%
RAS Content - ODOT TM 321	JMF ± 1.0%
RAM Content - ODOT TM 321	JMF ± 2.0%
Moisture content at time of discharge from the mixing plant - AASHTO T 329	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 00745.12(b). Full tolerance will be given for RAP content even if it exceeds the limits established in 00745.10(b). Full tolerance will be given for RAS or RAM content even if it exceeds the limits established in 00745.10(c).

Take corrective action when the RAP, RAS, or RAM content exceeds the above tolerance. If the RAP, RAS, or RAM content continues to be outside tolerance, stop production until a plan for corrective action is approved by the Engineer.

00745.16 Asphalt Concrete Pavement Production QC/QA - Provide ACP according to the following:

(a) Quality Control - Provide and maintain a quality control program as defined in Section 00165, the MFTP, and according to the following:

(1) Personnel Requirements - Maintain quality control by:

- Obtaining samples according to the MFTP with certified technicians.
- Having all testing, data analysis and reporting of test results performed by a CAT-I.
- Having a CAT-II available to evaluate and reconcile laboratory and field test results, submit required forms within required timeframes, and make necessary process adjustments.
- Providing at least one CAT-I full-time at each plant site when producing mixture for the Project.
- Providing access to laboratory facilities, technicians, and test results to the Engineer at all times during the production and testing process.

(2) Laboratory Requirements - Furnish and maintain an ODOT certified quality control laboratory. Furnish the laboratory with the necessary equipment and supplies for performing Contractor quality control testing. Calibrate all testing equipment according to the required test methods. The Engineer may inspect measuring and testing devices to confirm both calibration and condition.

The laboratory shall be operational before beginning the ACP production and be equipped with a telephone or cellular telephone, if either service is available. Provide laboratory equipment meeting the requirements of the applicable test methods identified in these Specifications and selected for use on the project.

(3) Production Sampling and Testing - Perform sampling and testing according to Section 00165 and the MFTP.

(4) Testing Frequency - Conduct the above testing program, once for each subplot, on randomly selected samples for each design mixture. Do not obtain the first sample of the day in the first 25 tons of production. If the random number indicates that the sample is to be obtained in the first 25 tons, sample at 25 tons. In addition, test the asphalt content at least once during each day of production. This requirement may be waived by the Engineer.

Provide "QC Program" sampling and testing frequencies (random numbers) to the Engineer before starting production. Provide QC test results to the Engineer by the middle of the following work shift.

Stop production when the pay factor for any constituent with a weighting factor greater than one falls below 0.75. Resume production when a plan for correction is accepted by the Engineer.

(5) Plant Calibration - Calibrate all meters and belt scales at the ACP mixing plant according to ODOT TM 322 before beginning production.

(b) Mix Design Verification:

(1) Mix Design Verification Quality Control:

a. General - Before beginning production and placement of WMAC, perform mix design verification (MDV) tests on the HMAC as required at start-up according to 00745.16(b-1-d). Two consecutive MDV test results from testing of HMAC shall be within the limits of 00745.16(b-1-a). The Engineer may waive ODOT TM 306 for HMAC production required before WMAC production for one shift.

Perform MDV testing on projects with Level 2, Level 3, or Level 4 ACP. Perform MDV tests on every subplot and as required at start up according to 00745.16(b-1-c) and the MFTP. Perform gradation and asphalt content testing with each MDV test. Calculate the following values for each MDV test:

- Air Voids
- Voids in Mineral Aggregate (VMA)
- Voids Filled with Asphalt (VFA)
- Passing No. 200/Effective Asphalt Content (Pbe) Ratio

The running averages of four MDV results shall be within the limits given below:

	Average of	Limit
Air Voids	4 samples	JMF Target \pm 1.0%
VMA	4 samples	12.5 - 17.0 (3/4" Mix) 13.5 - 17.0 (1/2" Mix) 14.5 - 17.0 (3/8" Mix)
VFA	4 samples	65 - 75 (3/4" and 1/2" Mix in Level 3 and 4) 65 - 78 (3/4" and 1/2" Mix in Level 2) 70 - 80 (1/2" Mix in Level 1 and 3/8" Mix in Levels 1 - 4)
Passing No. 200/Pbe	4 samples	0.8 - 1.6

b. Laboratory Compactor Selection - Use the equivalent laboratory compactor for MDV as used to develop the JMF.

c. Reconciliation of Laboratory and In-place Properties - Have a CDT provide the results from the initial control strip to the CAT-II for evaluation and comparison with the MDV results at the completion of the control strip. If the MDV and density test results are contradictory, inform the Engineer and initiate an investigation. The CAT-II shall recommend a plan to the Engineer for resolving the discrepancy based on the results of the investigation. Submit results of investigation and plan no later than the end of two shifts after investigation has been initiated.

d. Mix Design Verification Requirements at Start-Up - Perform MDV testing at the start-up of the JMF production according to the following process:

1. Obtain a sample in the first 100 tons of production and immediately perform MDV testing.
2. If the Va and VMA mix properties of 00745.16(b-1-a) are within tolerance, then continue subsequent MDV testing at the established random QC subplot interval. If not, then go to step "3".
3. If the Va and VMA mix properties are out of tolerance in 00745.16(b-1-a), then make mix adjustments within the requirements of 00745.16(b-1-e) and immediately obtain another sample and perform MDV testing. Two adjustments will be given. If any of the test results for Va and VMA are not within the limits of 00745.16(b-1-a) after second adjustment, then stop production and go to step "4".
4. Have the CAT-II submit the revised JMF targets and production and plant adjustments to the Engineer. Obtain the approval of the Engineer before restarting production. Production will be restarted with MDV testing according to this subsection.

Use the initial MDV sample as the first random QC subplot test. Subsequent MDV samples required due to failure of start-up criteria will be used for a subplot QC test if the sample is taken within 100 tons of the scheduled random QC sample location. If not, perform the MDV testing separate from, and not included in, the random QC testing program. Complete all required MDV testing at no additional cost to the Agency.

e. Corrective Action - Take corrective action when required by the MDV start-up process of 00745.16(b-1-d). After the requirements of 00745.16(b-1-d) have been met, take corrective action if the MDV test results show that two consecutive running averages of four samples are outside the limits for air voids, VMA, VFA, or P No. 200/Pbe ratio according to 00745.16(b-1-a). Document the corrective action and submit to the Engineer. If the subsequent MDV test results following the corrective action are outside the limits of 00745.16(b-1-a), immediately stop production and make adjustments. Restart production according to 00745.16(b-1-d) only after the Engineer has approved the proposed adjustments. If the MDV test results are outside the limits of 00745.16(b-1-a), but the mixture meets the current requirements for gradation and asphalt content, an adjustment to the JMF targets is required. A new lot is not required as a result of the adjustment.

f. Field Tensile Strength Ratio Testing - Perform a Tensile Strength Ratio (TSR) test according to AASHTO T 283 on a sample obtained during the first 2 days of production after QC test results verify that ACP constituents with a weighting factor greater than one according to 00745.95 are in tolerance. Provide test results to the Engineer within 6 calendar days of obtaining the sample. Stop production and make adjustments if the TSR is less than 70. Restart production only after the Engineer has approved the proposed adjustments.

The Engineer may waive Field TSR testing if the Contractor provides Field TSR data dated within the prior 3 months of the first MDV sample.

g. Request for Job Mix Formula Target Adjustment - A request for an adjustment to the JMF targets may be made to the Engineer by the Contractor's CAT-II. The requested change will be reviewed and documented by the Engineer. If acceptable, a revised JMF will be allowed. Document the subplot test for which the adjusted targets are in effect. When making adjustments for gradation do not exceed the tolerances specified for the original JMF limits. Keep AC content adjustments for HMAC within 0.5 percent of the original JMF.

Keep AC content adjustments for WMAC within 0.3 percent of the original JMF. The JMF asphalt content may only be adjusted if the production VMA meets the requirements of 00745.16(b-1-a). Keep adjustments for RAP or RAM within 5 percent of the original JMF blend percentage, but do not exceed the requirements of 00745.10(b) or 00745.10(c). Adjusting proportions of the combined RAP and RAS will not be allowed during production of the mixture. Keep adjustments for RAS content within 1 percent of the original JMF, but do not exceed the requirements of 00745.10(c). A gradation adjustment is required if the VMA is outside of the 00745.16(b-1-a) limits. Regardless of these tolerances, keep the adjusted JMF within the mixture specification control points of 00745.12. If a redesign of the mixture becomes necessary, submit a new JMF according to the requirements of these specifications.

(2) Mix Design Verification Quality Assurance - The Engineer will observe and document the Contractor's performing of MDV test procedures and calculations. Immediately correct any deviations from the specified test procedures. The Engineer may conduct MDV assurance testing at any time.

(3) Mix Design Verification for Warm Mix Asphalt Concrete - Perform MDV testing on WMAC according to 00745.16(b-1-a). Continued production and placement of WMAC will be allowed at the discretion of the Engineer.

(c) Quality Assurance and Acceptance - Any quality assurance testing for Level 1 and Level 2 ACP will be at the discretion of the Engineer. The Agency will provide quality assurance according to Section 00165 for Level 3 and Level 4 ACP. When QA testing is performed, the Contractor's quality control results will be used for acceptance if they are within acceptable limits of the QA test results as defined by ODOT's Quality Assurance Program.

00745.17 Small Quantity Acceptance - When the quantity of ACP in a lot is less than 2,500 tons, the Engineer may accept the ACP according to Section 4(B) of the MFTP or by test results according to the following:

(a) Within Specification Limits - If all subplot 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 subplot 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 00745.95 or may choose to sample the in-place material for further testing according to 00745.17(b-3). 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 and use the average as a third test result. The maximum composite pay factor (CPF) will be 1.0.

(3) In-Place Samples - If the Contractor chooses to sample the in-place material, sample from a minimum of three random locations from the area represented by the lot in question under the observation of the Engineer. If the in-place sample test results are within specification, the material will be accepted and paid for at the full bid price. If the in-place sample test results are not within specification, the material will be accepted and paid for at an

adjusted price according to 00745.95. The maximum CPF will be 1.0. Perform sampling and testing of in-place material at no additional cost to the Agency.

Equipment

00745.20 Lime Treated Aggregate Plant - When lime treated aggregate is specified, provide a mixing plant that includes:

- A pug mill that mixes the aggregate and lime until the aggregate is uniformly coated and the lime is distributed throughout the aggregate.
- Provide a system for adding water to the pug mill if necessary to achieve aggregate that is in SDC. This requirement may be waived by the Engineer if the stockpiled aggregates are watered to the satisfaction of the Engineer.
- A lime metering or weighing device that determines the amount of lime incorporated within any selected time period. Provide a device that is of sufficient accuracy to supply lime within the tolerances specified in 00745.11(c).

00745.21 Mixing Plant - Provide ACP plants that comply with the following:

(a) DEQ Permits - Before producing ACP for this Contract at a new or revised plant location, provide the Engineer with copies of all permits according to 00160.70.

(b) Scales - Provide required scales to assure a uniform mixture. Check and adjust scales according to 00190.30.

(c) Vibratory Scalping Devices - Provide vibratory scalping devices ahead of the mixer to reject aggregate, RAP, RAS, or RAM and lumps of cemented material that are detrimental to the mix.

(d) Asphalt Antistrip Additive Metering Device - When asphalt antistrip additive is added into the asphalt at the ACP mixing plant, provide a means to weigh or meter the additive at a specified rate that has an accuracy of plus or minus 0.5 percent.

(e) Thermometers - Provide the following:

- A direct reading, full operating range thermometer in the asphalt feed line near the mixer unit.
- A thermometric instrument that automatically registers the temperature of the materials at the discharge of the mixer.

(f) Sampling Devices - Provide and operate a device that produces a representative sample of the quantity of material required for the appropriate tests when sampling at or around crushing, screening or mixing plants.

(g) Warm Mix Asphalt Concrete Mixing Production - Modify the asphalt mixing plant as required by the manufacturer to introduce the WMAC technology. Plant modifications may include additional plant instrumentation, the installation of asphalt binder foaming systems and WMAC additive delivery systems, tuning the plant burner, and adjusting the flights in order to operate at lower production temperatures and reduced tonnage. Document the integration of plant controls and interlocks.

00745.22 Hauling Equipment - Provide hauling vehicles in good operating condition with tight, clean, smooth beds. Coat the beds with a minimum amount of an approved material to keep the ACP from sticking to the beds. Do not use diesel oil. Drain excess coating material before loading by raising the truck bed, opening belly dump gates, or operating the conveyor belt, as appropriate.

00745.23 Pavers - Provide pavers that are:

- Self-contained, self-propelled, supported on tracks or wheels, none of which contact the mixture being placed.
- Equipped with augers and a screed or strike-off assembly, heated if necessary, which:
 - Can spread and finish the ACP to a uniform texture, in the specified widths, thicknesses, lines, grades and cross sections.
 - Will not segregate, tear, shove or gouge the ACP.
- Equipped with a paver control system which:
 - Controls the ACP 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.
- Equipped with 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 directed. 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.

00745.24 Compactors - Provide the specified self-propelled rollers capable of reversing without backlash, as follows:**(a) Steel-Wheeled Rollers** - Steel-wheeled rollers with a minimum gross static weight as follows:

	Level 1 and Level 2	Level 3	Level 4
Breakdown and Intermediate	8 ton	10 ton	12 ton
Finish	6 ton	8 ton	10 ton

(b) Vibratory Rollers - Vibratory rollers that:

- Are equipped with amplitude and frequency controls.
- Are specifically designed to compact ACP.
- Are Capable of at least 2000 vibrations per minute.

Have a minimum gross static weight meeting the requirements of 00745.24(a).

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

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

- Have a minimum gross static weight meeting the requirements of 00745.24(a).
- 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 psi to 90 psi
- Be fully skirted to reduce tire heat loss and mixture pick up.

(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 directed. 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

00745.30 Quality Control Personnel - Provide technicians having CAgT, CAT-I, CAT-II, CDT, and CMDT technical certifications.

Construction

00745.40 Season and Temperature Limitations - Place ACP during the dates indicated, and 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
Less than 2 inches	60 °F	All Year**	3/15 9/30	All Year**
2 inches - 2 1/2 inches	40 °F	All Year**	3/15 9/30	All Year**
Greater than 2 1/2 inches	40° F	All Year**	3/15 9/30	All Year**
Temporary	40 °F	All Year**	All Year**	All Year**

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

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

00745.41 Prepaving Conference - Have a prepaving conference with all Contractor supervisory personnel, all subcontractors who are to be involved in the paving work, and the Engineer. Meet at a mutually agreed time and discuss all methods of accomplishing all phases of the paving work. When Level 3 and Level 4 mixes quantities are greater than 5,000 tons include in the prepaving conference a Contractor representative who is responsible for project quality control..

00745.42 Preparation of Underlying Surfaces - All bases and foundations on which the pavement is to be constructed shall meet the applicable Specifications and be approved before the start of paving. Recondition existing bases and foundations according to Section 00610. Trim broken or ragged edges to firm material when directed.

Treat all paved surfaces on and against which ACP is to be placed with an asphalt tack coat, according to Section 00730.

Level and compact depressed areas with ACP as specified or directed. Perform the leveling work as a separate operation and at the locations and to the extent as shown or directed. Spread the leveling material with a paving machine, unless otherwise directed.

Protect all existing structures from the overlay operation and check and clean as necessary after the overlay.

Remove existing pavement markers, recessed markers, and pavement legends before paving. Remove pavement lines, bars, and pavement legends as shown or directed and according to 00851.40.

00745.43 Drying and Heating Aggregates:

(a) Burner Operation - Operate the burner used to heat the aggregates to completely burn the fuel so the aggregate and asphalt are not contaminated and the asphalt is suitably aged.

(b) Heating Temperatures - Establish the allowable mixing and placement temperature ranges by the JMF. Measure the mixture temperature at the discharge of the mixer. Measure the placement temperature behind the paver. The allowable production temperatures may be adjusted based on the asphalt cement supplier's recommendation if approved by the Engineer. The maximum mixture temperature of the ACP and the minimum placement temperature shall be as follows:

Grading Type	AC Temperature °F	
	Maximum At Mixer	Minimum Behind Paver
HMAC	350	240
WMAC	—	215

Within the above limits, the Contractor with approval of the Engineer, or the Engineer may adjust this temperature in 10 °F increments from the JMF as follows:

- **Up** - If the aggregate coating, moisture content, workability or compaction requirements are not attained.
- **Down** - If the aggregate coating, moisture content, workability and compaction requirements are attained.

00745.44 Asphalt Concrete Pavement Storage - Temporary storing or holding of ACP in storage silos will be allowed if the Contractor complies with the following:

(a) Flow Diverter - Provide a device to divert the flow of ACP away from the silo when starting or stopping plant production, or at any other time necessary, so improperly proportioned mixture or incompletely mixed portions of the mixture do not enter the silo.

(b) Batcher - Equip storage silos with a batcher, rotating chute, or similar device to prevent segregation of ACP as it enters the silo.

(c) Unheated Silos - Store ACP in unheated silos only when the total elapsed time from the mixing to placing is less than 6 hours.

(d) Heated Silos - Store ACP in heated, insulated silos no more than 72 hours only if an atmosphere is maintained in the silo at all times which prevents damage to the mixture or asphalt properties.

(e) Discharging AC and Loading Trucks - Discharge the ACP and load trucks so segregation is prevented. If the ACP is segregated, dispose of segregated ACP and stop temporary storage of the ACP at no additional cost to the Agency.

00745.45 Control of Line and Grade - Use a floating beam device of adequate length and sensitivity to control the grade of the paver. Where this method is impractical, manual control of grade will be allowed when approved.

00745.46 Hauling, Depositing, and Placing - Haul, deposit, and place ACP as follows:

(a) Hauling - Cover ACP if rain or cold air temperatures are encountered any time between loading and placement.

ACP will be rejected before placing if one or more of the following occurs:

- Below temperature limit specified in 00745.43
- Slumping or separating
- Solidifying

Dispose of rejected loads at no additional cost to the Agency.

Deliver the mixture to the paving machine at a rate that provides continuous operation of the paving machine, except for unavoidable delay or breakdown. If excessive stopping of the paving machine occurs during paving operations, the Engineer may suspend paving operations until the mixture delivery rate matches the paving machine operation.

(b) Depositing - Deposit ACP from the hauling vehicles so segregation is prevented.

When ACP is windrowed, the pick-up equipment shall:

- Pick up substantially all of the ACP deposited on the roadway.
- Be self-supporting, not exerting any vertical load on the paving machine, or causing vibrations or other motions which could have a harmful effect on the riding quality of the completed pavement.

(c) Placing - Alternative equipment and means may be allowed by the Engineer if the use of a paver is impractical.

Do not place ACP during rain or other adverse weather conditions, unless allowed by the Engineer. ACP in transit at the time adverse conditions occur may be placed if:

- It has been covered during transit.
- The ACP temperature is satisfactory.
- It is placed on a foundation free from pools or flow of water.
- All other requirements are met.

When leveling irregular surfaces and raising low areas, do not exceed 2 inches actual compacted thickness of any one lift, except the actual compacted thickness of intermittent areas of 1,000 square feet or less may exceed 2 inches, but not more than 4 inches. This may require portions of the mixture to be laid in two or more lifts.

Place the mixture in the number of lifts and courses, and to the compacted thickness for each lift and course, as shown. Place each course in one lift unless otherwise specified. Do not exceed a

compacted thickness of 4 inches for any lift. Limit the minimum lift thickness to twice the maximum aggregate size in the mix.

Do not intermingle ACP produced from more than one JMF. Each base course panel placed during a working shift shall conform to a single JMF. The wearing course shall conform to a single JMF, except for adjustments in the JMF according to 00745.16(b-1).

00745.47 Longitudinal Joints - At longitudinal joints, bond, compact and finish the new ACP equal to the ACP against which it is placed.

(a) Location - Place the ACP 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 - Construct longitudinal joints at either lane lines or fog lines, or as shown or 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 00745.47(c) do the following:

- Construct and maintain a wedge of ACP 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 additional cost to the Agency. ACP for the temporary wedge will be paid for at the pay item price.

(c) Placing Under Traffic - When placing ACP 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 week complete the full width of the area to be paved, including shoulders, to the same elevation with no longitudinal drop-offs.

00745.48 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 an 8 foot long wedge (1V:50H taper rate).
- For wedges that will be under traffic for 24 hours or longer, construct a 25 foot long wedge (1V:160H taper rate).
- Construct, maintain, remove, and dispose of the temporary wedge at no additional cost to the Agency. ACP 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 ACP 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 Asphalt Concrete Pavement - After completing a temporary end panel as specified, dispose of unused, remaining ACP as directed. Payment will be made for the entire load of ACP, but will be limited to only one load for each joint of each 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 00745.70.

(b) Abutting Bridge Ends - Compact the ACP abutting bridge ends and other rigid type structures in the longitudinal direction and either transverse or diagonal direction, 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. Saw the cut 3/8 inch wide, $\pm 1/8$ inch, by 1/2 inch less than the thickness of the panel of pavement depth or 1 1/2 inches deep, whichever is less.

Flush the saw cut thoroughly with a high-pressure water stream 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 QPL.

00745.49 Compaction:

(a) General - After the ACP has been spread, struck off, and surface irregularities and other defects remedied, roll it uniformly until compacted as specified.

(1) Temperature - Complete breakdown and intermediate compaction before the ACP temperature drops below 180 °F, unless otherwise directed or required based on the control strip. For WMAC, complete breakdown and intermediate compaction before the WMAC temperature drops below 160 °F. When the rolling causes tearing, displacement, cracking or shoving, make necessary changes in compaction temperature, type of compaction equipment, and rolling procedures.

(2) Rolling - Provide sufficient rollers of the types appropriate to compact the mixture while it is still within the specified temperature. Do not use equipment which crushes the aggregate. Do not displace the line and grade of edges. Moisten steel roller wheels with a minimum amount of water, or other approved material, necessary to prevent the ACP from sticking to them and spotting or defacing the ACP.

Operate rollers at a slow, uniform speed recommended by the manufacturer. Drive rolls or wheels shall be nearest the paver unless otherwise approved. Operate pneumatic rollers no faster than 3 mph. Operate vibratory rollers at frequencies of at least 2,000 vibrations per minute.

Begin rolling at the sides and proceed longitudinally, parallel to the road centerline, gradually progressing to the center, unless otherwise directed. On superelevated curves, begin rolling at the low side and progress to the high side. When paving in echelon, or when abutting a previously placed lane, roll the longitudinal joint first, followed by the regular rolling pattern. Do not make sharp turns or park rollers on hot ACP. Stop each pass at least 5 feet longitudinally from preceding stops.

Perform finish rolling with rollers meeting the requirements of 00745.24(a) or 00745.24(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 ACP shall be determined by random testing of the compacted road surface with calibrated nuclear gauges. Use the MAMD method of compaction measurement.

For Level 2, Level 3 and Level 4 mixes, construct a control strip at the beginning of work on each JMF on the project according to ODOT TM 306. The purpose of the control strip is to determine the maximum density that can be achieved for the JMF, paving conditions, and equipment on the project. Additional control strips are necessary when there is a change in compaction equipment or when JMF targets are adjusted according to 00745.16(b-1-a). The Engineer may waive the control strip for irregular areas or areas too small to establish a reasonable roller pattern.

Stop paving if three consecutive control strips fail to achieve the specified density. Take all actions necessary to resolve compaction problems. Do not resume paving until allowed by the Engineer.

A pneumatic tired roller is not required for Level 1 and Level 2 ACP. Have at least one available pneumatic tired roller conforming to 00745.24(c) on the project and in good operating condition for Level 3 and Level 4 ACP.

Have the CDT notify the Engineer and CAT-II when the average density for a subplot exceeds 95 percent of MAMD. 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 subplot by averaging five QC tests performed at random locations with the nuclear gauge operated in the backscatter mode. Lots and sublots shall correspond with those defined in 00745.02. In addition, perform at least one density test each day of production. The additional testing may be waived by the Engineer.

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

b. Core Correlation of Nuclear Gauge Readings - Correlate each nuclear gauge on the Project when requested or required. New correlations are required if the aggregate source or the asphalt cement source changes. Apply correlation factors to all nuclear gauge readings for all mixtures placed on the Project. Determine the core correlation factor according to WAQTC TM 8 and ODOT TM 327.

Perform core correlation of nuclear gauge readings for each new lift when requested by the Engineer or Contractor. The party requesting the core correlation pays the costs of coring and lab testing of the cores. The party performing nuclear gauge testing pays the costs of the nuclear gauge testing.

(3) Moving Average Maximum Density 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 ACP to at least the percent of the MAMD applicable for the mix type and lift as follows:

Course of Construction	ACP
First ACP lift less than 3 inches placed on aggregate base	91.0 *
All other	92.0

* If any part of the width of a lift at a station requires 91.0 percent, then the entire width of that lift at that station shall be 91.0 percent

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

(c) Thin Pavement - Compaction to a specified density will not be required for leveling, patches, or where the nominal compacted thickness of a course of ACP will be less than 2 inches.

Perform breakdown and intermediate rolling until the entire surface has been compacted by at least four coverages of the rollers. Perform additional coverages, as directed, to obtain finish rolling of the ACP.

(d) Other Areas - Compaction to a specified density will not be required on temporary surfacing, guardrail flares, mailbox turnouts, road approaches, pavement repair, and areas less than 8 feet wide or limited length, regardless of thickness. Compact these surfaces according to 00749.45.

(e) Bridge Decks and End Panels - Compaction to a specified density will not be required for ACP placed on bridge decks and end panels. Perform the same rolling pattern, without vibration, as established by 00745.49(b-1). In the absence of a rolling pattern established by 00745.49(b-1), perform breakdown and intermediate rolling until the entire surface has been compacted by at least six coverages of the rollers. Perform additional coverages, as directed, to obtain finish rolling of the ACP.

Temporary

00745.50 Temporary Surfacing Course - Provide ACP for temporary surfacing that is a well-graded, uniform, durable commercial mix. All new materials, or a combination of new materials and reclaimed materials, may be used, according to 00745.03. The Contractor is responsible for the quality of material furnished according to Section 00165 and for maintaining the surface in a condition appropriate for the facility. Mix used for temporary surfacing will not be eligible for price adjustment under 00745.95.

Maintenance

00745.60 Correction of Defects - Correct all defects in material and work, as directed, at no additional cost to the Agency, according to the following:

(a) Fouled Surfaces - Before the ACP cools repair, clean, and retack fouled surfaces that would prevent full bond between successive lifts of mixture.

(b) Boils, Slicks, and Oversized Material - Before the ACP cools replace boils, slicks, and oversized material with fresh mixture.

(c) Segregation - Take corrective measures when segregation or non-uniform surface texture is occurring in the finished mat. If segregation continues to occur, stop production until a plan for providing uniform surface texture is approved.

(d) Roller Damage to Surface - Before the ACP cools correct surface damage from rollers with additional fresh mixture or by other approved means.

(e) Longitudinal Joints - Take corrective measures when open longitudinal joints are being constructed or when the elevation of the two sides of a longitudinal joint does not match. If problems with the longitudinal joint continue to occur, stop production until a plan for providing tight, equal elevation longitudinal joints is approved.

(f) Non-specification Compaction - Take corrective measures when the specified compaction density is not being achieved.

(g) Other Defects - Remove and replace any ACP that:

- Is loose, broken, or mixed with dirt.
- Shows visually too much or too little asphalt.

Finishing and Cleaning Up

00745.70 Pavement Smoothness - Furnish a 12 foot straightedge and, when required a 12 foot rolling straightedge, and test as specified. Additional testing may be required. Mark areas not meeting the surface tolerance.

(a) Level 1 and Level 2 ACP - Test with the 12 foot straightedge in travel lanes parallel to and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than 1/4 inch.

(b) Level 3 and Level 4 ACP:

(1) Single Course Construction - Test with the 12 foot straightedge in travel lanes parallel to and perpendicular to the centerline, as directed. The pavement surface shall not vary by more than 1/4 inch.

(2) Multiple Course Construction - Test the surface of the course on which the wearing course is placed according to 00745.70(a).

Test the wearing surface with the rolling straightedge in the designated wheel path of a 0.1 mile strip of each travel lane per mile, where directed, and on each transverse joint throughout the project. Operate the rolling straightedge parallel to the centerline. The surface shall not vary more than 0.015 foot.

Also test the wearing surface with a 12 foot straightedge placed perpendicular to the centerline at least once within the above-mentioned 0.1 mile strip. It shall not vary by more than 1/4 inch.

If the 0.1 mile testing strip meets the Specifications, no further testing of the mile represented by the testing strip will be required, except at the transverse joints. If any part of the testing strip does not meet the Specifications, test both wheel paths of the entire mile.

(c) Utility Appurtenances - If the Contractor constructs or adjusts utility appurtenances, manhole covers, and valve boxes, the tolerances of 00745.70(a) and 00745.70(b) apply. If the utility appurtenances are adjusted by others, these tolerances do not apply.

(d) Shoulders and Paved Medians - Test the base and wearing course with the 12 foot straightedge parallel to and perpendicular to the centerline for shoulders and paved medians where permanent traffic barriers will be located. The pavement surface shall not vary by more than 1/4 inch.

00745.75 Correction of Pavement Roughness - Correct equipment or paving operation procedures when tests show the pavement smoothness does not comply with 00745.70. 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:

(1) Base Course:

- Profile to a maximum depth of 0.4 inch with equipment meeting the requirements of 00620.20.
- Profile to a maximum depth of 0.4 inch with abrasive grinders equipped with a cutting head comprised of multiple diamond blades.
- Remove and replace the base lift.

(2) Wearing Course:

- Remove and replace the wearing surface lift.
- Profile to a maximum depth of 0.3 inch with abrasive grinders equipped with a cutting head comprised of multiple diamond blades and apply an emulsion fog seal as directed.

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

Measurement

00745.80 Measurement - The quantities of ACP will be measured on the weight basis, with separate measurement being made for the asphalt concrete mixture and the asphalt cement contained in the mixture. No deduction will be made for lime or any other additive used in the mixture.

When RAP, RAS, or RAM materials are used, measurement of the total asphalt quantity will be based on quality control tests averaged at least to the nearest 0.01 percent. For mixtures not containing RAP, RAS or RAM materials, measurement of the total asphalt quantity will be based on quality control tests averaged at least to the nearest 0.01 percent when the Engineer determines that payment by invoice and tank sticking is impractical.

If an estimated bulk specific gravity for the aggregates is shown in the Special Provisions, determine the actual bulk specific gravity for the aggregates, recompute the quantities of ACP to be used, and inform the Agency in writing. The quantities of ACP will be adjusted accordingly with no adjustment in Contract unit prices. The provisions of 00140.20 and 00195.20 will apply.

When listed in the Contract Schedule of Items, extra or additional work for approaches, driveways, walks, and other miscellaneous structures will be measured according to 00749.80 through 00749.82.

If there is no separate item listed in the Contract Scheduled of Items for leveling work, the quantities will be included in the appropriate ACP items.

Payment

00745.90 Payment - The accepted quantities of ACP incorporated into the Project, whether or not recycled materials are used, will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Level ____, _____ ACP	Ton
(b) _____ Asphalt in _____ ACP	Ton

In item (a), the following will be inserted in the blanks:

- The level of ACP (1, 2, 3, 4) will be inserted in the first blank.
- The type of ACP (3/4 inch, 1/2 inch, 3/8 inch) will be inserted in the second blank.
- The words "Lime Treated" will be inserted in the third blank when applicable.
- The words "in Leveling", "in Temporary", or "in Leveling and Temporary" will be inserted in the fourth blank when applicable.

In item (b), the performance graded asphalt binder will be inserted in the first blank. The types of ACP will be inserted in the second blank. This item applies to all asphalt used in ACP, including residual asphalt in RAP, RAS, or combined RAP and RAS. Substituted asphalt cement described in 00745.11(a) will be paid for under the asphalt specified in the Contract Schedule of Items.

00745

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.

No separate or additional payment will be made for:

- reconditioning existing roadway
- leveling work
- lime
- QC testing
- sawing, cleaning, and filling joints on bridge deck overlays

When indicated by other pay items in the Contract Schedule of Items, separate payment will be made for work described in 00745.42, 00749.91 and 00749.92.

When a panel consists of both temporary and permanent courses, payment for the entire panel will be based on the permanent course.

Anti-stripping asphalt cement additives will be paid for at the Contractor's actual documented costs with no percentage allowance or markup allowed. No additional payment will be made for anti-stripping additives or treatments that are not anti-stripping asphalt cement additives.

00745.95 Price Adjustments - The Composite Pay Factor (CPF), calculated according to 00165.40, 00745.16, and 00745.95, will be applied to the Contract unit price for pay items (a) and (b) of 00745.90 and to the applicable 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 00745.17 and 00745.95, the maximum CPF for material represented by less than three samples will be 1.0.

To accommodate the lot definition of 00745.02, interpret the upper specification limit (USL) and the lower specification limit (LSL) in 00165.40 to allow adjustments to a JMF according to 00745.16 without changing lots. Include all material from the original JMF and revisions of that JMF in the statistical analysis unless a change in the lot is required by 00745.02. If JMF target values are modified according to 00745.16, the CPF will be calculated in the following manner:

- The adjusted target value will be evaluated as zero with the USL and LSL representing the allowable tolerances of 00745.14. All sample test values for the changed constituents will be compared to the target for each subplot. The differences between the target values and sample test values are the adjusted sample test values for each subplot. These will be analyzed for determination of the pay factor for the constituent.

The Pay Factor (PF) for compaction will be:

Type/Method	PF	Maximum PF
Normal Pavement		
Control Strip Method.....		1.00
MAMD Method.....		1.05
Thin Pavement.....	1.00	
Other Areas.....	1.00	

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

Gradation Constituents			
All Aggregate Passing	3/4"	1/2"	3/8"
1 1/2"			
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 ACP constituents statistically evaluated will be eligible for a maximum PF of 1.05 (see 00165.50(b-1)), unless otherwise specified.

When the CPF is greater than 1.000 for material used in leveling courses for ACP, it will be reduced as follows:

$$\text{Reduction in CPF} = (\text{CPF} - 1) \times 0.5$$

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 formulas:

$$(\text{CPF} - 1) \times [(\text{JMF}\% \div 100 \times \text{Asphalt Unit Price}) + (\text{ACP Unit Price})] \times (\text{LQ}) = \underline{\hspace{2cm}}$$

Where:

JMF% is the asphalt cement % from the JMF

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 - Furnish all sealant materials for crack repair of flexible pavements that is 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.

Furnish 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 Equipment - 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 inches 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.

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 1 hour after placement of the sealant and refilling has been completed.

Measurement

00746.80 Measurement - The quantities of sealed cracks will be measured on either the length basis, or the weight basis.

Payment

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

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

No separate or additional payment will be made for required cleaning and routing.

Section 00748 - Asphalt Concrete Pavement Repair

Description

00748.00 Scope - This work consists of excavating and removing existing asphalt concrete surfaces, aggregate bases, and aggregate subbases and constructing new subbases, bases, and asphalt concrete surfaces to the lines and grades shown or directed.

Materials

00748.10 Materials - Furnish materials meeting the following requirements:

Aggregate Base	02630
Aggregate Subbase.....	00641.10(b)
Asphalt Concrete Pavement (ACP).....	00744 and 00745
Emulsified Asphalt Concrete (EAC).....	00735
Stone Embankment.....	00330.16
Subgrade Geotextile, Level B.....	02320
Subgrade Reinforcement Geogrid, Level B.....	02320
Water.....	00340

00748.16 Acceptance of Material - All material will be accepted by visual inspection by the Engineer. The Engineer may perform tests to verify that the materials meet the appropriate specifications.

Equipment

00748.20 Equipment - Provide appropriate equipment necessary to perform the work according to Sections 00320, 00330, 00340, 00350, 00620, 00641, 00735, 00744, and 00745.

Construction

00748.40 Excavation - Excavate and remove material to the lines and grades shown or directed. Dispose of the excavated material according to 00330.41(a-5).

00748.41 Cold Plane Pavement Removal - Remove the existing pavement to the depth, width, grade, and cross section as shown or directed. Perform cold plane pavement removal according to 00620.40.

00748.42 Geosynthetics:

(a) Geotextile - Place geotextile as shown.

(b) Subgrade Reinforcement Geogrid:

(1) Placement - Prepare the surface receiving geogrid to a smooth, uncompacted condition to the depth shown and as follows:

- Orient the geogrid rolls parallel to the roadway centerline.
- Unroll the geogrid in the same direction as aggregate base placement. If the geogrid shifts or becomes misaligned, realign it and anchor it according to the manufacturer's recommendations.

(2) Overlaps - Overlap the geogrid a minimum of 24 inches. Overlap the geogrid in the same direction as aggregate base placement with the preceding layer lapped on top of the following layer.

(3) Protection of Geogrid - Drive rubber tired equipment on the geogrid at no more than 5 mph. Drive tracked equipment on the geogrid only after placing a minimum of 6 inches of aggregate base on top of the geogrid. Do not turn or make sudden stops or starts on the geogrid or the aggregate base.

During installation cover the geogrid with the aggregate base as soon as possible. Do not leave uncovered for more than 5 calendar days.

(4) Repair - Repair or replace damaged or torn geogrid according to manufacturer's recommendations at no cost to the Agency.

00748.43 Backfill - Place the backfill to lines and grades shown or directed. Compact each layer of material until there is no reaction or yielding under the compactor.

00748.44 Asphalt Concrete - Place EAC or ACP to the lines and grades shown or directed. Compact the EAC according to 00735.46. Compact ACP according to 00744.49 and 00745.49(d), as applicable.

Measurement

00748.80 Measurement - The quantities of asphalt concrete pavement repair will be measured on the area basis, of surfacing area repaired to the full depth as shown. The surfacing area will be determined by horizontal measurements. In areas where directed to repair to a depth other than shown, the areas will be adjusted by converting to an equivalent number of square yards on a proportionate volume basis.

EAC and ACP will be measured according to 00735.80, 00744.80, and 00745.80, as applicable.

Payment

00748.90 Payment - The accepted quantities of asphalt concrete pavement repair will be paid for at the Contract unit price, per square yard, for the item " _____ inch Asphalt Concrete Pavement Repair".

The depth will be inserted in the blank.

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.

EAC and ACP will be paid for according to 00735.90, 00744.90, and 00745.90, as applicable.

No separate or additional payment will be made for excavation, cold plane pavement removal, geosynthetics, stone embankment, aggregate, and water.

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 Contract Schedule of Items according to 00749.91 and 00749.92, or when called for by the Special Provisions.

Materials

00749.11 Aggregate Base - Furnish aggregate base materials for base, foundation courses, leveling courses, and bedding meeting the requirements of Section 02630. If a designated size is not shown, or given, furnish either 1" - 0 or 3/4" - 0, as the Contractor elects.

00749.12 Asphalt Tack Coat - Furnish asphalt tack coat material meeting the requirements of Section 00730.

00749.13 Asphalt Concrete - Unless another class is shown, furnish Level 2, 1/2 inch ACP according to Sections 00744 and 00745, as applicable. 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.

00749.14 Concrete - Furnish commercial grade concrete meeting the requirements of Section 00440.

Equipment

00749.20 Equipment - Provide plant and equipment meeting the requirements of Section 00745.

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 00744.43(c) and 00745.46(c), as applicable, 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 allowed, 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 the following or as directed:

- Compaction to a specified density will not be required, regardless of thickness. Perform breakdown and intermediate rolling until the entire surface has been compacted with at least four coverages by the rollers. Perform additional coverages, as directed, to obtain finish rolling of the ACP.
- Along curbs and walls, on walks, irregular areas, and other areas not practically accessible to rollers conforming to 00744.24 or 00745.24, compact the mixture with small, self-propelled rollers, mechanical tampers, hot hand tampers, or hand rollers. On depressed areas a trench roller may be used, or cleated compression strips may be used under the roller to transmit compression to the depressed area.

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.

00749.47 Concrete - Construct concrete curbs according to the applicable provisions of Section 00759.

Measurement

00749.80 Measurement - Work performed under this Section will be measured by one of the methods described 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 according to the following:

- **Unit Basis** - Measurement will be the actual count of each location where the structure is constructed.

- **Area Basis** - Measurement will be the ground surface, limited to the neat lines of the structure as shown or directed.
- **Length Basis** - Measurement will be 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 00744.80 and 00745.80, as applicable. In addition, measurement will be made for extra costs of placing asphalt concrete in the structures if pay items are included in the Contract Schedule of Items.

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

Payment

00749.90 Payment - The accepted quantities of structures placed under this Section will be paid for at the Contract unit price, per unit of measurement, for the items listed in 00749.91 and 00749.92.

When earthwork is included as separate pay items, payment will be made according to 00330.90 through 00330.94 as appropriate.

When earthwork is not included as separate pay items, no separate or additional payment will be made for earthwork.

Aggregate will be paid for according to 00640.90 and 00641.90 as appropriate.

Payment for street connections, or the extra costs for them, which meet the criteria described in 00749.80 will be included in payment for the pavement items.

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

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 (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 items to be paid for under Method "B" are:

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 (c) includes raised traffic islands, traffic separators, and concrete curbs necessary for the islands.

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 for furnishing all equipment, labor, and incidentals necessary to complete the respective structures in place as specified.

Section 00754 - Plain Concrete Pavement Repair

Description

00754.00 Scope - This work consists of saw cutting and removing existing concrete pavement and constructing new plain portland concrete pavement repairs as shown and specified.

00754.01 Abbreviations:

SSD - Saturated Surface-Dry

SSFC - Stationary Side Form Construction

00754.02 Areas of Work - Locations of the areas for repair are as shown. Additional areas of repair may be required as determined by the Engineer.

00754.04 Preparing Conference - Supervisory personnel of the Contractor and any subcontractors 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

00754.10 Materials - Furnish materials meeting the following requirements:

Resin Bonded Anchors.....	00535
Bar Reinforcement	02510
Concrete Materials	02001
Curing Materials	02050
Epoxy and Nonepoxy Bonding Agents	02070
Epoxy and Nonepoxy Grouts	02080
Galvanizing	02530.70
Portland Cement Concrete Repair Materials.....	02015
Poured Joint Fillers.....	02440.30
Preformed Expansion Joint Filler	02440.10

00754.11 Classes of Concrete - If the time frame designated for opening traffic is less than 72 hours after concrete placement, provide Class HES4000 - 1 1/2 concrete designed to attain a minimum average compressive strength of 3,000 psi prior to allowing traffic on the concrete. Otherwise furnish Class 4000 - 1 1/2 paving concrete.

00754.13 Concrete Mix Designs - Prepare and submit either new mix designs or current mix designs for each class of concrete required according to Section 02001.

00754.15 Quality Control - Provide quality control according to Section 00165, Section 02001, and the following:

(a) Concrete Mixture - 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.

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

00754.16 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 and the MFTP.

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

(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 subplot. 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 Section 02001.

(d) Hardened Concrete - Cast and cure the test cylinders according to AASHTO T 23 in 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 cylinders at an ODOT certified laboratory.

(2) Actual Strength Test Value - The ASTV at 28 days is the average compressive strength of the three cylinders tested. If the compressive strength of a single test specimen varies by more than 10 percent 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 - Sample and test according to Section 00165 and 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 percent 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 00150.25.

If an ASTV falls below the $f'c$, the Contractor may submit a written plan within 3 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

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test results are suspect from definable external factors, the Engineer may allow an alternate method of acceptance.

00754.17 Spall Repair Material - For spall repair, furnish a PCC repair material meeting the requirements of Section 02015 except do not use products that contain magnesium phosphate. Use either "Rapid Setting" or "Very Rapid Setting" material.

00754.18 Bond Breaker - Bond breaker must be one of the following:

- Non-woven geotextile meeting the property requirements listed in Table 02320-4.
- Liquid curing compound evenly applied as a bond breaker in two applications, at a rate of 1 gallon per 130 to 165 square feet for each application, over the entire surface area.

Equipment

00754.20 Batch Plant - Provide batch plants according to 02001.40.

00754.21 Mixers - Provide mixers according to 02001.40.

For projects requiring Class HES concrete, mobile mixers may be used if the mixers conform to the following:

- The mixer is self-propelled and carries sufficient unmixed dry bulk cement, sand, coarse aggregate, admixtures, and water to produce a minimum of 6 cubic yards of concrete on site.
- The mixer provides positive measurement of cement being introduced into the mix by meter or counter.
- The mixer provides positive control of the flow of water into the mixing chamber. Water flow is readily adjustable to provide for minor variations in aggregate moisture.
- Each mixer is calibrated to automatically proportion and blend all components according to the mix design on a continuous or intermittent basis as required by the placing operation.

Perform a calibration and yield test on each mixer prior to the first placement to accurately proportion the specified mix. Use a written calibration procedure from the mixer manufacturer, a procedure provided by the agency or other written procedure acceptable to the agency. The calibration process may be witnessed by the Engineer. Provide the Engineer with information about the scheduled date, time and place for the calibration. Perform a new calibration when the source of materials changes, when the mixer undergoes a major repair, or when requested by the Engineer.

00754.22 Hauling Equipment - Use truck mixers to transport concrete. Provide hauling equipment conforming to AASHTO M 157.12 or AASHTO M 157.11.6.

00754.23 Paving Equipment - Provide paving equipment conforming to the following:

- 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.
- Capable of meeting the smoothness requirements.
- Approved by the Engineer.

00754.24 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.

00754.25 Smoothness Testing Equipment - Provide one 12 foot straightedge.

00754.26 Concrete Drills - Provide a drilling system consisting of drilling equipment and drilling supports that:

- Is capable of drilling holes of the required diameter and depth.
- Can produce holes parallel to the pavement surface and parallel to each other within a tolerance of $\pm 1/8$ inch.
- Can provide hole alignments at mid-depth of PCC pavement.

Labor

00754.30 Quality Control Personnel - In addition to the certified technicians required in 02001.50 provide and designate an individual to be present at the placement site at all times during concrete placements and who is authorized and responsible for acceptance and rejection of materials.

Construction

00754.40 Weather Limitations - Coordinate all operations involved in repairing 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. Stop placement when descending air temperature falls below 35 °F. Do not begin placement until the air temperature is 35 °F in the shade and rising and is forecast to remain above 35 °F.

Protect the pavement from weather damage. Protect unhardened PCC from precipitation with protective material. When PCC is placed during cold weather and the air temperature is forecast to drop below 33 °F, prevent the concrete from freezing for a minimum of 7 days after placement.

Remove and replace weather-damaged pavement at no additional cost to the Agency.

00754.41 Preparation:

(a) Removal of Existing Pavement - Remove full panels of existing concrete pavement full depth as shown or directed. A vertical full depth saw cut is required along all longitudinal joints and at transverse locations. Cut concrete through tie bars and dowels. Remove concrete pavement with equipment approved by the Engineer in a manner that does not damage remaining pavement or connections and allows for specified connections. Repair damage to the existing pavement due to the Contractor's operations, at the Contractor's expense, by extending the full depth repair to the satisfaction of the Engineer.

(b) Concrete Pavement Base Repair - Use material similar to existing base material or use commercial concrete. If concrete is used, place a bond breaker between the new concrete base and the new concrete pavement. If the repair is a nominal 2 inches deep or less, the repair may be accomplished by pouring the patch monolithically with the new concrete pavement, without a bond breaker. Cost of incidental base repair, leveling, or backfilling, up to a nominal 2 inches deep, will be included in the concrete pavement repair pay item. Base repair, leveling, and related backfilling of subbases or subgrade in excess of a nominal 2 inches will be paid for as concrete pavement base repair with quantities computed from bottom of slab downward to limits of removal. PPC repair material may be substituted for commercial grade concrete.

Compact unbound granular materials used in the base repair as directed. Allow concrete or substitutes to cure sufficiently to support necessary construction activities without yielding prior to continuing those activities. No further testing of pavement base material is required.

(c) Spall Repair Area - Saw cut the existing concrete pavement to a nominal depth of 2 inches. Remove existing concrete within the perimeter of the saw cut to a depth of 2.0 inches, or to sound concrete as determined by the Engineer. If jack hammers are used for removing pavement, they shall not weigh more than 30 pounds, and chipping hammers shall not weigh more than 15 pounds. Do not operate hammers at an angle greater than 45 degrees measured from the surface of the pavement. Any existing pavement that is to remain that has been damaged shall be repaired at the Contractor's expense.

(d) Preparation of Existing Concrete - Before placement of concrete, blow clean the existing concrete surfaces within the pour area with compressed air and dampen the area to be paved with a light application of water. If the area becomes dry before new concrete is placed, blow clean and dampen the area again.

00754.43 Placing Dowel Bars and Tie Bars:

(a) Dowel Bars - Provide smooth, round, epoxy coated dowel bars. Coat with plastic, heavy oil, or other approved material that will neither bond with nor be harmful to the PCC. Use a framework to place dowels that is continuous across the entire lane width, holds the dowels parallel with each other, holds the dowels parallel with the surface of the pavement, and holds the dowels parallel to the roadway centerline. For dowels placed across an expansion joint, use a dowel bar basket or other system of support that leaves no permanent incompressible members in place within the joint. Maximum alignment tolerance shall be 5 degrees or 3/16 inch in the length of the dowel. Place dowels within 3/8 inch of the center of the slab vertically.

Place dowel bars for joint contact at existing concrete pavement surfaces by drilling the existing concrete section and then inserting the dowel bars and grouting them in place. Drill the holes large and deep enough to insert the dowel bars with adequate epoxy or non-epoxy grout. Adjust hole locations to avoid damaging any existing reinforcement when drilling the holes. Blow the dowel bar holes clean with compressed air before grouting. Center the bar in the hole for the full length of embedment before grouting. Pump the grout into the hole around the bar so the back of the hole will be filled first. Do not allow blocking or shimming to impede the flow of the grout into the hole. If dams are needed, place them at the front of the holes to confine the grout. Place the dams to permit the escape of air without leaking grout. Do not remove dams until grout has cured in the hole.

(b) Tie Bars - Provide epoxy coated tie bars and place them for contact-type longitudinal joints by one of the following methods:

- By drilling the hardened concrete section and then inserting the tie bars as resin-bonded anchors in accordance with construction and testing procedures in Section 00535.
- By inserting the tie bars into the plastic slipformed concrete before vibrating and finishing the concrete. The tie bars may be bent before insertion. Replace any loose tie bars by drilling and grouting, as described above, at no additional cost to the Agency.
- By using threaded mechanical splice couplers from the QPL. Submit splices for approval before using. Rebar splices shall be:
 - Accompanied by manufacturer's quality compliance certificate according to 00165.35.
 - Installed according to manufacturer's recommendations.

00754.44 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%

00754.45 Mixing Concrete:

(a) General - Mix the concrete in a batch plant mixer, truck mixer, or mobile mixer and the following:

- 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 retemper 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.

00754.46 Placing Concrete:

(a) General - Perform the strike-off, consolidation, final floating and surface finishing according to the following:

- Vibrate throughout the concrete until it is uniformly consolidated. Do not segregate.
- 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 00754.49. Keep the surface free from laitance, soupy mortar, marks or irregularities.
- Finish the surface according to 00754.49.

Correct all damage to the subgrade or base due to the Contractor's operations, at no additional cost to the Agency, to the satisfaction of the Engineer.

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

(c) 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 00754.43 and 00754.48.

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

- Is not in place within 90 minutes after being mixed.
- Has begun to take an initial set before placement.

(e) Hand Operated Equipment - Use shovels to hand spread and distribute the concrete. Do not use rakes. Do not foul the concrete with foreign matter, or disturb joint devices during such operations. Furnish hand operated mechanical vibrators satisfactory to the Engineer. Use the vibrators to consolidate the concrete pavement at least 6 feet each side of construction and expansion joints and all other areas as directed.

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

00754.48 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.

Construct all joints which contain preformed filler 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. Saw longitudinal weakened plane joints at the earliest possible time following placement of the concrete to prevent uncontrolled cracking without damaging the pavement or joint. 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.

(c) Construction Joints - Construct construction joints when there is an interruption of 30 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) Transverse Contraction Joints - Form transverse contraction joints by sawing to the required dimensions shown on the Plans. Saw transverse contraction joints at the earliest possible time following placement of the concrete to prevent uncontrolled cracking without damaging the pavement or joint. Repair any damage to the curing material during the sawing operations immediately after the sawing is completed.

(e) Sealing Sawed Joints - Fill sawed longitudinal weakened plane joints and transverse contraction joints with poured joint filler. Thoroughly clean joints at the time of sealing. Ensure the curing period for joints is complete before allowing construction equipment and vehicles on the pavement.

00754.49 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 00754.56(a). Lap each successive check with the previous check path by at least half the length of the straightedge.

(a) 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 1/8 inch to 3/16 inch. Randomly space the markings from 1/2 inch to 1 1/4 inches as approved. Avoid overlaps of the texturing. Construct markings either perpendicular or parallel to the roadway centerline to match the adjacent concrete pavement textured finish.

With approval of the Engineer, an astroturf or broom finish may be used in place of tining on roads to receive an overlay.

(b) Transverse Profile - Match the surface of the fresh concrete in the transverse direction to the surface of the existing concrete at the ends of the patch. Taper into existing pavement ruts in the first and last 10 feet to 20 feet to provide a transverse surface finish for the remainder of the patch meeting the requirements of this section.

00754.52 Edge Tooling and Filling - Tool edges at longitudinal joints and 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 all 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 a full panel length. Low spots exceeding 1/4 inch in depth, if in hardened concrete, may be filled with an epoxy grout, provided the filling is neat and blends inconspicuously with adjoining concrete. Prepare the area according to the grout manufacturer's recommendations.

00754.53 Curing Concrete - Immediately after the final floating, surface finishing and edging have been completed, and while the concrete surface is still moist, cover and cure the entire exposed surface of the newly placed concrete for at least 72 hours. If the specifications require opening the lanes to traffic in less than 72 hours, remove curing covers just prior to opening to traffic. Use one of the following provisions:

(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. Liquid membrane-forming compounds are not allowed when an asphalt concrete layer will be placed on the new concrete.

(b) Other Coverings - Apply clear or white polyethylene film or insulated curing blankets as a waterproof and moisture-proof covering. Place the film or blankets beyond the edge of the repaired areas and weight to hold in position. Do not mar the concrete with the covering.

00754.54 Longitudinal Pavement Cracks - Remove and replace all patches that show longitudinal cracking or do not bond at no additional cost to the Agency.

00754.55 Spall Repair - In spalled areas, remove the existing pavement according to 00754.41(c). The repair limits shall extend beyond the spalled area a minimum of 3.0 inches. Use only rectangular or square repair shapes. Prepare the repair area according to 00754.41(d) and the PCC repair material manufacturer's recommendations, then apply a coat of epoxy grout or bonding agent to all vertical surfaces and place PCC repair material before grout dries. When a spall repair is placed directly against an adjacent longitudinal joint, place a bond breaker between the existing concrete and the area to be patched. Mix and place PCC repair material according to the manufacturer's recommendation. Use shovels to hand spread and distribute the concrete. Do not use rakes. Do not contaminate the concrete with foreign matter. Cure PCC repair material according to the manufacturer's recommendation.

00754.56 Surface Tolerance, Testing, and Correction - The surface of finished pavement shall not deviate from longitudinal and transverse smoothness more than the limits identified below. Perform straightedge testing under the supervision of the Engineer as soon as the hardness of the concrete permits.

(a) Straightedge Testing and Tolerance - Test pavement surface longitudinal and transverse smoothness with a 12 foot straightedge. The extent of the testing will be determined by the Engineer. The pavement surface shall not deviate from the straightedge at any point by more than 1/8 inch, except the transverse surface at the patch ends may vary as required in 00754.49(b).

(b) Correcting Deficiencies - Correct all segments that exceed the requirements of 00754.56(a) by one of the following methods:

- (1) Remove the non-specification concrete pavement as determined by the Engineer and replace with specification concrete pavement.
- (2) Profile with an abrasive grinder equipped with a cutting head comprised of multiple diamond blades.

Retest according to 00754.56(a). Perform all corrective work at no additional cost to the Agency, including traffic control.

Maintenance

00754.60 Protection of Concrete - Repair or replace any part of the pavement damaged by traffic or damaged from any other causes before its official acceptance, according to 00170.80. Do not operate construction equipment or 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 3,000 psi as determined by testing at least two cylinders cured according to AASHTO T 23 (field cure) and tested according to AASHTO T 22.
- (c) Approval is given by the Engineer before opening to traffic.
- (d) 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.

00754.61 Protection of Shoulders - A portion of the shoulder adjacent to the proposed patch, may be removed as necessary to ensure proper forming at the edge of the patch. Prior to opening to traffic, the disturbed shoulder area shall be replaced with material types and thickness similar to the existing shoulder, compacted, and restored to the existing line and grade. Include all cost of the shoulder replacement in the price bid for Concrete Pavement Repair.

Measurement

00754.80 Measurement - The quantities of work performed under this Section will be measured according to the following:

- (a) **Concrete Pavement Repair** - Concrete pavement repair will be measured on the area basis and will be determined by measuring the width and length of each separately constructed panel of pavement. The width is the measured edge-to-edge width on the surface of the pavement, perpendicular to centerline. The length is the measurement from end-to-end of pavement along the center line of the roadway, including the length of the bar lap splices.

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.

- (b) **Spall Repair** - Spall repair will be measured on the area basis and will be determined by measuring the width and length of each separate repair. The width is the measured edge-to-edge width on the surface of the pavement. The length is the measurement from end-to-end of pavement along the center line of the roadway.

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

Payment

00754.90 Payment - The accepted quantities of work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Plain Concrete Pavement Repair.....	Square Yard
(b) Concrete Pavement Spall Repair.....	Square Yard
(c) Concrete Pavement Base Repair.....	Square Yard

Item (a) includes saw cutting, removing concrete pavement, preparing the base, and preparing the cut edges.

Item (b) includes sawing and removing concrete.

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.

Section 00755 - Continuously Reinforced Concrete Pavement

Description

00755.00 Scope - This work consists of constructing continuously reinforced portland concrete pavement with metal reinforcement, and associated reinforced concrete pavement as shown and specified.

00755.01 Abbreviations:

GPT	-	Graphic Profile Test
LSL	-	Lower Specification Limit
PI	-	Profile Index
SSD	-	Saturated Surface-Dry
SSFC	-	Stationary Side Form Construction
SSTV	-	Sublot Strength Test Value
USL	-	Upper Specification Limit

00755.04 Aggregate Production and Prepaving 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 Engineer, at a mutually agreed time, to discuss methods of accomplishing aggregate production.

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

Materials

00755.10 Materials - Furnish materials meeting the following requirements:

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

00755.11 Classes of Concrete - Furnish Class 4000 - 1 1/2 paving concrete unless otherwise shown or indicated in the Special Provisions.

00755.13 Concrete Mix Designs - Prepare and submit either new mix designs or current mix designs for each class of concrete required according to Section 02001.

00755.15 Quality Control - Provide quality control according to Section 00165, Section 02001, and the following:

(a) Concrete Mixture - 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.

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

00755.16 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 Agency 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 subplot. 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 Section 02001.

(d) Hardened Concrete - Acceptance of hardened concrete will be based on statistical analysis, according to Section 00165, of the compressive strength tests of the cylinders cast by the QCT. Test the cylinders at an ODOT certified laboratory.

(1) Random Sampling and Testing - Obtain samples from each subplot on a random basis. Cast a minimum of 3 cylinders. Cast and cure the test specimens according to AASHTO T 23 in 6 inch x 12 inch single-use plastic molds and test at 28 days according to AASHTO T 22.

(2) Lots - A lot is the total quantity of concrete produced for each mix design with the same specification limits of all constituents in each stage. Slipformed and non-slipformed concrete will be sampled and evaluated as separate lots.

In lots with less than three sublots, the valid individual cylinders each will be considered a subplot and statistically evaluated. Obtain at least one set of cylinders for each lot.

(3) Sublot Strength Test Value - The average of the 28 day compressive strength tests of the three cylinders will constitute the SSTV.

Any cylinders in a subplot showing definite evidence (other than low strength) of improper sampling, molding, curing or testing will be discarded, and the average of the strengths of the

remaining cylinders will constitute the SSTV. If all three cylinders comprising a subplot are discarded, the lot will be evaluated on the basis of the reduced number of sublots.

If the compressive strength of the lowest strength cylinder in a subplot is lower than the average strength of the remaining cylinders in that subplot by more than 10 percent, that cylinder strength will be discarded and the average of the remaining cylinders will comprise the SSTV.

(4) Quality Level Analysis - Statistically analyze the SSTV's and determine the PF for each lot of concrete, except that there will be no USL, and the LSL will equal the specified design strength.

Equipment

00755.20 Batch Plant - Provide batch plants according to Section 02001.

00755.21 Mixers - Provide mixers according to Section 02001 except mix concrete in the batch plant mixer. Truck mixers may be used only as allowed in 00755.45.

00755.22 Hauling Equipment - Transport concrete in non-agitating equipment. Truck mixers may be used to transport concrete only as allowed in 00755.45. Hauling equipment shall conform to AASHTO M 157.12 or AASHTO M 157.11.6 when allowed.

00755.23 Paving Equipment - Provide self-propelled paving machines conforming 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 00755.49(a).
- Equipped with a positive interlock system to stop all vibration and tamping elements when the forward motion of the machine is interrupted.
- For projects that have more than 1,000 feet of concrete paving, equipped with an electronic monitoring device that:
 - Is near the operator's controls visible to the paver operator and Engineer.
 - Operates continuously while paving.
 - Displays the operating frequency of each individual internal vibrator for both manual and automatic sequencing.
 - Records the time of day, station location, paver track speed and the operating frequencies.

00755.24 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.

00755.25 Smoothness Testing Equipment - Provide all equipment and supplies for determining smoothness according to 00755.55.

(a) Straightedge - Provide two 12 foot straightedges.

(b) Profilograph - Provide a California type profilograph computerized or not computerized, complete with recorder, for determining the profile index of the pavement according to ODOT TM 770.

Have the profilograph on the Project, calibrated, in good working condition and ready for operation before construction of any concrete pavement begins. Provide a competent operator experienced in the operation of the equipment.

(c) 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 shall be able to generate the equivalent California-type profilograph plot and values according to 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.

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

00755.26 Concrete Drills - Provide a drilling system consisting of drilling equipment and drilling supports that:

- Is capable of drilling holes of the required diameter and depth.
- Can produce holes parallel to the pavement surface and parallel to the longitudinal joint within a tolerance of $\pm 1/8$ inch.
- Can provide hole alignments at mid-depth of PCC pavement.

Labor

00755.30 Quality Control Personnel - Provide technicians having CAgT, CSTT, CCT, and QCT technical certifications.

Additional Contractor quality control responsibilities include the following:

- 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.
- 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.

Construction

00755.40 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 allowed to proceed.

Do not place PCC during periods of rain. Do not place PCC on frozen bases. Stop placement when descending air temperature falls below 35 °F. Do not begin placement until the air temperature is 35 °F in the shade and rising and is forecast to remain above 35 °F.

Protect the pavement from weather damage. Protect unhardened PCC from precipitation with protective material. When PCC is placed during cold weather and the air temperature is forecast to drop below 33 °F, prevent the concrete from freezing for a minimum of 7 days after placement.

Remove and replace weather damaged pavement at no additional cost to the Agency.

00755.41 Preparation of Base:

(a) Condition - Before paving operations begin, bring the base on which the pavement is to be constructed to a finished condition required by the Specifications.

Clean the surface of all loose material. Remove all pooling and flowing water. Place concrete on existing and new asphalt only when the asphalt surface is less than 90 °F.

(b) Area - Bring the full width and length of the area on which the tracks of the paving equipment are to operate to the density and surface tolerance required of the base material.

00755.42 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 pay all costs to implement the change. Any changes require Engineer's approval.

00755.43 Placing Reinforcement:

(a) General - Place reinforcement as shown and specified. The Contractor's equipment hauling reinforcement to the site will not be allowed on the concrete subgrade or base.

The reinforcement shall be straight, clean, and free of scale or other matter which would interfere with its bonding to the concrete.

Place the reinforcement on support devices that maintain it in specified position during concrete placement. The use of tube feeding to place rebar in plastic concrete mix will not be allowed.

On areas where traffic is operating adjacent to concrete paving operations, do not lift reinforcement from the surface or place on supporting devices more than 2 hours before placing the concrete, unless otherwise approved by the Engineer.

(b) Deformed Bar Reinforcement - Tie or clip at every other transverse bar intersection, as a minimum, in a manner that does not allow for displacement. Tie or clip every lap splice as shown.

(c) Welded Wire Fabric - Store, handle and place with care to prevent distortion.

(d) Support Devices - Support devices used to hold reinforcement in proper position in the concrete shall:

- Hold the reinforcement within 1/2 inch of the vertical position shown.
- Not displace more than 3 cubic inches of concrete when embedded in the slab.

Obtain approval of the proposed support devices before use.

If concrete placement operations displace the reinforcement, stop production and place additional support devices.

(e) Tie Bars - Place tie bars required for contact-type longitudinal joints by one of the following methods:

(1) By drilling the hardened concrete section and then inserting and grouting the tie bars into place. Drill the holes large and deep enough to insert the tie bars with adequate epoxy or nonepoxy grout. Take care not to damage the reinforcement when drilling the holes. Drill after the concrete attains enough strength so no damage to the concrete is caused by the drilling. Replace loose tie bars at no additional cost to the Agency.

(2) By inserting the tie bars into the plastic slipformed concrete before vibrating and finishing the concrete. The tie bars may be bent before insertion. Replace any loose tie bars by drilling and grouting, as described in 00755.43(e-1), at no additional cost to the Agency.

(3) By using threaded mechanical splice couplers from the QPL. Submit splices for approval before using. Rebar splices shall be:

- Accompanied by manufacturer's quality compliance certificate according to 00165.35.
- Installed according to manufacturer's recommendations.

(f) Dowel Bars - Place dowel bars for joint contact at existing concrete pavement surfaces by drilling the existing concrete section and then inserting the dowel bars and grouting them in place. Drill the holes large and deep enough to insert the dowel bars with adequate epoxy or nonepoxy grout. Adjust hole locations to avoid damaging any existing reinforcement when drilling the holes. Blow the dowel bar holes clean with compressed air before grouting. Center the bar in the hole for the full length of embedment before grouting. Pump the grout into the hole around the bar so the back of the hole will be filled first. Do not allow blocking or shimming to impede the flow of the grout into the hole. If dams are needed, place them at the front of the holes to confine the grout. Place the dams to permit the escape of air without leaking grout. Do not remove dams until grout has cured in the hole.

00755.44 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 - Batch materials according to 02001.40.

00755.45 Mixing Concrete - Mix the concrete according to 02001.40. Mix the concrete in a batch plant mixer, except truck mixers may mix and deliver concrete only to areas inaccessible to paving equipment.

00755.46 Placing Concrete:

(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 damage to the subgrade or base due to the Contractor's operations to the satisfaction of the Engineer at no additional cost to the Agency. 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, except when 00755.50 applies.

(c) Spreading and Finishing Construction - Except for concrete pavement to be placed and finished at locations inaccessible to slipform paving equipment, place the concrete with slipform paving equipment designed to spread, consolidate, screed, and float-finish the plastic concrete in one complete pass of the machine to provide a dense and homogeneous pavement surface with a minimum of hand finishing. Use hand screeding and float finishing only on small irregular areas.

Consolidate the plastic concrete by internal vibration with transverse vibrating units located within the specified thickness of pavement sections for the full width of pavement. A series of equally spaced longitudinal vibrating units may be used to supplement or replace the transverse vibrating units.

Maintain the frequency of vibration of each vibrating unit above 7,500 cycles per minute. Maintain the frequency or amplitude of vibration to consolidate the plastic concrete along the entire length of the vibrating unit and for a distance of at least 1 foot. Vary the frequency or vibration of amplitude proportionately with the rate of travel to result in a uniform density and air content.

Horizontally space vibrators according to the manufacturer's recommendations or not more than 18 inches, center-to-center, whichever is less. Do not exceed a 9 inch space from the outer edge of the pavement to the outside vibrator.

(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, the vibratory and tamping elements shall also be stopped immediately. Apply no external force to the paver.

(e) 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 00755.43 and 00755.48.

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

- Is not in place within 1 hour after being mixed.
- Has begun to take an initial set before placement.
- Has been retempered with water.

(g) Protect Surface - Equip supports of the slipform paver, and other equipment which ride on previously placed pavement to meet the requirements of 00755.60, to prevent marring, edge breaking or chipping of the previously placed pavement.

When concrete is placed adjacent to an existing pavement, equip that part of the equipment which is supported on the existing pavement with protective pads on crawler tracks or use rubber-tired wheels. Offset the track or wheels to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge.

(h) Hand Operated Equipment - Use shovels, not rakes, to hand spread and distribute the concrete. Do not foul the concrete with foreign matter, or 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 each side of construction and expansion joints and any other areas as directed.

(i) Illumination - During hours of darkness, adequately illuminate work areas at no additional cost to the Agency.

00755.47 Test Strip - At the beginning of paving operations, construct one initial test strip of concrete pavement at least 0.1 mile, but not more than 0.2 mile in length at the specified paving width. Use the same equipment for the remainder of the paving. Do not perform further paving until the test strip is evaluated according to 00755.55. 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 00755.55.

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 and construct additional test strips at no additional cost to the Agency.

The Engineer may waive the initial test strip if the Contractor is proposing to use a batch plant mixer and paving equipment that were satisfactorily used on a Department project within the preceding 12 months and the mixer hasn't been altered or moved.

00755.48 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.

Construct all joints at right angles to the surface of the pavement. 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 - 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, 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. Saw longitudinal weakened plane joints at the earliest possible time following placement of the concrete to prevent uncontrolled cracking without damaging the pavement or joint. 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 45 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.

(1) Continuously Reinforced Pavement - Furnish a self-supported working platform at each construction joint. This working platform shall be at least 4 feet wide and long enough to span the entire width of the pavement panel being constructed. Construct and support the platform so it does not rest upon or touch the reinforcing steel. Have the workers use this platform when working in the area around construction joints and do not walk on the reinforcing steel. Remove any debris or spilled concrete at and beyond the joint, and support the reinforcement in proper position.

Form construction joints with a special header board. Take care when forming construction joints to assure that the reinforcement and its supports are not displaced, distorted or otherwise disturbed. When concrete placement resumes, remove the header board so neither the reinforcement nor the bond between the reinforcement and the previously placed concrete is disturbed.

(2) Other Pavements - 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) Terminal Expansion Joints - Locate terminal expansion joints at the ends of runs of continuously reinforced concrete pavement and construct to the dimensions and details shown.

The concrete in sleeper slabs shall conform to 00755.11. The steel reinforcement shall conform to Section 02510.

Vibrate concrete in sleeper slabs until it is completely consolidated and the excavations are completely filled. Construct sleeper slabs at least 24 hours before paving operations, unless otherwise allowed. Cure the surfaces of sleeper slab concrete according to 00755.53 until covered with concrete pavement.

00755.49 Surface Finishing - After the concrete has been given a preliminary finish by the finishing devices in the slipform paving equipment, 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 00755.55(a). Lap each successive check with the previous check path by at least half the length of the straightedge. This longitudinal checking and correction on areas to be graphically profiled will be waived if it is successfully demonstrated that a pavement surface is otherwise produced which conforms to 00755.55(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 wide tines spaced 3/4 inches apart that will mark the finished surface to a depth of 1/8 to 3/16 inch without tearing the surface. Avoid overlaps of the texturing. Texture the surface parallel to the roadway centerline and full roadway width.

00755.50 Stationary Side Form Construction - Consolidate and finish according to 00755.51.

(a) Mandatory SSFC - Use stationary side form construction on the standard reinforced concrete pavement at the ends of structures.

(b) Optional SSFC - With the approval of the Engineer, pavement may be constructed between stationary side forms in:

- Areas inaccessible to slipform paving equipment.
- Irregular areas.
- Short sections of pavement which are necessary to facilitate traffic movement.

00755.51 Modification of Strike-off, Consolidation, Final Floating, and Surface Finishing -

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 allowed 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 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 00755.49. Keep the surface free from laitance, soupy mortar, marks or irregularities.
- Finish the surface according to 00755.49.

00755.52 Edge Tooling and Filling - Tool edges at transverse joints and longitudinal 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.

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, provided the filling is neat and blends inconspicuously with adjoining concrete. Prepare the area according to the grout manufacturer's recommendations.

00755.53 Curing Concrete - Immediately after the final floating, surface finishing and edging have been completed, and while the concrete surface is still moist, cover and cure the entire exposed surface of the newly placed concrete for at least 72 hours according to one of the following provisions:

(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 the covering 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 equivalent to the sheeting and use:

(1) Polyethylene Film - Sheeting shall be clear or white.

(2) Waterproof Paper - Transverse laps shall be at least 18 inches, and cement longitudinal seams.

(3) Cotton or Jute Mats - Before placing, saturate the mats with water and keep fully wetted during the curing period.

00755.54 Longitudinal 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 cracks which are visible without magnification will be considered unacceptable and be repaired or removed as determined by the Engineer. Perform all remedial work at the no additional cost to the Agency.

00755.55 Surface Tolerance, Testing, and Correction - The surface of finished pavement shall not deviate from longitudinal and transverse smoothness more than the prescribed limits. Perform straightedge testing and graphic profile testing under the supervision of the Engineer with equipment furnished and operated by the Contractor as soon as the hardness of the concrete permits.

(a) Straightedge Testing and Tolerance - Longitudinal and transverse smoothness testing of the pavement surface shall be done 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 00755.55(b).

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

(1) General - Test the longitudinal surface of all traffic lanes, ramps, shoulders and bridges for smoothness by the graphic profile method according to ODOT TM 770. Before paving

commences on the Project, demonstrate the profilograph or 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 ramps, 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 00755.95.

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 00755.47. 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 profilograph or 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 joints for 12 foot wide lanes and 4 feet from each edge and longitudinal joints for 14 foot wide lanes. The intent is to provide a profile in each vehicle wheel path. Take profiles on transition areas of entrance and exit ramps 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 00755.55(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:

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

* Report to the nearest 0.01 mile

(c) Correcting Deficiencies - Should testing described in 00755.49, 00755.51, and 00755.55 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 00755.49 or 00755.51 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 00755.51 or 00755.55(a) are not met, correct according to 00755.55(c-2-a) or 00755.55(c-2-b) and retest.

(2) Failure To Meet Graphic Profile Requirements - Correct any segment or partial segment that exceeds the requirements of 00755.55(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 - Remove the non-specification concrete pavement as determined by the Engineer and replace with specification concrete pavement.

b. Grind - Profile with abrasive grinders, 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 00755.49(b), by transverse sawing with diamond blade saws.

Retest their entire length, according to 00755.55(b), all segments requiring corrective work with the profilograph or profilometer under the supervision of the Engineer. Perform all corrective work and graphic profiling, including traffic control, at no additional cost to the Agency.

00755.56 Pavement Thickness - Construct the pavement to the thickness shown. Pavement not so constructed will be subject to replacement according to 00755.57, or to payment at adjusted prices according to 00755.93.

(a) Sticking Measurements - Determine conformance with minimum thickness requirements by random sticking measurements of the plastic concrete according to ODOT TM 775 under the Engineer's observation. Report thickness to the nearest 0.1 inch.

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. When directed, take one sticking measurement at a randomly

selected location in each unit and partial unit. Record measurements to the nearest 0.1 inch. Take the measurements:

- After consolidation and screeding and before the float finish.
- No closer than 2 feet from the panel edges.
- Within 10 feet longitudinally and 1 foot transversely from the calculated random location determined by the Engineer.

If a sticking is not obtained for a unit or a partial unit, or is not available to represent the area of pavement remaining after the limits of pavement over 1.0 inch deficient is determined, the measurement will be assumed to be the same as the preceding or following sticking measurement, that is nearest in distance.

(b) Thickness 0.5 Inch Deficient - If a sticking 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 according to AASHTO T 24 and repair core holes as directed, at no additional cost to the Agency. 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 sticking measurements.

(1) Corrective Grinding Areas - If corrective grinding required by 00755.55(c) is performed at a sticking measurement site, obtain a core at the sticking 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 00755.55 is 7.0 inches per mile or less in each wheel path, a core is not required after corrective grinding is performed at a sticking measurement site within the segment or partial segment represented by the profile indexes.

b. Profile Index Greater 7.0 Inches Per Mile - If an original graphic profile index for a segment or partial segment determined by 00755.55 is more than 7.0 inches per mile for a wheel path, obtain a core, after corrective grinding has been performed, at a sticking measurement site within the segment or partial segment represented by the profile indexes if the sticking measurement is the specified depth or less.

(2) Cores Requested By Contractor - If the Contractor believes that a sticking measurement or a core 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 sticking measurement or core site in question and the same distance from centerline. The replacement core measurement will replace the original sticking or core measurement.

(d) Thickness Over 1.0 Inch Deficient - If a sticking measurement shows pavement over 1.0 inch deficient, obtain a core at the sticking measurement site. If this core, or a core determined by 00755.56(c-1), 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 00755.57 or no payment under 00755.93.

When it is suspected by the Engineer that the pavement in the adjacent travel lanes 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 lanes 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.

00755.57 Deficient Pavement - Remove and replace pavement deficient in thickness by more than 1.0 inch, according to 00755.56(d), at no additional cost to the Agency. If allowed 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.

00755.58 Terminal Anchors - Furnish concrete for anchors according to 00755.11. Furnish steel meeting the requirements for standard pavement reinforcement as shown.

Vibrate the concrete in anchors until it is consolidated and the excavations are filled. Construct anchors at least 24 hours before paving operations. Keep the surfaces of anchor concrete moist and clean until covered with pavement concrete.

00755.59 Flexible to Rigid Pavement Transition Systems - Furnish the concrete in pavement transition systems according to 00755.11. Furnish steel meeting the requirements for standard pavement reinforcement as shown.

Vibrate the concrete in pavement transition systems until it is consolidated and the excavations are filled. Construct pavement transition systems at least 24 hours before paving operations.

Maintenance

00755.60 Protection of Concrete - 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.

The maturity method, AASHTO T 325, may be used to estimate concrete strength for opening pavement to construction traffic. Install at least two maturity thermocouples for each day's placement in areas where the maturity method will be used for early opening. Install the thermocouples near the day's final placement for areas being evaluated for early opening.

When the maturity method is used, the Engineer may verify the maturity method with strength specimens. Establish a new strength-maturity relationship if strength specimens deviate more than 10 percent from the maturity-estimated strengths. Suspend use of the maturity method for opening pavements to traffic when the strength-maturity relationship deviates by more than 10 percent until a new strength-maturity relationship is established.

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 percent of the specified 28 day strength as determined by testing at least three cylinders cured according to AASHTO T 23 (field cure) and tested according to AASHTO T 22.

(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 00755.55.

Measurement

00755.80 Measurement - The quantities of concrete pavement will be measured on the area basis. 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.

The quantities of terminal anchors will be measured on the length basis, along the center line of each anchor as constructed.

Payment

00755.90 Payment - The accepted quantities of work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Continuously Reinforced Concrete Pavement	Square Yard
(b) Continuously Reinforced Concrete Pavement ___ Inches Thick	Square Yard
(c) Reinforced Concrete Pavement	Square Yard
(d) Reinforced Concrete Pavement ___ Inches Thick	Square Yard
(e) Terminal Anchors	Foot
(f) Flexible to Rigid Pavement Transitions	Each

In items (b) and (d), the thickness of the pavement will be inserted in the blank when more than one thickness is required under the Contract.

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.

No separate or additional payment will be made for splices in the terminal anchors required due to staged construction.

00755.92 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:

$$\text{Price Adjustment} = 0.3 \times (\text{PF} - 1) \times \text{Unit Price}$$

00755.93 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 00755.56, 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 allowed by the Engineer to remain in place under the provisions of 00755.57.

00755.95 Bonus Payment for Smoothness - A bonus payment of up to 1.5 percent will be made to the Contractor for each 0.1 mile segment or partial segment of pavement except shoulders, as determined in 00755.55(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 00755.55(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 Contract Schedule of Items

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
SSD	-	Saturated Surface-Dry
SSFC	-	Stationary Side Form Construction
SSTV	-	Sublot Strength Test Value
USL	-	Upper Specification Limit

00756.04 Aggregate Production and Preparing 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 Engineer, at a mutually agreed time, to discuss methods of accomplishing aggregate production.

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

Materials

00756.10 Materials - Furnish materials meeting the following requirements:

Bar Reinforcement	02510
Concrete Materials	02001
Curing Materials	02050
Epoxy and Nonepoxy Bonding Agents	02070
Epoxy and Nonepoxy 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 - Furnish Class 4000 - 1 1/2 paving concrete unless otherwise shown or indicated in the Special Provisions.

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.

00756.15 Quality Control - Provide quality control according to Section 00165, Section 02001, and the following:

(a) Concrete Mixture - 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.

(b) Records - Deliver all batch tickets, water-cement ration calculations, and all other records required 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 Agency 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 subplot. 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 Section 02001.

(d) Hardened Concrete - Cast and cure the test specimens according to AASHTO T 23 in 6 inch x 12 inch 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 - The ASTV at 28 days is the average compressive strength of the three cylinders tested. If the compressive strength of a single test specimen varies by more than 10 percent 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 percent 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 00150.25.

If an ASTV falls below the $f'c$, the Contractor may submit a written plan within 3 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.

Equipment

00756.20 Batch Plant - Provide batch plants according to Section 02001.

00756.21 Mixers - Provide mixers according to Section 02001 except mix concrete in the batch plant mixer. Truck mixers may be used only as allowed in 00756.45.

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

00756.23 Paving Equipment - 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).
- Equipped with a positive interlock system to stop all vibration and tamping elements when the forward motion of the machine is interrupted.
- For projects that have more than 1,000 feet of concrete paving, equipped with an electronic monitoring device that:
 - Is near the operator's controls visible to the paver operator and Engineer.
 - Operates continuously while paving.
 - Displays the operating frequency of each individual internal vibrator for both manual and automatic sequencing.

- Records the time of day, station location, paver track speed and the operating frequencies.

(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. The rate of vibration shall be not less than 3,500 cycles per minute for surface vibrators and shall be not less than 7,000 cycles per minute for internal vibrators 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 of them. 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) Profilograph - When required, provide a California type profilograph, computerized or not computerized, complete with recorder for determining the profile index of the pavement according to ODOT TM 770.

Have the profilograph on the Project, calibrated, in good working condition and ready for operation before construction of any concrete pavement begins. Provide a competent operator experienced in the operation of the equipment.

(c) 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 shall also be able to generate the equivalent California-type profilograph plot and values according to 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.

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

Labor

00756.30 Quality Control Personnel - Provide technicians having CAgT, CCT, CSTT, and QCT technical certifications.

Additional Contractor quality control responsibilities include the following:

- 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.
- 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.

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 allowed 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 7 days after placing.

Remove and replace weather damaged pavement at no additional cost to the Agency.

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.

The base shall be moist before the concrete is placed. When the base is a treated base the surface shall be clean and free of all loose material. Place concrete on existing and new treated base only when the surface temperature is less than 90 °F. If water is used for cooling, remove all excess water standing in pools or flowing on the surface before placing concrete.

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 pay all costs to implement the change. Any changes require the Engineer's approval.

00756.43 Placing Dowel Bars and Tie Bars:

(a) Dowel Bars - Provide smooth, round, epoxy coated dowel bars. Coat with plastic, grease, heavy oil, or other approved material that will neither bond with nor be harmful to the PCC. Use a framework to place dowels that is continuous across the entire lane width, holds the dowels parallel with each other, holds the dowels parallel with the surface of the pavement, and holds the dowels parallel to the roadway centerline. For dowels placed across an expansion joint, use a dowel bar basket or other system of support that leaves no permanent incompressible members in place within the joint. Maximum alignment tolerance shall be 5 degrees or 3/16 inch in the length of the dowel. Place dowels within 3/8 inch of the center of the slab vertically.

Place dowel bars for joint contact at existing concrete pavement surfaces by drilling the existing concrete section and then inserting the dowel bars and grouting them in place. Drill the holes large and deep enough to insert the dowel bars with adequate epoxy or nonepoxy grout. Adjust hole locations to avoid damaging any existing reinforcement when drilling the holes. Blow the dowel bar holes clean with compressed air before grouting. Center the bar in the hole for the full length of embedment before grouting. Pump the grout into the hole around the bar so the back of the hole will be filled first. Do not allow blocking or shimming to impede the flow of the grout into the hole. If dams are needed, place them at the front of the holes to confine the grout. Place the dams to permit the escape of air without leaking grout. Do not remove dams until grout has cured in the hole.

(b) Tie Bars - Provide epoxy coated tie bars and place them for contact-type longitudinal joints by one of the following methods:

- By drilling the hardened concrete section and then inserting and grouting the tie bars into place. Drill the holes large and deep enough to insert the tie bars with adequate epoxy or nonepoxy grout. Take care not to damage the reinforcement when drilling the holes. Drill after the concrete attains enough strength so no damage to the concrete is caused by the drilling. Replace loose tie bars at no additional cost to the Agency.
- By inserting the tie bars into the plastic slipformed concrete before vibrating and finishing the concrete. The tie bars may be bent before insertion. Replace any loose tie bars by drilling and grouting, as described above, at no additional cost to the Agency.
- By using threaded mechanical splice couplers from the QPL. Submit splices for approval before using. Rebar splices shall be:
 - Accompanied by manufacturer's quality compliance certificate according to 00165.35.
 - Installed according to manufacturer's recommendations.

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 - Batch materials according to 02001.40.

00756.45 Mixing Concrete - Mix materials according to 02001.40. Mix the concrete in a batch plant mixer, except truck mixers may mix and deliver concrete only to areas inaccessible to paving equipment.

00756.46 Placing Concrete - Place the concrete pavement with a slipform paving machine as described in (a), (b), (c), and (d) below. Concrete pavement may be constructed between stationary side forms as described in (e) below only when:

- Areas of continuous concrete pavement are less than 1,000 square yards.
- Areas are inaccessible to slipform paving equipment.
- In areas of irregular geometry.
- In short sections of pavement which are necessary to facilitate traffic movement.

(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 damage to the subgrade or base due to the Contractor's operations, to the satisfaction of the Engineer, at no additional cost to the Agency. 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) Spreading and Finishing Construction - Place the concrete with slipform paving equipment designed to spread, consolidate, screed, and float-finish the plastic concrete in one complete pass of the machine to provide a dense and homogeneous pavement surface with a minimum of hand finishing. Use hand screeding and float finishing only on small irregular areas.

Consolidate the plastic concrete by internal vibration with transverse vibrating units located within the specified thickness of pavement sections for the full width of pavement. A series of equally spaced longitudinal vibrating units may be used to supplement or replace the transverse vibrating units.

Maintain the frequency of vibration of each vibrating unit above 7,500 cycles per minute. Maintain the frequency or amplitude of vibration to consolidate the plastic concrete along the entire length of the vibrating unit and for a distance of at least 1 foot. Vary the frequency or vibration of amplitude proportionately with the rate of travel to result in a uniform density and air content.

Horizontally space vibrators according to the manufacturer's recommendations or not more than 18 inches, center-to-center, whichever is less. Do not exceed a 9 inch space from the outer edge of the pavement to the outside vibrator.

(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 1 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.

When concrete is placed adjacent to an existing pavement, equip that part of the equipment which is supported on the existing pavement with protective pads on crawler tracks or use rubber-tired wheels. Offset the track or wheels to run a sufficient distance from the edge of the pavement to avoid breaking the pavement edge

(i) Hand Operated Equipment - Use shovels and muckrakes, not rakes, for hand spreading and distributing. Do not foul the concrete with foreign matter, or 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 no additional cost to the Agency.

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:

00756

- 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 and construct additional test strips at no additional cost to the Agency.

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. Saw longitudinal weakened plane joints at the earliest possible time following placement of the concrete to prevent uncontrolled cracking without damaging the pavement or joint. 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.

(c) Construction Joints - Construct construction joints when there is an interruption of 45 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) Transverse Contraction Joints - Form transverse contraction joints by sawing to the required dimensions shown on the Plans. Saw transverse contraction joints at the earliest possible time following placement of the concrete to prevent uncontrolled cracking without damaging the pavement or joint. Repair any damage to the curing material during the sawing operations immediately after the sawing is completed.

(e) Sealing Sawed Joints - Fill sawed longitudinal weakened plane joints and transverse contraction joints with poured joint filler. Thoroughly clean joints at the time of sealing. Ensure the curing period for joints is complete before allowing construction equipment and vehicles on the pavement.

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 interval 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. Check the transverse direction as required. Use of a proof rod 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).

(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 wide tines spaced 3/4 inches apart that will mark the finished surface to a depth of 1/8 to 3/16 inch without tearing the surface. Avoid overlaps of the texturing. Texture the surface parallel to the roadway centerline and full roadway width.

00756.51 Modification of Strike-off, Consolidation, Final Floating, and Surface Finishing - 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 allowed 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 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 longitudinal contact joints and 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 the edges of concrete pavement so that a nominal 5/8 inch diameter radius is produced. 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 QPL 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, cover and cure the entire exposed surface of the newly placed concrete for at least 72 hours according to one of the following provisions:

(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 the covering 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 equivalent to the sheeting and use:

(1) Polyethylene Film - Sheeting shall be clear or white.

(2) Waterproof Paper - Transverse laps shall be at least 18 inches, and cement longitudinal seams.

(3) Cotton or Jute Mats - Before placing, saturate the mats with water and keep fully wetted during the curing period.

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 be repaired or removed as determined by the Engineer. Perform all remedial work at no additional cost to the Agency.

00756.55 Surface Tolerance, Testing, and Correction - Perform straightedge testing according to 00756.55(a). Except as specified, when the Project exceeds 1,500 feet 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, ramps shoulders and bridges for smoothness by the graphic profile method according to ODOT TM 770. Before paving commences on the Project, demonstrate the profilograph or 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 ramps, 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 00756.95.

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 profilograph or 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 joints for 12 foot wide lanes and 4 feet from each edge and longitudinal joints for 14 foot wide lanes. The intent is to provide a profile in each vehicle wheel path. Take profiles on transition areas of entrance and exit ramps 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:

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

* 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 grinders, 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 profilograph or profilometer under the supervision of the Engineer. Perform all corrective work and graphic profiling, including traffic control, at no additional cost to the Agency.

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) Sticking Measurements - Determine conformance with minimum thickness requirements by random sticking measurements of the plastic concrete according to ODOT TM 775 under the Engineer's observation. Report thickness to the nearest 0.1 inch.

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. When directed, take one sticking measurement at a randomly selected location in each unit and partial unit. Record measurements to the nearest 0.1 inch. Take the measurements:

- After consolidation and screeding and before the float finish.
- No closer than 2 feet from the panel edges.
- Within 10 feet longitudinally and 1 foot transversely from the calculated random location determined by the Engineer.

If a sticking is not obtained for a unit or a partial unit, or is not available to represent the area of pavement remaining after the limits of pavement over 1.0 inch deficient is determined, the measurement will be assumed to be the same as the preceding or following sticking measurement, 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 according to AASHTO T 24 and repair core holes as directed, at no additional cost to the Agency. 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 lanes 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 lanes 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, according to 00756.56(d), at no additional cost to the Agency. If allowed 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 - 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.

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 percent of the specified 28 day strength as determined by testing at least three cylinders cured according to AASHTO T 23 (field cure) and tested according to AASHTO T 22.

The maturity method, AASHTO T 325, may be used to estimate concrete strength for opening pavement to construction traffic. Install at least two maturity thermocouples for each day's placement in areas where the maturity method will be used for early opening. Install the thermocouples near the day's final placement for areas being evaluated for early opening.

When the maturity method is used, the Engineer may verify the maturity method with strength specimens. Establish a new strength-maturity relationship if strength specimens deviate more than 10 percent from the maturity-estimated strengths. Suspend use of the maturity method for opening pavements to traffic when the strength-maturity relationship deviates by more than 10 percent until a new strength maturity relationship is established.

(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 Measurement - The quantities of concrete pavement will be measured on the area basis. 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 Payment - The accepted quantities of plain concrete pavement will be paid for at the Contract unit price, per unit of measurement 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, and for furnishing all equipment, labor, and incidentals necessary to complete the work as specified.

No separate or additional payment will be made for construction joint reinforcement bars, tie bars, dowel bars, curing materials, and saw cutting.

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:

$$\text{Price Adjustment} = 0.3 \times (\text{PF} - 1) \times \text{Unit Price}$$

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 allowed by the Engineer to remain in place under the provisions of 00756.57.

00756.95 Bonus Payment for Smoothness - If a profilograph or profilometer is used according to 00756.55 a bonus payment of up to 1.5 percent 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 Contract Schedule of Items

Section 00758 - Reinforced Concrete Pavement Repair

Description

00758.00 Scope - This work consists of saw cutting and removing existing concrete pavement and constructing new reinforced and continuously reinforced portland concrete pavement repairs as shown and specified.

00758.01 Abbreviations:

SSD - Saturated Surface-Dry

SSFC - Stationary Side Form Construction

00758.04 Prepaving 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

00758.10 Materials - Furnish materials meeting the following requirements:

Bar Reinforcement	02510
Concrete Materials	02001
Curing Materials	02050
Epoxy and Nonepoxy Bonding Agents	02070
Epoxy and Nonepoxy Grouts	02080
Galvanizing	02530.70
Portland Cement Concrete Patching Materials	02015
Poured Joint Fillers.....	02440.30
Prefomed Expansion Joint Filler	02440.10
Structural Steel.....	02530

00758.11 Classes of Concrete - Furnish Class 4000 - 3/4 or Class 4000 - 1 paving concrete. The use of high-early strength concrete may be necessary when early opening to traffic required.

00758.13 Concrete Mix Designs - Prepare and submit either new mix designs or current mix designs for each class of concrete required according to Section 02001.

00758.14 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 Section 02001, and has a minimum compressive strength of 3,000 psi before opening to traffic.

00758.15 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 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.

(c) Records - Deliver all batch tickets, water-cement ratio calculations, and all other records required in 00758.15(b) to the Engineer upon availability but no later than the morning of the next day.

00758.16 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 and the MFTP.

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

(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 subplot. 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 Section 02001.

(d) Hardened Concrete - Cast and cure the test cylinders according to AASHTO T 23 in 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 cylinders at an ODOT certified laboratory.

(2) Actual Strength Test Value - The ASTV at 28 days is the average compressive strength of the three cylinders tested. If the compressive strength of a single test specimen varies by more than 10 percent 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 - Sample and test according to Section 00165 and 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 percent 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 00150.25.

If an ASTV falls below the $f'c$, the Contractor may submit a written plan within 3 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.

00758.17 Spall Repair Material - For spall repair, furnish a PCC repair material meeting the requirements of Section 02015 except do not use products that contain magnesium phosphate. Use either "Rapid Set" or "Very Rapid Set" material.

Equipment

00758.20 Batch Plant - Provide batch plants according to 02001.40.

00758.21 Mixers - Provide mixers according to 02001.40.

For projects requiring high early strength concrete, mobile mixers may be used if the mixers conform to the following:

- The mixer is self-propelled and carries sufficient unmixed dry bulk cement, sand, coarse aggregate, admixtures, and water to produce a minimum of 6 cubic yards of concrete on site.
- The mixer provides positive measurement of cement being introduced into the mix by meter or counter.
- The mixer provides positive control of the flow of water into the mixing chamber. Water flow is readily adjustable to provide for minor variations in aggregate moisture.
- Each mixer is calibrated to automatically proportion and blend all components according to the mix design on a continuous or intermittent basis as required by the placing operation.

Perform a calibration and yield test on each mixer prior to the first placement to accurately proportion the specified mix. Use a written calibration procedure from the mixer manufacturer, a procedure provided by the agency or other written procedure acceptable to the agency. The calibration process may be witnessed by the Engineer. Provide the Engineer with information about the scheduled date, time and place for the calibration. Perform a new calibration when the source of materials changes, when the mixer undergoes a major repair, or when requested by the Engineer.

00758.22 Hauling Equipment - Use truck mixers to transport concrete. Provide hauling equipment conforming to AASHTO M 157.12 or AASHTO M 157.11.6.

00758.23 Paving Equipment - Provide paving equipment conforming to the following:

- 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.
- Capable of meeting the smoothness requirements.
- Approved by the Engineer.

00758.24 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.

00758.25 Smoothness Testing Equipment - Provide one 12 foot straightedge.

Labor

00758.30 Quality Control Personnel - In addition to the certified technicians required in 02001.50 provide and designate an individual to be present at the placement site at all times during concrete placements and who is authorized and responsible for acceptance and rejection of materials.

Construction

00758.40 Weather Limitations - Coordinate all operations involved in repairing 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. Stop placement when descending air temperature falls below 35 °F. Do not begin placement until the air temperature is 35 °F in the shade and rising and is forecast to remain above 35 °F.

Protect the pavement from weather damage. Protect unhardened PCC from precipitation with protective material. When PCC is placed during cold weather and the air temperature is forecast to drop below 33 °F, prevent the concrete from freezing for a minimum of 7 days after placement.

Remove and replace weather-damaged pavement at no additional cost to the Agency.

00758.41 Preparation:

(a) Removal of Existing Pavement - Remove existing reinforced concrete pavement full depth as shown or directed. Cut the reinforced concrete full depth with a concrete saw prior to removal. Remove concrete pavement with equipment approved by the Engineer in a manner that does not damage remaining pavement and allows for specified connections. Repair damage to the existing pavement due to the Contractor's operations, at the Contractor's expense, by extending the full depth repair to the satisfaction of the Engineer.

(b) Removal of Terminal Expansion Joint Steel W-Beam Flange and Web - Remove the existing terminal expansion joint steel W-beam top flange and web as shown or as directed. Cut the steel web to facilitate removal. Cut the steel web so that no more than 1/4 inch remains above the existing sleeper slab. Perform the removal in a manner that does not damage remaining pavement and sleeper slab. Repair any damage to the existing pavement or sleeper slab due to the Contractor's operations, at the Contractor's expense, to the satisfaction of the Engineer.

(c) Preparation of Base - If the existing base requires removal, replace it with plain concrete conforming to the applicable parts of this Specification and to the depth shown. Place a 6 mil polyethylene bond breaker between the new plain concrete base and the new reinforced concrete pavement as shown or directed.

(d) Reinforced Bar Lap Area - Saw cut the existing reinforced concrete pavement to a nominal depth of 2 inches. Do not damage the existing reinforcing steel or concrete pavement and base. Remove existing concrete with jack hammers and chipping hammers that will not damage reinforced concrete pavement to remain in place as directed. Do not use jackhammers heavier than nominal 30 pounds class. Do not use chipping hammers heavier than nominal 15 pounds class to remove concrete within 3/4 inch of reinforcing steel. Do not operate hammers at an angle greater than 45 degrees measured from the surface of the pavement. Repair all damage to

the existing pavement due to the Contractor's operations, at the Contractor's expense by extending the full depth repair full width to the satisfaction of the Engineer. Use hand tools such as hammers and chisels to remove final particles of unsound concrete or to achieve the required depth.

Protect and keep reinforcing steel clean of grease, oil, dirt, grout, or other contaminants at all times. Do not bend reinforcing steel that remains in place.

(e) Preparation of Existing Concrete - After pavement in repair areas is removed, sandblast all vertical surfaces of adjoining concrete. Before placement of concrete, blow clean the area with compressed air and apply a coat of epoxy grout or bonding agent to all vertical surfaces. If grouted surfaces become dry before new concrete is placed, sandblast clean and apply a new coat of grout.

00758.43 Placing Reinforcement:

(a) General - Place reinforcement as shown and specified. Lap splices according to Section 00530. The Contractor's equipment hauling reinforcement to the site will not be permitted on the subgrade or the base material.

Use reinforcement that is straight, clean, and free of scale or other matter which would interfere with its bonding to the concrete.

Place the reinforcement on support devices that maintain it in specified position during concrete placement.

On areas where traffic is operating adjacent to concrete paving operations, do not lift reinforcement from the surface nor place on supporting devices more than 2 hours before placing the concrete, unless otherwise approved by the Engineer.

(b) Deformed Bar Reinforcement - Tie or clip at every other transverse bar intersection, as a minimum, in a manner that does not allow for displacement. Tie or clip every lap splice as shown.

(c) Support Devices - Support devices used to hold reinforcement in proper position in the concrete shall:

- Hold the reinforcement within 1/2 inch of the vertical position shown.
- Not displace more than 2 cubic inches of concrete when embedded in the slab.

Obtain approval of the proposed support devices before use.

(d) Tie Bars - Place tie bars required for contact-type longitudinal joints by drilling the hardened concrete section and then inserting and grouting the tie bars into place. Drill the holes large and deep enough to insert the tie bars with adequate epoxy or non-epoxy grout. Do not damage the existing reinforcement when drilling the holes. Replace any loose tie bars at the Contractor's expense.

(e) Dowel Bars - Provide smooth, round dowel bars. Coat with plastic, grease, heavy oil, or other approved material that will not bond with or be harmful to the PCC. Place dowels in supporting framework or support devices that hold dowels parallel with each other, parallel with the surface of the pavement, and perpendicular to the joint. Obtain approval of the proposed method of support prior to use. Maximum alignment tolerance shall be 5 degrees or 3/16 inch in the length of the dowel. Place dowels within 3/8 inch of the center of the slab vertically.

00758.44 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%

00758.45 Mixing Concrete:

(a) General - Mix the concrete in a batch plant mixer, truck mixer, or mobile mixer and the following:

- 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 retemper 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.

00758.46 Placing Concrete:

(a) General - Perform the strike-off, consolidation, final floating and surface finishing according to the following:

- Vibrate throughout the concrete until it is uniformly consolidated. Do not segregate.
- 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 00758.49. Keep the surface free from laitance, soupy mortar, marks or irregularities.
- Finish the surface according to 00758.49.

Correct all damage to the subgrade or base due to the Contractor's operations, at no additional cost to the Agency, to the satisfaction of the Engineer.

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

(c) 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 00758.43 and 00758.48.

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

- Is not in place within 90 minutes after being mixed.
- Has begun to take an initial set before placement.

(e) Hand Operated Equipment - Use shovels to hand spread and distribute the concrete. Do not use rakes. Do not foul the concrete with foreign matter, or disturb joint devices during such operations. Furnish hand operated mechanical vibrators satisfactory to the Engineer. Use the vibrators to consolidate the concrete pavement at least 6 feet each side of construction and expansion joints and all other areas as directed.

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

00758.48 Joints:

(a) General - Provide and construct contraction, expansion, or construction joints transverse or longitudinal as shown or directed. Extend all joints and joint filler to pavement edges or to each other as applicable.

Construct all joints at right angles to the surface of the pavement. Joints shall not vary from the 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.

Construct all joints which contain preformed filler before the final floating and surface finishing of the concrete, unless otherwise directed.

(b) Longitudinal Joints - Construct contact type or weakened plane type longitudinal joints as shown.

(1) Longitudinal Contact Joints - Construct longitudinal contact joints when concrete is placed against hardened concrete, 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 30 minutes in the concrete placing operations. Place construction joints no closer than 150 feet from the end of a repair or from an adjacent construction joint.

New concrete placed against construction joints shall conform to the proportions and consistency of the previously placed concrete.

(1) Continuously Reinforced Pavement - Furnish a self-supported working platform at each construction joint. The working platform shall be at least 4 feet wide and long enough to span the entire width of the pavement panel being constructed. Construct and support the platform so it does not rest upon or touch the reinforcing steel. Have the workers use this platform when working in the area around the construction joints. Do not walk on the reinforcing steel. Remove all debris and spilled concrete at and beyond the joint. Support the reinforcement as shown.

(2) Other Pavements - Unless otherwise shown, do not construct construction joints within 10 feet of a transverse 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.

00758.49 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 00758.56(a). Lap each successive check with the previous check path by at least half the length of the straightedge.

(a) 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 1/8 inch to 3/16 inch. Randomly space the markings from 1/2 inch to 1 1/4 inches as approved. Avoid overlaps of the texturing. Construct markings transversely 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 to receive an overlay.

(b) Transverse Profile - Match the surface of the fresh concrete in the transverse direction to the surface of the existing concrete at the ends of the patch. Taper into existing pavement ruts in the first and last 10 feet to 20 feet to provide a transverse surface finish for the remainder of the patch meeting the requirements of this section.

00758.52 Edge Tooling and Filling - Tool edges at transverse joints and longitudinal 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.

Fill all 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, provided the filling is neat and blends inconspicuously with adjoining concrete. Prepare the area according to the grout manufacturer's recommendations.

00758.53 Curing Concrete - Immediately after the final floating, surface finishing and edging have been completed, and while the concrete surface is still moist, cover and cure the entire exposed surface of the newly placed concrete for at least 72 hours. If the specifications require opening the lanes to traffic in less than 72 hours, remove curing covers just prior to opening to traffic. Use one of the following provisions:

(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. Liquid membrane-forming compounds are not allowed when an asphalt concrete layer will be placed on the new concrete.

(b) Other Coverings - Apply clear or white polyethylene film or insulated curing blankets as a waterproof and moisture-proof covering. Place the film or blankets beyond the edge of the repaired areas and weight to hold in position. Do not mar the concrete with the covering.

00758.54 Longitudinal Pavement Cracks - Remove and replace all patches that show longitudinal cracking or do not bond at no additional cost to the Agency.

00758.55 Spall Repair - In spalled areas, remove the existing pavement according to 00758.41(d). Prepare the repair area according to 00758.41(e) and the PCC repair material manufacturer's recommendations. Mix and place PCC repair material according to the manufacturer's recommendation. Use shovels to hand spread and distribute the concrete. Do not use rakes. Do not contaminate the concrete with foreign matter.

00758.56 Surface Tolerance, Testing, and Correction - The surface of finished pavement shall not deviate from longitudinal and transverse smoothness more than the limits identified below. Perform straightedge testing under the supervision of the Engineer as soon as the hardness of the concrete permits.

(a) Straightedge Testing and Tolerance - Test pavement surface longitudinal and transverse smoothness with a 12 foot straightedge. The extent of the testing will be determined by the Engineer. The pavement surface shall not deviate from the straightedge at any point by more than 1/8 inch, except the transverse surface at the patch ends may vary as required in 00758.49(b).

(b) Correcting Deficiencies - Correct all segments that exceed the requirements of 00758.56(a) by one of the following methods:

(1) Remove the non-specification concrete pavement as determined by the Engineer and replace with specification concrete pavement.

(2) Profile with an abrasive grinder equipped with a cutting head comprised of multiple diamond blades. Take care not to unnecessarily sacrifice concrete cover over the reinforcing steel.

Retest according to 00758.56(a). Perform all corrective work at no additional cost to the Agency, including traffic control.

Maintenance

00758.60 Protection of Concrete - Repair or replace any part of the pavement damaged by traffic or damaged from any other causes before its official acceptance, according to 00170.80. Do not operate construction equipment or 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 3,000 psi as determined by testing at least two cylinders cured according to AASHTO T 23 (field cure) and tested according to AASHTO T 22.
- (c) Approval is given by the Engineer before opening to traffic.
- (d) 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.

Measurement

00758.80 Measurement - The quantities of work performed under this Section will be measured according to the following:

(a) **Pavement Repair** - Reinforced concrete pavement repair will be measured on the area basis and will be determined by measuring the width and length of each separately constructed panel of pavement. The width is the measured edge-to-edge width on the surface of the pavement, perpendicular to centerline. The length is the measurement from end-to-end of pavement along the center line of the roadway, including the length of the bar lap splices.

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.

(b) **Bar Lap** - Reinforced bar lap areas will be measured on the unit basis. The reinforced bar lap area consists of an area of one 12 foot lane width and from 24 inches to 30 inches long.

Where the bar lap areas consist of an area less than one lane width, the quantity of bar lap area will be adjusted by converting to a proportionate quantity based on a 12 foot lane width. A 6 foot wide pavement repair will be counted as one-half of a bar lap area.

(c) **Spall Repair** - Spall repair will be measured on the area basis and will be determined by measuring the width and length of each separate repair. The width is the measured edge-to-edge width on the surface of the pavement. The length is the measurement from end-to-end of pavement along the center line of the roadway.

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

(d) **Pavement Repair at Joints** - Pavement repairs at joints will be measured on the length basis.

(e) **Plain Concrete Pavement** - Plain concrete pavement used to replace the existing base will be measured on the area basis and will be determined by measuring the width and length of the plain concrete pavement placed.

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

Payment

00758.90 Payment - The accepted quantities of work performed under this Section will be paid for at the Contract unit price, per unit of measurement, for the following items:

Pay Item	Unit of Measurement
(a) Continuously Reinforced Concrete Pavement Repair.....	Square Yard
(b) Reinforced Concrete Pavement Repair	Square Yard
(c) Extra for Reinforced Bar Lap Areas	Each
(d) Concrete Pavement Spall Repair.....	Square Yard
(e) Extra for Expansion Joint Repair.....	Foot
(f) Extra for Terminal Expansion Joint Repair.....	Foot
(g) Extra for Terminal Expansion Joint Repair (Steel Beam).....	Foot
(h) Concrete Pavement Base, _____Inches Thick	Square Yard

Items (a) and (b) include saw cutting, removing concrete pavement including the PCC in the bar lap splice area, and preparing the cut edges.

Item (c) includes providing bar lap areas as specified using tied laps.

Item (d) includes sawing and removing concrete.

Items (e), (f), and (g) include removing existing joints and removing all or portions of existing steel beams.

In item (h), the thickness of pavement base will be inserted in the blank.

Item (h) includes removing existing base material and furnishing the bond breaker.

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.

No separate or additional payment will be made for intermediate bar lap splices necessary to accommodate staging or reopen the roadway to traffic.

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 and furnishing and installing metal handrail in close conformity to the lines, grades and dimensions shown or established. The commercial grade concrete items in this Section will be collectively referred to as "structures".

Materials

00759.10 Materials - Furnish materials meeting the following requirements:

Bar Reinforcement	02510
Commercial Grade Concrete.....	00440
Dowels	02510.50
Epoxy Bonding Agent.....	02070
Metal Handrail	02830
Prefomed Expansion Joint Filler	02440.10
Welded Wire Fabric.....	02510.40

00759.11 Aggregate Base - Furnish aggregate base materials for base, foundation courses, leveling courses, or bedding meeting the requirements of Section 02630. If a designated size is not shown or given, furnish either 1" - 0 or 3/4" - 0, as the Contractor elects.

00759.12 Sidewalk Ramp Treatment - Furnish truncated dome detectable warning surfaces for sidewalk ramps and accessible route islands from the QPL.

Use only adhesives recommended or supplied by the manufacturer.

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.

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 3/4 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 Surfacing - 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 16 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 or 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 Surfacing - 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.

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 7 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 Metal Handrail - Fabricate and assemble free standing and bolted down metal handrail as shown.

00759.53 Welding - Welding, welder qualifications, prequalification of weld details and inspection of welds shall conform to AWS D1.1. Submit all welding procedure specifications to the Engineer for approval.

00759.54 Bolt Holes:

(a) Punched Holes - Use a die with a diameter not exceeding the diameter of the punch by more than 1/16 inch. Ream any holes that are required to be enlarged to admit the anchor bolts. Make clean cut holes without torn or ragged edges.

(b) Accuracy of Punched Holes - Locate all holes punched full size so accurately that when multiple anchor plates are stacked with the edges even, a cylindrical pin 1/8 inch smaller in diameter than the nominal size of the punched hole may be entered perpendicular to the face of the plate without drifting in each of the connecting holes in the same plane. Non-conforming pieces will be rejected.

Measurement

00759.80 Measurement - The quantities of structures constructed under this Section will be measured according to the following:

- **Volume Basis** - Measurement will be limited to the neat lines of the finished structure as shown or directed.
- **Area Basis** - Measurement will be the finished surface, limited the neat lines shown or directed.
- **Length Basis** - Measurement of concrete items will be along the face of the structure, from end to end including curb tapers or depressed lengths at driveways and ramps. Measurement of metal handrail will be along the top rail member, from center of end post to center of end post.
- **Each Basis** - Measurement will be by actual count.

Payment

00759.90 Payment - The accepted quantities of structures will be paid for at the Contract unit price, per unit of measurement, for the following items:

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) Concrete Walks.....	Square Foot
(f) Monolithic Curb and Sidewalks	Square Foot or Foot
(g) _____ Concrete Surfacing	Square Foot
(h) Concrete Stairs	Cubic Yard
(i) Concrete Bus Shelter Pads.....	Each
(j) Concrete Mowing Strip.....	Foot
(k) Metal Handrail, _____ Rails	Foot

In item (a) the type of curb will be inserted in the blank, if appropriate.

Item (b) includes traffic separators.

Items (c) and (d) include monolithic curb at driveway locations.

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Items (e) and (f) include sidewalk ramps.

In item (g), the specified thickness, or type, of concrete surfacings will be inserted in the blank, if appropriate.

Item (h) includes pipe handrail.

In item (k), the number of rails will be inserted in the blank.

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.

When earthwork is included as separate pay items, payment will be made according to 00330.90 through 00330.94 as appropriate.

When earthwork is not included as separate pay items, no separate or additional payment will be made for earthwork.

Aggregate will be paid for according to 00640.90 or 00641.90 as appropriate.