

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

A. GENERAL

These Specifications cover the construction, reconstruction and overlaying of streets and roads. Work shall include furnishing all equipment, materials, labor, etc., as required to complete the required improvements. Items specified in this Technical Specification are intended to be broad in scope and may not always apply to all items of work to be constructed. All applicable sections, as determined by the City Engineer, shall control the work.

B. EARTHWORK

1. Clearing and Grubbing. Clearing and grubbing shall include the removal and disposal of any obstructions, such as existing curbs, sidewalks, pavement, culverts, fences, etc., and organic material such as trees, tree stumps, brush, hedges, vegetation, roots, rubbish, posts, fences, topsoil, and any other obstacles or materials in the construction area which would prevent completing the project, and which are unsuitable for road work construction.

All vegetation and rubbish shall be removed and disposed of by the Contractor in conformance with the requirements of local authorities controlling air pollution and solid waste disposal.

2. Roadway Excavation. Prior to any excavation, the area to be excavated shall be cleared and grubbed. Roadway excavation shall consist of the excavation, haul, and satisfactory disposal of all materials taken from within the right-of-way for the construction of embankments, subgrade, shoulders, intersections, ditches, waterways, entrances, approaches (including excavation at private entrances outside the right-of-way), curbs, sidewalks, and incidental work, in accordance with the Specifications and the lines, grades, and cross sections shown on the Drawings, and as required by the City Engineer.

3. Embankments. Prior to construction of any embankment, the area beneath the embankment and the areas from which embankment material will be obtained shall be cleared and grubbed. The existing soil beneath the embankment shall then be compacted to 90 percent of maximum density as determined by ASTM D-698 for a minimum of 6 inches below ground surface. Any unsuitable material shall be removed prior to placement of any embankment.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Upon completion of the embankment foundation, embankment material shall be placed in horizontal lifts and compacted to 95 percent of ASTM D-698. Embankment lift depth shall not exceed the capability of compaction equipment being used to achieve the required compaction for the full depth of each lift. The embankment material shall be native or import free of vegetative or organic matter, boulders 6 inches or larger in diameter, or frozen material and shall be at or below optimum moisture content at the time of placement.

The embankment shall be brought to the lines and grade required on the Drawings . Any unsuitable material which may have been used in constructing the embankment shall be removed and replaced with suitable material and compacted at no cost to the City.

4. Roadbed Cuts. In roadbed cuts, the subgrade material shall be compacted to 95 percent of maximum density as determined by ASTM D-698 for a minimum of 6 inches below the top of the subgrade. Depending on the type of material encountered, the Contractor may have to scarify, aerate or water, overexcavate, or take other actions as necessary to achieve the required compaction.

5. Water for Compaction. The Contractor shall be responsible for obtaining, transporting and the application of the water.

6. Finishing of Subgrade. All roadbeds, ditches, and other excavations and embankments shall be trimmed accurately to the lines, grades and cross sections as shown on the Drawings and shall be finished in a thoroughly workmanlike manner to within plus or minus 0.05 foot of the required grade. They shall be in neat and well finished condition at the time the project is completed. The entire right-of-way area shall be cleaned up and made free of debris and foreign matter of all kinds. Accumulations of dirt and/or other materials shall be disposed of in a satisfactory manner .

Upon completion of the subgrade and prior to placement base rock, the Contractor shall load test the finished subgrade surface. The load test shall consist of slowly driving a loaded dump truck over the road surface. The dump truck shall have a minimum capacity of 10 cubic yards. All soft areas shall be noted. The City Engineer and Contractor shall note any soft areas. The Contractor shall excavate out and either replace unsuitable material or properly compact all soft areas in order to provide a firm base that conforms to the Specifications. Any soft areas that occur as part of the project because of overwatering, improper compaction, weather, etc., shall be replaced.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

C. GEOTEXTILE FABRIC

1. Scope. This work consists of furnishing and placing geotextile fabrics in underdrains, under embankments, over roadbed subgrade, and at other locations as shown on the Drawings or directed by the City Engineer.

2. Materials. Geotextile fabric shall be Mirafi 500X, Exxon GTF 200, or approved equal.

3. Construction. Geotextile fabric shall be installed as shown on the Drawings or as directed by the City Engineer.

Fabric placed for subgrade stabilization under embankments or over roadbed subgrade shall be placed parallel to the centerline of the roadway, with placement starting at the low side of the super elevation or crown. The fabric shall either be sewn together at all longitudinal and transverse edges or overlapped a minimum of two feet at all edges. Transverse overlaps shall be made in the direction of base material placement.

D. AGGREGATE BASE AND BASE ROCK

1. Scope. Aggregate base and base rock shall be placed to the lines, depths, and grades shown on the Drawings. Prior to placement of the materials, each succeeding lift, i.e., subgrade, aggregate base, base, etc., shall be properly constructed and reviewed by the City Engineer.

2. Materials. All aggregate materials for aggregate base rock, base rock, unless called for otherwise, shall meet the following requirements:

Abrasion (AASHTO T-96)	35% Maximum
Durability Index Coarse and Fine	35% Maximum

a. Aggregate Base. The aggregate base shall be a well-graded 4"-0 pit run angular basalt material mined from an approved rock quarry site. The fraction passing the No. 200 sieve shall not be greater than 6 percent of the total aggregate weight. Other materials may be considered by the City Engineer; however, samples must be submitted for review.

b. Base Rock. Base rock shall conform to the requirements of Section 02630 - Base Aggregate, "Oregon Standard Specifications for Construction," current edition, as follows:

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

(1) Grading. Base rock shall be crushed rock, including sand. Uniformly grade the aggregates from coarse to fine. Sieve analysis will be determined according to AASHTO T-27.

**Grading Requirements - Base Rock
Separated Sizes**

Sieve Size Passing	Percentages (by weight)	
	1"-0	3/4"-0
1-1/2"	100	
1-1/4"		
1"	90-100	100
3/4"		90-100
1/2"	55-75	
3/8"		55-75
1/4"	40-55	40-60
No. 10	*	*

* Of the fraction passing the 1/4-inch sieve, 40 percent to 60 percent shall pass the No. 10 sieve.

(2) Fracture of Rounded Rock. Fracture of rounded rock will be determined according to WAQTC TM1. Provide at least one mechanically fractured face based on the following percentage of particles retained on the 1/4-inch sieve for the designated size:

Designated Size	Minimum % of Fractured Particles (by weight) of Material Retained on 1/4" Sieve
1-1/2"-0 and larger	50
Smaller than 1-1/2"-0	70

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

(3) Durability. Base rock shall meet the following requirements:

Test	Test Method	Requirements
Degradation (Coarse Aggregate):		
Passing No. 20 sieve	OSHD TM 208	30.0% Max.
Sediment Height	OSHD TM 208	3.0" Max.

(4) Sand Equivalent. Base rock will be tested according to AASHTO T-176, and shall have a sand equivalent of not less than 30.

3. Materials Certification and Testing. The Contractor shall submit samples of the material to be utilized on the project to the City Engineer for his review. The Contractor shall also submit copies of appropriate test data that demonstrates that the materials meet the suitability requirements of the Specifications. The Contractor will be responsible for performing quality control testing during the production of the aggregate materials and for providing certification to the City Engineer that the materials meet the requirements of the Specifications. The City Engineer may take samples of the aggregate materials for testing to verify compliance with the requirements of the Specifications. Materials found to be outside of the specification limits shall be replaced with suitable material at no expense to the City.

4. Construction. The construction procedure here described shall be understood to apply to each of the courses and/or layers of which the road base is to be constructed. The construction of the road base shall not be limited to the construction of the main roadway to which the Contract applies, but shall include the construction of base on approach roads, driveways, connecting roads and connecting streets as shown on the Drawings. After the subgrade is brought to the proper line, cross section and compaction, the aggregate materials shall be spread and shaped as required. The spreading and shaping of the aggregate materials shall be so performed as to prevent separation of the coarser material from the finer materials including the use of adequate water. The aggregate materials shall be brought to proper moisture content as required for compaction and compacted to 90 percent of maximum density as determined by ASTM D-1557, as appropriate. Following construction of each lift, the Contractor shall do such blading, brooming, watering and other work as necessary to prevent raveling and rutting. These operations are to be continued as required until the lift is covered by a following lift or until all work to be done under the Contract is completed. If the required compacted depth of the base exceeds 8 inches, it shall be

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

constructed in two or more lifts, each lift not exceeding 8 inches in depth. The finished surface when tested with a 10-foot straightedge shall not vary from the testing edge by more than 0.05 foot at any point.

Upon completion of the aggregate materials and prior to placement of asphalt concrete pavement, the Contractor shall load test the finished base surface. The load test shall consist of slowly driving a loaded minimum 10 yard dump truck over the road surface. All soft areas shall be noted. The Contractor shall excavate and/or compact all soft areas in order to provide a firm base that conforms to the requirements of the Technical Specifications.

Gravel shoulders when required shall be constructed as a part of construction of the base and are not to be added on after completion of asphalt paving. The finished gravel shoulder shall be graded, trimmed and compacted to the required lines, grades and cross sections in a neat manner leaving the gravel shoulder flush with the edge of the asphalt pavement. Coarse segregated aggregate shall not be used in the construction of gravel shoulders. All such non-specification material shall be removed and replaced with specification material.

E. SOIL STERILANT

Upon completion of the base and prior to placement of asphalt concrete, the Contractor shall apply a soil sterilant to the surface of the base. The sterilant shall be Pramitol 5SP as manufactured by CIBA-GEIGY or approved equal and shall be applied in accordance with the manufacturer's or suppliers recommendations to adequately sterilize the base. The Contractor shall supply the City Engineer with a description of the sterilant and the name of the supplier prior to application in order that the suitability of the proposed product may be verified. The applicator shall be licensed by the State of Oregon for the class of herbicide utilized. Any damage to adjacent areas caused by the sterilant shall be repaired by the Contractor.

F. OVERLAY PREPARATION

1. Asphalt Concrete Patching. The City Engineer will mark all unstable or unsuitable areas. The Contractor shall then remove all material from the designated areas to a depth as detailed on the Drawings or as required by the City Engineer. The area shall then be backfilled with base rock as detailed on the Drawings, or as required by the City Engineer. All materials shall be properly placed and compacted as outlined in this Technical Specification.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

2. Cleaning. The existing surface of all areas to be overlaid shall be thoroughly cleaned of all loose material, dirt, debris, or other undesirable materials by brooming, flushing with water, or other methods acceptable to the City Engineer.

3. Asphalt Concrete Preleveling. All areas with irregular grades to be preleveled will be marked by the City Engineer and preleveled by the Contractor with Class D asphalt concrete. The preleveling will be performed while the street is clean and thoroughly dry and will be accomplished by applying a tack coat of CRS-1 or CSS-1 emulsified asphalt at a rate of 0.05 to 0.15 gallons per square yard and then placing and compacting the asphalt mix. The actual rate of tack coat application will be determined in the field by the Contractor and the City Engineer. The compaction of the asphalt concrete shall be accomplished with a pneumatic-tired roller. The rolling shall follow directly behind the placement and be performed in such a manner that the entire surface receives at least four coverages of the roller. The pneumatic-tired roller shall be capable of exerting at least 80 pounds per square inch ground pressures and shall not be operated at speeds in excess of 5 mph. Finish rolling shall be accomplished with a steel-wheeled roller and shall continue until all roller marks are eliminated.

4. Asphalt Crack Sealing. All cracks and joints shall be routed and cleaned of all loose material and vegetation. Cleaning shall be accomplished with using a hook or other similar device to loosen the material and either blowing, brooming or flushing the material from the crack. After all cracks are cleaned, the entire paved surface shall be cleaned of foreign material. Care shall be taken not to refill the cracks with foreign material.

Filling of cracks and voids shall not commence until they are clean and dry. Voids in the base below the pavement shall be filled with clean sand and compacted. Cracks 1-inch and less in width shall be completely filled to the pavement surface with hot liquid rubberized asphalt conforming to ASTM D3405. Cracks greater than 1-inch in width shall be filled with a mixture of 50 percent 1/4-0 aggregate and 50 percent CSS-1 asphalt emulsion or other approved mixture to within 1/4 inch of the pavement surface and topped off with hot liquid rubberized asphalt. The following day, any cracks which are not completely full shall be topped off with additional rubberized asphalt. After sealing, the filler shall be broomed or squeegeed flush with the existing pavement surface and allowed to cure prior to constructing the asphalt concrete overlay. All sealed cracks shall be flush with the existing pavement after sealing is complete.

5. Paving Fabric. Once the street is clean and all repair work is completed, the paving fabric shall be installed where called for on the Drawings or as required by the City Engineer. The following procedures and materials are to be used.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

a. Apply a tack coat of AR4000W graded asphalt cement at the rate of 0.15 to 0.25 gallons per square yard. This can only be done with the ambient temperatures above 60°F. The actual rate will be determined in the field by the City Engineer to suit the existing surface. The tack material shall be between 275° and 325°F at the time of application and shall be applied with a single pass of distributor truck. An accessory hand sprayer shall be used on patches, lap sections and areas where truck spraying is impractical. It is extremely important that the tack coat be uniformly applied. Application will not be allowed unless the distributor equipment is operating properly.

b. The paving fabric, when required, shall be placed directly behind the distributor with the use of equipment that will provide automatic tensioning capabilities to assure fast wrinkle-free unrolling. Any minor wrinkles or air bubbles shall be brushed out with a stiff-bristle push broom. Wrinkles that won't brush out shall be cut out and a patch of fabric layered at least 6 inches in all directions be installed. The fabric shall be cut into sections to match curves and corners. Overlap these sections and the start of all new rolls at least 6 inches and apply approximately 0.20 gallons per square yard tack coat to the seams. If any blistering of the fabric arises a 4-ton tandem roller shall be used to restore the fabric adhesion prior to the overlay application.

The paving fabric used shall be non-woven, fabricated from polypropylene resin, and shall have the following properties:

Weight, oz./sq.yd.	4.0 Minimum
Grab Tensile Strength, lbs.	90 Minimum
Elongation at Break, %	55 Minimum
Asphalt Retention, gals/sq.yd.	0.20 Minimum

The overlay work shall begin as soon after laydown of the paving fabric as practical.

6. Asphalt Tack Coat. An asphalt tack coat shall be applied to existing pavement surfaces to be overlaid with new asphalt concrete, except where paving fabric has been placed. All pavement repair work and surface cleaning shall be completed prior to application of tack coat. The material is to be CRS-1 or CSS-1 emulsified asphalt unless otherwise approved. The tack coat shall be applied at the rate of 0.05 to 0.20

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

gallons per square yard. The actual application will be determined in the field by the Contractor and the City Engineer to suit the existing surface.

All surfaces must be clean and dry at the time of the tack coat application and at a temperature of at least 50°F. The tack coat shall only be constructed far enough in advance as is appropriate to ensure a tacky, sticky condition at the time the asphalt concrete is placed on it.

G. HOT-MIX ASPHALT CONCRETE PAVEMENT

1. Scope. After completion of the base, the Contractor shall place and compact the hot-mix asphalt concrete to the lines, grades, thicknesses, and cross-sections shown on the Drawings and as established by the City Engineer. The asphalt concrete shall consist of a hot mixture of asphalt cement, well-graded high quality aggregate, mineral filler and adhesive as required. It shall be plant mixed into a uniformly coated mass, hot laid on a prepared foundation and compacted to the specified density. It is the intent that the asphalt cement mix generally comply with the requirements of the "Oregon Standard Specifications For Construction," 2002 edition, as modified hereafter.

2. Pre-paving Conference. At least one week before paving is scheduled to begin, the Contractor will set up a pre-paving meeting between the Contractor and the City Engineer. If a paving Subcontractor is being used they shall also be present. The intent of the meeting is to allow the City Engineer and the Contractor to jointly review the proposed method of operation, equipment, personnel, mix, schedule, etc., along with the project specifications.

3. Hot-Mix Asphalt Concrete. Materials and construction shall be performed in accordance with "Section 00745 - Hot Mix Asphalt Concrete (HMAC)" and related sections of the "Oregon Standard Specifications for Construction," current edition, supplemented and modified as follows:

a. Project Mix Requirements.

Unless required otherwise by the City Engineer, HMAC shall be:

- Level 2 HMAC
- 1/2-inch Dense Graded
- Asphalt Cement PG 64-28
- Lime Treatment of Aggregates Required

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

b. Delete subsection 00745.03 and replace with the following:

00745.03 Reclaimed Asphalt Pavement (RAP) Material - No RAP material shall be used on this project.

c. Delete subsection 00745.10(f) and replace with the following:

00745.10(f) Aggregate Production Quality Control - Testing required to qualify HMAP aggregate material source prior to production consists of the following (ODOT certification of the material source can be substituted for this testing):

Soundness	AASHTO T-104
Abrasion	AASHTO T-96
Degradation	ODOT TM T-208
Lightweight Pieces	AASHTO T-113
Plastic Index	AASHTO T-103
Friable Particles	AASHTO T-112

Quality control testing required on HMAP aggregate during production consists of the following:

Gradation	AASHTO T-27	3 test minimum, start of production and 1 test every 1,000 tons
Sand Equivalent	AASHTO T-176	3 test minimum, start of production and 1 test every 1,000 tons
Fracture Face	WAQCT TM-1	3 test minimum, start of production and 1 test every 3,000 tons
Wood Particles	ODOT TM T-225	3 test minimum, start of production and 1 test every 3,000 tons
Elongated Pieces	ODOT TM T-229	3 test minimum, start of production and 1 test every 3,000 tons

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Dust or Clay Coating	ODOT TM T-226	3 test minimum, start of production and 1 test every 3,000 tons
-------------------------	---------------	--

Compliance of HMAP aggregates produced and stockpiled before the Award Date or Notice to Proceed of this Contract will be determined by the following:

Continuing production records meeting the requirements set forth in these Specifications for stockpiled material or furnish records of testing for the entire stockpile, changing sampling frequency to the following:

- a. Start of production means “One Set of Tests Per Stockpile.”
- b. One per 1,000 tons means “One Set of Tests Per 1,000 Tons of Material in the Stockpile” with a minimum of 3 sets of gradation tests per project.
- c. One per 3,000 tons means “One Set of Tests Per 3,000 Tons of Material in the Stockpile.”

d. Delete subsections 00745.16(a)(3) and 00745.16(a)(4) and replace with the following:

00745.16(a)(3) HMAC Production Sampling, Testing, and Frequency - Quality control testing of hot-mix asphalt concrete pavement mixture required during placement is as follows unless approved otherwise by the City Engineer:

Asphalt Content	AASHTO T-308	1 test every 1,000 tons, 1 test per day minimum
Gradation	(Residual Agg. from AASHTO T-308)	1 test every 1,000 tons, 1 test per day minimum
Maximum Specific Gravity	AASHTO T-209	1 test every 1,000 tons, 1 test per day minimum
Compaction	WAQCT TM-8	5 tests every 1,000 tons
Percent Hydrated Lime	ODOT TM T-321	1 test every 1,000 tons

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Asphalt content, gradation, and maximum specific gravity testing will be performed at the start of production to verify the hot-mix asphalt mix design.

e. Delete subsection 00745.16(c).

f. Add the following subsection:

00745.42 Preparation of Underlying Surfaces - All edges of manholes, valve boxes, curbs, existing pavement, etc., that are to be in contact with the new asphalt concrete shall be cleaned and painted or sprayed with a thin tack coat. This tack coat is to be applied only far enough in advance as is appropriate to ensure a tacky, sticky condition at the time the asphalt concrete comes in contact with the structure. The application of the tack coat shall be done in a neat, workmanlike fashion. Any material inadvertently applied to surfaces outside the limits of the paving, such as on sidewalks, exposed sections of curbs, etc., shall be fully cleaned by the Contractor.

g. Add the following subsection:

00745.44 Paving Crew - Only trained and experienced personnel shall be used on the paving crew performing the work. The Contractor shall submit to the City Engineer, prior to the pre-paving conference, job assignments, experience history, and training background for all members of the paving crew. Untrained and inexperienced personnel may not be used. The City Engineer may request personnel be replaced if it cannot be demonstrated that they have the proper training and experience to be a part of an experienced crew. The paving superintendent and paving machine operator shall have at least five years experience, and the roller operators shall have at least two years experience.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

h. Add the following subsection:

00745.48(b) Depositing - The Contractor shall employ suitable methods of transferring the asphalt concrete mix from the hauling equipment to the paver that will not impact the proper operation of the paver. The Contractor shall discontinue any methods that impact the quality of the asphalt concrete pavement being placed. When asphalt concrete mix is transported from the batch plant resulting in a 45 minute or greater travel time, the Contractor shall remix the asphalt concrete mix before it is placed into the paver in order to provide a uniform temperature in the mix.

i. Add the following subsection:

00745.63 Protection Under Traffic - No traffic or equipment shall come in contact with the compacted mixture until it has cooled and set sufficiently to prevent marking; edges shall be protected from being broken down; edge drop-offs one or more inches in height shall be marked with warning devices visible by day and night to traveling public at spacing sufficiently close to indicate the alignment and location of the hazard if the road is under traffic.

j. Delete the following subsections:

00745.80
00745.83
00745.90
00745.93

k. Delete Subsection 00745.95 and replace with the following:

00745.95 HMAC Price Adjustments -

(a) Compaction. If the test results for a given test lot show the density of the asphalt concrete pavement to be below the required 91 percent, the following price adjustment will be applied for each test lot having low densities:

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Average % of Specified Density (ASTM D-2041)	Density Price Adjustment
91% and above	0.0%
90 - 90.9	5.0%
89 - 89.9	10.0%
88 - 88.9	20.0%
Below 88	Replace Asphalt Concrete Pavement

If the average percent compaction is acceptable and one test falls below 88 percent in any given lot, additional core samples will be taken in the problem area. If the additional core samples have low densities in the problem area as determined by the City Engineer, pavement shall be replaced at no cost to the City.

(b) Thickness. The thickness of the pavement shall be determined by measuring the depth of the cores taken from the test lot for compaction compliance. Should the pavement thickness be more or less than required, a price adjustment shall be determined as follows for each lot having the non-specified thickness.

Average % of Specified Thickness	Thickness Price Adjustment
95% and greater	0.0%
85% - 94.9%	Actual % of thickness deficit plus 5.0%
Below 85%	Corrective action required

The average will be made by measuring at least 3 cores for a maximum of 3,000 square yard test lots. The actual thickness of each core will be used.

(c) Computation of Total Price Adjustment. The price adjustment shall be additive for density and thickness. The total price adjustment will be determined as follows:

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Density price adjustment + Thickness price adjustment = Total price adjustment

Payment = Bid Price - (Bid price x total price adjustment)

For example: For a density price adjustment of 5 percent, a thickness price adjustment of 2 percent, and a bid price of \$45/ton, payment would be as follows:

Price Adjustment: 5% + 2% = 7.0%

Payment: \$45 - (\$45 x 7.0%) = \$41.85/ton

Note: Other deficiencies in the quality of the asphalt concrete pavement will require replacement, corrective work, or negotiated price adjustments.

H. ASPHALT SEAL COAT

After the construction of the asphalt concrete, the City Engineer will evaluate the surface to determine whether a fog seal is required. When test results and inspection shows that the Asphalt Concrete meets the minimum requirements of these Specifications, but a seal is still needed, then the Contractor shall apply a fog seal consisting of CSS-1 emulsified asphalt mixed with water at a rate of 1 to 1 and applied at a rate to be determined by the City Engineer. It is anticipated that this rate will be between 0.05 to 0.20 (0.03 to 0.10 residual) gallons per square yard.

The areas to be sealed shall be dry and free of dirt, dust, leaves, or other foreign matter at the time of placement. After application and initial cure of the emulsified asphalt the Contractor shall apply a light coat of clean fine sand. The sand shall be applied evenly and then broomed across the pavement surface. After approximately 5 days the Contractor shall sweep the street and remove the excess loose sand.

All of this work, a portion of it, or none of it may be performed, depending on the evaluation made by the City Engineer.

I. EMULSIFIED ASPHALT SURFACE TREATMENT

1. Scope. This work shall consist of applications of emulsified asphalt and graded aggregates applied in successive spreads to form a firm finished surface.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

The emulsified asphalt oil mat shall be constructed in accordance with these Specifications and in reasonably close conformity to the lines, grades, thicknesses and cross sections shown on the Drawings or established by the City Engineer.

The rates of spreads and quantities of materials are subject to variation as directed by the City Engineer to adjust for variable conditions encountered or experienced during the construction. Also, the Contractor shall recognize that the nature of the work calls for equipment in varying number and versatility and modification of procedures to some extent. Generally, the ratio of asphalt to aggregate shall be held closely constant to that specified.

2. Materials.

a. Bituminous Materials. The bituminous materials to be used in the emulsified asphalt oil mats shall be CRS-2P or HFRS-P1. Asphalt materials shall conform to the requirements of the "Oregon Standard Specifications for Asphalt Materials 2005." Asphalt materials shall be provided by a supplier approved by the City.

The materials may be conditionally accepted based on certification at the source or point of loading for transport to the project. Excessive delay in the use of the emulsified asphalt or excessive pumping of the emulsified asphalt may significantly reduce the viscosity and may make the material unsuitable for chip seal use. For this reason, pumping which occurs between the bulk storage tank, hauling transportation, field storage tanks, and distributor shall be kept to an absolute minimum. Final acceptance of emulsified asphalt will be at the point of application.

Obtain asphalt samples according to AASHTO T 40 at the frequency of one sample per truck. Samples will be tested at the Oregon Department of Transportation Materials Laboratory, or other laboratory as designated by the City. Polymer-modified asphalt will be tested within 14 calendar days from the date it is sampled.

b. Aggregates for Emulsified Asphalt Surface Treatment.

(1) Quality. Aggregates shall consist of broken stone, crushed gravel, or a combination of both. Aggregates produced from gravel materials (alluvial rock) shall be pre-screened and produced only from the +1-inch material. At least 100 percent by weight of the total aggregate retained on the No. 10 and larger sieves shall be fractured on four faces, as determined visually by the City Engineer. Elongated pieces in the coarse aggregate (aggregate larger than

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

1/4-inch) shall be determined as described in ODOT Test Method 229 with the proportional caliper device set at a ratio of 5:1 and shall not exceed 10 percent by weight of the material retained on the 1/4-inch sieve. The aggregate shall be clean. Unless all dirt, dust, clay, and other objectionable matter is removed by dry screening, the aggregates shall be made clean by washing and/or by eliminating from the quarry rock or pit-run product, or from the product of the breaker crusher, the smaller sized rock or gravel with which the dirt, clay, and other objectionable matter is combined. The cleanness value as determined by ODOT TM 227 shall be a minimum value of 75.

(2) Size and Grading. The percentage composition by weight of aggregates shall conform to one of the following gradations:

Sieve Sizes Passing	Designated Sizes (inches)	
	3/4"-1/2"	1/2"-1/4"
1"	100	—
3/4"	90-100	100
1/2"	0-10	85-100
1/4"	0-2	0-15
No. 8	—	0-4
No. 40	—	—
No. 200 (wet)	0-2	0-2
No. 200 (wet)	0-1*	0-1*

*(in gravels)

(3) Unit Mass (Weight) of Aggregate. Provide aggregate with a minimum unit mass (weight) of 1440 kg/m³ (90 pounds per cubic foot) according to AASHTO T 19.

(4) Soundness. Provide coarse and fine aggregate meeting the soundness testing requirements using sodium sulfate salt according to AASHTO T 104. The weighted percentage loss shall not exceed 12 percent by mass (weight).

(5) Durability. Provide aggregates meeting the following durability requirements:

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Test	Test Method		Maximum Values
	ODOT	AASHTO	
Abrasion		T 96	30.0%
Degradation (coarse aggregate)			
Passing 850 µm (No. 20) Sieve	TM 208		30.0%
Sediment Height	TM 208		3.0 inches

(6) Harmful Substances. Provide aggregates meeting the following harmful substances requirements:

Test	Test Method		Maximum Values
	ODOT	AASHTO	
Lightweight Pieces		T 113	1.0% Maximum
Wood Particles	TM 225		0.1% Maximum

(7) Quality Control. Unless otherwise directed by the City Engineer, the Contractor shall demonstrate quality control procedures as outlined below. The Contractor shall provide certification and test results to the City Engineer demonstrating that the aggregate is acceptable for use. 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. The City may perform quality assurance testing at the discretion of the City. At a minimum, the quality control tests shall be as follows:

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

	Test Method		Start of Production	One per Shift*
	ODOT	AASHTO		
Fracture of Gravel	WAQTC TM 1	TP 61	X	X
Elongated Pieces	TM 229		X	X
Sieve Analysis		T-11/ T-27	X	X**
Cleanness Value	TM 227		X	X**

* A shift means a production shift or 1,100 tons, whichever results in the greatest sampling frequency.

**Perform at least three tests per project.

3. Construction. The Contractor shall prepare and submit to the City Engineer, prior to the beginning of construction, a Work Plan. The Work Plan shall detail traffic control provisions, methods of performing the work, scheduling, and any other pertinent information requested by the City Engineer. The Contractor and City Engineer shall communicate sufficiently prior to construction to facilitate completion of the Work Plan in a timely and efficient manner.

a. Weather Limitations. Emulsified asphalt shall not be applied when the pavement temperature is below 70°F, nor if the humidity is higher than 75 percent. The application of the emulsified asphalt and the aggregate chips shall be complete 3 hours before sunset. Chip seals damaged by rain during the first 24 hours after application shall be removed by the Contractor by milling or other acceptable methods approved by the City Engineer and replaced at the Contractor's expense. Should the Contractor proceed with his operation knowing that adverse weather is predicted, he will be proceeding at his own risk and shall assume all losses that may occur due to the onset of inclement weather. The placing of emulsified asphalt chip seals shall not be allowed before July 1 or after August 31.

b. Equipment. The equipment to be used shall include a pressure distributor, hauling vehicles, chip spreader, compactors, power brooms, and such other equipment to ensure efficient operation and construction to meet specified results.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Equipment shall be provided in such number and capacities as will provide coordinated and uniform progress of the work. The Contractor shall provide two-way radio communication between the asphalt distributor and chip spreader.

(1) Asphalt Distributor. The asphalt distributor shall be so designed, equipped, maintained and operated that emulsified asphalt material at even heat may be applied uniformly on variable widths of surface up to 16 feet at readily determinable and controlled rates from 0.05 to 2.0 gallons per square yard, with uniform pressure, and with an allowable variation from any specified rate not to exceed 0.02 gallon per square yard. Distributor equipment shall include a tachometer, pressure gauges, accurate volume measuring devices or a calibrated tank, and a thermometer for measuring temperature of tank contents. Distributors shall have a power unit for the pump and full circulation spray bars adjustable laterally and vertically.

The distributor operator shall provide manufacturer's specifications showing proper nozzle size for desired travel and rate of emulsified asphalt application. Pump pressure shall be in the middle or lower end of the acceptable range. Nozzle angle shall be set accurately to the angle stated in the manufacturer's specifications. Bar height shall be set for triple lap coverage.

(2) Chip Spreaders. The chip spreaders shall be self-propelled and shall be equipped with a mechanical device that will spread the aggregate at a uniform rate across the full width of the chip spreaders. Spreaders shall be equipped with an aggregate segregator assembly. Chip spreaders shall be of adequate width to provide full coverage without gaps or overlaps of adjacent panels and without placing joints in the wheel paths.

(3) Compactors. Rollers shall be self-propelled pneumatic-tired or steel-wheeled with a minimum of one pneumatic-tired roller and one steel-wheeled roller required. They shall be in good condition and capable of operating at speeds compatible with the chip seal operation.

(a) Pneumatic-Tired Rollers. The pneumatic-tired rollers shall be self-propelled, tandem or multiple axle, multiple wheel type with smooth tread pneumatic tires of equal size staggered on the axles at such spacings and overlaps as will provide uniform compacting pressure for the full compacting width of the roller. The minimum load per tire will be 2,800 pounds, with tire inflation pressures of 45 to 60 psi.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

(b) Steel-Wheeled Rollers. The steel-wheeled roller shall provide a weight of not less than 200 pounds per inch of width of the compression roll or rolls.

(4) Power Brooms. Power brooms shall be pickup and/or non-pickup-type and shall have a positive means to control vertical pressure.

c. Sequence of Operations and Application Rates. The number of spreads, the size of aggregates, and the application rates for both emulsified asphalt and aggregates for the type of emulsified asphalt oil mat to be used shall be as shown in the following Table of Details. The rates of spread shall be subject to variation by the City Engineer, during the progress of work, as may be deemed necessary to produce the best results.

TABLE OF DETAILS
MULTIPLE SURFACE TREATMENT

Spreading Order and *Rates of Spread	
First Course	
Emulsified Asphalt	0.60
3/4" - 1/2"	0.015
Second Course	
Emulsified Asphalt	0.55
1/2" - 1/4"	0.015
Third Course	
Emulsified Asphalt	0.55
1/2" - 1/4"	0.010
Fourth Course	
Emulsified Asphalt	0.55
1/4" - No. 10	0.007
Fifth Course	
Emulsified Asphalt	0.55
1/2" - 1/4"	0.010

- * The rates of spread are in the following units:
- Emulsified Asphalt - Gallons per Square Yard (gal/S.Y.)
 - Aggregates - Cubic Yards per Square Yard (C.Y./S.Y.)

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Preceding spreads of designated size aggregate shall be shaped and compacted and shall be at established line and grade just prior to the succeeding spread. Use one of the following procedures as mutually agreed to by the City Engineer and Contractor.

- Complete first and second course 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.
- Prior to applying third course, lightly broom any loose aggregates from the surface. Apply the third course throughout the entire section. Square up 3 hours prior to sunset.
- The following year, place the third or fourth course of the asphalt surface treatment.
- Complete all courses the same day.
- Stop succeeding courses of each surface treatment (15 feet) beyond the preceding course, or as directed by the City Engineer, at project ends to provide a smooth transition to the existing pavement.

d. Applying Emulsified Asphalt. Apply emulsified asphalt at the rates specified and according to the following:

- Apply emulsified asphalt, working toward the aggregate stockpile at all times, unless otherwise approved by the City Engineer.
- Leave a minimum of 200 gallons of emulsified asphalt in the distributor tank at all times.
- Do not apply emulsified asphalt to more than one-half the width of the travel way at one time with the remaining width remaining open to traffic. Do not close the open lane until traffic controlled by pilot car is operating on the new surface treatment. Apply the surface treatment, weather permitting, to both sides of the travel way so that the end of the work is squared up three hours before sunset.
- Do not apply emulsified asphalt a greater distance than can be immediately covered by aggregates before the emulsion breaks.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

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

e. Hauling and Spreading Aggregates. Hauling and spreading equipment shall not be operated on uncovered emulsified asphalt. During the first one hour after application of the emulsified asphalt and aggregate, speeds shall be no more than 10 mph and after the first hour, speeds shall not be in excess of 15 MPH, until otherwise permitted by the City Engineer. At all times, hauling equipment shall be operated in a prudent manner and at moderate speeds that will not damage the new oil mat or create a hazard to the traveling public.

The chip spreaders shall be accurately calibrated for the various sizes of aggregates to be used in regard to gate opening, gear selection, and engine RPM. Following calibration, the rate of application shall be verified by truck measure and area covered.

Immediately following the application of the emulsified asphalt, the surface shall be covered with aggregate, unless otherwise authorized by the City Engineer. The rate of spread of this aggregate shall be maintained within 10 percent of specified rate. Emulsified asphalt that has set or "broke" before being covered with aggregate shall be removed or repaired by methods approved by the City Engineer and shall be at the Contractor's expense.

Operating the chip spreader at speeds which cause the chips to roll over after striking the emulsified asphalt will not be permitted.

The Contractor shall provide coverage without gaps or overlapping adjacent coverages. The Contractor shall not construct longitudinal joints within the wheel paths.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

The transverse cut off of aggregates shall be neat and any excess aggregates shall be removed from the surface prior to resuming operations.

Aggregates shall be surface damp at the time of application, but shall not have excess free water (water not adhering to the aggregate surface).

f. Shaping. After the aggregates have been spread upon the emulsified asphalt, any piles, ridges, or uneven distribution shall be spread and/or removed by hand tools or mechanical means, as the Contractor elects, to ensure against rough spots in the final surface.

In the event aggregates begin to be picked up under traffic or from the rolling operation, that area shall be immediately covered with additional quantities of fine aggregate and rolled.

g. Compaction. Initial rolling shall consist of one complete coverage with one roller remaining immediately behind the chip spreader. Secondary rolling shall begin immediately after completion of the initial rolling and continue until the surface has had three additional complete coverages (four coverages total). The sequence of rollers will be as directed by the City Engineer.

Rolling speeds shall be kept to a minimum, not to exceed 5 MPH, so that the rollers do not pick up aggregates from the emulsified asphalt surface.

Rolling shall normally commence at the low side of the cross section and progress with passes parallel to the roadway centerline. Each lap shall overlap the 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, the aggregate shall be thoroughly compacted with mechanical tampers or with hand tampers. Each hand tamper shall weigh not less than 50 pounds and have a tamping face of not more than 100 square inches.

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 shall be corrected by removal, replacement, addition of material, repetition of construction operations or other suitable means, as directed or approved by the City Engineer.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

h. Remove Excess Aggregate. Between the hours of 1:00 a.m. and 10:00 a.m. the day following the application of the final course, the entire surface shall be carefully bladed or power broomed to remove loose aggregate that could damage vehicles. Equipment shall be provided in such numbers and sizes to complete this operation within the prescribed time.

I. Establishment. After placement of the final course, during periods when partial construction is open to traffic and for one calendar week following original completion of the final course throughout the entire length of the project, the Contractor shall perform the following operations:

- The surface shall be bladed or broomed to correct bleeding of asphalt, to provide coverage with aggregates, to keep the surface free of gravel, traffic grooves, holes, and other deformations, and to eliminate other defects that may appear.
- Rolling and compacting of materials shall be performed to maintain or restore firmness and stability to the materials.
- Abutting shoulders shall be trimmed and materials which come into side ditches shall be removed and wasted in a manner satisfactory to the City Engineer.
- In curbed areas, the Contractor shall use a pick up type power broom. On bridges, sidewalks, and other areas off the roadway, all extraneous aggregates shall be removed by the Contractor to the satisfaction of the City Engineer.

The above operations shall be performed under traffic and at frequencies which the City Engineer determines as being necessary to develop and establish the course to uniform firmness and stability throughout.

Correct all deficiencies in surface in a manner acceptable to the City Engineer. Perform all corrective work at the Contractor's expense within 10 working days following notification.

J. CONSTRUCTION STAKING

The Contractor shall provide all construction staking necessary. Recommended minimum staking is as follows:

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

For the earthwork, slope stakes shall be provided at 50-foot stations and at all other grade changes. Upon grading and compaction of the earthwork subgrade to within 0.2 foot plus or minus of design grade, subgrade hubs shall be set for use by the Contractor in bringing the earthwork to final subgrade. Upon placing, grading and compaction of the base rock to within 0.1 foot plus or minus of design grade, provide hubs at 50 foot stations and at all other grade changes for use by the Contractor in fine grading the base rock. Where concrete curbs are to be constructed, provide offset grade and line stakes at 25-foot stations and at beginnings and ends of curves.

K. STREET MONUMENT BOXES

The Contractor shall provide and install cast iron street monument boxes at all points shown on the Drawings. The monument boxes shall be equal to Number 1036 as cast by Inland Foundry Company, Spokane, Washington and shall have the letters MON at least one inch tall cast in the cover. Reference stakes for location of the monument boxes shall be provided by the City Engineer. Monument boxes shall be installed after placement of the asphalt concrete pavement. Holes in the pavement shall be neatly cut to a 24-inch diameter. After installation of a street monument box, the hole shall be backfilled with Portland cement concrete (minimum 3000 psi compression strength). The asphalt concrete shall be patched to leave a smooth ride. Monuments within the boxes shall be installed by a Registered Professional Land Surveyor .

L. ADJUSTMENT OF UTILITY COVERS TO GRADE

The Contractor shall adjust the tops of all existing manholes, valve boxes and other utility covers as required to bring the covers or gratings of the structures to the grade required by the improvement involved. The method of adjustment shall be shown on the Drawings or as approved by the City Engineer. The Contractor shall repair any of these structures which are damaged during performance of the work at no cost to the City.

M. CULVERTS

- 1. General.** Culverts shall be installed in the location as shown on the Drawings, in accordance with the details.
- 2. Material.** Culverts shall be galvanized corrugated steel pipe and shall be 14-gauge with 2-2/3"x1/2" corrugations. Fabrication of pipe shall conform to AASHTO 218 Specifications. Coating shall be minimum 2-ounce zinc per square foot. Joints shall

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

be made with corrugated steel culvert bands over 3/8-inch neoprene gaskets. Culvert bands shall be 12 inches wide.

3. Installation. Culverts shall be bedded and backfilled uniformly on both sides of the pipe at the same time to prevent displacement or buckling of the pipe. Bedding material shall be worked carefully under the pipe haunches and then compacted. Bedding and backfill material shall consist of select native material free of particle sizes greater than 1 1/2-inch in diameter. All culverts shall be installed at the extended grade and slope of the existing CMP which is being extended.

N. DRAINAGE TRENCHES

Drainage trenches shall be constructed in the locations shown on the Drawings in accordance with the details.

O. PAVEMENT STRIPING

Traffic for painted traffic markings and striping shall meet or exceed the requirements for striping paint and glass beads of "Pavement Marking Materials" and "Oregon Standard Specifications for Construction," current edition. The paint color and type of markings shall be as shown on the Drawings or as required by the City Engineer. The Contractor shall lay out all pavement markings and striping.

P. RESTORATION, FINISHING, AND CLEANUP

Prior to the final inspection of the work, the Contractor shall restore or replace all paved surfaces, graveled surfaces, curbing, sidewalks, trees and shrubbery, lawns, pastures and fences, or other existing facilities disturbed or damaged by his work.

The Contractor shall cleanup and leave in a neat, orderly condition the right-of-way, and other property occupied in connection with the work.

The Contractor shall reshape, cleanout ditches, retrieve shoulders and slopes, and do all other work required to bring the project to the final lines, grades, and condition called for. The finished project shall be clean and neat in its final appearance.

CITY OF UNION, OREGON
TECHNICAL SPECIFICATIONS
SECTION 6
ROAD WORK

Q. TESTING

1. General. All testing shall be performed as per the requirements of the Drawings and Specifications. Materials and work which fail to meet contract requirements shall not be incorporated in the work.

2. Contractor's Responsibilities. The Contractor shall provide, at his expense, all preliminary testing needed to determine if materials and equipment are suitable for the project. If aggregates are crushed for use on this project, the Contractor shall be responsible for providing adequate quality control tests to document that the materials conform to these specifications. The Contractor will also provide routine testing services on materials and work incorporated on the project. These tests may include, but are not limited to, spot gradation checks, in-place densities, extraction/gradations, etc. In addition to the above tests, all other tests required by laws, ordinances, regulations, and orders of public authorities shall also be the responsibility of the Contractor. The results of all tests performed on materials to be used on the project by the Contractor shall be submitted to the City Engineer, prior to the use of any of these materials. The City may perform independent tests to verify work quality.

The Contractor shall cooperate with testing personnel and shall provide access to the work area and to manufacturer's operations. The Contractor shall notify testing and inspection personnel at least 24 hours in advance of operations to allow for personnel assignments and test scheduling. All materials to be tested shall be provided by the Contractor at his expense. After tests are completed, the Contractor shall be responsible for repairing test areas to match original conditions. The Contractor shall remove all defective material from the site at his expense. The Contractor shall pay for reinspection and retesting required because of defective work or ill-timed notices. Routine testing services are provided for City's information and in no way relieve the Contractor of his responsibility to comply with the Drawings and Specifications.