

**PART 300**

**STREETS AND RELATED WORK**

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## SUBGRADE PREPARATION

### 301.1 DESCRIPTION:

This section shall govern the preparation of natural, or excavated areas prior to the placement of sub-base material, pavement, curbs and gutters, driveways, sidewalks or other structures. It shall include stripping and disposal of all unsuitable material including existing pavement and obstructions such as stumps, roots, rocks, etc., from the area to be paved.

### 301.2 PREPARATION OF SUBGRADE:

With the exception of areas where compacted fills have been constructed as specified in Section 211 in the areas where new construction is required the moisture content shall be brought to that required for compaction by the addition of water, by the addition and blending of dry, suitable material or by the drying of existing material. The material shall then be compacted to the specified relative density. If pumping subgrade should become evident at any time prior to paving, the Engineer may require proof rolling with a pneumatic-tire roller or other approved equipment in order to identify the limits of the unacceptable area. The proof rolling will be performed at no additional cost to the Contracting Agency.

Municipality	Supplements
GI	<p><b>GI: 3.7 Roadway Installation Specifications</b>            Procedures and materials for constructing roadway improvements are as follows:</p> <p>A. Roadway excavation and subgrade preparation. Roadway excavation shall consist of excavation involved in the grading and construction of roadways, except structure excavation, trench excavation and any other excavation separately designated.</p> <p>1. Subgrade preparation. The subgrade shall be scarified and loosened to a depth of six (6) inches. When fill material is required a layer of approximately three (3) inches may be spread and compacted with the subgrade material to provide a better bond. The subgrade cut and fill areas shall be constructed to achieve a uniform soil structure.</p> <p>However, areas containing highly expansive clays within roadway areas may be compacted in place without scarification as directed by the Town Engineer. Moisture content of subgrade materials shall be brought to that required for compaction by the addition of water, by the addition and blending of dry, suitable material or by the drying of existing material. The material shall then be compacted to a minimum of ninety-five (95) percent as determined in accordance with ASTM D-698. All subgrade shall be approved by the Town Engineer prior to placement of ABC or select materials. The contractor shall provide means to proof roll roadway subgrade at the direction of the Town Engineer utilizing a minimum eighteen thousand (18,000) pound live axle load. Subgrade containing soft or excessively wet areas shall be removed and replaced with suitable materials under the direction of the Town Engineer. In this event the Soil Engineer should also be notified.</p>

Municipality	Supplements
GL:	<p><b>Subgrade</b>            Subgrade preparation shall be performed in accordance to MAG Section 301 for all Right-of-Way Projects. The City shall also require that subgrade moisture content be maintained between the limits of +2 and -4 percent of optimum moisture content as determined by AASHTO T-99 or ASTM D-968.</p>

Municipality	Supplements
MC:	<p><b>Preparation of Subgrade:</b> Subgrade preparation shall also include preparing subgrade to required line and grade for paved or unpaved shoulders, tapers, turnouts, and driveways, and all project locations where aggregate base and/or select material courses are used in accordance with the Project Plans.</p> <p><b>301.2.1</b> The Contractor may use removed existing asphalt concrete and other existing bituminous roadway surfacing materials, originating on the project site, as embankment fill. All materials used shall be thoroughly crushed to sizes not exceeding four inches, or as approved by the Engineer. These asphalt/bituminous materials shall be placed not less than two feet below subgrade elevation.</p> <p>Project earthwork quantities when included as separate bid items will include removed asphalt/bituminous material volumes, unless otherwise specified in the Special Provisions.</p> <p>All unsuitable material and all excess material shall be disposed of in accordance with the requirements of Sections 205.2 and 205.6, respectively. When additional material is required for fill, it shall conform to Section 210.</p>

Municipality	Supplements
PH:	<p><b>Preparation of Subgrade</b></p> <p>The Contractor's grading operations will proceed in an orderly sequence and shall be followed directly with the placement of base course. At no time shall the Contractor's total grading operations precede the placement of base course by more than 1200 feet without specific written approval of the Engineer. At the end of each day's operation, the first lift of base course shall have been placed to within a maximum distance of 300 feet behind the finished subgrade area. Drop-offs on opposite sides of the pavement at the same time will not be allowed.</p> <p>Existing pavement under proposed median islands shall be removed. Payment for this work shall be considered incidental to the project.</p> <p>When excavating for concrete work, such as curb and gutter and sidewalk, the Contractor shall place the excavated material in uniform windrows. The windrows shall not interfere with property access or traffic flow on the streets</p>

**301.3 RELATIVE COMPACTION:**

The subgrade shall be scarified and loosened to a depth of 6 inches. When fill material is required, a layer of approximately 3 inches may be spread and compacted with the subgrade material to provide a better bond. The subgrade cut and fill areas shall be constructed to achieve a uniform soil structure having the following minimum dry density when tested in accordance with AASHTO T-99, Method A, and T-191 or ASTM D-2922 and D-3017 with the percent of density adjusted in accordance with the rock correction procedures for maximum density determination, standard detail, to compensate for the rock content larger than that which will pass a No. 4 sieve.

- (A) All Streets..... 95 percent
- (B) Other traffic ways..... 90 percent
- (C) Curbs, gutters and sidewalks..... 85 percent

Municipality	Supplements
PH:	<p><b>Subgrade Compaction – Concrete</b></p> <p>Compaction of subgrade soils under concrete such as sidewalks, curbs, gutters, valley gutters and aprons shall be within the range of 80 to 90 percent of standard proctor density.</p>

	<p>The City Engineer may accept a waiver of this requirement if it can be shown through proper engineering testing, including, but not limited to, sieve analysis, plasticity index, soil type, and swell potential of the soil in question, that it is unnecessary. The testing and Waiver Request must be made under the direction, seal and signature of a Registered Professional Engineer licensed by the State of Arizona who has established proficiency in Geotechnical Engineering. The Geotechnical Engineer’s Recommendation for Waiver from this specification shall include a minimum and maximum range of compaction of the soil type being waived, but will not exceed a range of 10%. The Waiver Request shall be submitted with the plans for first review.</p>
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Municipality	Supplements
<b>GL:</b>	<p><b>Compaction</b>  Relative Compaction requirements will adhere to MAG Section 301.3 with the following exceptions:  Curb, gutters and sidewalks .....90 Percent  Driveways, Aprons and Valley Gutters .....95 percent</p>

Municipality	Supplements
<b>MC:</b>	<p><b>Relative Compaction:</b>  Rock 6 inches or greater that becomes exposed due to scarification shall be removed from the scarified subgrade.  (D) All MCDOT Roadway Pavements ..... 95 percent  (E) All MCDOT Graded Shoulders ..... 95 percent</p>

Municipality	Supplements
<b>PH:</b>	<p><b>Subgrade Compaction – Concrete</b>  Compaction of subgrade soils under concrete such as sidewalks, curbs, gutters, valley gutters and aprons shall be within the range of 80 to 90 percent of standard proctor density.</p> <p>The City Engineer may accept a waiver of this requirement if it can be shown through proper engineering testing, including, but not limited to, sieve analysis, plasticity index, soil type, and swell potential of the soil in question, that it is unnecessary. The testing and Waiver Request must be made under the direction, seal and signature of a Registered Professional Engineer licensed by the State of Arizona who has established proficiency in Geotechnical Engineering. The Geotechnical Engineer’s Recommendation for Waiver from this specification shall include a minimum and maximum range of compaction of the soil type being waived, but will not exceed a range of 10%. The Waiver Request shall be submitted with the plans for first review.</p> <p><b>301.3 RELATIVE COMPACTION: is changed to read:</b>  A) All subgrade under pavement shall be compacted to 100%  B) Curbs, Gutters and Sidewalks 90%</p>

Municipality	Supplements
<b>TE:</b>	<p><b>301.3:</b> Revise compaction table to read:  (A) All Streets ..... 95 Percent  (B) Other Traffic Ways ..... 90 Percent  (C) Curbs, Gutters, and Sidewalks . . . 95 Percent</p>

**301.4 SUBGRADE TOLERANCES:**

Subgrade upon which pavement, sidewalk, curb and gutter, driveways, or other structures are to be directly placed shall not vary more than 1/4 inch from the specified grade and cross-section. Subgrade upon which sub-base or base material is to be placed shall not vary more than 3/4 inch from the specified grade and cross-section. Variations within the above specified tolerances shall be compensating so that the average grade and cross-section specified are met.

**301.5 GRADING OF AREAS NOT TO BE PAVED:**

Areas where grade only is called for on the plan shall be graded to meet the tolerances for the subgrade where sub-base or base material is to be placed. The surface shall be constructed to a straight grade from the finished pavement elevations shown on the plans to the elevation of the existing ground at the extremities of the area to be graded.

**301.6 PROTECTION OF EXISTING FACILITIES:**

The Contractor shall exercise extreme caution to prevent debris from falling into manholes or other structures. In the event that debris should fall into a structure it shall immediately be removed.

**301.7 MEASUREMENT:**

Measurement for grading under pavement will be by the square yard.

Municipality	Supplements
MC:	<p><b>301.7 Measurement:</b> Measurement for Subgrade Preparation will be by the square yard. The area to be measured will be the total accepted area of new asphalt or Portland cement pavement, including paved shoulders, tapers, and turnouts, and unpaved roadway shoulders. Measurement will also include driveways that are paved or are surfaced with aggregate base or select materials. The area under concrete curb and gutter, concrete driveway entrances, and concrete alley entrances will not be measured for this pay item.</p> <p>Project earthwork quantities for Roadway Excavation, Borrow Excavation, and Fill Construction shall not be measured when they are all omitted from the bidding schedule. Payment for such earthwork items shall be included in the price bid for Subgrade Preparation.</p>

**301.8 PAYMENT:**

Payment for this grading work will be made only when it is performed for street or roadway paving projects. Payment for necessary grading for items outside of the lip of gutter shall be included in the cost of those items.

Payment will be made at the unit price bid per square yard, and such payment shall be compensation in full for the item complete in place, including stripping, excavating, hauling, filling, compacting, and disposing of excess or unsuitable materials, together with all costs incidental thereto.

Municipality	Supplements
MC:	<p><b>308.1 LIME SLURRY WITH FLY ASH STABILIZATION</b></p> <p><b>308.1 Description</b> This section shall consist of constructing a mixture of soil, lime slurry, fly ash and water for the stabilization of soils or base materials. The work shall be performed in conformity with the lines, grades, thickness, and typical cross sections shown on the plans.</p> <p><b>308.2 Materials</b></p>

**308.2.1 Soil or Subgrade**

The soil or subgrade material used for this work shall consist of materials on the site or imported and shall be free of roots, sod, weeds, and stones larger than 3 inches.

**308.2.2 Quicklime and Hydrated Lime**

Lime used to manufacture the Commercial Lime Slurry specified herein, shall be either Quicklime or Hydrated lime and shall conform to the requirements of ASTM C 977. Lime may only be used in the production of lime slurry. The direct use of dry hydrated lime or quicklime to the soil material is strictly prohibited. All lime shall come from a single source. If a source change is requested, a new mix design shall be submitted using lime from the proposed new source. The new design must be approved by the Engineer prior to use.

**308.2.3 Commercial Lime Slurry**

Commercial lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of solids content, shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

(A) Chemical Composition: The solids content of the lime slurry shall consist of a minimum of 90 percent by weight, of calcium and magnesium oxides (CaO and MgO), as determined by ASTM C-25.

(B) Residue: The percent by weight of residue retained in the solids content of lime slurry shall conform to the following requirements:

Residue retained on a No. 6 sieve Max. 0.2%

Residue retained on a No. 30 sieve Max. 4.0%

(C) Grade: Commercial lime slurry shall conform to a dry solids content as approved by the Engineer.

A certificate of compliance and a field summary of lime slurry produced shall be provided to the Engineer for each load of slurry.

**308.2.4 Water**

Water used for mixing or curing shall be reasonably clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Water shall be tested in accordance with and shall meet the suggested requirements of AASHTO T-26. Water known to be of potable quality may be used without test.

**308.2.5 Fly Ash**

Fly ash shall meet the requirements of AASHTO M-295, Class C.

**308.3 Mix Design**

Before commencing lime / fly ash treatment work, the Contractor shall submit for approval by the Engineer, a proposed mix design. A testing laboratory under the direction and control of a registered Professional Engineer shall prepare the proposed mix design. The mix design shall be determined using the soils or subgrade material to be stabilized and lime and fly ash from the proposed suppliers and shall determine the following:

- Percent of fly ash and rate of application.
- Percent of lime and rate of application of lime slurry in the treated soil or subgrade material.
- Optimum water content during mixing, curing and compaction.
- Gradation of in-situ mixture after treatment.
- Additional mixing or equipment requirements.
- Mellowing time requirements, if needed.
- The mix design shall comply with the following requirements:
- Plasticity Index: Less than 3, per AASHTO T-89 & 90.
- Swell Potential: One (1) percent or less vertical expansion of an air dried soil when inundated with water and allowed to swell at a confined pressure of 60 psi.

- Unconfined Compressive Strength: Minimum 300 psi in five days curing at 100° F when tested in accordance with ASTM D-1633 Method A.

### **308.4 Construction**

#### **308.4.1 General**

The completed subgrade shall consist of a uniform lime / fly ash mixture, free from loose segregated areas, have a uniform density and moisture content, and be well bound for its full depth. A smooth surface suitable for placing subsequent courses is required if pavement is to be placed directly on the treated subgrade.

Prior to beginning stabilization, the subgrade shall be constructed and brought to grade and shall be shaped to conform to the typical sections, lines, and grades as shown on the plans.

When the design requires treatment to a depth greater than 12 inches, the subgrade soil shall be treated in equal layers. The top layer(s) of soil shall be removed and stockpiled. The lower layer of soil to be treated shall then be treated and allowed to cure in place. After final mixing, the lower layer shall be compacted in maximum 12 inch compacted lifts. The stockpiled soil shall then be placed, treated, mixed and compacted in successive maximum 12 inch compacted lifts.

#### **308.4.2 Weather Limitation**

Lime slurry / fly ash treated subgrade shall not be constructed if the atmospheric temperature is below 40° F or when conditions indicate that temperatures may fall below 40° F within 24 hours.

#### **308.4.3 Equipment**

Contractor shall provide all equipment necessary to complete the work, including grading and scarifying equipment, lime slurry spreader (gravity feed spreaders will not be permitted), fly ash spreader, mixing and pulverizing equipment, sheepsfoot and pneumatic rollers, sprinkling equipment, and trucks. When using dry hydrate to make slurry, agitators are mandatory in spreader. All equipment used for this work shall be subject to approval by the Engineer.

#### **308.4.4 Application**

Lime slurry and fly ash slurry shall be spread only on that area where the mixing operations can be completed during the same working day. The application and mixing of lime and fly ash with the soil shall be accomplished by the methods hereinafter described as Slurry Placing.

**Slurry Placing:** Fly ash shall be spread with trucks equipped with an approved distribution system on the prepared subgrade at the rate specified by the job mix design in a single pass, just prior to the application of the lime slurry. The fly ash may be added to the lime slurry and placed together, if approved by the Engineer. Lime slurry / Lime slurry fly ash, shall be mixed in a portable mixing unit and spread with trucks equipped with an approved distribution system as a slurry. Commercial lime slurry shall be applied with a lime percentage not less than specified herein. The distribution of lime slurry shall be attained by successive passes over a measured section of subgrade until the proper amount of lime has been spread, as determined in the job mix design. The rate of application shall be verified using ASTM D-3155 methods.

**Thickness:** The thickness of the lime slurry treated subgrade shall be determined by visual inspection and/or by depth tests taken at intervals so that each test shall represent no more than 1000 square yards per layer, if more than one layer. The method used to remove material to determine depth of lime treatment may be by shovel and/or pick, coring or other method approved by the Engineer. Phenolphthalein solution shall be used to detect the presence of lime. When the grade deficiency is more than 1 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. Contractor shall replace, at no cost to the Agency, the material where depth tests are taken.

No traffic other than the mixing equipment will be allowed to pass over the spread of lime slurry until after completion of mixing.

#### **308.4.5 Mixing**

The full depth of the treated subgrade shall be mixed with an approved mixing machine. The use of disc plows or blades are prohibited except in areas specified by the engineer. To insure a complete chemical reaction of the lime, fly ash and soil or subgrade, water shall be used as required to maintain a moisture content at or above the optimum prior to beginning compaction and held above optimum during compaction. During the interval of time between application and mixing, lime that has been applied, unmixed and exposed to the open air for 10 hours or more will not be accepted. After mixing and prior to compaction, clay lumps shall meet the following criteria:

**Percent(by Weight)**

Minimum of clay lumps passing 1½ inch sieve 100

Minimum of clay lumps passing No. 4 sieve 60

**308.4.6 Compaction**

Compaction of the mixture shall begin after final mixing. Sheepsfoot or segmented steel rollers shall be used during initial compaction. Steel wheel or pneumatic tired rollers shall be used only during final compaction, if pavement is to be placed directly on the treated subgrade. Areas inaccessible to rollers shall be compacted to the required density by methods approved by the Engineer. The material shall be aerated or watered as necessary to provide and maintain required moisture content. The field density of the compacted mixture shall be a least 95 percent of the maximum density at 0-4 percent above optimum moisture. A composite of treated soil or subgrade materials from a minimum of five (5) random locations, per soil type, within the area to be stabilized shall be used to determine the maximum density and optimum moisture content in accordance with ASTM D-558. The in-place field density shall be determined in accordance with ASTM D-1556, ASTM D-2167 or ASTM D-2922.

After each section is completed, tests will be made by the Engineer. If the material fails to meet the density requirements, it shall be reworked to meet requirements. If pumping subgrade should become evident at any time prior to paving, the Engineer may require proof rolling with a pneumatic-tire roller or other approved equipment in order to identify the limits of the unacceptable area. The proof rolling will be performed at no additional cost to the Contracting Agency. All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts. Compaction and finishing shall be done in such a manner as to produce a smooth dense surface free of compaction planes, cracks, ridges, or loose materials. Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion, shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at no cost to the County.

**308.4.6.1 Tolerances**

At final compaction, the lime, fly ash and water content for each course of subgrade treatment shall conform to the approved mix design with the following tolerances.

**Material Tolerance**

Lime +0.5% of design, (ASTM C-114)

Fly Ash +1.0% of design, (ASTM C-114)

Water +4%, -0% of optimum, (ASTM D-698)

**308.4.7 Finishing and Curing**

After the final layer or course of lime slurry / fly ash treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the plans. The completed section shall then be finished by rolling with a pneumatic or other suitable roller.

The final layer of lime slurry / fly ash treated subgrade shall be maintained in a moist condition

until the next layer of pavement structure is placed. If required, a fog seal for curing, in compliance with Section 333, shall be furnished and applied to the surface of the final layer of the lime stabilized material as soon as possible after the completion of final rolling and before the temperature falls below 40° F. Curing seal shall be applied at a rate between 0.10 and 0.20 gallons per square yard of surface. The exact rate will be determined by the Engineer. After curing begins, all traffic, except necessary construction equipment shall be kept off the lime slurry / fly ash stabilized subgrade for a minimum of 7 days or until the final pavement structure layer(s) are placed.

**308.4.8 Maintenance**

The Contractor shall maintain, at his / her own expense, the entire lime slurry treated subgrade in good condition from the start of work until all the work has been completed, cured, and accepted by the Engineer.

**308.5 Measurement**

The quantity of lime slurry / fly ash treated soils shall be measured by the square yard, measured in place, treated, compacted, to the proper depth, and accepted. The quantity of curing seal shall be measured by the ton, diluted.

**308.6 Payment**

The lime slurry / fly ash treated soils measured as provided above, will be paid for at the contract price per square yard, which price shall be full compensation for the item complete in place, as herein described and specified. Payment for curing seal will be made at the contract price per ton for Fog Seal (Contingent Item) based on the rate of application as requested by the Engineer.

## LIME SLURRY STABILIZATION

### 309.1 DESCRIPTION:

This section shall consist of constructing a mixture of soil, lime and water for the stabilization of soils or base materials. The work shall be performed in conformity with the lines, grades thickness, and typical cross sections shown on the plans.

### 309.2 MATERIALS:

**309.2.1 Soil or Subgrade:** The soil or subgrade material used for this work shall consist of materials on the site or imported and shall be free of roots, sod, weeds and stones larger than 3 inches and have a Plasticity Index (PI) greater than 10, when tested in accordance with AASHTO T-89 & T-90.

**309.2.2 Quicklime and Hydrated Lime:** Lime used to manufacture the commercial lime slurry specified herein, shall be either quick lime or hydrated lime and shall conform to the requirements of ASTM C-977. Lime may only be used in the production of a lime slurry. The direct use of dry hydrated lime or quicklime to the soil material is strictly prohibited. All lime shall come from a single source. If a source change is requested, a new mix design shall be submitted using lime from the proposed new source. The new design must be approved by the Engineer prior to use.

**309.2.3 Commercial Lime Slurry:** Commercial lime slurry shall be a pumpable suspension of solids in water. The water or liquid portion of the slurry shall not contain dissolved material in sufficient quantity naturally injurious or objectionable for the purpose intended. The solids portion of the mixture, when considered on the basis of solids content, shall consist principally of hydrated lime of a quality and fineness sufficient to meet the following requirements as to chemical composition and residue.

(A) Chemical Composition: The solids content of the lime slurry shall consist of a minimum of 90% by weight, of calcium and magnesium oxides (CaO and MgO), as determined by ASTM C-25.

(B) Residue: The percent by weight of residue retained in the solids content of lime slurry shall conform to the following requirements:

Residue retained on a No. 6 sieve	Max.	0.2%
Residue retained on a No. 30 sieve	Max	4.0%

(C) Grade: Commercial lime slurry shall conform to a dry solids content as approved by the Engineer.

A certificate of compliance and a field summary of lime slurry produced shall be provided to the Engineer for each load of slurry.

**309.2.4 Water:** Water used for mixing or curing shall be reasonable clean and free of oil, salt, acid, alkali, sugar, vegetable, or other substances injurious to the finished product. Water shall be tested in accordance with and shall meet the suggested requirements of AASHTO T-26. Water known to be of potable quality may be used without test.

### 309.3 COMPOSITION:

**309.3.1 Lime Slurry:** Lime slurry shall be applied at the mix design rate for the depth of subgrade stabilization shown on the plans or requested by the Engineer.

**309.3.2 Mix Design:** Before commencing lime treatment work, the Contractor shall submit for approval by the Engineer, a proposed mix design. The proposed mix design shall be prepared by a testing laboratory under the direction and control of a registered Professional Engineer. The mix design shall be determined using the soils or subgrade material to be stabilized and lime from the proposed supplier and shall determine the following:

- (a) Percent of lime and rate of application of lime slurry in the treated soil or subgrade material.
- (b) Optimum water content during mixing, curing and compaction.
- (c) Gradation of in-situ mixture after treatment.
- (d) Additional mixing or equipment requirements.
- (e) Mellowing time requirements, if needed.

The mix design shall comply with the following requirements:

- (a) pH: Minimum 12.4 after compaction of initial mixing with lime at ambient temperature, in accordance with Eades-Grimm pH test method (ASTM C977 APPENDIX).
- (b) Plasticity Index: Less than 3, per AASHTO T-89 & T-90.
- (c) Swell Potential: One (1) percent or less vertical expansion of an air dried soil when inundated with water and allowed to swell at a confined pressure of 60 psf.
- (d) Hydrated Lime Content: Minimum 5.0 percent by dry weight of the combined lime/soil mixture, per ASTM D-3155.
- (e) Unconfined Compressive Strength: Minimum 160 psi in five days curing at 100°F. when tested in accordance with ASTM D-1633 Method A.

**309.3.3 Tolerance:** At final Compaction, the lime and water content for each course of subgrade treatment shall conform to the approved mix design with the following tolerance:

<u>Material</u>	<u>Tolerance</u>
Lime	+0.5% of design, (ASTM C-114)
Water	+4%, -0% of optimum, (ASTM D-698)

#### **309.4 CONSTRUCTION:**

**309.4.1 General:** It is the primary requirement of this specification to secure a completed subgrade containing a uniform lime mixture, free from loose segregated areas, of uniform density and moisture content, well bound for its full depth, and with a smooth surface suitable for placing subsequent courses.

Prior to beginning any lime slurry stabilization, the subgrade shall be constructed and brought to grade and shall be shaped to conform to the typical sections, lines and grades as shown on the plans.

When the design requires treatment to a depth greater than 12 inches, the subgrade soil shall be treated in equal layers. The top layer(s) of soil shall be removed and stockpiled. The lower layer of soil to be treated shall then be treated and allowed to cure in place. After final mixing, the lower layer shall be compacted in maximum 12 inch compacted lifts. The stockpiled soil shall then be placed, treated, mixed and compacted in successive maximum 12 inch compacted lifts.

**309.4.2 Weather Limitation:** Lime slurry treated subgrade shall not be constructed if the atmospheric temperature is below 40° F. or when conditions indicate that temperatures may fall below 40° F. within 24 hours.

**309.4.3 Equipment:** Contractor shall provide all equipment necessary to complete the work including grading and scarifying equipment, a spreader of the lime slurry (gravity feed spreader, will not be permitted), mixing and pulverizing equipment, sheepsfoot and pneumatic rollers, sprinkling equipment and trucks. When using dry hydrate to make slurry, agitators are mandatory in distributor trucks. All equipment used for this work is subject to approval by the Engineer.

**309.4.4 Application:** Lime slurry shall be spread only on that area where the mixing operation can be completed during the same working day. The application and mixing of lime with the soil shall be accomplished by the methods hereinafter described as Slurry Placing.

Slurry Placing: Lime slurry shall be mixed in a portable mixing unit and spread with trucks equipped with an approved distribution system as a slurry. Commercial lime slurry shall be applied with a lime percentage not less than specified herein. The distribution of lime slurry shall be attained by successive passes over a measured section of subgrade until the proper amount of lime has been spread, as determined in the job mix design. The rate of application shall be verified using the methods outlined by ASTM D-3155.

Thickness: The thickness of the lime slurry treated subgrade shall be determined by visual inspection and/or by depth tests taken at intervals so that each test shall represent no more than 1000 square yards per layer. If more than one layer, the method used to remove material to determine the depth of lime treatment may be by shovel and/or pick, coring or other method approved by the Engineer. Phenolphthalein solution shall be used to detect the presence of lime. When the grade deficiency is more than 1 inch, the Contractor shall correct such areas in a manner satisfactory to the Engineer. Contractor shall replace, at no cost to the Agency, the material where depth tests are taken.

No traffic other than the mixing equipment will be allowed to pass over the spread of lime slurry until after completion of mixing.

The Engineer reserves the right to vary the rate of application of lime from the specified application rates during the progress of construction as necessary to maintain a pH of the lime/soil mixture above 12.4 and the desired characteristics of the treated subgrade.

**309.4.5 Mixing:** The full depth of the treated subgrade shall be mixed with an approved mixing machine. The use of disc plows or blades are strictly prohibited except in areas specified by the engineer. To insure a complete chemical reaction of the lime and soil or subgrade, water shall be used as required to maintain a minimum moisture content 4% above the optimum prior to beginning compaction and held at 0-4% above optimum during compaction. During the interval of time between application and mixing, lime that has been applied, unmixed and exposed to the open air for 10 hours or more will not be accepted.

After mixing and prior to compaction, clay lumps shall meet the following criteria:

	<u>Percent</u>
Minimum of clay lumps passing 1-1/2 inch sieve	100
Minimum of clay lumps passing No. 4 sieve	60

**309.4.6 Compaction:** Compaction of the mixture shall begin after final mixing. Sheepsfoot or segmented sheel rollers shall be used during initial compaction. Steel wheel or pneumatic tired rollers shall be used only during final compaction. Areas inaccessible to rollers shall be compacted to the required density by methods approved by the Engineer.

The material shall be aerated or watered as necessary to provide and maintain required moisture content. The field density of the compacted mixture shall be at least 95 percent of the maximum density at 0-4% above optimum moisture. A composite of untreated soil or subgrade materials from a minimum of five (5) random locations, per soil type, within the area to be stabilized shall be used to determine the maximum density and optimum moisture content in accordance with ASTM D-558. The in-place filed density shall be determined in accordance with ASTM D-1556, ASTM D-2167 or ASTM D-2922.

After each section is completed, tests will be made by the Engineer. If the material fails to meet the density requirements, it shall be reworked to meet requirements.

If pumping subgrade should become evident at any time prior to paving, the Engineer may require proof rolling with a pneumatic-tire roller or other approved equipment in order to identify the limits of the unacceptable area. The proof rolling will be performed at no additional cost to the Contracting Agency.

All irregularities, depressions, or weak spots which develop shall be corrected immediately by scarifying the areas affected, adding or removing material as required, and reshaping and recompacting. The surface of the course shall be maintained in a smooth condition, free from undulations and ruts, until other work is placed thereupon or the work is accepted. Compaction and finishing shall be done in such a manner as to produce a smooth dense surface free of compaction planes, cracks, ridges or loose materials.

Throughout this entire operation, the shape of the course shall be maintained by blading, and the surface upon completion, shall be smooth and shall conform with the typical section shown on the plans and to the established lines and grades. Should the material, due to any reason or cause, lose the required stability, density, and finish before the next course is placed or the work is accepted, it shall be recompacted and refinished at no cost to the Agency.

**309.4.7 Finishing and Curing:** After the final layer or course of lime treated subgrade has been compacted, it shall be brought to the required lines and grades in accordance with the plans. The completed section shall then be finished by rolling with a pneumatic or other suitable roller.

The final layer of lime treated subgrade shall be maintained in a moist condition until the next layer of pavement structure is placed. If required, a fog seal for curing, in compliance with section 333, shall be furnished and applied to the surface of the final layer of the lime stabilized material as soon as possible after the completion of final rolling and before the temperature falls below 40° F. Curing seal shall be applied at a rate between 0.10 and 0.20 gallons per square yard of surface. The exact rate will be determine by the Engineer.

After curing begins, all traffic, except necessary construction equipment shall be kept off the lime stabilized subgrade for a minimum of 7 days or until the final pavement structure layer(s) are placed.

**309.4.8 Maintenance:** The Contractor shall maintain, at his/her own expense, the entire lime slurry treated subgrade in good condition from the start of work until all the work has been completed, cured and accepted by the Engineer.

**309.5 MEASUREMENT:**

The quantity of lime slurry treated soils shall be measured by the square yard, measured in place, treated, compacted, to the proper depth, and accepted.

The quantity of curing seal shall be measured by the ton.

**309.6 PAYMENT:**

The lime slurry treated soils measured as provided above, will be paid for at the contract price per square yard, which price shall be full compensation for the item complete, as herein described and specified.

Payment for curing seal will be by the ton, based on the rate of application as requested by the Engineer.

## UNTREATED BASE

### 310.1 DESCRIPTION:

Untreated base, i.e., select or aggregate base course, shall comply with Subsection unless the use of a different type of material is specifically authorized in the special provisions.

Municipality	Supplements
<b>MC:</b>	<b>310.1 DESCRIPTION:</b> Aggregate base shall conform to the requirements of Section 702 of the Uniform Standard Specifications. Aggregate base shall be crushed in accordance with Section 702.2.

### 310.2 PLACING:

Untreated base 6 inches or less in compacted thickness may be placed in a single layer and those more than 6 inches in thickness shall be built up in successive layers of approximately equal compacted thickness not to exceed a maximum thickness of 6 inches. The requirements which follow are applicable to all types of material.

After distributing, the base material shall first be watered and then immediately bladed to a uniform layer that will net, after rolling, the required thickness. If the materials deposited are not uniformly blended together, the blading operation shall be continued to such extent as may be necessary to eliminate segregation. The quantity of water applied shall be that amount which will assure proper compaction resulting in a relative density of not less than 100 percent as determined under Section 301. Care shall be exercised in connection with watering operations to avoid wetting the subgrade or any lower base course to detrimental extent.

Upon completion, the base surface shall be true, even and uniform conforming to the grade and cross-section specified.

Untreated base may vary not more than 1/2 inch above or below required grade and cross-section.

Municipality	Supplements
<b>GI:</b>	<b>Roadway Base Course</b> Untreated base, i.e., select or aggregate base course, shall comply with M.A.G. specifications unless the use of a different type of material is specifically authorized by the Town Engineer. Untreated base of six (6) inches or less in compacted thickness may be placed in a single layer. Untreated base more than six (6) inches in thickness shall be built up in successive layers of approximately equal compacted thickness not to exceed a maximum thickness of six (6) inches. The requirements which follow are applicable to all types of material.  1. Placement and compaction. After distribution, the base material shall first be watered and then immediately bladed to a uniform layer that will net, after compaction, the required thickness. If the materials deposited are not uniformly blended together, the blading operation shall be continued to such extent as may be necessary to eliminate segregation. The quantity of water applied shall be an amount which will assure proper compaction resulting in a maximum density of not less than one-hundred (100) percent as determined by ASTM D-698. Care shall be exercised in connection with watering operations to avoid wetting the subgrade or any underlying base course to detrimental extent. Upon completion, the base surface shall be true, even and uniform conforming to the grade and cross-section specified by the Town Engineer.  2. Base Course Deficiency. When in the opinion of the Town Engineer, there is reason to believe that deficiency in thickness or an excess of plasticity exists, samples will be taken in the same pattern as that defined in M.A.G. Specification 321. If the base has been covered or it is otherwise impractical to correct the deficiency, the following corrective measures shall be taken by the contractor at no additional cost to the Town.

	<p><b><i>TYPE DEFICIENCY CORRECTIVE MEASURE</i></b></p> <p>I 1” or more Place an additional asphalt in thickness overlay, Type D-½ if ½ the thickness of the deficiency in thickness for the full roadway width over the area involved, not less than six-hundred-sixty (660) feet or one city block in length. II A plasticity index Place an asphalt concrete overlay ½ of five (5) to ten inch in thickness over the same total (10) inclusive area as required for Type I. III A plasticity index Remove deficient material from affected of over 10 area and replace with material complying with the specifications.</p>
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**310.3 DEFICIENCY:**

When in the opinion of the Engineer there is reason to believe that a deficiency in thickness, or an excess of plasticity exists, measurements or samples will be taken in the same pattern as that defined in Section 321. If the base has been covered or it is otherwise impractical to correct the deficiency, the corrective measures in Table 310-1 shall be taken by the Contractor at no additional cost to the Contracting Agency.

<b>TABLE 310-1</b>		
<b>THICKNESS AND PLASTICITY DEFICIENCY</b>		
<b>Type</b>	<b>Deficiency</b>	<b>Corrective Measure</b>
I	1/2 inch or more but less than 1 inch thickness	Place asphalt chip seal using precoated chips in accordance with Section 330 for the full roadway width over the area involved but for not less than 660 feet or one City block in length.
II	1 inch or more in thickness	Place an additional asphalt concrete overlay, a 9.5 mm mix, of 1/2 the thickness of the deficiency in thickness for the full roadway width over the area involved, not less than 660 feet or one City block in length.
III	A plasticity index of 6 to 7 inclusive*	Place an asphalt concrete overlay 1/2 inch in thickness over the same total area as required for Type I and II.
IV	A plasticity index of over 7*	Remove deficient material from affected area and replace with material complying with the specifications.

\* The plasticity index shall be in accordance with AASHTO T-146 Method A (wet preparation), T-89 and T-90.

<b>Municipality</b>	<b>Supplements</b>
<b>ME:</b>	<ul style="list-style-type: none"> <li>▪ <b>ME:</b> Subsection 310.3 – Revise the Corrective Measures in Table 310-1, Types III &amp; IV to the following, “See Section 310.3.1 below”.</li> </ul> <p><b>J. Subsection 310.3.1 – Add the following Subsection:</b></p> <p>When the Plasticity Index of a native and/or untreated select or aggregate base course material is found to be above 5, the Contractor shall remove the material from the project site and replace it with acceptable material or may treat the material with lime. If lime treatment is selected and the material has been placed on grade at the project site, the treatment shall comply with Section 309. If the material is at the supplier’s pit, in storage stockpiles, etc., the supplier shall process the material at the pit or storage location. The Contractor shall submit for the Engineer’s approval, the method, equipment, procedure, test reports, mix design, etc. for the mixing, proportioning, processing of the lime and aggregate at the pit or stockpile.</p> <p>Whichever process is selected (field or stockpile), ample lime shall be added to reduce the</p>

	<p>Plasticity Index to non-plastic (P.I.=0). Sample(s) shall be obtained from the job site at the location(s) selected by the City. If any one sample fails, it will be the responsibility of the Contractor to determine the scope of the failure. A plan to determine the area of the failure will be submitted to and approved by the Engineer. All of the samples shall be obtained per ASTM D 75 – Standard Practice for Sampling Aggregates and tested per the City of Mesa Policy for Testing of Lime-Modified Aggregate Base to Determine Plasticity Index (March 11, 1999). The results of the testing shall be presented to the Engineer and he/she shall make the final determination on the area to be removed and replaced or be retreated with lime as described in Section 309.</p>
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**310.4 PAYMENT:**

Payment for untreated base will be made on the basis of the price bid per ton unless an alternate basis of payment is provided in the proposal.

Municipality	Supplements
<b>MC:</b>	<ul style="list-style-type: none"> <li>▪ <b>MC:</b> The Contractor shall furnish the Engineer certified weight tickets for the aggregate base (AB) placed on the project. Final pay quantities for aggregate base will be based upon the scale tickets submitted to the Engineer for aggregate base specifically used to construct roadway untreated base as shown in the contract documents.</li> </ul>

## **SOIL CEMENT BASE COURSE**

### **311.1 DESCRIPTION:**

This item shall consist of a base course composed of a mixture of local soil, portland cement, and water compacted at optimum moisture content.

### **311.2 MATERIALS:**

Portland cement and water shall comply with Sections 725 and 225. The soil for the mixture shall consist of the material in the area to be paved. The material shall not contain more than 5 percent gravel or stone retained on a 3 inches sieve. It shall be demonstrated by laboratory tests that the plasticity and hardening characteristics of the soil will be adequately modified by the specified cement content.

### **311.3 EQUIPMENT:**

An ample number of machines, combination of machines and equipment shall be provided and used to produce the complete soil cement base course meeting the requirements for soil pulverization, cement distribution, water application, incorporation of materials, compaction, finishing, and for application of the curing material as provided in these specifications.

Mixing shall be accomplished by means of multiple-pass soil-cement mixer, single-pass soil-cement mixer or central plant mixer.

Water may be applied through the mixer or with the water trucks equipped with pressure sprays. Water trucks providing fine fog-type sprays shall be furnished for finishing and curing. Properly adjusted garden type nozzles on a pressure bar may be used to produce fog spray if approved by the Engineer.

Cement spreader shall be a specially constructed device to distribute bulk cement uniformly at rate specified either in windrows or on the flat as determined by method of mixing.

### **311.4 CONSTRUCTION METHODS:**

Before undertaking construction of the soil cement base course, the area to be paved shall be brought to a compacted condition, true to line and grade as directed by the Engineer or as shown on the plans. During this process any unsuitable soil or material, including excess material retained on a 3 inches sieve, shall be removed and replaced with acceptable material. The compacted surface shall be at the proper elevation as specified, shown on the plans, or as directed by the Engineer, for the top of the soil cement base. At completion of this phase, the material and surface shall be approved by the Engineer before proceeding with the next step.

The material shall be scarified, pulverized, mixed with water and cement, compacted and finished and cured in lengths permitting the full roadway width to be complete in not more than 4 hours from the time that cement is exposed to water. Such lengths will generally be not less than 600 feet or the length of one City block and preferably more. Where a gutter section exists the material shall be pulled back from the gutter face for the full depth of the course before processing.

**311.4.1 Pulverizing:** Before application of cement, soil to be processed shall be scarified to depth of base. The material should be damp at time of scarifying to reduce the dust to a minimum and to aid in pulverization. If the soil contains clods, it shall be pulverized until not less than 80 percent, exclusive of gravel or stone, will pass a No. 4 sieve.

**311.4.2 Application of Cement:** The quantity of cement shall be by weight as a percentage of the dry weight of the soil as determined by the laboratory and/or as directed by the Engineer and shall be applied uniformly on the soil in a manner satisfactory to the Engineer. The allowable deviation in uniformity shall not exceed 10 percent. The entire operation of spreading and mixing shall be conducted in such a manner as will result in a uniform soil cement and water mixture for the full design width and depth.

The percentage of moisture in the soil, at the time of cement application, shall not exceed the quantity that will permit a

uniform and intimate mixture of the soil and cement during mixing operations, and it shall not exceed the specified optimum moisture content for the soil cement mixture.

**311.4.3 Mixing:** Mixing with addition of water as required shall be continued until the product is uniform in color and at optimum moisture content. Any mixture of soil and cement which has not been compacted and finished shall not remain undisturbed for more than 30 minutes but shall be agitated by remixing.

**311.4.4 Optimum Moisture:** Optimum moisture requirements and field tests of moisture density shall be determined in accordance with AASHTO T-134, T-191, T-217, or ASTM D-558, D-2922, D-3017 on representative samples of soil cement mixture obtained from the area being processed. At time of laydown, the moisture content shall not be below optimum moisture, and shall be less than that quantity which will cause the base course to become unstable during the compaction and finishing process. Any area which becomes so unstable shall be removed and replaced with new cement stabilized material.

**311.4.5 Compaction:** After mixing is complete, the mixture shall be carefully placed in a uniform loose depth which will provide a surface true to grade and section when compacted. Unless otherwise directed by the Engineer, initial compaction shall be by means of a tamping, grid, or pneumatic roller. After the tamping roller has partially walked out, pneumatic rollers shall be used. Density of final product shall be not less than 95 percent as determined by AASHTO or ASTM as specified above.

**311.4.6 Finishing:** As compaction nears completion, the surface of the base course shall be shaped to required lines, grades and cross-section. When required, the surface shall be lightly scarified with spike tooth harrows or other approved equipment to remove imprints left by equipment or to prevent slippage planes. During the finishing process the surface shall be kept moist by means of fog-type sprays. Surface finish and final compaction shall be completed in not more than 2 hours from time of laydown. The completed base course shall be true to line, grade, cross-section and shall not vary more than 1/2 inch in thickness and not more than 1 inch in surface tolerance when tested with a 10 foot straight edge. It shall be free of surface cleavage planes, cracks, or loose material. As a final operation, the surface shall be very lightly scalped with a motor grader, wet with a fog spray and rolled with a pneumatic roller as directed by the Engineer.

**311.4.7 Deficiency:** When in the opinion of the Engineer there is reason to believe that a deficiency in thickness exists, cores will be taken in the same pattern as that defined in Section 321. If the base has been covered or it is otherwise impractical to correct the deficiency, the corrective measures, listed in Table 310-1 for Type I or II deficiencies, shall be taken by the Contractor at no additional cost to the Contracting Agency.

**311.4.8 Curing:** After completion of the final finishing process, the soil-cement shall be cured with a bituminous curing seal applied at the end of each construction day. This seal may be either an emulsion or cut-back asphalt applied at a minimum rate of 0.20 gal./sq. yd. The finished soil-cement shall be kept continuously moist until the bituminous cure seal is applied, using fog or gravity bar spray. The spray equipment shall be approved by the Engineer before construction is begun.

**311.4.9 Construction Joints:** At the end of each day's work, a construction joint shall be made transverse to the centerline of the road by cutting back into the work to provide a full depth vertical joint. Except where specifically authorized by the Engineer, no other construction joints will be permitted. Where authorized, such joints shall be full depth vertical joints.

**311.4.10 Maintenance:** The Contractor shall maintain the surface until it has been covered with the designated bituminous wearing course. In case it is necessary to replace any soil cement, it shall be for the full depth. No skin patches or soil cement will be permitted. Minor surface pits may be filled with compacted bituminous surfacing, if authorized by the Engineer. Immediately prior to the placing of the bituminous wearing course, the surface shall be broomed to removed all loosened material from the surface.

### **311.5 MEASUREMENT:**

Measurement of soil cement will be the number of square yards constructed to the required depth, completed and accepted.

Measurement of portland cement will be the number of tons of cement mixed with local soil.

**311.6 PAYMENT:**

Payment will be made for the applicable items at the contract unit prices bid in the proposal, and shall constitute full payment for furnishing all material, equipment, tools, labor and incidentals necessary to complete the work and for carrying out the maintenance provisions.

No measurement or payment will be made for any imported earth materials.

## **CEMENT TREATED BASE**

### **312.1 DESCRIPTION:**

Cement treated base shall consist of a combination of base material and portland cement as specified in Section 705.

### **312.2 GENERAL:**

When the mixing of cement treated base in a stationary mixer is required, it will be so specified. Otherwise, cement treated base may be mixed in either a traveling plant or in a stationary plant, at the option of the Contractor.

If the cement treated aggregate is mixed in a central plant, it shall not contain moisture in excess of 1 percent above or below optimum at the time of delivery on the grade. Certain types of transit mixers will not discharge such material unless it is greatly in excess of optimum moisture. Use of such mixers will not be permitted.

If the material is mixed in place, the machine or combination of machines used shall be capable of thoroughly mixing the cement and aggregate, when using the granular material specified, in a single pass. No lift thickness shall exceed 8 inches. If the thickness required is in excess of 8 inches, it shall be mixed in 2 separate lifts of equal thickness.

### **312.3 CONSTRUCTION METHODS:**

Mixing of materials, regardless of the type of mixer used or method employed, shall be continued until the cement and water are evenly distributed throughout the aggregate, and a mixture of uniform appearance is obtained.

The amount of cement used shall conform to requirements of Section 705. Cement delivered in standard sacks from commercial producers will be assumed to weigh 94 pounds per sack and need not be weighed. Bulk cement or fractional sacks of cement shall be weighed.

The amount of water used shall be that required to give optimum moisture content. A portion of the required water may be added to the aggregate prior to the addition of the cement, if approved.

After spreading, the cement treated base shall be compacted to a density of at least 95 percent of the maximum density as determined by AASHTO T-134, T-191, T-217 or ASTM D-558, D-2922, D-3017.

After compaction, the surface of the cement treated base course shall not deviate at any point more than 3/8 inch from the lower edge of a 10-foot straightedge laid parallel to the centerline of the roadway.

A construction joint shall be made at the end of each day's construction by trimming the end of the compacted mixture to a straight vertical plane, normal to the centerline of the roadway and with the vertical edge in thoroughly compacted material.

Cement shall not be added to more material than will be mixed, compacted and sealed the same day. Cement treated base shall not be mixed or placed when either the aggregate or subgrade is frozen. The air temperature shall be at least 40°F. in the shade and rising at the time of mixing.

In areas which are inaccessible to the mixing, spreading or compacting equipment designated herein, other methods and equipment acceptable to the Engineer may be utilized.

The mixed material shall not remain undisturbed on the subgrade for more than 30 minutes and not more than 3 hours shall elapse between the time water is added to the mixture and final compaction is accomplished.

The mixed materials shall be spread for the full width of the base under construction, either by one spreader or by several spreaders operating in a staggered position across the subgrade, unless permission is granted to do part-width construction. Should permission be granted for part-width construction, not more than 30 minutes shall elapse between the times of placing the material in adjacent lanes at any location, and the longitudinal joint against which additional mixed material is to be placed shall be trimmed to a straight vertical plane parallel to the centerline of the roadway. Trimming shall be done in such a manner as to cause the least possible loosening of the compacted base material and to leave no loose material on the

subgrade. The material cut away in trimming may be used in the construction of the shoulders or the adjacent lanes if approved, or shall be disposed of in a satisfactory manner.

During mixing, spreading and compacting and until the application of the curing seal, any moisture lost by evaporation shall be replaced by the addition of water by means of a light fog or fine spray.

The mixed base materials shall be covered as soon as possible after final compaction and shall be cured in accordance with this specification.

#### **312.4 TRAVELING PLANT MIXING:**

**312.4.1 Placing Aggregate:** The aggregate to be treated shall be placed on the roadway either as a uniform layer which, when compacted, will produce a base of the depth and width shown on the plans or as one or more windrows which, when spread, will yield a uniform layer which will compact to the prescribed dimensions. If the aggregate is placed in one or more windrows, a windrow sizer will be required. The number and size of the windrows may vary, depending on the width and depth of treatment and on the capacity of the machine, but regardless of size, the windrow shall be uniform in cross-section and shall not be larger than can be handled by the plant.

Care shall be exercised during the placement of the aggregate to prevent segregation of the fine and coarse portion of the aggregate.

**312.4.2 Placing Cement:** Cement shall be added to the uniform layer or windrow of aggregate by means of mechanized equipment which will spread the cement in correct and uniform quantities. For any section of roadway, the quantity of cement placed by mechanical spreaders shall not deviate more than 10 percent from the computed quantity for the section. When cement is applied to a windrow, the top of the windrow shall be slightly trenched to retain the spread of cement.

If storm winds cause a loss of spread cement, spreading operations shall be halted until such winds subside and, at the first indication of losses, prompt action shall be taken to avoid further losses. If cement losses are deemed excessive, the deficient quantity shall be furnished and added in the proper amount by the Contractor at no additional cost to the Contracting Agency.

**312.4.3 Mixing:** Mixing shall be accomplished by means of an approved single pass traveling continuous mixing machine, or combination of machines, of the pug or auger type. The machine shall be so constructed that the device for picking up or mixing the aggregate can be controlled and during the mixing operations it shall be set to mix the aggregate, cement and water to the design depth without cutting into or disturbing the subgrade or picking up any material other than that material to be processed. The machine shall be equipped so that water may be introduced at the time of mixing through a metering device which will accurately and uniformly control and measure the amount of water being used.

The cement and aggregate shall be mixed in the machine simultaneously with the adding, through the machine, of the additional amount of water required.

The material shall be spread immediately after mixing, in reasonably close conformity to the lines, grades and dimensions established or shown on the plans.

**312.4.4 Stationary Plant Mixing:** If the stationary plant method of mixing is employed, the aggregate, cement and water shall be mixed at a central plant using either a batch pug mill type or a continuous type mixer. Dead areas in the mixer, in which the material does not move or is not sufficiently agitated, shall be corrected, either by a reduction in the weight of materials or by other adjustments.

**312.4.5 Batch Mixing:** If a batch pug mill type mixer is used, the aggregate and cement shall be proportioned by batch weights. Cement shall be weighed on separate scales from the aggregate batching scales.

The weight of the charge in a batch mixer shall not exceed that which will permit complete mixing of all materials. The period of mixing shall not be less than 30 seconds from the time all materials are in the mixer. Water may be proportioned by volume or by weight.

**312.4.6 Continuous Mixing:** If a continuous type mixer is used, the materials shall be proportioned by volume.

The continuous type mixer shall be equipped with metering devices and feeders which will introduce the cement, aggregate and water into the mixer in the specified proportions. The water pump shall be equipped with a means of varying the rate of delivery. The metering devices and feeders shall be interlocked and so synchronized as to maintain a constant ratio of cement and water to the aggregate.

The rate of feed to a continuous type mixer shall not exceed that which will permit complete mixing of all the material.

**312.4.7 Spreading:** The treated material shall be transported from the plant to the prepared subgrade in approved equipment.

The surface on which the material is to be placed shall be thoroughly moistened and kept moist, but not excessively wet, until covered by the material.

Plant mixed cement treated base shall be spread by approved spreader boxes or finishing machines. The machines shall be constructed and operated so as to produce a layer of uniform density and cross-section an in sufficient quantity to provide a compacted base reasonably conforming to the lines, grades and cross-sections established or shown on the plans.

**312.4.8 Compacting:** Initial compaction shall begin immediately after mixing and spreading. Successive passes of compacting equipment shall overlap the previous adjacent pass by at least 25 percent of its width. Following initial compaction and before final compaction, the treated material shall be bladed with a motor grader or a planing machine to obtain a surface reasonably true to the lines, grades and cross-sections established or shown on the plans. During and immediately following the shaping operations, if required, the Contractor shall lightly scarify the surface with a nail drag or other approved equipment to prevent the formation of surface compaction planes.

Extreme care shall be exercised by the Contractor during the blading operation so that no more material than is necessary is disturbed and so that this operation can be completed as quickly as possible. Material thus cut shall be wasted if so directed. Compaction shall proceed without interruption, except as stated above, until the required degree of compaction is obtained.

**312.5 INVERTED SECTION:**

Where the cement treated base is to be covered with an aggregate base material to prevent shrinkage crack reflection and overloading of the cement treated base, the minimum thickness of the aggregate base shall be 4 inches, unless otherwise specified in the special provisions. In order to provide for free internal drainage of the aggregate base course overlaying the cement treated material, it shall be non-plastic and the percentage of material passing the No. 200 sieve shall not exceed 8. The cement treatment shall be held back approximately 1 foot from each curb line so as to permit drainage of any water that may become trapped between the cement treated base material and the bituminous surfacing.

Municipality	Supplements
<b>PH:</b>	312.5 INVERTED SECTION: is changed to read: Where the cement treated base is to be covered with an aggregate base material, the minimum thickness of the aggregate base shall be 5 inches, unless otherwise specified in the special provision. In order to provide for free internal drainage of the aggregate base course overlaying the cement treated material, it shall be ABC, reference MAG 725. The cement treatment shall be held back approximately 1 foot from each curb line

**312.6 CURING:**

The mixed cement treated base materials shall be covered as soon as possible after final compaction with a bituminous curing seal. Application shall be by means of a pressure distributor in accordance with the requirements of Section 330. The approximate quantity of bituminous material to be used shall be as specified; however, the exact amount will be determined by the Engineer at the time of application.

After the bituminous curing seal has been applied, the cement treated base course shall be kept free of equipment and traffic for a period of at least 7 days or until it will not pick up under traffic. Curing seal shall conform to the requirement of Section 712 or 713 for the type specified.

In lieu of the curing seal, the Contractor may, at his option, keep the surface of the compacted base continuously moist until

overlaid with the aggregate base course. The aggregate base or the surfacing, may be placed as soon as the cement treated base has been compacted. The spray equipment on the water truck shall be approved by the Engineer prior to the use of this equipment to spray the soil cement base course. The spray equipment must produce a fine, even spray to prevent washing of the surface of the base course. A cement treated section may be opened to all traffic immediately after placement and compaction of the surfacing.

Municipality	Supplements
<b>PH:</b>	CURING: is modified to add: The bituminous curing seal specified in the first two paragraphs will not be used. Only the water curing and overlaying with the aggregate base course will be allowed

**312.7 DEFICIENCY:**

When, in the opinion of the Engineer, there is reason to believe that a deficiency in thickness exists in the cement treated base, cores will be taken in the same pattern as that defined in Section 321. If the base has been covered or it is otherwise impractical to correct the deficiency of 1/2 inch or more in thickness, the corrective measure listed in Table 310-1 for Type II deficiency shall be taken by the Contractor at no additional cost to the Contracting Agency.

**312.8 PAYMENT:**

Payment for the portland cement will be made by the tons of cement complete in place.

Payment for base material will be made by the tons of aggregate complete in place including mixing, spreading, and compacting.

No separate payment will be made for curing.

## **BITUMINOUS TREATED BASE COURSE**

### **313.1 DESCRIPTION:**

Bituminous treated base course shall consist of a mixture of aggregate and emulsified or liquid asphalt.

### **313.2 AGGREGATES:**

The aggregates shall consist of soil or mineral aggregates, or blends thereof, which, when stabilized and allowed to cure, will meet the requirements specified in the special provisions. The Contractor shall notify the Engineer if he intends to import material, in sufficient time to allow for the testing thereof to determine the suitability of the material and quantity and stabilizer required.

### **313.3 ADVANCE TESTS:**

When mixing is to be done on the site, a representative sample of the aggregates shall be taken from each 10,000 square feet to be stabilized. When mixing is done in a central mixing plant, samples which are representative of the aggregate to be used, shall be taken for tests.

The stabilizer and aggregates for the work shall meet the requirements of the special provisions. The quantity of stabilizer shall be as specified. In the case of emulsified asphalt, the Engineer will determine the quantity of water to be added.

#### **313.3.1 Application of Emulsified or Liquid Asphalt:**

(A) The addition of emulsified asphalt shall not be made when the aggregate contains more than 4 percent moisture.

(B) The addition of liquid asphalt shall not be made when the aggregate contains more than 2 percent moisture.

In special cases, when the aggregate is unusually porous, a moisture content in excess of the above may be permitted at the discretion of the Engineer, when laboratory tests indicate that such increased moisture content will not produce an unstable mixture.

### **313.4 MIXING:**

The aggregate and asphalt shall be thoroughly mixed in a central pug mill type mixing plant, or on the roadbed by traveling mixer or blade method. The mixture shall be uniform and contain the percent, by weight or volume of dry aggregate and asphalt as specified. If necessary, water shall be added to the aggregate in a quantity sufficient to completely disperse the emulsified asphalt and produce a plastic mixture free from balled fines or balled asphalt.

**313.4.1 Central Plant Mixing:** The aggregate and asphalt shall be mixed in a pug mill. Material shall be weighed and mixed in such proportions that the combined aggregates shall meet the grading limits specified.

The asphalt shall be added to the weighed aggregate in the mixer. Additional water, when needed, shall be added simultaneously with emulsified asphalt. Mixing shall continue until the asphalt is uniformly and thoroughly distributed throughout the mass. The minimum mixing time shall be 35 seconds.

**313.4.2 Travel Mixing:** The traveling mixing machine shall be of the pug type or auger type. The traveling mixer shall have provision for introducing the asphalt and water at the time of mixing through a metering device or other approved method. Both the asphalt and the water shall be applied by means of separate controls which will supply a uniform ratio of asphalt and/or water to the amount of aggregate passing through the mixer, and produce a complete mixture with a uniform moisture content. The controls shall be mechanically synchronized with the forward movement of the mixer. Leakage of asphalt and/or water from equipment will not be permitted and care shall be exercised to avoid the addition of asphalt or water by spilling or any other means not under the control of the Engineer.

Prior to mixing in the traveling mixer, the aggregate shall be placed in such a manner that all the material will be passed through the mixing machine in one mixing operation. If aggregate is brought to the site in separate sizes, each of the sizes in proper amount shall be deposited by means of approved spreading device equipped with a readily adjustable strike off device.

The rate of movement of the mixing machine, the amount of material mixed, and the number of passes shall be so regulated that a mix satisfactory to the Engineer will result. The material shall be mixed so that a uniform mixture of unchanging appearance is obtained and all particles of aggregate are coated with asphalt.

**313.4.3 Blade Mixing:** Unless otherwise permitted by the Engineer, the aggregate shall be thoroughly blended with the necessary additional water with a blade grader and uniformly spread over the site preparatory to application of the asphalt. Asphalt shall be spread by an approved pressure distributor in the number of applications directed by the Engineer. After each application, the aggregate shall be mixed. As needed, additional water shall be added by pressure distributor in the amount directed by the Engineer. After the final application, the material shall be bladed into a windrow and the windrow bladed back and forth across the site with a heavy blade grader having a wheelbase not less than 16 feet long, until a satisfactory mixture of uniform and unchanging appearance has been obtained. After having been mixed and deposited in the final windrow, the mixture shall not be allowed to remain in the windrow for more than 24 hours unless otherwise permitted by the Engineer. Mixing equipment must be of a type and in good working condition as approved by the Engineer.

**313.5 PLACING THE MIXTURE:**

The mixed base material shall be laid and rolled to the thickness shown on the plans in layers not to exceed 4 inches in compacted thickness.

If the aggregate and asphalt have been mixed in a central mixing plant, the treated base material shall be transported to the site in trucks and spread. Dumping in piles on the subgrade will not be permitted. If necessary, spreading shall be completed by blading the mixture to proper cross-section with a self-propelled pneumatic-tired blade grader. An approved spreading, screeding, and tamping machine may be used.

**313.6 COMPACTING THE MIXTURE:**

Rolling of the mixture shall commence immediately after it has been placed on the subgrade.

After the specified compaction has been secured in the top layer with the pneumatic-tired rollers, the roadway shall be thoroughly rolled with self-propelled tandem rollers with smooth steel wheels.

Each base course layer shall be rolled until it is compacted and true to grade and cross-section.

Areas inaccessible to the roller shall be compacted by power tamping to the same density as the rolled portion.

The surface of each layer shall be free of foreign material prior to placing the succeeding layer of material.

**313.7 FLUSH SEAL:**

After the top layer is compacted, cleaned and dried to the percent of moisture required, the surface shall be given a light uniform application of emulsified asphalt. It shall be mixed and applied in accordance with Section 333. After the seal has dried, the base shall be ready for final pavement surface.

**313.8 DENSITY AND TOLERANCES:**

Rolling shall be continued until at least 100 percent relative density is obtained as per AASHTO T-99, Method A, and T-191 or ASTM D-2922 and D-3017. The thickness of stabilized base compacted in place may deviate not more than 1/2 inch from that specified. The surface shall not show any deviation in excess of 1/4 inch when tested with a 10 foot straightedge applied parallel with the center line of the roadway.

**313.9 DEFICIENCY:**

When in the opinion of the Engineer there is reason to believe that a deficiency in thickness exists, cores will be taken in the same pattern as that defined in Section 321.

If the base has been covered or it is otherwise impractical to correct the deficiency, the corrective measures, listed in Table 310-1 for Type I or II deficiencies, shall be taken by the Contractor at no additional cost to the Contracting Agency.

**313.10 MEASUREMENT:**

Bituminous treated base course will be measured by the ton or square yard. Measurement by the ton will include imported materials and asphalts. Certified weight slips of all materials shall be delivered to the Engineer before the materials are applied. Measurements for determining the square yard area will be made horizontally unless otherwise specified.

**313.11 PAYMENT:**

The price bid per ton or square yard for work covered by this section shall include full compensation for all labor, material, and equipment required for the construction complete in place, of bituminous treated base course.

## **BITUMINOUS PRIME COAT**

### **315.1 DESCRIPTION:**

Bituminous prime coat shall consist of furnishing bituminous material and applying this bituminous material to a prepared base course, in accordance with these specifications.

### **315.2 MATERIALS:**

Bituminous material shall conform to the requirements of Section 712 for the type and grade specified.

### **315.3 CONSTRUCTION METHODS:**

**315.3.1 Preparation of Surface:** The surface on which the bituminous prime coat is to be placed shall be uniformly smooth and firm and reasonably true to grades and cross-sections as shown on the plans, and shall be so maintained throughout the period of placing the prime coat. In no event shall a prime coat be placed on a soft, uneven base. Any holes, depressions or irregularities shall be repaired by the removal of all loose and unsuitable material and replacement by suitable material, which shall be compacted to produce a dense surface conforming to the adjacent area. Uniformity of surface texture is of the utmost importance.

When required, the surface on which the prime coat is to be placed shall be lightly bladed and rolled immediately prior to the application of bituminous material.

**315.3.2 Application of Bituminous Material:** Bituminous material shall be applied only when the surface is either slightly damp or dry. For extremely dry areas, a light application of water may be required prior to the application of bituminous material.

The approximate quantity of bituminous material to be used will be specified; however, the exact amount used will be determined by the Engineer at the time of application. The bituminous material shall be uniformly applied to the prepared surface at the rate so designated and in one application.

The application of bituminous material and distributing equipment shall conform to the requirements of Section 330.

When it is deemed necessary, areas having excess bituminous material shall be blotted with material as directed.

When so directed, the surface of the complete prime coat shall be rolled with a pneumatic-tired roller.

**315.3.3 Maintenance of Surface:** Traffic shall be kept off the bituminous material until it has penetrated the base or subgrade and cured sufficiently.

The integrity of the prime coat shall be maintained at all times until the next course is placed or until the final acceptance. In the event traffic has caused holes or breaks in the surface, such holes or breaks shall be satisfactorily repaired by the Contractor.

### **315.4 MEASUREMENT:**

The accepted quantities of bituminous material for bituminous prime coat will be measured by the ton undiluted for the bituminous material used.

No measurement or direct payment will be made for rolling.

Materials necessary for repair of holes or breaks in the surface after the prime coat has been accepted, when such holes or breaks are caused by traffic other than that of the Contractor, will be measured for payment under the respective contract item for the materials used.

### **315.5 PAYMENT:**

Payment for the bituminous material will be on the basis of the price bid per ton, undiluted, complete in place.

Payment for furnishing, applying and removing blotter material will be paid for as an extra work item.

Municipality	Supplements
MC:	<p data-bbox="431 338 659 369"><b>317 Asphalt Milling</b></p> <p data-bbox="431 396 688 428"><b>317.1 DESCRIPTION:</b></p> <p data-bbox="431 428 1430 489">The work under this Section shall consist of milling existing asphalt concrete pavement where shown on the Plans or requested by the Engineer.</p> <p data-bbox="431 518 946 550"><b>317.2 CONSTRUCTION REQUIREMENTS:</b></p> <p data-bbox="431 550 1468 640">Contractor is responsible for locating all milling hazards on and below the surface within the area to be milled which may require special milling. Special milling is not a separate bid item and shall be paid for as Asphalt Milling.</p> <p data-bbox="431 640 1468 730">The milling cut depth shall be the depth indicated on the Plans plus or minus 1/8 inch. Contractor shall remove the milled material and sweep the roadway clean with a power pick-up broom to the satisfaction of the Engineer.</p> <p data-bbox="431 760 1451 850">The work shall result in a clean milled surface in the area indicated on the Plans to the specified depth and shall include the areas immediately around and next to any individual hazards located within the area to be milled.</p> <p data-bbox="431 850 1445 974">The Contractor shall be responsible for continually checking the milling operation to determine that the proper depth of milling has been achieved, that the proper profile and cross slope are achieved, and that the surface texture is (a) free from longitudinal ridges, and (b) has a uniform pattern.</p> <p data-bbox="431 1003 922 1035"><b>317.3 MEASUREMENT AND PAYMENT:</b></p> <p data-bbox="431 1035 1446 1125">Measurement for Asphalt Milling will be by the square yard and shall only include areas milled to the required depth and cross section. Payment for this work will be made at the unit bid price for Asphalt Milling</p>

## **ROAD-MIXED SURFACING**

### **320.1 DESCRIPTION:**

Road-mixed surfacing shall consist of a mixture of mineral aggregate and bituminous binder mixed on the roadbed or other area, spread and compacted on a prepared subgrade or base course in conformity with the lines, grades, and dimensions shown on the plans or typical cross-section, or as specified in the special provisions.

### **320.2 MATERIALS:**

Materials shall conform to the requirements of Sections 710 and 712 for the type and grade specified on the special provisions.

### **320.3 PRIME COAT:**

When a prime coat is required, it shall be applied as specified in Section 315.

### **320.4 SPREADING AGGREGATE:**

The mineral aggregate shall be deposited in a windrow along one side of the roadbed by means of approved spreader box equipped with a readily adjustable strike off device or other suitable equipment. The maximum lift for blade mixing and laying shall not exceed 1 cubic yard per running foot. If the mineral aggregate is delivered to the roadbed in separate sizes, each size of aggregate shall be spread in a windrow of the required quantity for that size of material, after which the windrows of various sizes shall be blended into one windrow alongside of the roadbed.

The aggregate shall be so spread that the windrows will be uniform and equal in size and will contain the proper quantity of material to provide surfacing of the required width and thickness. Care shall be exercised to prevent the aggregate from becoming mixed with earth or shoulder material. Preparatory to applying the liquid asphalt, a portion of the material from the windrow shall be spread uniformly over one-half the width of the roadbed.

Unless permitted by the Engineer, no more aggregate shall be spread on any one day than can be mixed with liquid asphalt within 72 hours. If traffic conditions require, the Engineer may require spread or flattened windrows.

### **320.5 APPLICATION OF LIQUID ASPHALT:**

The temperature of the liquid asphalt, when applied, shall be in accordance with Section 712, and 16 to 22 gallons shall be applied for each cubic yard of road-mix material, in not less than 2 approximately equal applications.

Unless otherwise approved by the Engineer, no liquid asphalt shall be spread when weather conditions are unsuitable, or when the moisture content of the mineral aggregate exceeds 3 percent by weight of the dry aggregate. When the aggregate is unusually porous, the permissible moisture content may be increased and liquid asphalt spread at the discretion of the Engineer, when laboratory tests indicate that such increased moisture content will not produce an unstable mixture.

Liquid asphalt shall be prevented from spraying upon adjacent pavements, structure, guard rails, guide posts, culvert markers, trees and shrubbery, adjacent property and improvements, and other highway improvements or facilities not specifically mentioned herein, or that portion of the traveled way being used by traffic.

### **320.6 MIXING:**

Immediately following each successive application of liquid asphalt, the surfacing material shall be thoroughly mixed by means of a blade. After the final application, the material shall be bladed into a windrow and the windrow bladed back and forth between the center and the edge of the area to be surfaced with a heavy blade grader having a wheel base not less than 16 feet long, until a satisfactory mixture of uniform appearance is obtained.

Should the mixture show an excess or deficiency of liquid asphalt, or uneven distribution thereof, prior to spreading and

compacting, the condition shall be corrected by adding mineral aggregate or liquid asphalt, as the need may be, and remixing the material to produce a satisfactory mixture. If necessary, all compressed masses of material shall be broken up. After mixing, the material shall be placed in a windrow prior to spreading.

After the material has been mixed as above specified all of the mixed material shall be bladed into a single windrow in the center of the roadbed and the entire mass of treated material turned not less than 4 complete times by blading first to one side of the road and then to the other.

In lieu of mixing the material as above specified, a road-mixing machine or any equipment other than that required above may be employed which will produce a completed mixture equal to that which would be produced by means above specified. The Engineer reserves the right to order the use of any equipment discontinued which, in his opinion, fails to produce a satisfactory mixture.

Road-mixing machines shall be of the pug mill or auger type or other suitable equipment capable of picking up the loosened material completely from the roadbed, leaving practically no loose material on the ground, and which will introduce the liquid asphalt through a metering device at the time of mixing. The machine shall be equipped with the positive control of the amount of liquid asphalt introduced into the mix which can be readily adjusted to changes in grading of the road material.

The rate of movement of the machine along the roadway, the amount of material mixed and the amount of mixing shall be so regulated that a uniform mixture of unchanging appearance is obtained and all particles of aggregate are thoroughly coated with liquid asphalt. Before mixing on the roadbed the loosened material shall be placed in windrows or in a blanket of uniform cross-section and of such size that all the material in the windrow or blanket can be passed through the mixing machine at each mixing operation. Sufficient material, as determined by the Engineer, shall be placed in windrows or in a blanket in advance of mixing.

No mixed material shall be spread and compacted until the mixture has been approved by the Engineer.

The amount of material mixed on any one day shall not be more than can be spread and compacted on the following day, except that when directed by the Engineer mixed material shall remain in the windrow for a longer period.

Mixing the liquid asphalt with the mineral aggregate prior to delivery on the roadbed will be permitted, provided that the complete mixture is uniform in character and the same consistency with respect to grading, asphalt content and moisture as that specified for road-mixing.

Liquid asphalt added to mineral aggregate at a central mixing plant shall be accurately weighed by means of dial scales or other approved weighing devices. Liquid asphalt added to mineral aggregate in a traveling mixing plant shall be accurately measured by means of meters or other approved measuring device. Weighing or measuring liquid asphalt being added to mineral aggregate at mixing plants in accordance with the above specified methods shall be for the purpose of properly proportioning the material and not for determining the pay quantities of liquid asphalt.

### **320.7 SPREADING AND COMPACTION:**

Spreading shall be in increments not exceeding 1 inch in thickness.

Rolling shall be continuous throughout the spreading operations until all the loose material has been laid and consolidated.

Segregation of coarse or fine particles shall be avoided and the surfacing as spread shall be free from lumps or pockets of coarse or fine material. Segregated materials or lumps shall be remixed by blading.

After spreading on the roadbed, should the moisture content of the mixture exceed 3 percent it shall be reduced by blading and reblading the mixture and allowing it to dry before the final spreading. Should blading and reblading of the mixture fail to reduce the moisture content below that above specified, the mixture shall be scarified, turned and respread until the moisture content does not exceed 3 percent by weight of the dry aggregate, with the exception, however, that in certain special cases, when the mineral aggregate is unusually porous the permissible moisture content may be increased at the discretion of the Engineer, when laboratory tests indicate that such increase will not result in an unstable mixture.

During blading and rolling, all lumps or compressed masses of the mixture shall be remixed and again rolled. On completion of the blading operations all loose stones shall be swept to the outside of the surfaced area and incorporated with the shoulder material or picked up and disposed of.

The edges of the completed surfacing shall be trimmed uniformly to the required cross-section and width before the shoulders are finally rolled and shaped.

The completed surface, when ready for acceptance, shall be thoroughly compacted, smooth and even, true to grade and cross-section, and free from ruts, humps, depressions, or irregularities. When a 10 foot straightedge is laid on the finished surface and parallel with the center line of the road, the surface shall vary in no place more than 1/8 inch from the lower edge of the straightedge.

Should pneumatic-tired roller be used, the final finishing shall be done with a tandem roller. Sufficient blading and rolling equipment shall be furnished.

Where shown on the plans or specified in the special provisions, road-mixed material shall be placed and compacted around spillway assemblies, drop inlets and manholes outside the area to be surfaced, upon road approaches and connections, over gutter, ditch and dike areas, and over other areas, to the thickness shown on the plans or ordered by the Engineer.

At locations where the surfacing is to be placed over areas inaccessible to the required spreading and compacting equipment or over areas where the use of required spreading and compacting equipment would be impractical, the mixed material may be spread and compacted by other methods when approved or so ordered by the Engineer. Road-mixed surfacing placed on road approaches and connections shall be placed to the thickness and as specified for surfacing to be placed on the roadbed.

After final rolling the finished surface course shall have a density of at least 92 percent of the theoretical maximum density possible to obtain with the same materials in like proportions when computed without voids by specific gravity tests.

**320.8 MEASUREMENT:**

Measurements for determining the area to be paid for will be made horizontally unless otherwise specified.

**320.9 PAYMENT:**

Payment for road-mixed surfacing will be made on the basis of the price bid per square yard unless an alternate basis of payment is provided in the proposal. The price bid per square yard shall include the furnishing of all labor, materials, tools, compaction, asphalt and the dressing of the subgrade, or base course necessary to complete the work. Prime coat, when required, will be paid for by the ton, undiluted, complete in place.

## ASPHALT CONCRETE PAVEMENT

### 321.1 DESCRIPTION:

This section covers the placement of asphalt concrete either as a surface course, base course and/or curb upon a previously prepared base or subgrade in accordance with these specifications or as shown on the plans or ordered in writing by the Engineer.

### 321.2 MATERIALS AND MANUFACTURE:

Materials and manufacture shall conform with Section 710 for the type specified.

### 321.3 WEATHER AND MOISTURE CONDITIONS:

Asphalt concrete shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 40 degrees F. or above. No asphalt concrete shall be placed when the weather is foggy or rainy, or when the base on which the material is to be placed contains moisture in excess of the optimum. Asphalt concrete shall be placed only when the Engineer determines that weather conditions are suitable.

Municipality	Supplements
<b>GI:</b>	<p><b>Weather and moisture conditions</b></p> <p>This procedure shall consist of leveling, surface and/or base courses and curbs placed upon the previously prepared base or subgrade in accordance with these specifications to the compacted thickness and design shown on the plans or ordered in writing by the Town Engineer.</p> <p>Asphalt concrete shall be placed only when the surface is dry and when the ambient air temperature is forty (40) degrees Fahrenheit and rising. No asphalt concrete shall be placed when the weather is foggy or rainy, or when the base on which the material is to be placed has a moisture content in excess of optimum. Asphalt concrete shall be placed only when the Town Engineer determines that weather conditions are suitable</p>

Municipality	Supplements
<b>MC:</b>	<p><b>321.3</b></p> <p>Asphalt concrete of less than 2 inches in thickness shall be placed only when the atmospheric temperature in the shade is 55° F or above</p>

Municipality	Supplements
<b>PH:</b>	<p>WEATHER AND MOISTURE CONDITIONS: is changed to read:</p> <p>For base paving two inches thick or greater, atmospheric temperature shall be 40 degrees Fahrenheit and rising.</p> <p>For surface paving or pavement less than two inches thick, the surface temperature shall be 50 degrees Fahrenheit or greater.</p> <p>Subsection 321.5.2 (A) Spreading and Finishing Equipment: 6<sup>th</sup> Paragraph is changed to read:</p> <p>“Ski-type device or stringline as described in A or B above (MAG 321.5.2, paragraph 5) shall be used as directed by the Engineer.”</p>

	In conditions where the curb and/or gutter is not even and true to grade, the Engineer may require the Contractor to use a ski-type device or stringline as described in C above (MAG 321.5.2, paragraph 5) to establish the grade of the asphalt concrete surface adjacent to the curb or gutter.
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**321.4 APPLICATION OF TACK COAT:**

A tack coat shall be applied to all existing and to each new course of bituminous surfaces prior to the placing of a succeeding layer of bituminous mixed material. The tack coat may be deleted when a succeeding layer of asphalt concrete is being applied over a freshly laid course that has been subjected to very little traffic when approved by the Engineer.

The application of the tack coat shall comply with Section 329. The grade of emulsified asphalt shall be SS-1 h as specified in Section 713.

The same material that is specified above for the tack coat shall be applied to the vertical surfaces of existing pavements, curbs, and gutters, against which asphalt concrete is to be placed.

The surface to be covered may require repair or patching as directed by the Engineer.

**321.5 PLACING, SPREADING, AND FINISHING:**

Asphalt concrete shall be delivered and placed at a temperature within the job mix formula limits specified in Section 710. Tarpaulins shall be furnished and used to cover all loads during transportation if the temperature of the mixture is below the job mix formula limits specified in Section 710. The temperature shall be taken at a point 6 inches below the exposed surface of the material, in the truck, on the job site, and just prior to placement. When releasing agents are placed in the truck beds, no free fluid shall be present in the truck bodies at the time of asphalt concrete loading. Diesel fuel shall not be used as a releasing agent.

The handling of the completed mixture shall at all times be such as to prevent segregation, and the material as spread shall be free from areas of excess coarse, or fine material. Float rock developed in the process of raking shall be placed on an underlying course or otherwise disposed of. In no case shall it be scattered over the surface of a final course.

Placement shall begin on pavement at points farthest from the source of supply, and progress continuously toward the source of supply, unless otherwise ordered by the Engineer, and no more than 1/2 day's delivery to the project shall be placed in any one lane in advance of the other lanes. The end of each lane shall be staggered in relation to the adjacent lane.

At locations where the mixture is to be placed over areas inaccessible to the required spreading or compacting equipment or over areas where the use of the required spreading and compacting equipment would not be practicable, the mixture may be spread or compacted by other methods as approved by the Engineer.

Municipality	Supplements
<b>GI:</b>	<ul style="list-style-type: none"> <li>▪ <b>GI: Placing, spreading and finishing.</b> Asphalt concrete shall be delivered and placed and at a temperature no higher than necessary to accomplish placing, finishing and spreading. Tarpaulins shall be furnished and used to cover all loads during transportation if, as determined by the Town Engineer, difficulties in spreading, finishing, or compacting are experienced and the temperature of the mixture at a point six (6) inches below the exposed top surface, does not exceed two-hundred-fifty (250) degrees Fahrenheit when taken at the point of delivery in the truck. No free treating fluid shall be present in the truck bodies at the time of asphalt concrete loading. The handling of the completed mixture shall at all times be such as to prevent segregation, and the material as spread shall be free from areas of excess material (coarse or fine). Float rock developed in the process of raking shall be placed on an underlying course of otherwise disposed of. In no case shall it be scattered over the surface of a final course.</li> </ul>

	<p><b>321.5.1 Base Preparation:</b> The base prepared by the Contractor, on which the asphalt concrete is to be placed, shall be smooth, firm, and true to grade and cross-section as shown on the plans, and shall be so maintained throughout the period of placing asphalt concrete. If necessary, in order to obtain the above specified base condition, and if ordered by the Engineer, a leveling course of asphalt concrete compacted in layers not exceeding 2 inches in thickness or aggregate base shall be spread to level irregularities such as dips, depressions, and sags. All irregularities such as humps or high spots shall be removed in order to provide a smooth base of uniform grade and cross-section, so that subsequent surfacing will be of uniform thickness.</p> <p>No additional compensation will be allowed for furnishing and placing these materials, and full compensation for all materials and for all work incidental to the correcting of irregularities will be considered as included in the contract price for asphalt concrete.</p> <p>Pavement termination per Detail 201, Type A or B, shall be installed on all street edges where no other curb or retainment has been installed. This will include but not be limited to the center line of half streets, diagonal or perpendicular end terminations, street edges without curb and gutter or single curb.</p> <ul style="list-style-type: none"> <li>▪ <b>GI: Base Preparation</b> The base, as prepared by the contractor, on which the asphalt concrete is to be placed, shall be smooth, firm and true to grade and cross-section as shown on the plans and shall be so maintained throughout the period of placing asphalt concrete. If necessary, in order to obtain the above specified base condition and if ordered by the Town Engineer, a leveling course of asphalt concrete compacted in layers not exceeding two (2) inches in thickness or aggregate base shall be spread to level irregularities such as dips, depressions and sags. All irregularities such as humps Public or high spots shall be removed in order to provide a smooth base of uniform grade and cross-section, so that subsequent surfacing will be of uniform thickness. No additional compensation will be allowed for furnishing and placing these materials and full compensation for all materials and for all work incidental to the correcting of irregularities will be considered as included in the contract price for asphalt concrete.</li> </ul>
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Municipality	Supplements
SC:	<p><b>Base Preparation:</b> <i>Add the following paragraph:</i></p> <p>All street sections without curb and gutter are required to have a thickened edge per MAG Standard Detail No. 201 - Type A.</p>

**321.5.2 (A) Spreading and Finishing Equipment:** Self-propelled mechanical spreading and finishing equipment shall be provided with a vibrating screed or strike off assembly capable of distributing not less than the full width of a traffic lane. The term screed includes any strike off device that operates by cutting, crowding, or other practical action which is effective on mixtures at workable temperatures without tearing, shoving, or gouging, and which will produce a finished surface of the smoothness and texture required. The screed shall be adjustable to the required template and elevation. The forward speed of operation of self-propelled mechanical spreading and finishing equipment shall be so regulated that no irregularities will result in the surface texture or smoothness of the mat due to excessive forward speed of the spreading machine. The forward speed of operation shall not exceed 55 feet per minute unless the contractor can demonstrate to the satisfaction of the Engineer that higher speeds will not affect the smoothness of the mat.

All material within the self-propelled mechanical spreading and finishing equipment shall be handled to prevent segregation of the aggregate. This includes but is not limited to devices such as augers, screws or slat conveyors. These devices shall extend to the final or termination point where the material is being transported within the equipment. If any of the devices fail to function, the paving operation shall be terminated immediately until repairs are completed. In the case of the screed,

auger extensions and vibrators shall be installed wherever the screed is extended more than one (1) foot beyond the end of the base auger or auger extension. However, when placing material against an extremely uneven curb or edge over a short distance, the Engineer may waive the auger extensions and vibrators.

Self-propelled mechanical spreading and finishing equipment shall be equipped with a control system capable of automatically maintaining the screed elevation as specified herein.

The control system shall be automatically actuated from either a reference line or surface through a system of mechanical sensors or sensor directed mechanisms or devices which will maintain the paver screed at a predetermined transverse slope and at the proper elevation to obtain the required surface. When directed, the transverse slope control system shall be made inoperative and the screed shall be controlled by sensor directed automatic mechanisms which will independently control the elevation of each end of the screed from reference lines or surfaces.

The controls shall be capable of working in conjunction with any of the following attachments:

- (A) Ski-type device of not less than 30 feet in length.
- (B) Taut stringline or wire set to grade.
- (C) Short ski or shoe.

The Contractor shall furnish all necessary equipment to perform the paving operation including a long ski or shoe and all required stakes and wire. Should the automatic control system become inoperative during the day's work, the Contractor may be permitted to place the remaining material on site using manual controls; however, no further material shall be delivered to the project site, and work shall not be resumed thereafter until the automatic control system has been made operative.

In conditions where the curb and/or gutter is not even and true to grade, the Engineer may require the Contractor to use a ski-type device or stringline as described in A or B above to establish the grade of the asphalt concrete surface adjacent to the curb or gutter.

When trucks are backed into the self-propelled mechanical spreading and finishing equipment, it shall be in such a manner that the equipment will not be jarred excessively or moved out of line. Once in position, the truck shall be securely attached to the equipment during spreading and finishing.

When the Engineer deems that the automatic screed control operation is not practical under a particular set of conditions, he/she may order the use of manual control in lieu thereof. However, the machine shall be equipped with the automatic device.

Use of the spreader boxes will be permitted by the Engineer only in writing, under certain conditions, such as in alleys and on narrow paving projects where it is not practical to use self-propelled equipment. The spreader box will be equipped with a readily adjustable strike off blade. In order to obtain a smooth surface manipulation of the controls of the spreader box shall be held to a minimum. Trucks shall be backed into the spreader box in such a manner that the box will not be jarred excessively or moved out of line and the trucks shall be securely attached to the spreading and finishing.

If approved in writing by the Engineer, asphalt base course material may be placed with a self propelled pneumatic tired blade grader equipped with an automatic leveling device capable of accurately maintaining transverse slope of the blade at a preset angle. The grader shall have a blade not less than 12 feet long. Motor graders shall be free from appreciable lost motion in the blade control.

Municipality	Supplements
GI:	<ul style="list-style-type: none"> <li>▪ <b>GI: Spreading and finishing equipment.</b> Self propelled mechanical spreading and finishing equipment shall be provided with a screed or strike off assembly capable of distributing not less than the full width of traffic lane. The term screed includes any strike off device operating by cutting, crowding, or other practical action which is effective on mixtures at workable temperatures without tearing, shoving, or gouging and which will produce a finished surface of the smoothness and texture required.</li> </ul>

	<p>Self-propelled mechanical spreading and finishing equipment shall be equipped with a control system capable of automatically maintaining the screed elevation as specified herein. When more than one course is placed, longitudinal joints of each course shall be staggered not less than six (6) inches with relation to the longitudinal joints of the underlying course. Sufficient rolling equipment shall be furnished to compact and finish satisfactorily the amount of mixture being placed. A minimum of two (2) rollers and two (2) operators shall be provided for production of one-hundred-fifty (150) tons or less per hour where the thickness of lift to be placed is (1) inch or less, the minimum pieces of rolling equipment shall be three (3) rollers consisting, unless otherwise directed by the Town Engineer, of one (1) smooth wheel and two (2) pneumatic rollers and three (3) operators. In all cases one (1) additional roller and operator shall be provided for each additional one-hundred (100) tons, or fractional part thereof, per hour.</p> <p>Breakdown rolling shall begin as soon as the mixture will bear the roller without undue displacement. Rolling shall be longitudinal, overlapping on successive trips by at least ½ but not more than ¾ the width of the rear wheels. Asphalt will be placed at a minimum temperature of two-hundred-fifty (250) degrees Fahrenheit. The motion of the roller shall at all times be slow enough to avoid displacement of the mixture. Rolling shall continue until the specific gravity of the compacted mixture is not less than ninety-five (95) percent of the specific gravity of specimens composed of the same materials in similar proportions or composed of the same mixture compacted in the laboratory by the seventy-five (75) blow method of ASTM D-1559.</p> <p>At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers and finished, where necessary, with a hot smoothing iron to provide a uniform and smooth layer over the entire area compacted in this manner. The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than one-fourth (¼) inch from the lower edge of a twentyfive-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Town Engineer. When deviations in excess of the above tolerance are found, such places as humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with the bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Town.</p>
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Municipality	Supplements
<b>GI</b>	<p><b>Placement</b> All courses of asphaltic concrete shall be placed and finished by means of a self-propelled paving machine equipped with a screed and automatic controls. Spreader boxes will not be permitted to place asphalt material on city streets</p>

**321.5.2 (B) Compaction Equipment:** All rollers used in compaction of asphalt concrete shall be self-propelled and reversible, with a minimum weight of 8 tons. All rollers shall be maintained to insure smooth operation in respect to steering, the ability to stop, start and reverse. All rollers shall be equipped with an automatic device or devices capable of properly dispensing an approved releasing agent on the wheels to prevent the wheels from picking up the asphalt concrete. Diesel fuel shall not be used as a releasing agent. All rollers shall be equipped with scrapers to keep the wheels clean from asphalt and other debris.

Pneumatic-tired rollers shall be of the 2 axle tandem type, having a rolling width of not less than 5 feet. All tires shall not be less than 20 inches in diameter, shall be of the same size and shall have treads satisfactory to the Engineer. The roller shall be so constructed that the operating weight per tire shall not be less than 2000 pounds and the tires shall be spaced so that the entire gap between adjacent tires will be covered by the tread of the following tire. Except as otherwise specified, each tire shall be inflated to 90 psi and at all times the air pressure in each tire shall not vary more than 5 psi from the specified pressure. Pneumatic-tired rollers shall be equipped with skirt-type devices mounted around the tires so that the temperature of the tires will be maintained during the rolling process.

Steel-wheeled tandem rollers or vibratory rollers may be used where applicable. In all cases, the larger of the two roller wheels will be operated in the forward position. The steel wheels shall be straight, free from grooves and/or pits. Vibratory rollers shall be operated in accordance with standard practices and manufacturer recommendations.

**321.5.3 Leveling Course:** A leveling course shall be used when specified, or as directed in writing by the Engineer, to bring existing pavement to a uniform grade prior to placing an overlay or other course.

After the prime coat or tack coat has been applied, the leveling course mixture shall be spread to the proper width and to such depth as will compact to the required thickness. Actual quantities of the mixture required will be determined by the Engineer.

The distance to which a leveling course may be spread in advance of covering it with the following course shall be as ordered by the Engineer.

The leveling course material shall be placed in layers, 2 inches maximum compacted thickness, prior to finishing by means of self-propelled spreading equipment, spreader box or motor graders as discussed above. Other means may be permitted for placing the leveling course provided the method, at the discretion of the Engineer, can provide a finish surface that does not vary from the design surface by more than the amount specified below. In order to obtain a smooth surface, manipulation of controls of the paver shall be at a minimum. Unless otherwise permitted by the Engineer, adjustments shall not be made on less than 50 feet intervals and any adjustment shall not result in a change in thickness of the pavement in excess of 1/8 inch. Except where the machine is equipped with electronic grade controls.

The placing of the leveling course shall be not less than one lane width and for the longest practical length for any one lay, preferably not less than 1200 feet. The exact width and length will be approved by the Engineer. Compaction shall be accomplished by use of pneumatic-tire or steel-wheel rollers. Rolling shall proceed concurrently with the laydown of the leveling course. During the rolling operation, the speed of the roller shall not exceed 3 miles per hour. Additional rollers may be required depending on the placement rate of the asphalt concrete. If ample number of rollers are not present, the contractor shall adjust the placement rate to accommodate the roller speed.

The leveling course shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/2 inch from the lower edge of a 25 foot straightedge when the straightedge is placed parallel the centerline of the roadway. The straightedge shall be furnished by the Contractor and shall be constructed of such lightweight materials that it can be handled by the inspector without assistance.

When deviations in excess of the above tolerance are found, such places as humps; or depressions shall be corrected to meet the specified tolerance. All labor and equipment necessary to correct such deviations shall be at no additional cost to the Contracting Agency. Adjustment in the cost for the material may be requested by either the Contracting Agency or Contractor depending on the type of deviation.

**321.5.4 Asphalt Base and Surface Course:** Asphalt base and surface courses shall be spread and finished by means of self-propelled mechanical spreading and finishing equipment as described and specified above, except as otherwise noted. The compacted thickness of layers placed shall not exceed 150% of the Design Target Lift Thickness of Table 710-1 except as otherwise provided in the plans and specifications, or if approved in writing by the Engineer.

When more than one course is placed, longitudinal joints of each course shall be staggered not less than 6 inches with relation to the longitudinal joints of the underlying course.

Before a surface course is placed adjacent to cold transverse construction joints, the joints shall be trimmed to a vertical face by cutting (e.g., sawcut) the material back to its full depth to expose a fresh surface. The joint shall be cut on a 10 to 15 degree skew from a line perpendicular to the center line of the street or roadway. The joint formed when the fresh mixture is placed shall be dense and well sealed. The transverse surface joints shall be tested with a 25 foot straightedge and shall conform to the requirements herein for surface smoothness. For short overnight intermissions in paving, a full depth bulkhead (e.g., wooden member) can be placed near the end of the day's pavement. The bulkheads and excess material will be removed just prior to the placement of the following day's pavement.

An approved joint heater shall be used on cold transverse or longitudinal joints where conditions are such that it is deemed necessary by the Engineer. The joint heater shall be capable of heating the joint to a minimum temperature of 200 °F. for a minimum depth of 1/4 inch at a speed commensurate with that of the laydown machine.

If it is deemed necessary by the Engineer to seal the joint, a light coat of asphalt emulsion shall be applied to the exposed edge before the joint is made.

Sufficient rolling equipment shall be furnished to satisfactorily compact and finish the amount of mixture being placed. However, there shall be a minimum of two rollers with two (2) operators on the project at all times. Upon direction of the Engineer, one of the rollers may be a pneumatic-tire roller. During rolling operations, the speed of the roller(s) shall not exceed 3 miles per hour. If ample number of rollers are not present, the contractor shall adjust the asphalt placement rate to accommodate the roller(s) speed. The type and required number of rollers shall be on the project and in acceptable operating condition, prior to the placement of any asphalt material. All rollers shall be operated continuously from the breakdown through finish rolling. The contractor may use vibratory rollers in lieu of the steel-wheeled roller, however when the thickness of the asphalt is one(1) inch or less, all rolling will be done in the static mode.

When more than one width of asphalt concrete material will be placed, a 6 inches strip adjacent to the area on which future material is to be laid shall not be rolled until such material has been placed but shall not be left unrolled more than 2 hours after being placed, unless the 6 inches unrolled strip is first heated with a joint heater. After the first strip or width has been compacted, the second width shall be placed, finished and compacted as provided for the first width, except that rolling shall be extended to include the 6 inches of the first width not previously completed.

At any place not accessible to the roller, the mixture shall be thoroughly compacted with tampers and finished, where necessary, with a hot smoothing iron to provide a uniform and smooth layer over the entire area compacted in this manner.

Breakdown rolling shall begin as soon as the mixture will bear the roller without undue displacement. Rolling shall be longitudinal, overlapping on successive trips by at least 1/2 but not more than 3/4 the width of the rear wheels. Alternate trips of the roller shall be of slightly different lengths. The motion of the roller shall at all time be slow enough to avoid displacement of the mixture.

Break down and compaction rolling shall be done by either steel-wheel or pneumatic-tire rollers. The Engineer may require a pneumatic-tire roller for one of the rolling operations. Rolling shall continue until the specific gravity of the compacted mixture is not less than 95 percent of the specific gravity of specimens composed of the same materials in similar proportions or composed of the same mixture compacted in the laboratory by the 75 blow method of AASHTO T-245 if the mix was designed by the Marshall method. If the mix was designed by The Asphalt Institute’s SP-2 Gyratory method, rolling shall continue until the specific gravity of the compacted mixture is not less than 93 percent of the maximum theoretical specific gravity (ASTM D-2041) of specimens composed of the same materials in similar proportions or composed of the same mixture compacted in the laboratory.

Finish rolling shall be done by means of steel-wheeled roller or a vibratory steel-wheel roller operated in the static mode.

The completed surfacing shall be thoroughly compacted, smooth and true to grade and cross-section and free from ruts, humps, depressions or irregularities. An acceptable surface shall not vary more than 1/4 inch from the lower edge of a 25-foot straightedge when the straightedge is placed parallel to the centerline of the roadway. The straightedge shall be furnished by the contractor and shall be acceptable to the Engineer.

All streets shall be water tested for drainage in the presence of the Engineer or designated representative before final acceptance. Any areas not draining properly shall be corrected to the Engineer’s satisfaction at the Contractor’s expense. Water for this testing shall be provided and paid for by the Contractor.

When deviations in excess of the above tolerance are found, humps or depressions shall be corrected to meet the specified tolerance, or shall be cut out along neat straight lines and replaced with fresh hot mixture and thoroughly compacted to conform with and bond to the surrounding area. Materials and work necessary to correct such deviations shall be at no additional cost to the Contracting Agency.

Municipality	Supplements
ME	<p data-bbox="334 1749 987 1778">: Subsection 321.5.4 – Modify the 10th paragraph as follows:</p> <p data-bbox="428 1778 1446 1869">The percent compaction of asphalt mixes designed by the AASHTO T-245 method will be changed from 95 percent to 95.0 percent. The percent compaction of asphalt mixes designed by the Gyratory method shall be changed from 93 percent to 93.0 percent.</p> <p data-bbox="428 1896 1395 1925">Section 321, 322 and 336 – for all pavement work covered by these sections, the following</p>

	<p>applies: After the asphalt concrete surface course has been placed, all manholes, valve boxes, cleanouts and other existing structures shall be built up or otherwise adjusted to finish grade. The adjustment shall be per M.A.G. Std. Detail 270 and 422. Detector loops for traffic signals shall be installed prior to installation of the surface course.</p>
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Municipality	Supplements
SC:	<p><b>Asphalt Base and Surface Course:</b> <i>Modify the sixth paragraph above Table 321-1 to read as follows (Added text is highlighted.):</i></p> <p>The completed surfacing shall be thoroughly compacted, smooth, and true to grade and cross-section, <b>within the tolerances specified herein</b>, and free from ruts, humps, depressions, or irregularities. An acceptable surface shall not vary more than 1/4-inch from the lower edge of 12-foot straightedge when the straightedge is placed parallel <b>or perpendicular</b> to the centerline of the roadway. The straightedge will be furnished by the Contractor and shall be acceptable to the Engineer. <b>In addition to the smoothness requirements specified above, asphalt concrete pavement shall be true to the grades shown or indicated on the plans and shall not vary more than 1/4-inch from the plan elevations. Finish pavement grades adjacent to curbs shall be within 1/4-inch of the design elevation but in no case below the lip of the gutter.</b></p>

**321.5.5 Preservative Seal:** An asphalt concrete preservative seal shall be used on all new asphalt concrete pavement and shall comply with Section 334. The Engineer will make a field determination and provide the actual application rate or delete the requirement. This seal is not required for pavement matching and surface replacement over pipe trenches, etc., unless specified in the special provisions.

Municipality	Supplements
ME:	<p><b>Subsection 321.5.5</b> – Replace the Subsection as follows:  A surface treatment per Sections 333 or 334 will be required when the surface course asphalt is an R mix as defined by the East Valley Asphalt Mix Design Criteria. When the surface course asphalt is an A mix, the surface treatment will be required when specified in the contract documents (special provisions, plans, bid proposal, etc.) or when, in the opinion of the Engineer, the traffic conditions of the street justifies the treatment. The application rate and the type of treatment shall be approved by the Engineer.</p> <p><b>Subsection 321.5.6</b> – Add the following Subsection:  The Contractor shall be responsible for providing the City of Mesa with an acceptable product per the applicable current MAG Sections and the current East Valley Asphalt Criteria. Routine testing of the aggregates, binder, anti-strip material and the asphalt mixture shall be the responsibility of the Contractor or his representative. The City of Mesa shall test, as it deems necessary. If the City test results are not in agreement with the Contractor’s test results, the Contractor shall have the option to retain a third party consultant for testing. The consultant shall be a Professional Engineer registered in the State of Arizona, knowledgeable in asphalt pavements and approved by the City Engineer. The consultant’s expertise shall include but not be limited to design, production, transportation, placement and compaction of hot Mix Asphalt. The standards outlined in the East Valley Asphalt Criteria, MAG Specifications, etc. shall be used for the testing of the asphalt mix. The number and locations of the test samples shall be approved by the City Engineer. The results of the third party shall be binding. All cost incurred by the consultant shall be at the Contractor’s expense</p>

Municipality	Supplements
SC:	<p><b>Preservative Seal:</b> <i>Add the following paragraph:</i></p> <p>Preservative seal on streets classified as residential and local collector shall be in accordance with MAG Section 718, Type D (polymer modified type B). Preservative seal shall be applied no earlier than 48 hours after completion of surface course paving, and no later than the end of the warranty period</p>

**321.6 CORRECTIVE REQUIREMENTS FOR DEFICIENCIES:**

Municipality	Supplements
GI:	<p>Asphalt mixtures placed within the existing and proposed right of way of the City of Glendale shall conform to the approved mix design, subject to normal production tolerances defined in the above referenced document. Any material placed which does not conform to the approved mix design will be subject to removal and replacement at the expense of the Contractor.</p>

Municipality	Supplements
ME:	<p><b>Subsection 321.6 – Add the following paragraph:</b></p> <p>When more than one deficiency occurs in the same asphalt as discussed in the following Subsection 321.6.1, 321.6.2 and 321.6.3, the corrective action will be the most stringent of the deficiencies. If all three deficiencies occur in the same asphalt, the Engineer has the option to require the asphalt to be removed and replaced with material meeting the specification requirements for the mix type involved. If the asphalt remains in place and the Contractor selects the option to pay a cash amount with the City, the amount of the money paid shall be the sum of all individual monetary penalties for each deficiency.</p>

**321.6.1 Thickness:** The engineer or the permittee will test the density and thickness of the asphalt concrete after pavement construction is complete, using cores. The cores will be taken by the Engineer at random locations, at a minimum sampling rate of one core per 1,000 feet of lineal distance per paver pass width. For residential streets, a paver pass width will be considered to be a minimum of 12 feet. For residential streets, a minimum of one core will be taken between intersecting streets or portions thereof. When a deficiency of more than 1/4 inch is found, two additional cores will be taken not closer than 100 feet apart nor closer than 100 feet to the original core, and the average of these three cores will be used to determine the amount of the deficiency. Further cores may be taken by the Contractor if he so chooses, to determine the limits of the deficiency, and shall be at no additional cost to the Contracting Agency but shall not be used in determining the average thickness of the pavement. Thickness of the cores shall be determined by average caliper measurement. Where pavement thickness is deficient by 1/4 inch or less, it will be paid for at the contract price. The contractor shall repair all of the core holes using hot asphalt concrete from the project or a high quality asphalt based patching compound.

Where the pavement is deficient in thickness by more than 1/4 inch but not more than 1/2 inch, payment will be reduced per Table 321-1.

<b>TABLE 321-1</b>	
<b>PAVEMENT THICKNESS PAYMENT REDUCTION (AC)</b> <b>For Thickness Deficiency of More Than 1/4 inch and less than 1/2 inch</b>	
<b>Specified Mat Thickness</b>	<b>Reduction in Payment or Corrective Action</b>
A: When the agency is the contracting party:	
Less than 1.5 inches	50%
1.50 inches to 1.99 inches	33%
2.00 inches to 2.49 inches	25%
2.50 inches to 2.99 inches	20%
3.00 inches and over	17%
B: When the agency is not the contracting party (work under permit, e.g. subdivision, utilities, etc.)	
For all thicknesses	Corrective action shall be the same as that for pavement thickness deficiencies exceeding 1/2 inch as described below.

When the deficiency of the pavement thickness exceeds 1/2 inch, the pavement shall be overlaid on the area affected, but in no case less than one City block or 660 feet, whichever is less in length, for the full width of pavement, with a new mat of material specified by the Engineer, equal in thickness to the deficiency but not less than 1/2 inch in any instance. This is to be done at no additional cost to the Contracting Agency. At locations where specific grades must be maintained, such as adjacent to curb and gutter or to accommodate drainage, the asphalt concrete surface may require milling prior to placement of the overlay.

When the pavement is deficient in thickness by more than 1/4 inch, all coring done to establish this premise shall be done by a laboratory that is independent of the contractor, and who is working under the direction of the Engineer. The cost of this work shall be born by the contractor by reduction of payments due under the contract.

<b>Municipality</b>	<b>Supplements</b>
<b>GI</b>	<p><b>Paving deficiency</b></p> <p>When, in the opinion of the Town Engineer, there is reason to believe that the pavement may be deficient in thickness, cores will be taken at his direction, at random locations. When a deficiency of more than 1/4 inch is found, two (2) additional cores will be taken not closer than one-hundred (100) feet apart nor closer than one-hundred (100) feet to the original core and the average of these three (3) cores shall be used to determine the amount of the deficiency. Further cores may be taken by the contractor if he so chooses, to determine the limits of the deficiency and shall be at no additional cost to the Town but shall be used in determining the average thickness of the pavement. Thickness of the cores shall be determined by average caliper measurement.</p> <p>When the deficiency of the pavement thickness exceeds 1/2 inch, the pavement shall be overlaid on the area affected, but in no case less than one city block or six-hundredsixty (660) feet whichever is less in length, for the full weight of pavement, with a new mat of material specified by the Town Engineer, equal in thickness to the deficiency but not less than 3/4 inch in any instance. This is to be done at no additional cost to the Town. When the pavement is deficient in thickness by more than 1/4 inch, all coring done to establish this premise shall be at the expense of the contractor.</p>

Municipality	Supplements
GI:	<p><b>: Lift Thickness</b></p> <p>Completed pavement which is deficient in either thickness or density shall be subject to removal and replacement at the expense of the Contractor. The choice of asphaltic concrete mix designation shall be governed by the following target lift thicknesses:</p> <p>Table 3.3 Target Lift Thickness Nominal Maximum Size Asphalt Mixture</p> <p>1" (25 mm) 3/8" (9.5 mm) 1-1/2" (37.5 mm) 1/2" (12.5 mm) 2" (50 mm) 3/4" (19 mm) 3" (75 mm) 1" (25 mm) 4" (100 mm) 1-1/2" (37.5 mm)</p> <p>NOTE: 19mm and larger sizes shall not be used for a surface course. Pavement replacement in trenches shall use either 9.5mm or 12.5mm mixtures placed in lifts not to exceed 2 -1/2 inches.</p>

Municipality	Supplements
ME:	<ul style="list-style-type: none"> <li>▪ Subsection 321.6.1 – Thickness – Replace Subsection with the following: When, in the opinion of the Engineer, there is reason to believe that the pavement may be deficient in thickness, cores will be taken by the Engineer at random locations, with 1 core per pass of the paver or portion thereof of width and not less than 500 feet of lineal distance, with a minimum of 1 core per pass of the paver width between intersecting streets or portions thereof. When a deficiency of more than ¼ inch is found and at the option of the Contractor, 2 additional cores will be taken not closer than 100 feet apart nor closer than 100 feet to the original core, and the average of these 3 cores will be used to determine the amount of the deficiency. The Contractor shall make necessary arrangements and pay all costs for the additional cores. The City will provide the laboratory testing. Further cores may be taken by the Contractor, if he so chooses, to determine the limits of the deficiency.</li> </ul> <p>The City may request companion cores for their testing and analysis. The cores shall be at no additional cost to the City and shall not be used in determining the average thickness of the pavement. Thickness of the cores shall be determined by average caliper measurement. When pavement thickness is deficient by ¼ inch or less, it will be paid for at the contract price. When the pavement (base or surface) is deficient in thickness by more than ¼ inch but less than or equal to ½ inch, the Contractor has the option 1) to remove the defective asphalt mix and replace it with asphalt of proper thickness, 2) to place an overlay as discussed in the following paragraph or 3) to provide a monetary compensation to the City. The monetary compensation will be a payment of \$1.00 per square yard for all deficient mat thicknesses.</p> <p>When the contracting party is the City of Mesa, a Change Order will be issued reducing the specified amount of money. When the contracting party is other than the City of Mesa, the Contractor shall pay the specified amount of money to the City of Mesa prior to acceptance. In the case of deficient base asphalt, when the asphalt is placed thinner than specified but not more than 1/2-inch and with the approval of the Engineer, the Contractor can provide additional surface asphalt to compensate for the base. When the deficiency of the pavement thickness exceeds ½ inch, the pavement shall be overlaid on the area affected, but in no case less than one City block or 660 feet whichever is less in length, for the width of pavement, with a new mat of material specified by the Engineer. The thickness of the overlay shall be equal in thickness to the deficiency but not less than three times the nominal maximum aggregate size unless otherwise approved by the Engineer. This is to be done at no additional cost to the City. Note: Removal or milling of all or a portion of the asphalt surface may be required to achieve the minimum thickness and/or to provide the correct elevation of the asphalt surface at the control points (lip of gutter, valley gutter, etc.).</p>

**321.6.2 Density:** The Engineer or the permittee will test the density and thickness of the asphalt concrete after pavement construction is complete using cores. The cores will be taken in the same pattern as defined in Section 321.6.1, except that additional cores shall be taken if the density is less than the specified density. When the density represented by the average of three cores is deficient and the Contractor is unable to correct the deficiency, corrective action will be taken as prescribe in Table 321-2. For the purposes of this specification, the material represented by the set of three cores shall include all of the material placed in that paver pass for a length extending from half the distance to the previous core to half the distance to the next core.

At the discretion of the Engineer, for density deviations equal to or less than one percent, the average density of all of the cores taken from a given day's production may be used to represent all of the material placed that day.

The Agency's approval of the mix design does not guarantee the mix can be compacted to the specified limits. The Contractor shall work closely with the mix designer, compaction equipment manufacturers and the material supplier to assure the mix approved for use on the project can be compacted to the limits specified.

<b>TABLE 321-2</b>	
<b>PAVEMENT DENSITY CORRECTION (ASPHALT CONCRETE)</b>	
Deviation Below Specification	Action
<b>A. When the Agency is the Contracting Party:</b>	
Equal to or less than 1.0%	\$1.00/ton of Asphalt Concrete penalty
Greater than 1.0% and equal to or less than 2.0%	\$2.00/ton of Asphalt Concrete penalty
Greater than 2.0% and equal to or less than 3.0%	\$3.00/ton of Asphalt Concrete penalty
Greater than 3.0%	See Note Below
<b>B. When the Agency is not the contracting party (work under permit, e.g.: subdivisions, utilities etc.)</b>	
Equal to or less than 2.0%	See Agencies' policies, amendments, etc. pertaining to the action
Greater than 2.0% and equal to or less than 3.0%	Mill and inlay at a minimum depth of three times the nominal aggregate size using the same mix as specified for the project
Greater than 3.0%	See Note Below

Note: The Contractor shall remove and replace the entire asphalt layer that is deficient. The dimensions of the repairs shall be the width of the paver or 12 feet, whichever is greater, and the length of one City block or 660 feet, whichever is less.

<b>Municipality</b>	<b>Supplements</b>
<b>ME:</b>	<ul style="list-style-type: none"> <li>▪ Subsection 321.6.2 – Density – Replace subsection with the following: When, in the opinion of the Engineer, there is reason to believe that the compaction of the mixture is deficient, either by inadequate or excessive compaction, cores will be taken in the same pattern as that defined in the first paragraph of Subsection 321.6.1 – Thickness. The cores shall be tested for specific gravity per AASHTO T166.</li> </ul> <p>The Contractor has the option to remove and replace the defective asphalt mix or to provide corrective action as specified below. Replacement or corrective action shall apply to the affected area but not less than one city block or 660 feet, whichever is less. The tolerances for deficient compaction and related corrective action shall be per Tables A or B.</p>

<b>TABLE A</b>	
<i>Corrective Action for Inadequate Specific Gravity</i>	
Below Minimum requirements established in Section K above. (%)	<i>A or R – Asphalt Mix</i> As defined by East Valley Asphalt Criteria
Less than 1.0	Apply a Surface Treatment See Note #1
1.0 to less than 2.0	Apply a Surface Treatment Plus Monetary compensation See Notes #1 & 2
2.0 to less than 3.0	Apply a Surface Treatment Plus Monetary Compensation See Notes #1 & 3
Greater than or equal to 3.0	Remove and Replace Defective Asphalt See Note #5

<b>TABLE B</b>	
<i>Corrective Action for Excessive Specific Gravity</i>	
Greater than the minimum established in Section K above. (%)	<i>A or R* - Asphalt Mix</i> As defined by East Valley Asphalt Criteria
Greater than 2.0 to less than 3.0	Monetary Compensation and Delete any Surface Treatment See Notes #3 & 6
3.0 to less than 4.0	Monetary Compensation and Delete any Surface Treatment See Notes #4 & 6
4.0 and greater	Remove and Replace Defective Asphalt See Note #5

- Only applies for R Asphalt mixes when air voids are less than 6%.

Notes:

1. A surface treatment shall be applied per Section 333 or Section 334. The application rate and the type of treatment shall be approved by the Engineer. The surface treatment shall be applied at no cost to the City.
2. The monetary amount of \$0.50 per square yard per inch of depth for each square yard having the deficiency shall be paid to the City for long-term maintenance created by the deficient asphalt. If the Contracting Agency is the City of Mesa, a change order will be issued deducting the monies from the contract. If the Contracting Agency is someone other than the City of Mesa, the Contractor shall pay the specified amount of money to the City of Mesa prior to acceptance.
3. Same as Note #2 above except the amount paid shall be \$1.00 per square yard per inch of depth of the deficient asphalt.
4. Same as Note #2 except the amount paid shall be \$1.50 per square yard per inch of depth of the deficient asphalt.
5. The minimum thickness of the removed asphalt shall be three times the nominal size of the

	<p>aggregate unless otherwise approved by the Engineer. If the removal is the total asphalt section, the Contractor shall use any means available to him for the removal. If only partial removal is required, the removal will be with a cold asphalt milling machine. The removal and replacement of the asphalt shall be at no cost to the City.</p> <p>6. Delete the surface treatment as required in Detail M-19.1, Note #7.</p>
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**321.6.3 Mineral Aggregate:** When the mineral aggregate gradation deviates from the requirements of this specification in an amount which, in the opinion of the Engineer, will affect the stability or durability of the mix, the Contractor shall, as directed by the Engineer, either: remove the asphalt concrete and replace it with material which meets the requirements of this specification, or place an additional mat of such thickness and gradation as required by the Engineer which will, in the opinion of the Engineer, correct the deficiency.

The above corrective work, due to deviations from the requirements for mineral aggregate, shall be done at no additional cost to the Contracting Agency.

Municipality	Supplements
<b>GI:</b>	<ul style="list-style-type: none"> <li>▪ <b>Asphalt Concrete</b> The asphalt to be mixed with mineral aggregate shall be paving grade asphalt conforming to Section 710 and 711 of M.A.G. Specifications and as directed by the Town Engineer.</li> </ul> <ol style="list-style-type: none"> <li>1. When aggregate is subject to stripping, as determined by ASTM methods, dry hydrated lime conforming to the requirements of ASTM C-207 Type N, Portland cement conforming to M.A. G. Section 725 or other approved anti-strip agent shall be added. Hydrated lime and Portland cement shall be added in accordance with M.A.G. Section 710.2.3. Other approved no strip agents shall be added in accordance with the manufacturer’s recommendations upon approval by the Town Engineer.</li> <li>2. Mineral filler shall conform to the requirements of AASHTO M-17. The mineral filler shall be dry hydrated lime conforming to the requirements of ASTM C-207 Type N, or Portland cement conforming to Section 725 or other approved mineral filler and shall be added to the aggregate in accordance with the requirements contained herein. The amount of mineral filler to be used shall be determined by the Town Engineer. The method of adding the mineral filler shall be such that the aggregate is uniformly coated and the mineral filler is uniformly distributed without loss or waste within the material prior to adding the asphalt to the mixture. Unless otherwise authorized by the Town Engineer, no work shall be started on the project, nor any mixture accepted until the contractor or his supplier has submitted a satisfactory job-mix formula based upon tests of the materials furnished.</li> <li>3. Testing of asphalt and asphaltic products shall be done at the direction of the Town Engineer at prescribed intervals and specified in the Town of Gilbert Standard Specifications and per Section 321 of M.A.G. Specifications</li> </ol>

Municipality	Supplements
<b>ME:</b>	<ul style="list-style-type: none"> <li>▪ Subsection 321.6.3 – Replace Subsection with the following: When in the opinion of the Engineer, there is reason to believe that the asphalt cement content of the mix is either deficient or in excess, cores will be taken in the same pattern as that defined in the first paragraph of Subsection 321.6.1 – Thickness. The cores shall be tested for asphalt content per Subsection 710.4.2. When the asphalt cement content of any core is found to be either deficient or in excess, two additional adjacent cores will be collected and tested. The average of the three tests shall be used to determine the final asphalt cement content at that point.</li> </ul> <p>A) Asphalt Content Exceeding the Limits: When the asphalt cement content is in excess of that established in Subsection 710.4.2 but not</p>

	<p>beyond 0.2 percentage points above the limit and if the air voids of the in-place material is between 3.0 and 7.0 percent inclusive, and the air voids of the laboratory compacted specimen, composed of the same asphalt mix placed in the field, is within 1.0 percent of design, the Contractor may comply with the following paragraph. In all other cases, the Contractor shall remove and replace the asphalt concrete with new material at no additional cost to the City. The limits of the corrective action shall be over the affected area but not less than one city block or 660 feet. The Contractor shall remove any areas of bleeding, but in no case less than the specified roller width, as directed by the Engineer, and replace the affected material with new material meeting the specification requirements for the mix type involved. This shall be done, any time within the one (1) year warranty until the bleeding has been corrected, at no additional cost to the City. Should the stability of the mix be affected by the excess asphalt cement to such an extent that the pavement is displaced under normal traffic load, within the one (1) year warranty, the areas affected shall be removed and replaced with new material, at no additional cost to the City. The criteria for determining stability of the mix shall be 3/8-inch movement or more of the asphalt (rutting or shoving) measured with a 10-foot straight edge in any direction.</p> <p>B) Asphalt Content Below the Limits:  When the asphalt cement content is below the limit established in Subsection 710.4.2 but not beyond 0.2 percentage points below the limit, the Contractor shall have the option of removing and replacing the deficient asphalt or to place a surface treatment on the affected area per Sections 333 or 334. The application rate and the type of treatment shall be approved by the Engineer. The limits of the corrective action shall be over the affected area but not less than one city block or 660 feet. In addition to the treatment, the Contractor shall pay \$0.50 per square yard per inch of depth of deficient asphalt, to the City for long term maintenance created by the deficient asphalt. If the Contracting Agency is the City of Mesa, a change order will be issued deducting the monies from the contract. If the Contracting Agency is someone other than the City of Mesa, the Contractor shall pay the specified amount of money to the City of Mesa prior to acceptance. When the asphalt cement content is greater than 0.2 percentage points below that established in Subsection 710.4.2, the contractor shall remove the asphalt concrete and replace it with material that meets the specifications at no additional cost to the City. The limits of the corrective action shall be over the affected area but not less than one city block or 660 feet.</p>
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**321.6.4 Acceptance Testing Requirements:** Tests used to determined acceptance under Section 321.6 will be performed by the Engineer or a laboratory employed by the Engineer. In either case, the laboratory shall be accredited by the AASHTO Materials Reference Laboratory (AMRL) or an equivalent certification Agency for AASHTO Method T 166.

If the Contractor has reason to question the validity of any of the acceptance test results, he may request that the Engineer consider verification tests for final acceptance. Any request for verification testing must describe the Contractor’s reasons for questioning the validity of the original acceptance results and must clearly describe which set of acceptance tests are in question. The Engineer may either accept or reject the request for verification testing.

If the Engineer accepts the request for verification testing, he will engage an independent laboratory who is accredited by AMRL or equivalent. The independent laboratory shall be paid by the Engineer and shall perform a completely new set of acceptance tests (as required by 321.6) representing the area or set of tests in question. These tests shall include unit weight and thickness of cores, as well as Marshall or Maximum theoretical unit weight of the material obtained from the cores.

The verification tests shall be made on 6-inch diameter core specimens taken as near as it is practical to the acceptance test locations. For each sample, a minimum of three core specimens shall be taken, and the average values for unit weight and/or thickness shall be used.

An adequate number of cores will be taken so their combined weight will be sufficient for a laboratory unit weight test in accordance with ASTM D2041 or AASHTO T 166, as appropriate for the specified mix design. The appropriate laboratory unit weight test shall be performed on the verification sample after re-heating and re-mixing the core specimens. The cores shall be prepared for testing by cleaning with a steel brush and by removing any extraneous lifts of differing materials. After removing extraneous materials, the entire core specimen will be used in the laboratory unit weight determination without removing aggregate particles that were cut by coring or trimming.

The number of samples taken will be in accordance with the Engineer's acceptance test frequency. The independent laboratory shall compile the test results and transmit them to both the Engineer and the Contractor. The independent laboratory shall include a letter signed by an Engineer registered in the State of Arizona, who is a specialist in asphalt concrete. The signed letter shall give an opinion that the material evaluated either does or does not comply with project specifications, and shall clearly describe any deficiencies.

If the difference in test results of the independent laboratory versus the original acceptance laboratory falls outside the multi-laboratory precision statements for the test methods being used, the contracting Agency will bear the cost of the verification testing. If the difference in tests results fall within the multi-laboratory precision statement, the cost for verification testing will be deducted from payments that were to be made to the Contractor. For test methods that do not have multi-laboratory precision statements, the cost for verification testing will be deducted from payments that were to be made to the contractor.

**321.6.5 Asphalt Cement Content:** Corrective requirements and penalties for deficient asphalt cement as determined by tests conducted on the asphalt material used for paving shall be as indicated in Section 710.4.2 Asphalt Cement Content and Table 710-10 Asphalt Cement Content Corrective Action for Deviations.

**321.6.6 Air Voids:** Corrective requirements and penalties for deficient air voids as determined by tests conducted on the asphalt material used for paving shall be as indicated in Section 710.4.4 Volumetrics and Table 710-11 Laboratory Voids Acceptance and Penalties.

**321.7 CURBS:**

The curb shall be placed by an approved extrusion type machine. In the event the Contractor wishes to utilize a template which varies from the cross-section shown on the plans, such change must meet the approval of the Engineer. The asphalt mix used shall be a 9.5 mm mix. One percent by weight of the total mixture shall consist of a granulated synthetic resin stiffener, Lexite or equal, complying with the following characteristics:

Softening Point (Ring & Ball)	ASTM D36	210 degrees F. minimum
Acid Number	ASTM D465	Less than 1.00
Saponifiable matter	ASTM D464	Less than 1%
Iodine Number	ASTM D29	175—185

**321.8 MEASUREMENT:**

Asphalt concrete pavement will be measured by the ton, or by the square yard, for the mixture actually used as allowed above, which shall include the required quantities of mineral aggregates, filler material, asphalt cement, and sand. Measurement shall include any tonnage used to construct intersections, roadways, streets, or other miscellaneous surfaces indicated on the plans or as directed by the Engineer.

Weighmaster's Certificates, in accordance with Section 109, will be provided regardless of method of measurement.

The bid price per ton or square yard for asphalt concrete shall include the cost of the asphalt cement in the percentages as specified in Section 710.

Asphalt concrete curbs will be measured by the linear foot, parallel to the base or foundation, unless otherwise specified.

Preservative seal for asphalt concrete pavement will be measured by the gallon diluted, unless otherwise indicated in the special provisions.

**321.9 PAYMENT:**

The asphalt concrete measured as provided above, will be paid for at the contract price per ton or square yard, which price shall be full compensation for the item complete, as herein described and specified.

Payment for tack coat will be by the ton diluted, based on the rate of application; as directed by the Engineer.

The quantities of preservative seal, measured as provided above will be paid for at the contract bid price per gallon diluted or as specified, which price shall be full compensation for the item complete as herein described or as specified.

No payment will be made for any overrun in quantity of asphalt concrete in excess of 10 percent based on actual field measurement of area covered, design thickness, and a unit weight of 145 pounds per cubic foot. The calculations and payment for overrun will be by individual bid item. To compensate or adjust for a thickness deficiency in an underlying asphalt concrete course, the Engineer may authorize a quantity increase in excess of 10 percent for a subsequent asphalt concrete course. In such cases, the quantity in excess of 10 percent will be paid for at the lowest unit bid price.

Payment for the curbs will be at the contract unit price bid per linear foot, which price shall be full compensation for the curb complete in place, including all necessary labor, equipment and material.

Except as otherwise specified in the special provisions, no separate payment will be made for work necessary to construct miscellaneous items or surfaces of asphalt concrete.

Municipality	Supplements
<b>GI:</b>	<ul style="list-style-type: none"> <li>▪ <b>3.2 Street Types</b>                      The Town of Gilbert Street hierarchy policy includes the following general types: Major Arterial, Minor Arterial, Major &amp; Industrial Collector, Residential Collector, Local Industrial, Local and Agrarian.                      Specifications for Access Points on various street types are reflected in Town of Gilbert Standard Details:                      No. 1 Major Arterials                      No. 2 Minor Arterials                      No. 3 Major &amp; Industrial Collector                      No. 4 Residential Collector Streets                      No. 5 Local Industrial Streets                      No. 6 Local &amp; Agrarian Streets</li>   <li><b>3.3 Roadway widths (by type)</b>                      General rights-of-way expectations/requirements are established to accommodate projected traffic generation demand according to various development types.                      Roadway dimension specifications, by street type, are depicted in Town of Gilbert Standard Details:                      No. 21 Major Arterial Street                      No. 22 Minor Arterial Street                      No. 23 Major Collector Street                      No. 24 Residential Collector Street                      No. 25 Industrial Collector Street                      No. 26 Local Industrial Street                      No. 27 Local Street                      No. 28 Agrarian Street</li> </ul>

	<p><b>3.4 Street Signage</b> Street name specifications are set forth on Town of Gilbert Standard Detail No. 70, 71 &amp; 71A. Public Works and Engineering Standards and Details.</p> <p><b>3.5 Driveway Details</b> Site access from public rights-of-way is specified according to land use and anticipated traffic type. Town of Gilbert Standard Details, pertaining to driveways and refuse truck maneuvering areas are: No. 250 Residential Driveway No. 251 Return Type Driveways No. M-42 Commercial Driveway No. 80 Driveways for Refuse Trucks/Dumpster Bins</p> <p><b>3.6 Paving Standards</b> Specifications for paving of all types are set forth in this section. Related improvements, such as parkway treatments, pathways, curb, gutter, sidewalk and scuppers are also referenced. Town of Gilbert Standard Details for paving base are as follows: No. 33 Depth of Base Course, 4" Minimum Bituminous Surface No. 34 Depth of Base Course, 2-½" Minimum Bituminous Surface No. 35 Depth of Base Course, 2-½" Minimum Bituminous Surface No. 36 Depth of Base Course, 2-½" Minimum Bituminous Surface</p> <p>Related paving specifications, pertaining to street designs include the following Town of Gilbert Standard Details. No. 41 Cul-de-Sac No. 43 Temporary Turn-around No. 45 Backfill, pavement &amp; Surface Replacement</p> <p>Town of Gilbert Standard Details for pathways and scuppers include: No. 42 Meandering Sidewalk M.A.G. Detail 206 Scupper</p>
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Municipality	Supplements
<b>ME:</b>	:Subsection 321.9 and 329.7 – Delete the reference in these Subsections dealing with payment for tack coat. No additional payment shall be made for tack coat. Tack coat shall be incidental to the payment for asphalt concrete

Municipality	Supplements
<b>PE:</b>	<ul style="list-style-type: none"> <li>▪ Exact point of pavement matching, termination and/or overlay, if necessary, shall be determined in the field by the Field Engineering Division.</li> <li>2. All frames, covers, valve boxes and manholes shall be adjusted to finished grade upon completion of paving or related construction. The concrete collar shall be adjusted level with existing bituminous pavement. Adjustment of existing Type "A" or Type "B" water valve boxes in right-of-way shall be considered incidental.</li> <li>3. All Contractors/Developers shall comply with the City of Peoria Standard Detail 149 for Trench Plating.</li> <li>4. Paving shall not start until all appropriate testing has been completed and accepted (pressure testing of utilities, density testing, videoing of sewer line, etc.). Service stubs to all platted lots shall be extended, and all conflicting utility construction completed prior to start of paving.</li> <li>5. Trees and shrubbery in the right-of-way, which conflict with the improvements proposed herein, are not to be removed or relocated without prior approval of the City of Peoria. The permittee shall be responsible for obtaining the necessary authorization to remove and/or relocate said trees or shrubbery.</li> <li>6. In all areas where new construction of curb, gutter, sidewalks, and driveways is required, and the engineer determines the existing grade to consist of soils with swelling characteristics, the</li> </ul>

moisture content shall be brought as close as possible to optimum required for compaction by the addition of water, blending of dry suitable material or by drying of existing material. The material shall then be compacted to a relative density of 75 percent minimum to 85 percent maximum with 80 percent as ideal.

7. Construction loads: During construction operations, heavy equipment may cross existing or proposed pipe. In this case, an earth fill should be constructed to at least three (3) feet above pipe. The fill must be sufficient to prevent the lateral displacement of the pipe.

8. Unless otherwise specified, the City of Peoria requires that the asphaltic concrete mix design meet the current City of Phoenix mix design for a C-3/4" mix. Copies of this mix design and related product codes are available from the Engineering Department.

9. All street improvements for custom homes must be completed in accordance with the City of Peoria policy on unpaved roads. All private access must be constructed with an acceptable dust palliative.

10. All Contractors/developers are responsible to construct stabilized construction entrances in order to reduce or eliminate the tracking of sediment onto public rights-of- ways or streets. Gravel track-out pads shall meet current Maricopa County standards. The contractor/developer shall immediately remove any sediment tracked onto public rights-of-ways or streets.

11. If any existing barricades, traffic signs or street name signs need to be removed during construction, notify the City of Peoria Public Works Streets Division at (623) 773-7432. A minimum of 48-hours notice is needed for removals. If signs and barricades belong to another agency, it is the responsibility of the contractor/developer to notify them.

12. No water supply hose or ramps shall be placed across or in the arterial or collector streets. Approval in writing from the City Engineer or his designee is required for placement of the supply hose or ramps in local street streets. Applications shall include submittals of the manufacturer's specifications, materials used, dimensions of the ramp, proposed location, proposed barricading and signage.

## ASPHALT CONCRETE OVERLAY

### 322.1 DESCRIPTION:

Asphalt concrete overlay consists of the placing and compaction of plant mix asphalt concrete over existing asphalt concrete paving. The thickness of the overlay shall be as shown on the plans or as specified in the special provisions. Preliminary preparation of existing surfaces will be required except when accomplished by the Contracting Agency, and it is so stipulated in the special provisions. With the exception of those which have been preheated and remixed only, existing surfaces shall receive a tack coat.

### 322.2 MATERIALS:

The tack coat, asphalt concrete mix and transportation of the mix shall be as specified in Sections 710 and 321, except for the maximum size of aggregate and percentage of binder which shall be as specified in the following paragraph.

### 322.3 ASPHALT CONCRETE:

The aggregate gradation and percentage of asphalt binder shall be in accordance with Section 710 using a 12.5 mm mix for overlay more than one inch in thickness and a 9.5 mm mix for overlay one inch or less in thickness, unless otherwise shown or specified in the special provisions.

### 322.4 PREPARATION OF SURFACES:

Except when they have been preheated and remixed, surfaces shall be prepared as follows:

Before placing asphalt concrete overlay, severely raveled areas or cracked areas that are depressed more than 3/4 inch from the adjoining pavement shall be cut out and patched at least 48 hours prior to the resurfacing operation. Over-asphalted areas or rough high spots shall be removed by burning or blading. Large shrinkage cracks shall be filled with asphalt sealing compound acceptable to the Engineer. The entire surface shall be cleaned with a power broom. Raveled areas that do not require removing shall be cleaned by hand brooming. The above are incidental, and the cost thereof shall be included in the bid items.

After surfaces have been prepared to the satisfaction of the Engineer, they shall receive a tack coat as specified in Section 321. Traffic will not be permitted over surfaces which have received a tack coat. When the overlay is to extend onto the concrete gutter, the gutter shall be thoroughly cleaned of loose dust and cement particles and shall be tack coated.

Municipality	Supplements
<b>GI:</b>	<b>Preparation of surfaces</b> Before placing asphalt concrete overlay, severely raveled areas or cracked areas that are depressed more than 3/4 inch from the adjoining pavement shall be cut out and patched at least forty-eight (48) hours prior to the resurfacing operation. Over-asphalted areas or rough high spots shall be removed by burning or blading. Large shrinkage cracks shall be filled with asphalt sealing compound acceptable to the Town Engineer. The entire surface shall be cleaned with a power broom. Raveled areas that do not require removing shall be cleaned by hand brooming. Asphaltic seal, tack coat and asphalt concrete shall only be placed when the ambient air temperature is seventy (70) degrees Fahrenheit and rising and existing surfaces are dry. After surfaces have been prepared and all manholes and valves have been adjusted in the base course to the satisfaction of the Town Engineer, they shall receive a tack coat as specified by the Town Engineer. Traffic will not be permitted over surfaces which have received a tack coat. Asphalt rejuvenating agent, a cationic oil and resin emulsion, shall comply with Section 718 of M.A.G. Specifications and shall be applied at the rate of 0.07 to 0.15 gallons of undiluted concentrate per square yard. However, the exact quantity shall be as directed by the Town Engineer

### 322.5 CONSTRUCTION METHODS:

Placing and rolling on the asphalt concrete and the smoothness of the surface shall be as specified in Section 321.

**322.6 MANHOLES:**

Manholes shall be built up and the frames set flush with the finished surface of the new paving, and tops of valve boxes, clean-outs and other existing structures shall be adjusted to finish grade. In the event the base course and original paving have been removed or disturbed in order to build up the manhole, they shall be replaced with approved materials which shall be thoroughly compacted. The asphalt concrete around the manhole frame shall be completed and made flush with the adjacent overlay.

<b>Municipality</b>	<b>Supplements</b>
<b>ME:</b>	<b>ME:</b> Section 321, 322 and 336 – for all pavement work covered by these sections, the following applies: After the asphalt concrete surface course has been placed, all manholes, valve boxes, cleanouts and other existing structures shall be built up or otherwise adjusted to finish grade. The adjustment shall be per M.A.G. Std. Detail 270 and 422. Detector loops for traffic signals shall be installed prior to installation of the surface course

**322.7 PAYMENT:**

Payment for tack coat and asphalt concrete will be as specified in Section 321 except as noted above.

## **HEATER REMIX RESURFACING**

### **323.1 DESCRIPTION:**

Heater remix resurfacing consists of heating, scarifying and remixing existing asphalt concrete paved surfaces, and unless otherwise specified in the special provisions, followed by the application of a rejuvenating agent and an asphalt concrete overlay.

### **323.2 COORDINATION:**

There shall be close coordination between those performing the heating and remixing operation and those placing the asphalt concrete overlay.

### **323.3 WEATHER CONDITIONS:**

Heater remix resurfacing shall not be done when it is raining or there is a threat of rain. The ambient temperature shall be at least 50°F. and rising and the application shall cease when the temperature is 55°F. and falling.

### **323.4 SURFACE PREPARATION:**

The pavement to be treated shall be cleaned of trash, debris, earth or other deleterious substances present in sufficient quantity to interfere with the work to be performed.

### **323.5 HEATER SCARIFY REMIX EQUIPMENT:**

The heater remixer shall consist of an insulated 8-12 foot minimum adjustable width heating furnace chamber with ports to inject fuel and air for satisfactory combustion without excessive smoke. The use of highly volatile fuels for heating, such as gasoline, will not be permitted within the boundaries of any incorporated City. Use of said highly volatile fuels for heating may be permitted in unincorporated areas only if authorized in writing by the Engineer prior to such use. The burners shall be rated at 10,000,000 BTU per hour minimum. The hourly production shall be not less than 1100 square yards of heated and remixed surface. Movable exhaust ducts shall be provided and equipped with shields to protect trees and adjacent shrubbery. The heating chamber and scarifier shall be positively controlled by side shifting and rear wheel steering to heat areas divergent from the central axis of the machine at intersections and along existing structures. The scarifier shall be sectioned and spring tensioned to insure continuous and undiminished pavement contact. It shall be equipped with automatic release mechanism to protect manholes and valve boxes from damage.

### **323.6 HEATING AND REMIXING:**

Prior to heating and remixing, all manholes in the path of the heater shall be checked for presence of explosive gases and ventilated, if necessary. The existing surface shall be evenly heated and remixed to a depth of from 0.05 to 0.08 foot by a continuously moving surface heater remixer machine. The remixed surface shall be left in an evenly spread condition and aggregate shall not be pulverized, spalled or broken. At least 80 percent of the aggregate shall be remixed by spinning or tumbling and heated to a minimum temperature of not less than 250°F. measured within 3 minutes following heating. The asphalt binder shall not be charred in excess of 0.10 of 1 percent. No uncontrolled heating causing differential softening of the upper surfaces without affecting the underlying structure will be permitted. The remixed layer shall be uniformly and evenly heated throughout.

### **323.7 ASPHALT REJUVENATING AGENTS:**

Following the mixing operation, an asphalt rejuvenating agent, or emulsion, if required, of the type designated in the contract, shall be applied at the rate hereinafter specified, by a pressure distributor while the remixed material is still hot. The pressure distributor shall be as specified in Section 330.

Where the contract requires the use of an asphalt rejuvenating agent, or emulsion, it will designate one of the following types:

(A) Type I asphalt rejuvenating agent, a cationic oil and resin emulsion, shall comply with Section 718 and shall be applied

at the rate of 0.07 to 0.15 gallons of undiluted concentrate per square yard. However, the exact quantity shall be as directed by the Engineer.

The Contractor shall furnish the Engineer with the brand name and name of the manufacturer of the Type I asphalt rejuvenating agent he proposes to use and the material shall be approved by the Engineer before it is used. The Contractor shall also furnish the Engineer with a manufacturer's certificate of compliance indicating quality and specification control.

(B) Type II asphalt emulsion shall be SS-1 or SS-1h emulsified asphalt as specified in Section 713 and shall be applied at the rate of 0.10 to 0.20 gallons per square yard undiluted. However, the exact quantity shall be as directed by the Engineer.

**323.8 ASPHALT CONCRETE OVERLAY:**

Asphalt concrete overlay shall be in accordance with applicable requirements specified in Section 322.

The asphalt concrete overlay shall be placed within 48 hours after the heating and remixing operation, unless otherwise specified in the special provisions.

The overlay shall also cover existing pavement over areas not accessible to the heater remixer. Such areas including edges of adjoining concrete, shall receive a tack coat and joints shall be finished as specified in Section 321.

**323.9 PAYMENT:**

Payment for heater remix surfacing will be made on the basis shown below:

- |                                       |                    |
|---------------------------------------|--------------------|
| (A) Heater Remix Only                 | Square Yard        |
| (B) Type I Asphalt Rejuvenating Agent | Ton (Undiluted)    |
| (C) Type II Asphalt Emulsion          | Ton (Undiluted)    |
| (D) Asphalt Concrete Overlay          | Ton or Square Yard |
| (E) Tack Coat                         | Ton (Diluted)      |

## PORTLAND CEMENT CONCRETE STREET PAVEMENT

### 324.1 DESCRIPTION:

This item shall consist of construction of a pavement composed of plain jointed portland cement concrete on a prepared subgrade. The Contractor shall furnish all labor, materials and equipment necessary for the construction of the pavement in accordance with these specifications and in reasonably close conformity to the lines, grades, thicknesses and details indicated by the plans or as established by the Engineer. All tests shall be performed by a laboratory approved by the Engineer.

### 324.2 MATERIALS:

**324.2.1 Portland Cement Concrete:** Portland cement concrete shall conform to the applicable requirements of MAG Standard Specifications Section 725 and the additional requirements of this section.

Concrete shall develop a modulus of rupture of not less than 520 psi within 14 days after placement, and not less than 650 psi at 28 days' age as determined by tests of specimens fabricated in accordance with ASTM C-31 and tested in accordance with ASTM C-78 procedures. The Contractor shall submit data acceptable to the Engineer at least 30 days in advance of the start of concrete paving operations which demonstrate that concrete produced with materials and proportions as proposed for use in the construction will conform to the modulus of rupture requirements of these specifications. The data shall include results of compressive strength tests conducted at the same age as modulus of rupture tests to establish the correlation which can be expected between the flexural and compressive strength properties of the concrete. The Engineer may, at his option, use compressive strength tests of specimens fabricated in accordance with ASTM C-31 and tested in accordance with ASTM C-39 to verify conformance to the modulus of rupture requirements of these specifications.

The maximum concrete slump shall be as determined by the approved mix design.

**324.2.2 Concrete Materials:** Portland cement conforming to the requirements of ASTM C-150 for Type III, low-alkali, may be used at the Contractor's option. Aggregates shall be crushed rock or gravel conforming to the requirements of ASTM C-33. Coarse aggregate gradation shall conform to requirements for Size No. 57. Fine aggregates shall have an average sand equivalent of not less than 75 when tested in accordance with the requirements of AASHTO T-176 or ASTM D-2419.

**324.2.3 Reinforcement:** Tie bars shall be deformed billet steel reinforcing bars conforming to the requirements of ASTM A-615, Grade 40.

Dowel bars shall be plain round bars conforming to the requirements of ASTM A-615, Grade 40. One-half the length of each dowel bar shall be painted with one coat of tar paint.

Metal sleeves of an approved design shall be provided for use with dowel bars. Sleeves shall cover 2 inches, plus or minus 1/4 inch, of the dowel, shall have a closed end with a suitable stop to hold the end at least 1 inch from the end of the bar, and shall be designed to prevent collapse during construction. An approved basket support shall be used to hold bars parallel to pavement surface.

**324.2.4 Curing Materials:** Materials for curing concrete shall conform to the requirements of Section 726.

**324.2.5 Joint Materials:** Joint sealant shall be a one component, hot-poured type, conforming to the requirements of ASTM D-3406.

Back-up rod or tape and bond breakers provided to control the depth of sealant, achieve the desired shape factor, support sealant against indentation and sag, or to prevent bond of the sealant to the bottom concrete surface shall be compatible with the joint sealant material.

Other pour-type joint sealants conforming to the requirements of Subsection 729.2 may be used if approved by the Engineer.

Preformed expansion joint filler shall conform to the requirements of ASTM D-1751.

### **324.3 CONSTRUCTION METHODS:**

**324.3.1 General:** Pavement shall be constructed with mechanical equipment utilizing stationary side forms or by the use of slipform paving equipment without stationary side forms. Manual methods of placing and finishing concrete with stationary side forms may be permitted by the Engineer for areas inaccessible for mechanical equipment.

Curbs, or combined curb and gutter, shall be constructed along the edges of all pavement where shown in the plans and shall be formed to the cross-section in accordance with the plans. Curbs may be constructed integrally with the pavement using a slipform or extrusion equipment or placed immediately after finishing operations by hand forming or using face forms. They may also be constructed as a separate operation after pavement construction using forms, slipform, or extrusion equipment. The edge of each gutter of the curb and gutter section built first may be used as a form in lieu of the setting of stationary side forms. Curbs, or curb and gutter, constructed as a separate operation shall otherwise conform to the requirements of Section 340. All curbs and gutters shall have the same thickness as the main roadway section. All joints shall be aligned with roadway joints.

**324.3.2 Equipment:** Design, capacity, and mechanical condition of equipment and tools necessary for handling materials and performing all parts of the work shall be approved by the Engineer. Equipment shall be at the jobsite sufficiently ahead of the start of concrete paving operations to permit thorough examination and approval by the Engineer prior to start of concrete paving.

Equipment used to place concrete may consist of one or more machines, shall be capable of uniformly distributing and consolidating the concrete as it is placed without segregation and shall be capable of producing concrete pavement which will conform to the required cross-section with a minimum of hand work. The number and capacity of machines furnished shall be adequate to perform the work required at a rate equal to the concrete delivery rate.

Vibrators shall be used to consolidate concrete; the rate of vibration shall be not less than 3,500 cycles per minute for surface vibrators and not less than 8,000 cycles per minute for internal vibrators. Power to vibrators mounted on mechanical equipment shall be so connected that vibration ceases when forward or backward motion of the machine is stopped. Contractor shall furnish a tachometer or other suitable device for measuring and indicating the frequency of vibration.

Slipform pavers shall be equipped with high frequency internal vibrators mounted with axes either parallel or normal to pavement alignment for the full paving width. Vibrators mounted with axes parallel with pavement alignment shall be spaced at intervals not to exceed 24 inches, measured center-to-center. Vibrators mounted with axes normal to pavement alignment shall be spaced so that lateral clearance between individual vibrating units does not exceed 6 inches.

Slipform paving equipment which will be wholly or partially supported on subgrade shall be equipped with traveling side forms of sufficient dimensions, shape and strength to support the concrete at free edges laterally for a sufficient length of time during placement to produce pavement of the required cross-section, and shall be equipped and operate with automatic sensing and control devices such that the machine automatically senses deviations from the established guideline and performs the necessary corrective maneuvers to overcome variations from correct grade and alignment.

When concrete will be placed adjacent to existing pavement or curb and gutter, that part of the equipment supported on the existing pavement or curb and gutter shall be equipped with protective pads on crawler tracks or rubber-tired wheels with bearing surfaces offset a sufficient distance from the edge of the pavement or curb and gutter to avoid edge damage, or the surface of the existing pavement or curb and gutter shall be otherwise protected against such damage in a manner approved by the Engineer.

**324.3.3 Subgrade Preparation:** Subgrade shall conform to the compaction and elevation tolerances specified for the material involved, shall be kept smooth and compacted, and shall be free of all loose and extraneous material when concrete is placed.

The surface of the subgrade shall be uniformly moist when concrete is placed. The surface of the subgrade shall be moistened immediately prior to placement of concrete if necessary to produce a uniformly moist condition. Any excess water standing in pools or flowing on the surface shall be removed prior to placing concrete.

Construction equipment shall not operate on the subgrade in the paving lane when conditions of the job will permit operation from outside the lane. When job conditions make it necessary to operate equipment on the subgrade in the paving lane, suitable runways or other precautions shall be taken to prevent rutting or displacement of subgrade material. The grade shall be checked and corrected immediately ahead of concrete placement and all disturbed grade shall be properly recompact. When concrete pavement will be placed with slipform paving equipment which will be supported and operate on the subgrade, the subgrade and slipform paver track area shall be brought to proper grade and cross-section by means of a properly designed and operated machine.

**324.3.4 Stationary Side Forms and Setting of Forms:** Side form sections shall be straight, free from warps, bends, indentations or other defects. Side forms shall be of metal, have a base width of at least four inches and a minimum depth equal to the thickness of the pavement. No section shall show a variation from a true plane greater than 1/8 inch in ten feet on the top of the form or more than 1/4 inch in ten feet on the inside face. Flexible or curved forms of proper radius shall be used for curves of 100 feet radius or less. Suitable materials other than metal may be used to form end closures or at other locations where use of metal forms is not practical when approved by the Engineer. Forms shall be thoroughly cleaned and oiled each time they are used.

Forms shall be of such cross-section and strength and so secured and supported on the subgrade as to resist the pressure of the concrete when placed and the impact and vibration of any equipment they are to support without springing or settlement. The method of connection between sections shall be such that the joints shall not move in any direction.

Subgrade under forms shall be compacted and cut to grade so that the form when set will be uniformly supported for its entire length at the specified elevation. Forms shall be so supported and secured during the entire operation of placing and finishing that they will not deviate vertically at any point more than 1/8 inch from the proper elevation. Forms shall be set to the required lines and grades well in advance and for a distance sufficient to prevent delay in placing concrete, and shall be approved by the Engineer prior to placing concrete. When any form has been disturbed or any grade has become unstable, the form shall be reset and rechecked.

Side forms shall remain in place until the day after placing concrete, and in all cases until the edge of the pavement no longer requires the protection of the forms. Forms shall be carefully removed in such a manner as to avoid damage to the pavement. Use of pry bars between the pavement and the forms will not be permitted.

**324.3.5 Placing, Spreading and Compacting:** Except when otherwise approved by the Engineer, concrete shall be deposited on the subgrade and spread full width using mechanical methods that result in a minimum of handling and segregation. Necessary hand spreading shall be done with shovels, not rakes. Placement shall be continuous between transverse joints without the use of intermediate bulkheads.

The Contractor shall make adequate advance arrangements for preventing delay in delivery and placing of concrete. An interval of more than 15 minutes between placing of any two consecutive batches shall constitute cause for stopping operations, and Contractor shall install a construction joint in the concrete already placed at the location and of the type directed by the Engineer.

Concrete shall be deposited as near to expansion and construction joints as possible without disturbing them but shall not be dumped onto a joint assembly. Concrete shall be thoroughly consolidated against and along the faces of all forms, adjacent pavement or curb and gutter, and on both sides of all joint assemblies. Vibrators shall not be permitted to come in contact with joint assemblies, the grade, or side forms, and shall not be operated longer than 15 seconds in any one location.

Manual methods of placing, spreading, and compacting may be used in the construction of pavement lanes of irregular width or widths less than 10 feet, and sections of intersections or other locations with complex variable surface configurations when permitted by the Engineer. Workmen shall not be allowed to walk in the freshly placed concrete with boots or shoes coated with earth or other foreign substances.

**324.3.6 Shaping and Initial Finishing:** Concrete shall be struck off, consolidated, and float-finished with a slipform paver, mechanical finishing machine, vibrating screed, or by hand finishing methods when approved by the Engineer so that the complete pavement will conform to the thickness and cross-section requirements of the plans and specifications. When the pavement being constructed is contiguous to existing parallel concrete pavement or curb and gutter, the elevation of the new

pavement surface shall conform as closely as possible to the elevation of the existing pavement or gutter surface and in a manner which will prevent ponding.

Water shall not be applied to the pavement surface during screeding and finishing operations in excess of the amount lost by evaporation. Adding water to the surface of the concrete to assist in finishing operations shall not be permitted. When applications of water to the surface are required to prevent rapid evaporation of water from the surface during finishing operations, it shall be applied as a fog spray and with approved spray equipment.

**324.3.6 a) Slipform Supported on Subgrade Method:** The equipment shall spread, consolidate, screed and float-finish the concrete in one complete pass of the machine. The machine shall be operated with as nearly a continuous forward movement as possible and all paving operations shall be so coordinated as to provide uniform progress with stopping and starting of the paver held to a minimum. Sliding side forms shall be rigidly held together to prevent spreading. Any edge slump of the pavement, exclusive of edge rounding, in excess of 1/4 inch shall be corrected.

No abrupt changes in longitudinal alignment of the pavement will be permitted. The horizontal deviation shall not exceed 1 inch from the alignment established by the Engineer.

While concrete is being spread, compacted and shaped, vibrating units shall be operated within fresh concrete so that the longitudinal axis, at the center of each unit, is not more than 6 inches above the top of the subgrade. Amplitude of vibration shall be sufficient to be perceptible on the surface of concrete along the entire length of vibrating units and for a distance of at least one foot therefrom.

**324.3.6 b) Mechanical Equipment Supported on Fixed Form Method:** When concrete is spread without the use of internal vibration, the finishing machine shall be equipped with vibrating equipment that will internally vibrate the concrete for the full paving width and with not less than two oscillating or reciprocating screeds. Concrete shall be struck off and consolidated so that the surface will conform to the finished grade and cross-section shown on the project plans and with sufficient material on the surface for floating operations.

After the concrete has been struck off and consolidated, it shall be floated with a longitudinal float of a type approved by the Engineer.

A slipform paver or a single machine which will effectively spread, consolidate, screed, and float in one operation may be used in lieu of separate finishing and floating equipment.

**324.3.6 c) Manual Methods with Fixed Forms:** Concrete shall be deposited, spread and struck off to such an elevation that, when properly consolidated, the surface will conform to the required lines and grades. Concrete shall be consolidated by internal vibration as it is struck off with a screed. A slight excess of concrete shall be kept in front of the screed at all times during the strike-off operation.

After consolidation and screeding, concrete shall be tamped to the proper surface elevation and cross-section using either a heavy plank with a length in excess of the width of pavement being placed by one foot or more, or with a mechanical vibrating unit spanning the full width between forms. The tamping plank, if used, shall be stiffened as necessary to prevent sag and shall have the lower tamping edge shod with metal. The tamping plank shall be moved forward with a combined vertical tamping and longitudinal screeding motion so that the concrete will be thoroughly consolidated and the surface screeded to the required elevation. A small surplus of concrete shall be kept in front of the tamper or vibrating unit. Tamping or vibrating shall continue until the specified cross-section is obtained and the mortar flushed slightly to the surface. On grades in excess of 5 percent a second strike board shall follow from 25 to 50 feet behind the tamper or vibrating unit and shall be used in the same manner to remove waves caused by the flow of concrete behind the first strike board.

Other methods than the tamping plank may be utilized for screeding when approved by the Engineer.

Pavement shall be finished smooth and true to grade with suitable manually operated floats or powered finishing equipment.

**324.3.7 Final Finishing:** After the pavement has been float finished, it shall be scraped with a 10-foot long straightedge equipped with a handle to permit operations from the edge of the pavement, and excess water and laitance shall be removed from the surface. The straightedge shall be operated parallel to the centerline of the pavement and shall be moved forward one-half length after each pass. Irregularities shall be corrected by adding or removing concrete, and disturbed places shall be

again straight-edged.

Long-handled wood floats shall be used only in areas not accessible to finishing equipment and in emergencies, and use of such floats shall be confined to a minimum.

The addition of water to the surface of the concrete to assist in finishing operations shall not be permitted unless approved by the Engineer. When addition of water to the surface is permitted to prevent rapid evaporation of water from the surface during finish, it shall be applied as a fog spray with approved spray equipment.

Pavement edges and joints shall be edged in accordance with details shown on the project plans or as directed by the Engineer.

In advance of curing operations, pavement shall be given a texturing. Texturing shall be performed with an artificial turf drag with a board added to assure the weight needed to obtain an approved surface. Artificial turf shall be a molded composite structure with polyethylene face, nylon and polyester backing, a pile height of 0.85 inches, and total weight of 75 oz./sq. yd. The approved surface will be made by the Engineer on the initial construction and shall not be changed without approval. Each time the construction is stopped or cause the texturing to stop, the artificial turf must be shaken clean before continuing.

**324.3.8 Curing:** Curing shall begin immediately following surface texturing and edging. Contractor shall have at hand and ready to install before concrete placement begins the materials and equipment needed for adequate curing.

After finishing operations have been completed, the newly placed concrete shall be cured by moist curing methods, by application of a white liquid membrane compound, or by a combination of these methods. All surfaces not covered by reasonably waterproof forms shall be kept damp by applying water with a nozzle that so atomizes the flow of water that a fog mist and not a spray is formed until the surface is covered with liquid membrane compound, the surface has hardened sufficiently to permit sprinkling of the surface, or moist curing by covering with wet burlap or other approved materials can be initiated. Moisture from the nozzle shall not be applied under pressure directly upon the concrete and shall not be allowed to accumulate on the concrete in a quantity sufficient to cause a flow and erode the surface. Moist curing shall be continued until liquid membrane curing compound or other type of curing membrane is applied.

Membrane curing compound shall be applied to all pavement by automatic mechanical method from a construction bridge.

The edges of concrete slabs exposed by the removal of forms shall be protected immediately to provide these exposed surfaces with continuous curing treatment equal to the method selected for curing the pavement surface.

The membrane method of curing may be applied behind the final finishing operation after all free water has disappeared from the surface. Complete and uniform coverage at the rate of one gallon per 100 square feet, or as otherwise recommended by the manufacturer, shall be required. Compound shall be kept agitated to prevent pigment from settling.

### **324.3.9 Joints:**

**324.3.9.1 General:** Joints shall be provided in the pavement of the type, dimensions and at the locations as indicated in the plans or as specified herein.

Joints in concrete pavement will be designated as transverse expansion joints, longitudinal or transverse construction joints, longitudinal or transverse weakened plane joints, or isolation joints. The faces of all joints shall be perpendicular to the pavement surface. Joints shall be constructed in accordance with the details shown in the plans and in accordance with the following provisions.

At all times prior to acceptance of the construction, joints shall be maintained clean and free of all soil, gravel, and other foreign material except approved types of joint filler materials.

**324.3.9.2 Longitudinal Joints:** Longitudinal joints shall be weakened plane or construction joints. Longitudinal weakened plane joints shall be constructed by sawing or by insertion of a parting strip in the plastic concrete to be left in place. Longitudinal construction joints shall be constructed with tie bars or keyways as indicated in the plans.

**324.3.9.3 Transverse Joints:** Transverse joints shall be weakened plane, construction or expansion joints. All transverse weakened plane joints will be constructed by sawing and in accordance with the details shown in the project plans. Transverse construction joints shall be constructed with dowels or with sawed keyways and in accordance with the details shown in the project plans. Transverse expansion joints shall be constructed as butt joints with vertical expansion joint filler and with or without dowel bars in accordance with the details shown in the project plans. Dowel bars shall be supported on a basket-type system with a base plate on subgrade and up the side form to prevent material from entering dowel openings.

**324.3.9.4 Joint Location:** Longitudinal joints shall be constructed between traffic lanes and at other locations as indicated in the project plans.

Transverse construction joints shall be constructed at the end of a day's production or when placing of concrete is discontinued for more than 45 minutes. Transverse construction joints will not be allowed within 500 feet of a structure unless otherwise approved by the Engineer.

Transverse weakened plane joints in concrete placed in lanes adjacent to previously placed concrete shall be located to align with weakened plane joints in the adjacent lanes. No transverse weakened plane joint shall be constructed within 6 feet of another transverse joint. When the planned spacing of transverse weakened plane joints results in location of a weakened plane joint within 6 feet of another transverse joint, the transverse weakened plane joint shall be relocated so it is not within 6 feet of said transverse joint.

Transverse expansion joints shall be located at the junction of the normal roadway pavement slab with bridge approach slabs and at other locations as shown on the plans.

Isolation joints shall be provided around manholes, catch basins, or other elements which extend into or project through the pavement and act as point of restraint to horizontal or vertical movement of the pavement.

#### **324.3.9.5 Construction of Joints:**

**324.3.9.5.1 Sawed Joints:** Sawed joints shall be constructed by cutting a groove in the pavement using a single or multiple-blade power saw. The groove shall be cut to the dimensions shown on the project plans. Suitable guidelines or devices shall be used to assure joints are cut true to the lines as shown on the project plans.

If joints are sawed in stages, the initial saw cut shall be of the minimum width specified and sawed to the required depth shown on the project plans. The depth of the initial saw cut in the construction of weakened plane joints shall be a minimum of 1/4 of slab thickness.

Sawing of weakened plane joints shall be done before uncontrolled cracking takes place, and after the concrete has hardened to the extent that tearing or raveling of the edges of the saw cut is not excessive. The exact time for all sawing shall be determined by the Contractor when not otherwise specified herein.

Any procedure for sawing joints that results in premature, uncontrolled cracking shall be revised immediately. The Contractor shall be responsible for replacing or repairing areas containing uncontrolled cracking and for repairing spalled or chipped concrete along the edges of sawed joints as directed and to the satisfaction of the Engineer.

After saw cutting of the joint and just prior to sealing the joint, the internal joint surfaces shall be cleaned of all dirt, curing and compound residue, laitance and other foreign materials. The internal joint surface shall be defined as the sawed portion of the joint and the resultant crack for the full depth of the pavement.

**324.3.9.5.2 Construction Joints:** Longitudinal and transverse construction joints shall be of the type and formed in accordance with the details shown on Detail 224 or as directed by the Engineer.

**324.3.9.5.3 Expansion and Isolation Joints:** Transverse expansion and isolation joints shall be formed in accordance with the details shown on Detail 224 or as directed by the Engineer.

**324.3.9.5.4 Sealing of Joints:** Sealing of sawed joints where required shall be completed prior to the opening of the pavement to traffic unless otherwise approved by the Engineer. When delayed sealing of sawed joints is permitted, saw cuts and formed recess to be filled with sealant shall be protected to ensure thorough curing of the concrete along the edges of the joint recesses and to prevent entry of foreign materials into the joint. At the Contractor's option, inert compressible joint filler

material such as plastic backer rod or upholstery cord may be inserted into joints immediately after sawing or forming of the joint recess to provide curing protection and prevent entry of foreign material. If absorptive filler material is used, it shall be thoroughly moistened either before or immediately after installation in the sawed groove. When filler material is rope, or similar material which does not fill the entire depth of sawed groove, it shall be depressed not less than 1/2 inch below the pavement surface before the pavement is opened to traffic.

Sealant shall be applied in accordance with the sealant manufacturer's recommendations. A primer shall be furnished and applied after the joint has been cleaned and prepared to receive sealant if so indicated in the manufacturer's recommendations.

Prior to the application of the sealant, an approved type of inert, compressible joint filler material such as plastic backer rod or upholstery cord, or an approved type of bond breaker, shall be inserted along the joint in accordance with the details shown on the project plans. The joint shall then be filled with sealant to a level not less than 1/8 inch or more than 1/4 inch below the elevation of the pavement surface adjacent to the joint edge.

The equipment used to apply sealant shall be as recommended by the sealant manufacturer. Sealant shall not be spilled on the surface of the concrete pavement, and Contractor shall remove any sealant inadvertently spilled on the pavement surface.

**324.3.9.5.5 Repair of Cracks, Spalls, Raveling and Tearing:** Contractor shall be responsible for replacing or repairing all areas of pavement containing uncontrolled cracking, surface spalls, or other types of surface defects as directed by the Engineer. Repairs shall be made by methods acceptable to the Engineer and the repair shall be completed to the satisfaction of the Engineer.

#### **324.4 Tests of Finished Pavement:**

**324.4.1 Smoothness:** The pavement Surface Profile Index shall not exceed seven inches per mile in any 0.1 of a mile section or any remaining portion thereof as measured along any line parallel to the edge of the pavement except at and through intersections, and at and through railroad crossings. The surface profiles will be evaluated in accordance with the requirements of Arizona Department of Transportation Test Method 801.

After completion of all paving, the Contractor shall clean the pavement by brooming or any other method to allow the Engineer to obtain accurate profilograph readings. Profilograph readings will be taken one time in each wheel path of each lane.

Grinding will be required if necessary to produce a surface smoothness conforming to the requirements of this section. In addition, all high areas having deviations in excess of 0.3 of an inch shall be ground. After grinding, the finished surface of the ground area shall be provided with a uniform texture acceptable to the Engineer. The method of texturing shall be approved by the Engineer.

In addition to the Surface Profile Index requirement, the pavement surface including pavement in intersections will be tested with a ten-foot straight-edge placed parallel to the centerline of the pavement in each lane. Ordinates measured from the face of the straight-edge to pavement surface shall at no place exceed one-quarter inch. Areas that do not meet the required surface accuracy as determined by straight-edge testing shall be marked, and Contractor shall at his own expense and as required by the Engineer either:

- (1) Grind down areas higher than 1/4 inch but not more than 1/2 inch above the correct surface.
- (2) Correct areas lower than 1/4 inch but not lower than 1/2 inch below the correct surface by grinding down the adjacent areas.
- (3) Break out and replace pavement when the deviation exceeds 1/2 inch from the correct surface. Area replaced shall be of a length, width and depth as required to allow formation of a new slab of the required quality.

**324.4.2 Pavement Thickness:** Concrete pavement shall be constructed in accordance with the thickness requirements of the plans and specifications. Tolerances for base and subgrade construction and other provisions of these specifications which may affect thickness shall not be construed to modify such thickness requirements.

For the purpose of determining acceptability for thickness, cores shall be drilled by the Contractor at the locations specified by the Engineer. Cores shall have a minimum diameter of four inches. Length of cores will be determined in accordance with the requirements of AASHTO T-148 by measurements read to the nearest thousandth of an inch. The average of the measurements will be reported to the nearest hundredth of an inch.

In calculating average length, cores which have a length in excess of the thickness specified by more than 0.25 of an inch will be deemed to have a length of the specified thickness plus 0.25 of an inch. Field length measurements will be acceptable in lieu of average length measurement in accordance with the requirements of AASHTO T-148, provided the original core in any secondary unit meets or exceeds the specified thickness. Measurements in accordance with the requirements of AASHTO T-148 will be required on any questionable thickness measurements and on the three cores used to determine the average length for payment, regardless of length.

A primary unit of pavement shall be the area of pavement placed in each day's paving operation. Each intersection or special section shall be considered as a primary unit.

A secondary unit of pavement shall consist of 1,000 linear feet, or fraction thereof, of each traffic lane. Each 1,300 square yards of pavement in intersections, etc., shall be considered a secondary unit regardless of when the concrete was placed.

One core shall be drilled in each secondary unit. If the length of that core is not deficient by more than 0.25 of an inch, that secondary unit will be measured for payment at 100 percent. If the length of that core is deficient by more than 0.25 of an inch but less than 1.0 inch, two additional cores shall be drilled within that secondary unit and the length of the three cores averaged. If the average length is not deficient by more than 0.25 of an inch, that secondary unit will be measured for payment at 100 percent. If the average length of the three cores is deficient by more than 0.25 of an inch, that secondary unit will be measured for payment in accordance with the requirements of Table 324-1.

If the core in the secondary unit is deficient by more than 1.00 inch, that core will not be used in determining the average thickness of that secondary unit. Additional cores shall be drilled at intervals not to exceed ten feet in each direction from the deficient core, parallel to the main-line centerline, until one core is obtained in each direction which is not deficient by more than 1.00 inch. The pavement between these two cores will be evaluated separately from the balance of the pavement in that secondary unit. The limits for evaluation shall be between the longitudinal weakened plane or construction joint on each side of the core and between the next transverse weakened plane, construction, or expansion joint beyond each of the last two cores. Unless the Engineer allows the pavement to remain, it shall be removed and replaced with pavement of the specified thickness and no payment will be made for the removal pavement. One additional core shall be drilled in the secondary unit to represent the quality of the concrete in that unit after deducting the limits of the deficient area if that pavement represented by the deficient area is allowed to remain. The core shall be measured for payment as hereinbefore specified.

If the pavement in the deficient area is removed, either by the order of the Engineer or at the option of the Contractor, it shall be removed between the limits of the evaluation. After the pavement has been replaced, one core shall be drilled at random in that secondary unit after deducting the area of the replaced pavement and one core shall be drilled in the new pavement. Pavement represented by the core drilled in the secondary unit, less the replaced pavement, will be measured for payment as hereinbefore specified. The core drilled in the replaced pavement shall be not less than the specified thickness, otherwise that pavement will not be measured or paid for.

At all locations where cores have been drilled, the resulting holes shall be filled with concrete in a manner satisfactory to the Engineer.

### **324.5 PROTECTION OF PAVEMENT:**

The Contractor shall be responsible for taking adequate steps to protect concrete placed during rain, hot or cold weather as defined in ACI Standards. Any concrete damaged by rain or extreme temperatures shall be removed and replaced at the Contractor's expense.

When ordered by the Engineer, pavement crossings shall be constructed for the convenience of public traffic. Where motor vehicles are encountered, a temporary bridge to span the newly placed concrete will be provided.

No traffic or Contractor's equipment, except as hereinafter provided, will be permitted on the pavement until the concrete has developed a compressive strength of 3500 psi.

Equipment for sawing joints will be permitted on the pavement when, in the Contractor's judgment, the concrete has developed sufficient strength to support the equipment without damage to the concrete. In case of visible cracking or other damage to the pavement, operation of the equipment on the pavement shall be immediately discontinued.

Any damage to the pavement resulting from early use of pavement by the Contractor's equipment shall be repaired by the Contractor at his expense.

**324.6 METHOD OF MEASUREMENT:**

Portland cement concrete pavement will be measured by the square yard. Any opening in excess of one square yard will not be measured for payment.

**324.7 BASIS OF PAYMENT:**

The accepted quantities of portland cement concrete pavement, measured as provided for herein, will be paid for at the contract unit price complete in place, except that where the average length of cores indicates pavement deficient in thickness by more than 0.25 of an inch but not more than 1.00 inch, payment will be made as specified in Table 324-1. Payment will be made to the nearest cent.

No additional payment will be allowed for pavement constructed in excess of the thickness specified on the project plans.

<b>TABLE 324-1</b>	
<b>PAVEMENT THICKNESS PAYMENT REDUCTION (AC)</b>	
Core Thickness, Less Than Specified Thickness, Inches	Percent of Contract Unit Price Allowed
0.00 to 0.25	100
0.26 to 0.35	93
0.36 to 0.45	85
0.46 to 0.55	75
0.56 to 0.75	63
0.76 to 1.00	50

<b>Municipality</b>	<b>Supplements</b>
MC	<p><b>MC: ASPHALT - RUBBER CONCRETE, GAP GRADED</b></p> <p><b>325.1 DESCRIPTION:</b> Asphalt-rubber concrete consists of supplying, placing and compaction of plant mixed gap graded asphalt-rubber concrete over asphalt surfaces. The thickness shall be as shown on the plans or as specified in the special provisions. Preparation of existing surfaces will be required except when accomplished by the County and the requirement is modified by special provision.</p> <p><b>325.2 MATERIALS:</b> Asphalt-rubber concrete shall consist of a mixture of aggregate and asphalt-rubber binder. Tack coat, asphalt-rubber concrete mix and transportation thereof shall be as specified in Sections 710 and 321, except as modified below:</p> <p><b>325.2.1 - AGGREGATE:</b> The aggregate shall meet the following gradation: <b>Overlay Thickness 25 mm (1") 50 mm (2")</b></p>

**& 37.5 mm (1-1/2")**

Sieve Size Percent Passing Percent Passing

25 mm (1") 100 100

19 mm (3/4") 100 97-100

12.5 mm (1/2") 100 78-92

9.5 mm (3/8") 78-92 61-75

4.75 mm (#4) 28-42 30-40

2.36 mm (#8) 15-25 15-25

600 µm (#30) 5-15 5-15

75 µm (#200) 3-7 2-6

\*Type II Portland Cement 1.5%

Or

\*Hydrated Lime 1.0%

**\*By total weight of the mineral aggregate.**

70

The aggregate shall conform to the requirements of MAG 701 and 710 for asphalt concrete, except as modified below:

Sand Equivalent 65 minimum

Crushed Aggregate (retained 85 minimum

on 2.36 mm (#8) sieve, at least one

crushed face, produced by crushing)

**325.2.2 ASPHALT-RUBBER BINDER:**

The asphalt-rubber binder shall conform to Section 717.

**325.2.3 MIX DESIGNS:**

At the Pre-Construction Meeting, the Contractor shall submit the name of the asphalt-rubber concrete supplier, a description of the materials, and the job mix design(s). The design method used shall be in accordance with the Marshall Mix procedure, 75 blows, as described in "Design Methods for Hot-Mixed Asphalt-Rubber Concrete Paving Materials" by James G. Chehovits, October 1989. The job mix designs are subject to approval by the Engineer.

**ASPHALT RUBBER BINDER CONTENT:**

For Design purposes, the percent of asphalt-rubber binder in the mix(es) shall be:

**Overlay Thickness Asphalt Rubber Binder**

**High Traffic Low Traffic**

25 mm (1") and 37.5 mm (1-1/2") 8.0% to 8.4% 8.4% to 8.8%

50 mm (2") 7.1% to 7.4% N/A

The amount of asphalt-rubber binder in each mix shall be provided in the design for approval by the Engineer. Low traffic areas include residential streets. High traffic areas include arterial streets.

**AIR VOIDS:**

For Design purposes, the percent of air voids in the mix(es) shall be:

**Overlay Traffic Volume Air Voids**

Low Traffic 3.0% to 5.0%

High Traffic 4.0% to 6.0%

The amount of air voids in each mix shall be provided in the design for approval by the Engineer.

Mix designs shall include the following information as a minimum:

1. Aggregate source and identification (for each material used) gradation (for each material used) blend percentage mixture gradation
2. Asphalt - Rubber Binder (No extender oil allowed) source and PG grade of asphalt cement source and identification of ground rubber gradation ground rubber percentage of the asphalt - rubber binder type and amount of additive(s), if required temperature when added to aggregate

3. Recommended asphalt - rubber binder content by both weight of total mix and by weight of dry aggregate.

4. Recommended mixture production, lay down, ambient and/or pavement, and maximum / minimum temperatures.

The mix design shall include sufficient test results and documentation to assure that all requirements for rubber, aggregate and the asphalt-rubber binder are fulfilled.

**325.2.4 Production Tolerance:**

Production requirements for asphalt-rubber concrete shall be as specified in Section 710.4.4 Volumetrics, Section 710.5.1 Quality Control, and Section 321.6 Corrective Requirements for Deficiencies. The production tolerances including compaction requirements and corrective action will be enforced for asphalt-rubber concrete.

**Calibration Factors**

A minimum of one week prior to the production of asphalt rubber hot mix, the Contractor shall submit to the Engineer samples of all hot mix materials that will be used on the project. The materials shall be used to determine the calibration factors using the acceptance laboratory and the Contractor supplied ignition furnaces and related quality control test equipment. Calibration factors shall be recalculated whenever a change in the asphalt rubber hot mix materials occurs and when requested by the Engineer.

**325.3 SURFACE PREPARATION:**

Before placing asphalt-rubber concrete on existing pavements, severely raveled areas or cracked areas that are depressed more than 3/4" from the adjoining pavement shall be cut out and patched at least 48 hours prior to the resurfacing operation. Overasphalted (bleeding or flushing) areas or rough high spots shall be removed by burning or blading. Large shrinkage cracks shall be filled with asphalt sealing compound acceptable to the Engineer. The entire surface shall be cleaned with a power broom. Raveled areas that do not require removing shall be cleaned by hand brooming. The above surface cleaning requirements are included as part of the Asphalt-Rubber Concrete paving operations, and the cost thereof shall be included in the Asphalt-Rubber Concrete bid item. Pavement repairs and crack sealing when required are to be compensated for by other appropriate bid items. Prior to placing the asphalt-rubber concrete on milled surfaces, pot-holes left by the milling operation shall be repaired by the Contractor, as a related non-pay item and as required by the Engineer. The milled area shall be swept. After surfaces have been prepared to the satisfaction of the Engineer, they shall receive a tack coat as specified in Section 321. Traffic will not be permitted over surfaces which have received a tack coat. When the overlay is to extend onto the concrete gutter, the gutter shall be thoroughly cleaned of loose dust and cement particles and shall be tack coated.

**325.4 CONSTRUCTION METHODS:**

Asphalt-rubber concrete shall be placed only when the surface is dry, and when the atmospheric temperature in the shade is 13° C (55° F) or above. No asphalt-rubber concrete shall be placed when the weather is foggy or rainy. Asphalt-rubber concrete shall be placed only when the Engineer determines that weather conditions are suitable. Except as otherwise noted, placing and rolling of the asphalt-rubber concrete and the smoothness of the surface shall be as specified in Section 321 for asphalt concrete. The spreading equipment shall be equipped with a mat reference ski-type control device of not less than 9.2 meters (30 feet) in length, or other method of control approved by the Engineer.

The density of the compacted mixture shall not be less than 95% of the laboratory unit weight composed of the same mixture compacted by the 75 blow method of ASTM D- 1559 at 290° F ± 5° F, or at the job mix design specified compaction temperature. Pneumatic rollers shall not be used. Placement and compaction temperature shall be specified with the submitted mix design data but in no case less than 275° F at the point of placement. The temperature of the material in the truck shall be measured by inserting a thermometer, or other approved measuring device, to a point at least 6" below the surface of material.

If asphalt-rubber concrete is placed in a windrow during paving, the windrow shall not exceed a distance greater than 150 feet in front of the paving machine.

**325.4.1 Lime Water:**

An application of lime water shall be applied by the Contractor to the compacted asphalt rubber concrete surface after final compaction, but prior to opening the roadway to traffic, or when requested by the Engineer to cool the pavement to prevent tracking and pick-up. The lime water solution shall be applied at the rate of approximately ½ gallon/square yard. The lime shall be mixed using a minimum of (1) one, 50-pound bag per 3,000 gallons of water.

**325.4.2 Adjustments:**

After installation of an overlay course:

All necessary frame and cover adjustments for manholes, valves, survey monuments, sewer clean-outs, etc., shall be completed by the Contractor within the given segments being surfaced. On roads without curb and gutter, the existing shoulder elevation shall be adjusted by the Contractor to match the elevation at the edge of new overlay and slope away from new pavement surface at a rate that the existing quantity of shoulder material will allow. Shoulder material to include existing shoulder, millings, or import shall be compacted to a minimum of 95% of maximum density, determined in accordance with MAG section 301.3.

If the existing quantity of shoulder material is not sufficient to match the elevation at the edge of new overlay Contractor shall use any millings collected from milling operations on the same road to meet this requirement. In the case that there are no millings on the same road or if Contractor uses all the milling material and there is still a deficiency, Contractor shall be compensated for imported fill, measured by certified weigh tickets, at the contract unit price bid for Imported Fill, COMPLETE IN PLACE. The imported fill shall be select, aggregate base course, or a granular material approved by the Engineer.

**325.4.3 Corrective Requirements For Deficiencies:**

Corrective measures shall be as specified in Section 321.6 Corrective Requirements for Deficiencies and in Section 710.4.4 Volumetrics.

**325.5 MEASUREMENT:**

Asphalt-Rubber Concrete shall be measured by the ton, for the mixture actually used, which shall include the required quantities of mineral aggregates, filler material, rubberized asphalt binder and anti - strip agent. Application of Lime Water shall be measured by the square yard. The measured area shall be the area of asphalt-rubber pavement to which the lime water is applied. The measured area shall only be counted one time regardless of the number of applications applied to the asphalt-rubber pavement section.

**325.6 PAYMENT:**

Payment for Tack Coat will be as specified in Section 321 except as noted above.

Payment for Asphalt Milling will be as specified in Section 317 except as noted above.

Asphalt - Rubber Concrete will be paid at the contract unit price, COMPLETE IN PLACE.

Application of Lime Water as approved by the Engineer will be paid at the contract unit price bid

## **HOT IN-PLACE RECYCLING**

### **327.1 DESCRIPTION**

This work shall consist of rehabilitating the surface layer of existing asphalt concrete pavement. Rehabilitation shall be accomplished with specially designed equipment in a simultaneous multistep process of heating, scarifying, applying an asphalt recycling agent and thoroughly remixing and reshaping the old asphalt concrete surface, and then placing an overlay of new hot mix asphalt concrete in compliance with the lines, grades, thickness and typical cross sections shown on the plans. NOTE: This work shall be performed with a single machine that heats, scarifies, recycles and spreads new asphalt concrete hot mix, all in one continuous pass. Additional preheaters may be utilized to achieve specified depth and temperature.

### **327.2 MATERIALS:**

Asphalt Recycling Agent used to restore the existing pavement shall be approved by the Engineer prior to use. A manufacturer's certification shall be submitted for each load of recycling agent delivered to the project.

Hot Mix Asphalt Concrete (HMAC) shall meet the requirements of section 710.

### **327.3 EQUIPMENT**

The Contractor shall specify, in the bid proposal, the type of equipment intended for use. The equipment shall be on the project in operating condition a minimum of 2 days before beginning operations to allow evaluation by the Engineer. The Engineer reserves the right to reject equipment deemed not suitable for the intended purpose, at no additional cost to the Agency.

The recycling equipment shall meet the following minimum requirements:

Repaver: The equipment for this work shall be a self-contained, self-propelled, automated unit capable of heating, scarifying (or milling), mixing, redistributing and leveling the existing asphalt concrete pavement to the specified depth, all in a single pass.

It shall have a means of automatically applying an asphalt recycling agent at a uniform rate as shown on the plans, special provisions, or as requested by the Engineer. It shall be capable of applying a new HMAC layer over the hot, partially compacted recycled mixture.

Heating Unit: This unit shall be hooded to prevent damage to adjacent property, including trees and shrubs. It shall be capable of heating the pavement surface to a temperature high enough (375° - 400° F.) to allow scarification to the required depth without breaking aggregate particles or charring the pavement surface.

Scarifying or Milling Units: The sacrificers or rotary millers shall be able to penetrate the pavement surface to a depth shown, up to a maximum of one inch in one pass. Sacrificers or millers shall be equipped with separate, automatic height adjustments which allow clearance over manholes and other obstructions.

Recycling Agent Applicator: This system shall automatically add recycling agent to the scarified material at a uniform rate as shown on the plans, special provisions or as requested by the Engineer. The application rate shall be synchronized with the machine's forward speed to maintain a tolerance, within 5% of the specified rate.

Conveying System: Shall consist of a receiving hopper and conveying system to collect and transport new hot mix asphalt concrete material to the finishing unit.

Recycling Unit: A system that mixes, distributes and levels the scarified material over the width processed to produce a uniform cross-section of recycled material.

Finishing Unit: This unit shall have automatic screed controls to produce a surface conforming to that shown on the plans. The unit shall be capable of producing a uniform slope, grade and texture.

**327.4 CONSTRUCTION METHODS:**

The pavement to be treated shall be cleaned of trash, debris, earth or other deleterious substances present in sufficient quantity to interfere with the work to be performed.

The heating shall be sufficient to soften the pavement to the extent that it can be scarified or milled to the depth specified. Due to the varying properties of the existing asphalt pavement, depth of the scarification material may be varied, if requested by the Engineer. Heating shall be done in a manner that will assure uniform softening and will not char the asphalt.

The Contractor shall be responsible for protecting the area adjacent to the work from heat damage. If damage occurs, the Contractor shall replace all damaged areas, landscape, curb, parked vehicles, etc. at not cost to the Agency.

To provide a welded longitudinal joint, the standing edge of the adjoining asphalt pavement shall be fully heated to a width at least 2 inches beyond the width to be scarified and recycled.

Immediately following heating, the pavement surface shall be scarified (or milled) to the specified depth. The scarified material shall have a temperature between 225° F. and 265° F. unless otherwise requested by the Engineer. The material shall be leveled, mixed and treated with a recycling agent. The application rate shall be as shown on the plans, special provisions or as requested by the Engineer. Application rate for the recycling agent may be adjusted as necessary to maintain a uniform mixture.

The reclaimed material shall be gathered by a leveling device and spread to a uniform depth over the width being processed. After it is placed and while it still has a residual temperature of at least 190° F., a layer of new HMAC conforming to the job mix formula shall be placed over it. The application rate of new material shall be sufficient to provide the required pavement thickness.

Construction, compaction and smoothness of the surface shall be in accordance with Section 321 except as modified in this section

**327.5 WEATHER CONDITIONS:**

This work shall not be done when it is raining or if there is a threat of rain. The ambient temperature shall be at least 50° F. and rising and the application shall cease when the temperature reaches 55° F. and falling.

**327.6 AIR QUALITY:**

The equipment and process shall meet all Arizona Department of Environmental Quality (ADEQ) and County air quality regulations and the Contractor shall have the appropriate ADEQ air quality control permit prior to the issuance of the notice to proceed.

**327.7 MEASUREMENT:**

Pavement Recycling will be measured by the square yard completed and accepted. Recycling Agent will measure by the gallon of actual material used in place. Hot Mix Asphalt Concrete (HMAC) will be measured by the ton in place.

**327.8 PAYMENT:**

The accepted quantities of pavement recycling will be paid at the contract unit price per square yard. Payment shall include cleaning the existing pavement surface and heating, scarifying, redistributing, leveling and compacting HMAC pavement.

Asphalt Recycling Agent will be paid for by the gallon used in place.

Hot Mix Asphalt concrete (HMAC) will be paid for by the ton used in place.

## TACK COAT

### 329.1 DESCRIPTION:

Tack coat for bituminous paved surfaces shall consist of the application of emulsified asphalt as specified in Section 713.

Municipality	Supplements
MC	: Emulsified asphalt for tack coat shall be grade SS-1h.

### 329.2 PREPARATION OF SURFACE:

Surfaces to be treated shall be cleaned of all loose material as specified in Section 330.

### 329.3 APPLICATION:

Tack coat shall be diluted in the proportion of 50 percent water and 50 percent emulsion and applied at the rate of 0.05 to 0.10 gallons per square yard. Application shall be made in advance of subsequent construction as ordered by the Engineer.

### 329.4 EQUIPMENT:

Tack coat shall be applied by distributor trucks designed, equipped, maintained and operated in accordance with Section 330. Hand spray by means of hose or bar through a gear pump or air tank shall be acceptable for resurface work, corners or tacking of vertical edges. Care shall be taken to provide uniform coverage. Equipment that performs unsatisfactory shall be removed from the job.

### 329.5 PROTECTION FOR ADJACENT PROPERTY:

According to Section 333.

### 329.6 MEASUREMENT:

Bituminous emulsion that is diluted prior to application will be measured by the ton of diluted material. Any conversion from volumetric quantities shall be in accordance with Section 713.

### 329.7 PAYMENT:

Payment for the emulsified bituminous tack coat will be by the ton, diluted.

Municipality	Supplements
ME	Subsection 321.9 and 329.7 – Delete the reference in these Subsections dealing with payment for tack coat. No additional payment shall be made for tack coat. Tack coat shall be incidental to the payment for asphalt concrete.

## **ASPHALT CHIP SEAL**

### **330.1 DESCRIPTION:**

This work shall consist of the application of a bituminous material followed by the application of a cover material.

### **330.2 MATERIALS:**

**330.2.1 Asphalt:** The type of grade of the bituminous material will be specified in the contract documents.

Paving grade asphalt shall meet the requirements to Section 711.

Liquid Grade asphalt shall meet the requirements of Section 712.

Emulsified asphalt shall meet the requirements of Section 713.

**330.2.2 Aggregate:** The cover material (chips) shall meet the requirements of Section 716. Gradation of the chips shall be as specified in Table 716-1 or Table 716-2.

### **330.3 TIME OF APPLICATION AND WEATHER CONDITIONS:**

Chip seal shall not be applied for at least 7 days after completion of new bituminous paving.

The chip seal shall be placed only when the roadway surface is dry and there is no imminent threat of rain. The ambient temperature must be at least 60°F. and rising.

Caution should be exercised in the placement of asphalt chip seal between the dates of Oct. 1 and April 1.

### **330.4 CONSTRUCTION METHODS:**

**330.4.1 Preparation of surfaces:** Immediately before applying the bituminous material, the area to be surfaced shall be cleaned of dirt and other objectionable material. In urban areas, the surface shall be cleaned with a self-propelled pickup sweeper. In rural areas, power brooms may be used. When necessary, cleaning shall be supplemented by hand brooms.

The bituminous material shall not be applied until an inspection of the surface has been made by the Engineer and he has determined that it is suitable.

For chip seals using paving grade asphalt as the binder, a bituminous tack coat shall be applied prior to sealing. The tack coat shall comply with Section 329. The exact rate shall be determined by the Engineer.

**330.4.2 Application of Bituminous Material:** The bituminous material shall be applied as soon as possible after preparation of surfaces. At the time of application, temperatures of the asphalt shall be within the ranges specified in Table 330-1 and Table 330-2 or in Sections 711, 712 & 713 for each specified asphalt type. The Engineer may require a specific temperature within the ranges.

The quantity of liquid or emulsified asphalts will be between the range of 0.20 and 0.40 gals./sq. yd. The quantity of paving grade asphalt will be between the range of 0.17 and 0.31 gals./sq. yd. The exact rate of application will be determined by the Engineer.

The bituminous material shall be placed using a distributor as specified in Section 330. Application methods shall insure that a uniform distribution is obtained over the area to be sealed.

The chips shall be spread before the bituminous material sets. The maximum distance that the bituminous material is applied in advance of the chips will be determined by the Engineer.

TABLE 330-1		
APPLICATION TEMPERATURES OF LIQUID ASPHALTS		
All types of Liquid Asphalt	Distributor Application Temperature, Degree F.	
	Min.	Max.
70	105	175
250	140	225
800	175	255
3000	215	290

TABLE 330-2		
APPLICATION TEMPERATURE OF EMULSIFIED ASPHALTS		
Grade of Emulsified Asphalts	Distributor Application Temperature, Degree F.	
	Min.	Max.
RS-1, CRS-1, CRS-1h	75	140
RS-2, CRS-2, CRS-2h	125	185
SS-1, CSS-1	75	130
SS-1h, CSS-1h	75	130

The surfaces of structures, trees and shrubbery adjacent to the areas being seal coated shall be protected in such manner as to prevent their being spattered with bituminous material or marred. The Contractor shall be responsible for all damage to such structures or landscaping.

**330.4.3 Application of Cover Material:** Immediately following the application of the bituminous material, the chips shall be spread with a self-propelled mechanical spreader. The chip spreading equipment shall be capable of applying a uniform application of cover material. The self-propelled requirement may be waived for projects under 10,000 sq. yds.

At the time of application, precoated aggregate shall be within the temperature range of 250 degrees F. and 350 degrees F. measured at a point 6 to 12 inches below the top of the load.

At the time of application, uncoated chips shall not contain moisture in excess of a saturated, surface dry condition when liquid or paving grade asphalt are used as the seal coat binder.

At the time of application, chips shall be surface wet but free from running water when emulsified asphalt is used as the seal coat binder.

The precise application rate for cover material will be determined by the Engineer within the ranges of 15 to 25 pounds per square yard for the 1/4 in. size and 20 to 30 pounds per square yard for the 3/8 in. size.

When so directed by the Engineer and within 48 hours after application of the precoated chips, all chipped surfaces on major streets shall receive a flush coat in accordance to Section 333. The exact rate of application shall be as directed by the Engineer.

**330.4.4 Rolling:** Immediately following the application of the cover material, the surface shall be rolled with self-propelled

pneumatic-tired rollers. Three coverages shall be made with a pneumatic roller. Each roller shall carry a minimum of 2,000 pounds on each wheel and a minimum of 60 psi in each tire. The roller shall not travel in excess of 12 miles per hour. A minimum of 3 self-propelled pneumatic rollers shall be required for projects over 10,000 sq. yds. On projects under 10,000 sq. yds., one roller may be used provided it performs the same number of coverages.

**330.4.5 Joints:** All joints shall be constructed as approved by the Engineer such that there be a uniform application of cover material and bituminous material.

**330.4.6 Surplus Aggregate Removal:** Surplus aggregate shall be removed from the surface using methods specified in subsection 330.4.1 and stockpiled in the location indicated on the plans or as directed by the Engineer. In no event shall surplus aggregate be left on the pavement for more than 1 day (24 hours).

**330.4.7 Distributing Equipment:** Distributor trucks shall be of the pressure type with insulated tanks. Gravity distributors will not be permitted.

Spray bars and extensions shall be of the full circulating type. The spray bar shall be adjustable to permit varying height above the surface to be treated.

The nozzle spacings, center to center, shall not exceed 6 inches. The valves shall be operated so that one or all valves may be quickly opened or closed in one operation. The valves which control the flow from the nozzles shall be of a positive acting design so as to provide a uniform, unbroken spread of bituminous material on the surface.

The distributor shall be equipped with devices and charts to provide for accurate, rapid determination and control of the amount of bituminous material being applied. The distributor shall be equipped with a tachometer of the auxiliary wheel type registering speed in feet per minute. The distributor shall also be equipped with pressure gauges and an accurate thermometer for determination of the temperature of bituminous material. The spreading equipment shall be designed so that uniform application of a bituminous material can be applied in controlled amounts ranging from 0.05 to 2.0 gallons per square yard. Transverse variation rate shall not exceed ten (10) percent of the specified application rate. The distributor shall be equipped with a hose and nozzle attachment to be used for spotting skipped areas and areas inaccessible to the distributor. Distributor and booster tanks shall be maintained as to prevent dripping of bituminous material from any part of the equipment.

Equipment that fails to perform satisfactorily shall be removed from the job.

**330.5 TRAFFIC:**

Traffic will not be permitted on the surface until the cover aggregate has set. Traffic control shall be in accordance with Section 401 as supplemented by the Contracting Agency.

When using paving grade or liquid grade asphalt chip seal, the speed limit must be maintained at 25 mph for all equipment and traffic until the cover material is swept.

When using emulsified asphalt chip seals, only emergency or local access traffic will be allowed until the seal coat has had time to set.

**330.6 MEASUREMENT:**

Certified weight slips of all material shall be delivered to the Engineer before the materials are applied. Certified weight slips of any material being weighed back in for credit shall be delivered to the Engineer the next day.

**330.7 PAYMENT:**

Quantities of materials for this work will be paid for at the contract unit price.

- (A) Asphalt Cement, Liquid Asphalt, Emulsion, Diluted Emulsion Ton
- (B) Chips Ton

There will be no payment for materials not placed in accordance with this specification.

## ASPHALT EMULSION SLURRY SEAL COAT

### 332.1 DESCRIPTION:

The work covered by this specification consists of furnishing all labor, equipment, and materials necessary to perform all operations required for the application of an asphalt emulsion slurry surface.

NOTE . . . THESE SPECIFICATIONS DO NOT COVER THE APPLICATION OF COAL TAR SLURRY SEALS.

### 332.2 MATERIALS:

The asphalt emulsion material, mineral aggregate and mineral filler shall be as specified in Section 715.

### 332.3 DETERMINATION OF JOB MIX:

The job mixture shall be designed to provide a suitable surface for traffic conditions, climate and curing. All materials shall be pre-tested in a qualified laboratory to determine their suitability for use in the slurry seal. The Wet Track Abrasion Test (W.T.A.T.) will be used for design purposes to establish the mix design to be used in the specified slurry seal.

The test will show a maximum wear loss of 75 grams per square foot. Samples of materials to be used on the job shall be used to run the W.T.A.T. The test will be performed in accordance with ASTM D-3910 Design Testing and Construction of Slurry Seal.

**332.3.1 Composition of Slurry Seal Mixtures:** The job mixture shall conform to the requirements of the contract documents. The mixture shall attain an initial set in not less than 5 minutes nor more than one hour. In cases where the surface is not critical to be open to traffic, a longer set time may be allowed, however not to exceed 12 hours. The setting time may be adjusted by the addition or removal of approved mineral fillers or chemical agents. The mixture shall be one of three types whose combined aggregates conform to the gradation requirements of Table 715-1. The mixture shall be sufficiently free flowing to fill cracks in the pavement. The mixture shall not segregate during or after laydown. The mixture shall produce a skid-resistant surface.

**332.3.2 Trial Applications:** The Contractor shall place a test strip of 60 square yards in the area designated by the Engineer. The test section shall be placed using the same equipment and methods as will be used on the job. The slurry mixture placed in a test strip shall conform to the design mix as determined by the W.T.A.T. with minor variations to obtain crack filling, set time, pavement bond and a skid resistant texture. If the materials do not meet the requirements for fluidity, non-segregation, or surface texture, a new job mix shall be formulated and tested. Work shall not proceed before approval of design mix and acceptance following the placing of a test strip.

### 332.4 EQUIPMENT:

**332.4.1 General:** When requested by the Engineer, descriptive information on the slurry seal mixing and applications equipment to be used will be submitted for approval no less than 7 days before the work starts.

**332.4.2 Self Contained Slurry Machine:** The mixing machine will be a continuous flow type. It will be capable of accurately delivering a predetermined proportion of pre-wetted aggregate, mineral filler, water and asphalt emulsion to the mixing chamber and discharging the thoroughly blended mixture on a continuous basis. The mixing machine will be equipped with a mineral filler feeder. The feeder will have an accurate metering device or method to introduce a predetermined proportion into the mixer. The filler will be introduced into the mixing chamber at the same time and location as the aggregate.

The mixing machine will be equipped with a water pressure system and fog-type spray bar, adequate for complete water fogging of the surface to be sealed.

The mixing machine will be mounted on a truck or other vehicle capable of producing evenly controlled low rates of speed throughout the operation to ensure the slurry is spread evenly and all cracks are filled.

**332.4.3 Slurry Spreading Equipment:** Attached to the mixer machine shall be a mechanical type squeegee spreader equipped with flexible material in contact with the surface to prevent loss of slurry from the distributor. It shall be maintained to prevent loss of slurry on varying grades and crown by adjustments to assure uniform spread. There shall be a steering device and a flexible strike-off. The spreader box shall have an adjustable width. The box shall be kept clean. Build-up of asphalt and aggregate on the box shall not be permitted. The use of burlap drags or other drags shall be approved by the Engineer.

**332.4.4 Rollers:** Rollers shall be approved by the Engineer.

**332.4.5 Cleaning Equipment:** Power brooms, pick-up brooms, air compressors, water flushing equipment, and hand brooms shall be suitable for cleaning the surface and cracks of the old surface.

**332.4.6 Auxiliary Equipment:** Hand squeegees, shovels, and other equipment shall be provided as necessary to perform the work.

### **332.5 PREPARATION OF THE SURFACE:**

**332.5.1** Immediately before applying the slurry, the area to be surfaced shall be cleaned of dirt, loose material, and other objectionable material. In urban areas, the surface shall be cleaned with a self-propelled pick-up sweeper. In rural areas, power brooms may be used. When necessary, cleaning shall be supplemented by hand brooms. Water flushing will not be permitted in areas where cracks are present in the pavement surface.

The slurry shall not be applied until an inspection of the surface has been made by the Engineer and he has determined that it is suitable.

**332.5.2 Tack Coat:** When specified, a tack coat shall be applied in accordance with Section 329 using the same type and grade of asphalt emulsion as specified for the slurry seal.

**332.5.3 Water Fogging:** When required by local conditions, the surface, directly ahead of the slurry box, shall be pre-wetted by fogging. The fogging shall be accomplished in such a manner that the entire surface is damp with no apparent flowing water or puddles.

### **332.6 WEATHER LIMITATIONS:**

The slurry seal shall not be applied unless the pavement temperature is at least 45°F. and rising. The mixture shall not be applied during unsuitable weather.

### **332.7 PROTECTION OF UNCURED SURFACE:**

Adequate methods such as barricades, flagmen, pilot cars, etc., shall be used to protect the uncured slurry surface from all types of traffic.

### **332.8 MIXING AND APPLICATION:**

The mixing time shall not exceed four minutes. Excessive mixing will not be allowed. The resulting mixture shall have the desired consistency, when placed on the surface. If breaking, hardening, segregation, balling or lumping occurs during the mixing process, the batch will be discarded.

A sufficient amount of slurry shall be carried in all parts of the spreader at all times so that a complete coverage is obtained.

No streaks caused by oversized aggregate shall be left in the finished surface. Build-up on longitudinal and transverse joints will be kept to a minimum. Approved squeegees shall be used to spread slurry in areas nonaccessible to the slurry mixer.

**332.9 ROLLING:**

As soon as the asphalt slurry has been set sufficiently to prevent any material from being picked up, it shall be rolled until all ridges have been ironed out and a uniform surface is obtained.

**332.10 MEASUREMENT:**

Quantities and materials for this work will be paid for at the contract price per unit of measurement for each of the following pay items as indicated in the proposal.

- |                                       |                   |
|---------------------------------------|-------------------|
| (A) Bituminous tack coat if specified | Ton (Diluted)     |
| (B) Emulsified asphalt for slurry     | Ton (Undiluted)   |
| (C) Aggregate for slurry              | Ton (Surface Dry) |

## FOG SEAL COATS

### 333.1 DESCRIPTION:

Fog seal coats on bituminous paved surfaces shall consist of the application of emulsified asphalt and a sand blotter when necessary.

Municipality	Supplements
MC	: Fog seal coats for curing seal purposes as specified in Section 308 or Section 309 shall consist of the application of emulsified asphalt.

### 333.2 TIME OF APPLICATION AND WEATHER CONDITIONS:

Fog seal coats on new pavements shall be applied within 24 hours. This time restriction may be extended by the Engineer.

Emulsified asphalt shall not be applied when the surface is wet or when there is a threat of rain. The ambient temperature shall be at least 50 degrees F. and rising and the application shall cease when the temperature is 55 degrees F. and falling.

### 333.3 MATERIALS:

**333.3.1 Emulsified Asphalt:** Unless otherwise specified in the special provisions, emulsified asphalt may be a grade SS-1h, CSS-1h, or CQSH, as specified in Section 713. The emulsified asphalt shall be diluted in proportions of 50% water and 50% emulsified asphalt.

**333.3.2 Sand Blotter:** The sand shall be as specified in Section 701 and shall be graded in accordance with Table 333-1.

TABLE 333-1	
SAND BLOTTER GRADATION	
Sieve Size	Percentage Passing (by weight)
3/8 inch	100%
No. 4	90-100%
No. 200	0-12%

### 333.4 TESTS, TEST REPORTS AND CERTIFICATIONS:

Asphalt emulsion shall meet requirements of Section 713.

Test reports and certifications shall be as specified in Section 711.

### 333.5 PREPARATION OF SURFACES:

Immediately before applying the emulsion, the area to be surfaced shall be cleaned of dirt and loose material by means of power brooms, or pick-up brooms supplemented by hand brooms if necessary. The fog seal shall not be applied until an inspection of the surfaces has been made by the Engineer and he has determined that the surfaces are suitable.

### 333.6 APPLICATION OF ASPHALT EMULSION:

The diluted material shall be well mixed before application. It shall be applied by a distributor truck equipped with fog

nozzles at the approximate rate of 0.10 gallon per square yard. The exact rate shall be as directed by the Engineer. The distributor truck shall be as specified in Section 330.

Municipality	Supplements
MC	: For curing seal applications over Lime Slurry Stabilization or Lime Slurry with Fly Ash Stabilization the application rate shall be between 0.10 to 0.20 gallons per square yard.

**333.7 SAND BLOTTER:**

A sand blotter shall be applied as directed by the Engineer where there is an excess of asphalt emulsion. After the treated area has been opened to traffic, any excess asphalt emulsion that comes to the surface shall be immediately covered with additional sand.

**333.8 PROTECTION FOR ADJACENT PROPERTY:**

Care shall be taken to prevent the spraying of asphalt emulsion on adjacent pavements, including that portion of the pavement being used for traffic, on structures, guard rails, guide posts, markers, trees, shrubs, and property of all kinds.

**333.9 PROTECTION OF TREATED SURFACE:**

The treated surface shall be protected by barricades until the asphalt emulsion will not be picked up by traffic.

**333.10 PAYMENT:**

Payment for asphalt emulsion in place will be by the ton, diluted.

Payment for furnishing and applying sand blotter in place will be paid for by the ton.

## **PRESERVATIVE SEAL FOR ASPHALT CONCRETE**

### **334.1 DESCRIPTION:**

The asphalt concrete preservative seal shall be composed of a penetrating softening agent and sealant to rejuvenate and preserve the asphalt concrete pavement.

Preservative seals are applicable for new and existing asphalt pavements as directed on the plans, special provisions, or the Engineer.

### **334.2 MATERIALS:**

The preservative seal shall be as specified in Section 718.

### **334.3 CONSTRUCTION METHOD:**

The material shall be approved by the Engineer in accordance to this specification. The application rates, dilution and curing shall be directed by the Engineer in accordance with this specification.

The application rate will be based upon a typical surface condition test site with application rate trials to determine the needed rate. All application rates specified in Section 718 shall be a diluted 50-50 preservative seal and water, except as recommended by the manufacturer for Type D. Any over applied seal will be sanded as directed by the Engineer. Application equipment shall be in accordance with Section 330.

Before opening a treated area to traffic, the surface shall be checked for slipperiness and/or tackiness. If the treated portion of the roadway must be opened to traffic prior to the disappearance of slipperiness and/or tackiness, the surface shall be sanded with a minimum of 1 1/2 pounds per square yard or as directed by the Engineer. Sand Blotter shall comply with Section 333.

<b>Municipality</b>	<b>Supplements</b>
<b>TE</b>	<b>334.3:</b> Arterial Roadways, apply @ 0.05 gal./S.Y. All other Roadways, apply @ 0.1 gal./S.Y.

### **334.4 MEASUREMENT:**

Preservative seal for asphalt concrete will be measured by the gallon or ton applied including diluent.

### **334.5 PAYMENT:**

Payment will be made on the basis of the unit price bid in the proposal. Payment shall be full compensation for preservative seal complete and in place.

## HOT ASPHALT-RUBBER SEAL

### 335.1 GENERAL:

This work shall consist of an application of a combined mixture of hot paving grade asphalt and ground tire rubber. It shall be immediately covered with a cover material.

The work involves furnishing and placing all materials on existing pavement surfaces in accordance with this specification.

This specification includes the two approved processes for the production of Asphalt-Rubber. Method A uses ground reclaimed vulcanized rubber and a extender oil. Method B uses ground reclaimed vulcanized rubber and a kerosene diluent. Either method is acceptable based on proper compliance with the specifications and certifications of materials.

### 335.2 MATERIALS:

The asphalt, granulated rubber, extender oil, and kerosene shall comply with Section 717. Sand Blotter shall comply with Section 333. Cover material shall comply with Section 716 (PRECOATED). Tack coat shall comply with Section 329. Flush coat shall comply with Section 333.

**335.2.1 Certification and Quality Assurance:** Prior to application, the Contractor shall submit certification of compliance to the Engineer for all materials to be used in the work.

### 335.3 EQUIPMENT:

**335.3.1 General:** The method and equipment for combining the rubber and asphalt shall be so designed and accessible that the Engineer can readily determine the percentage by weight of each of two materials being incorporated into the mixture.

All equipment shall meet requirements of Section 330 with the following modifications:

(A) Pneumatic-tired rollers: At least three pneumatic-tired rollers shall be used. Each roller shall carry a minimum of 5,000 pounds on each wheel and a minimum of 90 psi in each tire. Rollers shall not travel in excess of 12 mph.

(B) Distributor: The distributor must be equipped with a mechanical mixing device.

**335.3.2 Mechanical Pre-Blender:** Rubber and the asphalt (and extender oil in Method A) for the asphalt-rubber blend may be pre-blended prior to introduction of the blend into the distributor.

The mechanical pre-blender shall be equipped with an asphalt totalizing meter in gallons and a flow rate meter in gallons per minute.

### 335.4 MIXING:

The percentage of rubber shall be 22% plus or minus 2% by weight of the total mixture. Mixing shall continue in the temperature range of 250 degrees F. to 450 degree F. until the consistency of the mixture approaches that of a semi-fluid material (i.e., reaction is complete). At the lower temperature, it will require approximately 30 minutes for the reaction to take place after the start of the addition of rubber. At the high temperature, the reaction will take place within approximately five minutes. Therefore, the temperature used will depend on the type of application and the methods used by the Contractor. Viscosity of the asphalt-rubber shall be more than 500 centipoises and less than 4000 centipoises at the time of application (ASTM D-2994). Application shall proceed immediately upon reaching the proper consistency.

**335.4.1 Adjustment to Spraying Viscosity with Diluent:** After the full reaction described in MIXING - Section 335.4 has occurred, the mix can be diluted with a kerosene type diluent. The amount of diluent used shall be less than 7.5 percent by volume of the hot asphalt rubber composition as required for adjusting viscosity for spraying or better wetting of the cover aggregate. Temperature of the hot composition shall not exceed the kerosene initial boiling point at the time of adding diluent.

**335.5 CONSTRUCTION:**

Prior to placing the hot asphalt-rubber seal coat, soil and other objectionable materials shall be removed from the pavement surface and a tack coat applied as specified in Section 329.

The application rate of the hot asphalt-rubber mixture shall be 0.55 to 0.65 gallons per square yard. Material shall be applied at temperatures of 375 degrees F. to 425 degrees F. for Method A and 300 degrees F. to 350 degrees F. for Method B. The application of the cover material shall follow as close as possible behind the distributor truck.

The cover material shall be preheated immediately prior to application and precoated as specified in Section 716 - PRECOATED. The temperature of the precoated chips shall be in accordance with Section 330.

Hot asphalt-rubber seal with hot precoated cover aggregate shall be placed only when the ambient temperature is at least 60 degrees F. and rising, on a dry surface and there is no imminent threat of rain.

The rate of application of the cover material shall be from 25 to 35 pounds per square yard for the 1/4 inch nominal size or 30 to 40 pounds per square yard for the 3/8 inch nominal size as directed by the Engineer.

The rolling of the cover material shall proceed immediately after application in order to insure maximum embedment of the aggregate. Sufficient rollers shall be used for the initial rolling to cover the width of the aggregate spread with one pass. The first pass shall be made immediately behind the aggregate spreader. If the spreading is stopped for an extended period, the spreader shall be moved ahead or off to the side so that all cover material may be immediately rolled. Three (3) complete passes with rollers shall be made with all rolling completed within one (1) hour after the application of the cover material.

The Contractor shall sweep all joint edges clean of overlapping cover material prior to the adjacent application of asphalt-rubber material. Transverse joints shall be made by placing building paper over the ends of the previous applications. The joining application shall start on the building paper. Once the application process has progressed beyond the paper, the paper shall be removed and disposed of to the satisfaction of the Engineer. All reasonable precautions shall be taken to avoid skips and overlaps at joints and to protect the surfaces of adjacent structures, trees and shrubs, etc., from being spattered or marred. Correction of any such defects will be required at no additional cost to the Contracting Agency.

Traffic will not be permitted on the surface until the cover aggregate has set. Traffic control shall be in accordance with Section 401 as supplemented by the Contracting Agency.

At signalized intersections, an application of 2 to 5 pounds of sand per square yard shall be applied through the intersection and for a distance of 200 feet each way from the near curb returns after rolling and before opening a lane to traffic. Sand Blotter shall meet requirements of section 333.

After sweeping and prior to striping, a flush coat shall be applied to the asphalt-rubber treatment consisting of 0.05 to 0.10 gallons per square yard according to Section 333. The application of the flush coat may be delayed to facilitate curing or to avoid placement under unfavorable high temperature conditions.

Note: The flush coat shall not be applied to the area 200 feet either side of and through signalized intersections.

**335.6 MEASUREMENT:**

Certified weight slips of all materials shall be delivered to the Engineer before the materials are applied.

Certified weight slips of any bituminous material being weighed back in for credit shall be delivered to the Engineer for the next day.



## PAVEMENT MATCHING AND SURFACING REPLACEMENT

### 336.1 DESCRIPTION:

Street and alley pavement and surfacing within the Contracting Agency's rights-of-way, removed by construction activities or to be widened or matched in connection with the improvement of Public Works, shall be placed as shown on the plans and applicable standard details, in accordance with this specification and/or the special provisions.

Asphalt concrete pavement replacement shall be constructed in accordance with Type A, B, D or E of standard details, as indicated on the plans, and as required by Sections 321 and 710.

Portland cement concrete pavement replacement shall be in accordance with Type C of the Standard Details, and as required by Sections 505 and 725.

ABC or decomposed granite surface replacement shall be constructed in accordance with Type F of standard details as indicated on the plans and in Section 702.

Temporary pavement replacement shall be constructed as required below.

Pavements to be matched by construction of new pavements adjacent to or at the ends of a project shall be saw cut in accordance with these specifications and where shown on the plans.

Pavement and surfacing replacement within ADOT rights-of-way shall be constructed in accordance with their permits and/or specification requirements.

### 336.2 MATERIALS AND CONSTRUCTION METHODS:

Materials and construction methods used in the replacement of pavement and surfacing shall conform to the requirements of all applicable standard details and specifications, latest revisions.

**336.2.1 Pavement Widening or Extensions:** Existing pavements which are to be matched by pavement widening or pavement extension shall be trimmed to a neat true line with straight vertical edges free from irregularities with a saw specifically designed for this purpose. The minimum depth of cut shall be 1 1/2 inches or D/4, whichever is greater.

The existing pavement shall be cut and trimmed after placement of required ABC and just prior to placement of asphalt concrete for pavement widening or extension, and the trimmed edges shall be painted with a light coating of asphalt cement or emulsified asphalt immediately prior to constructing the new abutting asphalt concrete pavements. No extra payment shall be provided for these items and all costs incurred in performing this work shall be incidental to the widening or pavement extension.

The exact point of matching, termination, and overlay may be adjusted in the field, if necessary, by the Engineer or designated representative.

**336.2.2 Pavement to be Removed:** Existing asphalt pavement to be removed for trenches or for other underground construction or repairs shall be cut by a device capable of making a neat, straight and smooth cut without damaging adjacent pavement that is not to be removed. The Engineer's decision as to the acceptability of the cutting device and manner of operation shall be final. If saw cutting, only, is to be utilized, it will be so specified in the plans or special provisions.

In lieu of cutting trenches across driveways, curbs and gutters, sidewalks, alley entrances, and other types of pavements, the Contractor may, when approved by the Engineer, elect to tunnel or bore under such structures and pavements.

When installations are within the street pavement and essentially parallel to the center line of the street, the Contractor, with approval of the Engineer, may elect to bore or tunnel all or a portion of the installation. In such installations, the seal coat requirements, as discussed in Section 336.2.4, will be modified as follows:

(A) If the pavement cuts (bore pits, recovery pits, etc.) are 300 feet or more apart, the bore or tunneled distance will not be considered as part of the open trench and the seal coat may not be required.

(B) If the pavement cuts (bore pits, recovery pits, etc.) are less than 300 feet apart, the distance between the cuts will be considered the same as a trench cut and the distance will be added to any trench cut distances.

**336.2.3 Temporary Pavement Replacement:** Temporary pavement replacement, as required in Section 601, may be with cold-mix asphalt concrete, with a minimum thickness of 2 inches, using aggregate grading in accordance with Section 710.

Temporary pavement replacement shall be used in lieu of immediate placement of single course permanent replacement or the first course of two course pavement replacement only on transverse lines such as spur connections to inlets, driveways, road crossings, etc., when required by the Engineer, by utilities or others who subcontract their permanent pavement replacement, under special prior arrangement; or for emergency conditions where it may be required by the Engineer. Temporary pavement replacement shall be placed during the same shift in which the backfill to be covered is completed.

Rolling of the temporary pavement replacement shall conform to the following:

(A) Initial or breakdown rolling shall be followed by rolling with a pneumatic-tired roller. Final compaction and finish rolling shall be done by means of a tandem power roller.

(B) On small areas or where equipment specified above is not available or is impractical, the Engineer will approve the use of small vibrating rollers or vibrating plate type compactors provided comparable compaction is obtained.

The surface of the temporary pavement shall be finished off flush with the adjacent pavement.

Municipality	Supplements
MC	: Temporary pavement replacement that uses cold-mix asphalt concrete shall be replaced no later than seven (7) calendar days after initial placement

Municipality	Supplements																								
PH:	<p>: TEMPORARY PAVEMENT REPLACEMENT: is changed to read:</p> <p>Temporary pavement replacement as required in Section 601 may be made using a cold mix asphalt concrete. The cold mix shall be MC-70 or MC-250 liquid asphalt (6.0 plus-minus 0.4 percent) combined with the aggregate gradation shown below. Paving asphalt AC 2.5 (5.5 percent) may be substituted for the liquid asphalt. AC 2.5 must be heated for mixing.</p> <table border="1" style="margin-left: auto; margin-right: auto;"> <thead> <tr> <th>Sieve Size</th> <th>% - Passing</th> <th>Tolerance</th> </tr> </thead> <tbody> <tr> <td>3/4"</td> <td>97-100</td> <td>+/- 7%</td> </tr> <tr> <td>1/2"</td> <td>88</td> <td>+/- 7%</td> </tr> <tr> <td>3/8"</td> <td>78</td> <td>+/- 7%</td> </tr> <tr> <td>#4</td> <td>60</td> <td>+/- 7%</td> </tr> <tr> <td>#8</td> <td>47</td> <td>+/- 5%</td> </tr> <tr> <td>#30</td> <td>25</td> <td>+/- 5%</td> </tr> <tr> <td>#200</td> <td>5</td> <td>+/- 2%</td> </tr> </tbody> </table> <p>Temporary pavement shall be used in lieu of immediate placement of single course permanent replacement or the first course of two course pavement replacement only on transverse lines such as spur connections to inlets, driveways, road crossings, etc., when required by the Engineer, by utilities or others who subcontract their permanent pavement replacement, under special prior arrangement; or for emergency conditions where it may be required by the Engineer. Temporary pavement replacement shall be placed during the same shift in which the backfill to be covered is completed.</p>	Sieve Size	% - Passing	Tolerance	3/4"	97-100	+/- 7%	1/2"	88	+/- 7%	3/8"	78	+/- 7%	#4	60	+/- 7%	#8	47	+/- 5%	#30	25	+/- 5%	#200	5	+/- 2%
Sieve Size	% - Passing	Tolerance																							
3/4"	97-100	+/- 7%																							
1/2"	88	+/- 7%																							
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#4	60	+/- 7%																							
#8	47	+/- 5%																							
#30	25	+/- 5%																							
#200	5	+/- 2%																							

	<p>The cold mix shall be placed in two inch increments and compacted with a roller that has not less than 60 p.s.i. contact pressure. Each layer shall be compacted to 96 percent of the laboratory compacted density for like materials. On small areas where the use of the equipment specified above is impractical, the Engineer will approve the use of small vibrating rollers or vibrating plate type compactors provided comparable compaction is obtained. The surface of the temporary pavement shall be flush with the adjacent pavement.</p>
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**336.2.4 Permanent Pavement Replacement and Adjustments:**

**336.2.4.1 Permanent Pavement Replacement:** Pavement replacement for cuts essentially parallel to the street centerline and greater than 50 feet in length shall be two course pavement replacement as hereinafter specified. For cuts greater than 600 feet in length the entire area shall then be seal coated in accordance with Section 330 (coated chips) or as otherwise specified. This seal coat shall extend from the edge of pavement or lip of gutter to the street centerline except that on residential streets less than 36 feet face to face of curb or where the pavement patch straddles the centerline, the entire width of street shall be seal coated.

In lieu of placing the seal coat as required previously, and with approval of the Contracting Agency, the Contractor may deposit with the Contracting Agency for credit to the Street Maintenance Department, a negotiated agreed upon amount. The Street Maintenance Department will incorporate this work into their street maintenance program.

Pavement replacement for cuts parallel to the street centerline less than 50 feet in length, transverse cuts, bell holes and similar small areas shall match gradation and thickness of the existing pavement. These one course pavement patches shall be compacted with a vibratory roller to the same density specified for asphalt concrete pavements.

Laying of single course or the base course of the asphalt concrete pavement replacement where a two course replacement is applicable shall never be more than 600 feet behind the ABC placed for the pavement replacement.

The trench must be compacted to its required density, and required ABC must be in place prior to the placement of the asphalt concrete.

Single course replacement shall consist of a 12.5 mm or 19 mm mix placed and finished as directed by the Engineer.

The base course of two course pavement replacement shall consist of a 19 mm mix in accordance with Section 710.

Where the base course is to be placed with non-compactive equipment, it shall be not less than 2 inches in thickness and the material shall be immediately rolled with a pneumatic-tired roller. The surface course shall be of sufficient depth to provide the total required compacted thickness of the two courses, but not more than 1 inch.

Where the trench is 6 feet or more in width, all courses, single or both courses of the two course pavement replacement, shall be laid with a self-propelled compacting, spreading equipment. When the trench is from 6 to 8 feet in width, the self-propelled compacting, spreading equipment shall not be wider than 8 feet. All courses, except the surface course, shall be of a compacted thickness of not less than 1 1/2 inches.

The surface course shall consist of a 9.5 mm mix in accordance with Section 710 as specified by the Engineer to match the existing surface. The surface course shall not be placed sooner than 2 weeks after the base course, except where the trench crosses a signalized intersection. In this case the surface course shall be placed within 48 hours, or the crossing pavement replacement shall be single course as specified above.

Placement of the surface course is to be by means which will result in a surface texture satisfactory to the Engineer, and flush with the existing pavement.

Where deep lift asphalt concrete (asphalt concrete base and asphalt concrete wearing course) exists, the base course replacement shall be made in lifts not exceeding 6 inches in compacted thickness to within 1/2 inch of the finish grade.

Municipality	Supplements
CH	<p data-bbox="337 247 1138 279"><b>Street Cut Backfill and Pavement Replacement (Specification #3) 2002</b></p> <ol data-bbox="428 279 1490 1434" style="list-style-type: none"> <li data-bbox="428 279 1490 369">1. All street cuts require a separate application and approval by the City Engineer/designee. Street cuts will generally not be approved unless: (a) the street is scheduled for near term replacement, or (b) there is no feasible alternative to cutting the street.</li> <li data-bbox="428 401 1490 491">2. Trenches and cuts shall <u>be</u> backfilled, <u>as approved by the City Engineer</u>, in accordance with the requirements as shown in Detail No. C-110 of these City of Chandler Standard Details and Specifications.</li> <li data-bbox="428 522 1490 764">3. Excavated material shall be immediately removed from the site. Backfilling shall begin immediately following completion of utility work. Immediately after backfilling is completed, steel plates shall be placed over the trench that are secured to prevent movement and for roadways with City posted speeds of 35 mph or greater, recessed flush with the roadway surface and for roadways with City posted speeds less than 35 mph, gradually ramped from plate edges with EPA approved material and the street opened to traffic. A permanent asphalt patch, which conforms to MAG Specifications and City of Chandler Standard Details, shall be placed within two working days of completion of backfill.</li> <li data-bbox="428 795 1490 947">4. The final pavement replacement shall be placed flush with the existing pavement edges. The grade from one end of the trench to the other shall be smooth and straight with no more than one quarter inch plus or minus deviation (but not both), in all directions within and 2 foot minimum beyond the edge of the pavement replacement as measured with a 10 foot straightedge.</li> <li data-bbox="428 978 1490 1129">5. No street cut shall be made without a Street Cut Permit. A permit to work in the right-of-way is not authorization to cut a street unless the approval to cut the street is specified on the permit. Street cuts made without approval are subject to be overlaid with asphalt to a length and width specified by the City Engineer at the contractor's expense, in addition to penalty charges.</li> <li data-bbox="428 1161 1490 1434">6. Permission to excavate in new streets will not be granted for two years after completion of street construction, reconstruction or renovation (major rehabilitation). Utilities shall determine alternate methods of making necessary repairs to avoid excavating in new streets. Exceptions to the above are as follows: <ul data-bbox="524 1314 1406 1434" style="list-style-type: none"> <li data-bbox="524 1314 1036 1346">A. Emergency which endangers life or property.</li> <li data-bbox="524 1346 967 1377">B. Interruption of essential utility service.</li> <li data-bbox="524 1377 1256 1409">C. Work that is mandated by city, county, state or federal legislation.</li> <li data-bbox="524 1409 1406 1434">D. Service for buildings where no other feasible means of providing service exists.</li> </ul> </li> </ol> <p data-bbox="475 1465 1490 1738">In addition to the payment of the Pavement Restoration Fee, a condition of any such street cut permit for cutting the pavement of a street within one year of construction, reconstruction or renovation, shall be that the permittee renovate such street by mill and overlay/ inlay, for a minimum of the full width of all lanes impacted by the cut(s) (outside lane includes to the curb) and for arterial streets, extending a minimum length of fifty (50) feet in both directions from the area of the cut(s) and for collector streets extending a minimum length of twenty five (25) feet in both directions from the area of the cut(s), all as more specifically directed by the City Engineer/designee. Provided, however, for pavement cuts smaller than two square feet, the requirement to <u>reconstruct or renovate</u> the street by mill and overlay/inlay shall not apply.</p> <ol data-bbox="428 1770 1490 1887" style="list-style-type: none"> <li data-bbox="428 1770 1490 1887">7. These requirements do not preclude emergency street cuts by utility companies to restore service or eliminate hazardous conditions. In such cases, immediate notification, in writing, will be provided to Off-site Inspection (782-3320) during working hours, or Police Dispatch (782-4132) for work after normal working hours.</li> </ol>

	<p>8. For an exemption from the pavement restoration fees or reconstruction requirements, a single pothole/cut shall be spaced no less than the following requirements, and as shown in Detail No. C-111.</p> <p style="padding-left: 40px;">A. Collector Streets</p> <ol style="list-style-type: none"> <li>1. Neither fees nor reconstruction will be required for one pothole of less than two square feet per traffic lane and/or turn lane at any one location. Potholes shall be spaced greater than 12.0 feet from the edge-of-pothole to the edge-of-pothole as measured perpendicular to the roadway. Any one location is defined as 5.0 feet either side of the centerline of a utility in the roadway.</li> <li>2. Neither fees nor reconstruction will be required for multiple potholes of less than two square feet in one lane or adjacent lane of the roadway that are spaced greater than 25.0 feet from the edge-of-pothole to the edge-of-pothole as measured parallel to the roadway.</li> </ol> <p style="padding-left: 40px;">B. Arterial Streets</p> <ol style="list-style-type: none"> <li>1. Neither fees nor reconstruction will be required for one pothole of less than two square feet per traffic lane and/or turn lane at any one location. Potholes shall be spaced greater than 12.0 feet from the edge-of-pothole to the edge-of-pothole as measured perpendicular to the roadway. Any one location is defined as 5.0 feet either side of the centerline of a utility in the roadway.</li> <li>2. Neither fees nor reconstruction will be required for multiple potholes of less than two square feet in one lane or adjacent lane of the roadway that are spaced greater than 50.0 feet from the edge-of-pothole to the edge-of-pothole as measured parallel to the roadway.</li> </ol> <p>For roadways with a flush median, the flush median shall be considered a traffic lane or turn lane for the determination of pavement restoration fees. For roadways with a raised median, each side of the median can be considered separately for the determination of fees. Potholes should not be located in the wheel path of any traffic lane unless approved in writing by the City inspector.</p> <p>For potholes that are spaced closer than as specified above, the pavement reconstruction, or the pavement restoration fee and mill and overlay requirements as established by the City Code will apply. The area of the pavement cut will be the sum of the area of all the potholes at any crossing location or along any utility line. The area to be milled and overlaid will be all lanes that are potholed, by 50' on arterials and 25' on collectors beyond the outside edges of all potholes at any crossing locations or along any utility line.</p>
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Municipality	Supplements
<b>GI</b>	<p><b>Pavement Matching</b></p> <p>Pavement matching and surfacing replacement shall conform to MAG Standard Specifications, Section 336. Sidewalk removal may be required prior to final acceptance and will be made to either the nearest joint score line, or five foot interval.</p>

Municipality	Supplements
<b>PH:</b>	PERMANENT PAVEMENT REPLACEMENT: Delete the second paragraph of this Subsection in its entirety.

	<p>The Contractor shall do the required seal coating using an asphalt overlay, slurry seal, microsurfacing, or a modified asphalt emulsion, as directed by the Engineer. Slurry seals are not permitted on major and collector streets.</p> <p>The Contractor shall be responsible for adjusting to grade all new and existing manholes, valves, survey monuments, clean outs, etc., as directed by the Engineer. The Contractor shall remove all asphalt material and aggregate from this or prior work from all metal lids and covers encountered using a method approved by the Engineer. Debris will not be allowed to enter sanitary or storm sewers. All loose material shall be removed from the excavation site and the interiors of structures prior to resetting the frames.</p> <p>The Contractor shall coordinate with the various utility companies regarding the adjustment and inspection of their facilities. Each utility company’s specifications shall be adhered to during the adjustment. The Contractor shall be responsible for meeting any additional requirements of the utility companies.</p> <p>Manhole frames shall be adjusted according to the MAG Standard Detail 422, except that the concrete collar shall extend up to the finished grade. Water valve, survey monument, and sewer clean out frames shall be adjusted in accordance with the City of Phoenix Supplement Standard Details P1270 and P1391.</p>
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Municipality	Supplements
SC	<p><b>Permanent Pavement Replacement:</b> <i>Add the following paragraph:</i></p> <p>The acceptable surface profile from the existing surface across a pavement replacement shall not vary more than ¼-inch from the lower edge of a 12-foot straightedge when the straightedge is placed parallel or perpendicular to the centerline of the roadway. When the width of the pavement replacement is greater than six (6) feet, compliance with the specification shall be measured by placing the straightedge a minimum of 4-feet overlapping the existing pavement.</p>

**336.2.4.2 Adjustments:** When new or existing manholes, valves, survey monuments, clean outs, etc. fall within the limits of the permanent pavement replacement as discussed in this Section, the Contractor shall be responsible for adjusting the various items to the new pavement surface or as directed by the Engineer. This will include but not be limited to slurry and chip seals.

The Contractor will coordinate with the Engineer and with representatives of the various utilities regarding the adjustment and inspection of the work. The Contractor shall be responsible for obtaining and complying with all specifications, special requirements, details, etc. of the Utility Company regarding the adjustments. When adjusting the Agency’s utilities, survey monuments, etc., the adjustment will comply with these Specifications and Details.

The work will be done in compliance with OSHA standards and regulations regarding confined space entry.

The Contractor shall remove all material attached to the lids and/or covers including that of prior work. The method of removal shall be approved by the Engineer and/or the Utility Representative.

Municipality	Supplements
ME	Section 321, 322 and 336 – for all pavement work covered by these sections, the following applies: After the asphalt concrete surface course has been placed, all manholes, valve boxes, cleanouts and other

	existing structures shall be built up or otherwise adjusted to finish grade. The adjustment shall be per M.A.G. Std. Detail 270 and 422. Detector loops for traffic signals shall be installed prior to installation of the surface course
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**336.3 TYPES AND LOCATIONS OF PAVEMENT AND SURFACING REPLACEMENT:**

Normally, the type of pavement replacement and backfill required will be noted on the plans or specified in other portions of the contract documents and construction will be in accordance with Detail 200. This detail requires that a 12 inches “T” Top be utilized when normal traffic flow is perpendicular to any one of the four sides of the trench excavation. Therefore, Type A pavement replacement will require a “T” Top whenever the trench crosses a street or goes through an intersection and at the end(s) if they terminate in the street. Type B pavement replacement will require the “T” Top on the sides that are perpendicular to normal traffic flow.

If a type is not noted on the plans or specified in the special provisions, the following criteria will govern:

Type A pavement replacement, including the “T” Top, will be utilized on all streets where the excavation is parallel to the centerline of the street.

Type B pavement replacement, including the “T” Top, will be utilized on all streets where the excavation is transverse to the centerline of the street.

Type C pavement replacement will be used to match existing portland cement concrete pavement.

Type D pavement replacement may be used when the condition of the existing pavement does not justify construction of Type A or B. Prior written approval of the Engineer is required.

Type F pavement replacement will be utilized to match existing ABC or decomposed granite roadways.

Where a longitudinal trench is partly in pavement, the pavement shall be replaced to the outside edge of the existing pavement, on a straight line, as indicated on the plans. Measurements for payment shall be from the inner limit of pay width allowed below, to the outside edge of the existing pavement as defined herein.

Where no part of a trench is in pavement, surfacing replacement will only be specified where existing surfacing materials have been removed.

When a trench cut is in aggregate surfaced area, the surfacing replacement shall be of a like type and depth as the existing material, compacted to the densities required in Section 601.

<b>Municipality</b>	<b>Supplements</b>
<b>MC</b>	: Type A and Type B pavement surface replacement match point location shall not be located within a lane wheel path. When the standard match point falls in a wheel path, the surface matching point shall be moved out of the wheel path area to within one foot of a lane line stripe or within the center two feet of the travel lane. Type A and Type B pavement surface replacement matching shall not be located within 48” of any asphalt pavement edge. When the required surface match point is located within 48” of an asphalt pavement edge, all asphalt surfacing shall be removed to the asphalt edge and the asphalt edge shall be the new asphalt surfacing match point location. When concrete curb and gutter exist adjacent to asphalt pavement, the lip of gutter shall be considered an edge of the asphalt pavement.

<b>Municipality</b>	<b>Supplements</b>
<b>PH:</b>	TYPES AND LOCATION OF BACKFILL AND SURFACING REPLACEMENT:  Normally, the type of pavement replacement and backfill required for the trench excavation will be noted on the plans or specified in the special provisions and construction will be in accordance

with City of Phoenix Supplement to MAG Detail P-1200.

(A) Unless otherwise specified, the "T" top as shown in City of Phoenix Supplement to MAG Specs Detail P-1200 will not be required within the City of Phoenix. If the project extends into another municipality/county the "T" top may be required for that portion of the project.

(B) When the trench excavation is not being accomplished in conjunction with a paving project, the following backfill and pavement replacement requirements apply:

(1) When the trench is transverse (45 to 90 degrees to street centerline) the backfill material required by Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is required.

(2) When the trench is parallel or less than 45 degrees to the street centerline, the backfill material required by Detail P-1200 for Type A shall be used. Permanent trench pavement replacement is required.

(3) When the trench crosses a major street, collector street, or any other signalized intersection, the backfill materials required by Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is required.

***(C) When the trench excavation is being accomplished in conjunction with a paving project the following backfill and pavement replacement requirements apply:***

(1) When the trench is transverse (45 to 90 degrees to street centerline) the backfill material required by Detail P-1200 for Type B will be used. Permanent pavement replacement is not required.

(2) When the trench is parallel or less than 45 degrees to the street centerline, the backfill material required by Detail P-1200 for Type A shall be used. Permanent trench pavement replacement is not required.

(3) When the trench crosses a major street, collector street, or any other signalized intersection, the backfill material required by Detail P-1200 for Type B shall be used. Permanent trench pavement replacement is not required.

(4) Temporary pavement replacement (MAG 336.2.3) will be required at intersections for traffic control and at existing partial paved areas when the total pavement is not scheduled for immediate removal and replacement. In addition to the above, the Engineer may require temporary pavement at any area where public safety and welfare warrants. This will be a non-pay item considered incidental to the project.

(5) If the excavation extends beyond the limits of the paving project, the Contractor shall provide permanent trench pavement replacement in accordance with paragraph (B) for this extension.

(D) When the trench excavation is made in Portland cement concrete pavement, Detail P-1200 Type C backfill and pavement replacement applies.

(E) When the condition of the existing pavement does not justify the use of Detail P-1200, Type A or Type B backfill, Type D backfill and pavement replacement shall apply. Written approval from the Engineer shall be required.

(F) When the trench excavation is made in ABC or decomposed granite pavement, Detail P-1200 Type E backfill and pavement replacement shall apply.

(G) When the trench excavation is made in asphalt concrete pavement which has a soil cement base course, concrete treated base course or bituminous treated base course, the Contractor

	has the option of matching the existing pavement structure, including all courses, or replacing the pavement structure with equivalent full depth asphalt concrete pavement. For computing the equivalent asphalt concrete pavement required, 1 inch of asphalt concrete is equivalent to 3.25 inches of ABC or 1.4 inches of soil cement, cement treated base or bituminous treated base. After computations are completed, the equivalent depth will be rounded off to the next higher 1/2 inch, i.e., 6.15 inches computed would be rounded to 6.5 inches.
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Municipality	Supplements
SC	<p><b>TYPES AND LOCATIONS OF PAVEMENT AND SURFACING REPLACEMENT</b>  <i>Add the following paragraph:</i></p> <p>The Contractor will be responsible to replace, at his own cost, any and all damaged pavement outside the pay limits, due to his construction activities on the project. This includes, but is not limited to, the replacement of newly cracked pavement, the replacement of existing cracked pavement where the cracks have been widened, the replacement of any chipped or missing pieces of pavement, and the replacement of any deformed pavement. The pavement will be sawcut at right angles to the roadway, to encompass the replacement areas</p>

**336.4 MEASUREMENT:**

Measurement for payment and surfacing replacement shall be by the square yard, based upon actual field measurement of the area covered except as noted below.

(A) In computing pay quantities for replacement Types A, B, and F, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than 1/2 the distance, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel.

(B) In computing pay quantities for replacement Types C, D, E, and T, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than 1/2 the distance plus 12 inches, either side, from the centerline of the pipe as depicted on Table 601-1, Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel.

(C) Where a longitudinal trench is partly in pavement, computations of pay quantities shall be based on the limitations specified above.

(D) The length of pavement and surfacing replacement shall be measured through any manhole, valve box, or other structure constructed in the pipe line, and any pavement or surface replacement and/or seal treatment in excess of the above pay widths shall be considered and included in the bid item for such structure.

(E) Any pavement replacement in excess of the specified pay widths necessitated by the installation of valves, tapping sleeves and valves, valve by-passes, and concrete thrust blocks shall be included in the bid price for these items.

(F) When special provisions allow deviations from the trench widths specified in Section 601, the above allowed pay widths for pavement replacement may be altered where so specified.

(G) Measurement of pavement and surfacing replacement shall be made along the finished surface of the ground to the nearest foot, and shall be computed to the nearest square yard.

Municipality	Supplements
MC	<p>Replace paragraphs (A) and (B) with the following:  (A) In computing pay quantities for replacement Types A, B, and F, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than 1/2 the distance, either side, from the centerline of the pipe as depicted on Table 601-1, <i>Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel</i>. Except, the pay width for Types A and B pavement replacement will</p>

	<p>extend to the adjusted field width required to obtain the surface match point outside of a wheel path or the added width required when the match point is relocated to the edge of the asphalt pavement.</p> <p>(B) In computing pay quantities for replacement Types C, D, E, and T, pay widths will be based on the actual field measured width, however the boundaries of the measurement will not extend further than 1/2 the distance plus 12 inches, either side, from the centerline of the pipe as depicted on Table 601-1, <i>Maximum Width At Top Of Pipe Greater Than O.D. Of Barrel</i>. The pay width for Type T pavement replacement will extend to the adjusted field width required when the surface match point is adjusted to be outside of a wheel path or is required to be relocated to the edge of the asphalt pavement.</p>
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Municipality	Supplements
<b>PH:</b>	<p>MEASUREMENT: change first paragraph to read:</p> <p style="padding-left: 40px;">Measurement and payment for permanent pavement replacement will be by the square yard, for the thickness specified. In computing the pay quantity, the field measurement along the centerline of the trench, and the trench pay width as listed in COP Supplement 601 shall be used. When the longitudinal trench is only partially in the pavement, adjustments in the pay width will be made by the Engineer.</p> <p style="padding-left: 40px;">There will be no separate measurement and payment for trench backfill. The cost of the backfill shall be considered incidental to the cost of the pipe.</p>

**336.5 PAYMENT:**

Direct payment for pavement or surfacing replacement will be made for replacement over all pipe trench cuts except as otherwise allowed in the special provisions. Payment for replacements over other work shall be included in the cost of constructing that work, in accordance with the applicable standard details and specifications.

Payment for temporary pavement replacement shall be included in the cost of the pipe.

When a Contractor has the option of either jacking and/or boring or open-cut construction, and elects to construct a pipeline by the jacking and/or boring method, he will be paid for the replacement of such items of work as pavement, curb and gutter, sidewalk, driveway, and alley entrances, as allowed for open-cut construction.

**CONCRETE CURB, GUTTER, SIDEWALK, SIDEWALK RAMPS, DRIVEWAY AND ALLEY ENTRANCE**

**340.1 DESCRIPTION:**

The various types of concrete curb, gutter, sidewalk, sidewalk ramps, driveways, and alley intersections shall be constructed to the dimensions indicated on the plans and standard detail drawings. Joints shall be designated as expansion joints or contraction joints and shall be constructed as per Subsection 340.3.

Municipality	Supplements
SC	<p><b>DESCRIPTION:</b> <i>Add the following sentence:</i></p> <p>All driveways, alley entrances and sidewalk ramps constructed in the City of Scottsdale shall be a minimum of 8 inches thick.</p> <p>All sidewalks constructed adjacent to roll, ribbon, mountable curb or other curb which may be easily driven over, shall be a minimum of 5 inches thick.</p> <p>All curb and sidewalk at curb returns shall be monolithically poured.</p> <p>MAG Standard Detail 206, Concrete Scupper, shall be the basis of scupper construction unless prior approval is obtained from City staff.</p>

**340.2 MATERIALS:**

Concrete shall be class B, conforming to the applicable requirements of Section 725.

Expansion joints filler shall comply with Section 729.

Municipality	Supplements
GI	<ul style="list-style-type: none"> <li>▪ <b>Materials</b> <ol style="list-style-type: none"> <li>1. Curb and gutter, vertical curb and sidewalk shall be class “B” concrete conforming to the applicable requirements of Section 725 of M.A.G. Specifications. Use of Fly Ash will not be permitted. Use of Calcium Chloride will not be permitted when ambient air temperature is ninety (90) degrees Fahrenheit or above increasing.</li> <li>2. Valley gutter, aprons and all driveway entrances shall be class “A” concrete conforming to applicable requirements of M.A.G. Section 725. Use of Fly Ash will not be permitted unless approved by the Town Engineer in writing. Calcium Chloride will not be permitted when ambient air temperature is ninety (90) degrees Fahrenheit and rising, or when temperature is ninety (90) degrees Fahrenheit and rising, or when temperature falls below thirty-two (32) degrees Fahrenheit.</li> <li>3. Driveways and entrances for commercial and industrial buildings and complexes shall be constructed utilizing class “A” concrete a minimum of eight (8) inches in thickness.</li> <li>4. Private and residential entrances and driveways other than rolled curb shall be constructed per M.A.G. Standard Detail 250.</li> <li>5. Aprons shall be constructed in accordance with approved plans and specifications utilizing class “A” concrete for commercial and residential projects.</li> </ol> </li> </ul>

	<p>6. Footings for valley gutters within the apron structures shall be constructed with class “A” concrete in accordance with approved plans and specifications. Footings shall be finished smooth and constructed independent of the apron structure. The use of bond breakers, such as felt, plastic, etc. will not be permitted unless approved in writing by the Town Engineer. Footings shall be constructed a minimum of twenty-four (24) hours prior to placement of concrete within the apron structure unless otherwise approved by the Town Engineer.</p> <p>7. Valley gutters shall be constructed of class “A” concrete and poured continuous</p>
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**340.2.1 Detectable Warnings** Detectable warnings shall consist of raised truncated domes aligned in a square grid pattern in conformity to the Americans with Disabilities Accessibility Guidelines. Truncated domes shall have the following nominal dimensions: base diameter of 0.9 inches, top diameter of 0.4 inches, height of 0.2 inches, and dome spacing center-to-center spacing of 2.35 inches, measured between the most adjacent domes on the square grid. Detectable warnings shall contrast visually with adjoining surfaces. Visual contrast shall be obtained by color, use safety yellow or other approved color. The color shall be an integral part of the material surface. The material is to be durable with a non-slip surface not subject to spalling, chipping, delamination, or separation. All detectable warnings shall be approved by the jurisdictional agency prior to installation.

Municipality	Supplements
MC	<p>Detectable warnings shall consist of raised truncated domes aligned in a square grid pattern in conformity to the Americans with Disabilities Accessibility Guidelines. Truncated domes shall have the following nominal dimensions: base diameter of 0.9 inches, top diameter of 0.4 inches, height of 0.2 inches, and dome spacing center-to-center spacing of 2.35 inches, measured between the most adjacent domes on the square grid. Detectable warnings shall contrast visually with adjoining surfaces. Visual contrast shall be obtained by color, use safety yellow or other approved color. The color shall be an integral part of the material surface. The material is to be durable with a non-slip surface not subject to spalling, chipping, delamination, or separation. Surface applications dependent on an adhesive bonding agent(s) are not approved for use. All detectable warnings must be approved prior to installation. Request for approval are to be directed to MCDOT’s Operations and Maintenance Division (602) 506-8362</p>

**340.3 CONSTRUCTION METHODS:**

Existing pavements and concrete, that are joined by new construction, shall be cut in accordance with Section 601.

The subgrade shall be constructed and compacted true to grades and lines shown on the plans and as specified in Section 301. All soft or unsuitable material shall be removed to a depth of not less than 6 inches below subgrade elevation and replaced with material satisfactory to the Engineer. When the Engineer determines that the existing subgrade consists of soils with swelling characteristics, the moisture content shall be brought as close as possible to the optimum required for compaction. This shall be done by the addition of water, by the addition and blending of dry suitable material or by the drying of existing material. The subgrade shall then be compacted to a relative density of 75% minimum to 85% maximum with 80% as ideal.

Material displaced in the construction shall not be placed on the base and/or surfacing material already in place on the roadway nor shall the excavated material be placed in such a manner as to interfere with access to property or traffic flow in the street.

Existing concrete sidewalks and driveways which abut the new sidewalks and driveway entrances shall be removed to a distance required to maintain a slope as indicated by standard details or not to exceed 1 inch per foot where sidewalks are concerned. Sawcutting is required at the match lines and payment will be made under the respective pay items as provided in the proposal.

Concrete curbs, gutters and sidewalks shall be constructed by the conventional use of forms, or may be constructed by means of an appropriate machine when approved by the Engineer.

If machines designed specifically for such work and approved by the Engineer are used, the results must be equal to or better than that produced by the use of forms. If the results are not satisfactory to the Engineer, the use of the machine shall be discontinued and the Contractor shall make necessary repairs at his own expense. All applicable requirements of construction by use of forms shall apply to the use of machines.

Forms conforming to the dimensions of the curb, gutter, sidewalk, sidewalk ramps, driveway, and alley entrance shall be carefully set to line and grade, and securely staked in position. The forms and subgrade shall be watered immediately in advance of placing concrete.

Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the concrete.

The concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to the forms. The concrete may be compacted by mechanical vibrators approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate is below the concrete surface.

Unless otherwise specified, expansion joints shall be installed at all radius points, at both sides of each driveway, at both sides of each alley entrance, at adjoining structures and at every change of depth in the concrete. The maximum distance between expansion joints shall be 50 feet. Expansion joints shall be constructed in a straight line, vertical plane and perpendicular to the longitudinal line of the sidewalk, curb and gutter, single curb, etc., except in cases of curved alignment, where they will be constructed along the radial lines of the curve. Expansion joints shall be placed to match the joints of the adjacent concrete such as sidewalk to the curb and gutter or single curb, etc. Expansion joints shall be constructed to the full depth and width of the concrete with the top of the material one-quarter inch below the top surface as depicted in Detail 230. Unless otherwise specified, all expansion joints installed against newly placed concrete, sawcut or other smooth surfaces shall comply with Section 729.1 - Premolded Joint Filler per ASTM D-1751, 1/2 inch, Bituminous Type. Expansion joints installed against existing uneven surfaces shall be per Section 729.2 - Pour Type Joint Filler.

Contraction joints, unless otherwise specified, shall be constructed in accordance with the standard details, and in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk, sidewalk ramp or curb and gutter, except in cases of curved alignment when they will be constructed along the radial lines of the curb.

Sidewalk or sidewalk ramp score marks, unless otherwise specified, shall be constructed in accordance with the standard detail.

All edges shall be shaped with a suitable tool so formed as to round the edges to a radius as indicated on the standard details.

The front face form shall not be removed before the concrete has taken the initial set and has sufficient strength to carry its own weight, gutter forms and rear forms shall not be removed until concrete has hardened sufficiently to prevent damage to the edges. Special care shall be taken to prevent any damage. Any portion of concrete damaged while stripping forms shall be repaired or if the damage is severe, replaced at no additional cost to the Contracting Agency. The face, top, back, and flow line of the curb and gutter shall be tested with a 10-foot straightedge or curve template, longitudinally along the surface. Any deviation in excess of 1/4 inch shall be corrected at no additional cost to the Contracting Agency.

The surface of concrete sidewalk or sidewalk ramp shall be tested with a 5-foot straightedge. Any deviation in excess of 1/8 inch shall be corrected at no additional cost to the Contracting Agency.

When required by the Engineer, gutters having a slope of 0.8 foot per hundred feet or less, or where unusual or special conditions cast doubt on the capability of the gutters to drain, they shall be water tested. Water testing shall consist of establishing flow in the length of gutter to be tested by supplying water from a hydrant, tank truck or other source. One hour after the supply of water is shut off, the gutter shall be inspected for evidence of ponding or improper shape. In the event water is found ponded in the gutter to a depth greater than 1/2 inch, or on the adjacent asphalt pavement, the defect or defects shall be corrected in a manner acceptable to the Engineer without additional cost to the Contracting Agency.

Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency.

Finishing and curing of the concrete shall be done in the manner specified in Section 505.

The Contractor shall stamp his name and year on all work done by him, on each end of the curb, gutter, sidewalk or sidewalk ramp. The letters shall not be less than 3/4 inch in height.

Municipality	Supplements
GI	<p><b>Subgrade Construction</b></p> <p>1. Curb subgrade. The subgrade shall be constructed and compacted true to grades and lines as shown on the plans and as specified by the Town of Gilbert. All soft or unsuitable materials shall be removed to a depth of not less than six (6) inches below subgrade elevation and replaced with material satisfactory to the Town Engineer. Subgrade materials shall be moistened or dried to optimum moisture content plus or minus two (2) percent and compacted to a minimum of ninety (90) percent of the maximum density in accordance with ASTM D-698.</p> <p>2. Sidewalk subgrade. Materials having expansive potentials of four (4) percent or less shall be moisture conditioned and compacted to the following specifications. Subgrade materials shall be moisturized to a moisture content of two (2) percent to four (4) percent above optimum for a minimum depth of eight (8) inches and compacted to a density of ninety (90) to ninety-five (95) percent a minimum of twenty-four (24) hours prior to concrete placement. Subgrade conditions shall be maintained in this condition until the time of concrete placement. Subgrade materials having an expansive potential greater than four (4) percent shall be moisture conditioned two (2) percent to five (5) percent above optimum for a minimum depth of twelve (12) inches and compacted to a density of ninety (90) to ninety-five (95) percent, between thirty-six (36) and forty-eight (48) hours prior to concrete placement. These conditions shall be maintained until the time of concrete placement. In no case shall curb subgrade consist of existing base materials and/or surfacing material already in place. Granular base materials or clean sands shall not be permitted for use as curb subgrade or be utilized as fill below bottom of curb, unless approved by the Town Engineer in writing.</p> <p>3. Valley Gutter, Apron and Driveway Subgrade. Materials having expansive potential shall be moistened or dried to optimum moisture content plus or minus two (2) percent for a depth of eight (8) inches and compacted to a density between ninety (90) and ninety-five (95) percent. The subgrade shall be firm and unyielding prior to the placement of concrete. Non-expansive materials shall be moistened or dried to optimum moisture content plus or minus three (3) percent for a depth of eight (8) inches and compacted a density of ninety-five (95) percent.</p> <p><b>Concrete Curbs, Gutters and Sidewalks Construction.</b></p> <p>Concrete curbs, gutters and sidewalks shall be constructed by the conventional use of forms, or an appropriate machine upon approval of the Town Engineer. Forms shall be thoroughly cleaned prior to each use and shall be coated with a light oil or other releasing agent of a type which will not discolor the concrete. The concrete shall be thoroughly spaded away from forms so that there will be no rock pockets next to the forms. The concrete may be compacted by mechanical vibrators as approved by the Town Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface and coarse aggregate is below the concrete surface.</p> <p>Expansion joints, unless otherwise specified, shall be constructed in accordance with the Town of Gilbert Standard Details and in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk or curb and gutter, except in cases of curved alignment, when they will be constructed along the radial lines of the curve. They shall be constructed to the full depth and width of the concrete and shall match the joints in the adjacent pavement, sidewalk or curb and gutter. Joints shall be constructed at all radius points, driveways, alley entrances and at adjoining structures with a maximum interval of fifty (50) feet between joints.</p> <p>Contraction joints, unless otherwise specified, shall be constructed in accordance with the Town of Gilbert Standard Details and in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk or curb and gutter, except in cases of curved alignment when they will be</p>

	<p>constructed along the radial lines of the curb. They shall be constructed to a depth of one (1) inch and at five-foot intervals on sidewalk and curb &amp; gutter widths of six (6) feet and eight-foot intervals on sidewalk widths of four (4) feet. Sidewalk score marks, at least ½ inch deep, are required every four (4) feet or every five (5) feet matching the width of the sidewalk. The front face form shall not be removed before the concrete has taken its initial set and has sufficient strength to carry its own weight. All gutters will be required to be flow tested.</p> <p>Grinding and/or epoxy patching of curbs-gutters-aprons, valley gutters – driveways- scuppers – manhole bases and inverts of any concrete structure to correct deficiencies that result from improper grade setting, or construction methods, or breakage due to any circumstances shall not be permitted.</p>
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Municipality	Supplements
<b>GI</b>	<p><b>Curb returns and ramps</b> 3.22 Curb returns and ramps: All street intersections shall be constructed with concrete vertical curb returns and a single sidewalk ramp. For back of curb radius 30' and over, use MAG Std. Det. 231. For back of curb radius less than 30' and a curb height more than 4", use MAG Std. Det. 232. For back of curb radius less than 30' and a 4" curb height, use MAG Std. Det. 234. The radius to back of curb for the return shall be: Glendale Table 3.1</p> <p><b>Concrete placement and curing</b> 3.27 Concrete placement and curing: All concrete shall be mixed, placed and cured as required by MAG specifications. For curb, gutter and sidewalk, subgrade densities shall be 90% of a Standard Proctor, (ASTM D-698). These specifications require that white-pigmented curing compound be used on all concrete paving items such as streets, curbs, gutter and sidewalks. The particular white-pigmented curing compound selected by the contractor must meet the requirements of either AASHTO M-148, Type 2, Class A, or that of ASTM C 309, Type 2, Class A. It is important to begin the application of curing compound immediately after the surface water has disappeared from the concrete and the surface will support walking workmen. The coverage should be uniform, not spotty or with missed areas. The curing compound should be applied at a rate of 200 square feet per gallon</p>

Municipality	Supplements
<b>ME</b>	<p>Subsection 340.3 – for all concrete sidewalk expansion joints, the following applies: Expansion joints for concrete sidewalk shall be constructed at all radius points, at both sides of each driveway and alley entrance, at adjoining structures, and at every change of depth in the concrete. There shall be a maximum interval of 50-feet between expansion joints. The expansion joint shall be constructed to the full width of the concrete. The depth of the expansion joint material shall be one-inch (1”) greater than the depth of the thickest concrete adjacent to the joint. The expansion joint material shall comply with subsection 729.1 of the M.A.G. Uniform Standard Specifications and shall be installed in a vertical plane with the top of the joint material one-quarter inch (1/4”) below the sidewalk surface as depicted in M.A.G. Detail 230. U. Subsection 401.3 – Add a new sentence to read as follows: Contractor shall use off-duty City of Mesa police officers as required by the City of Mesa Traffic Barricade Manual for work within the City limits.</p>

Municipality	Supplements
<b>PH:</b>	<p>CONSTRUCTION METHODS: change the 3rd, 4th, and 5th paragraphs to read:</p> <p>Expansion joints, unless otherwise specified, shall be constructed in accordance with the City of Phoenix Detail P1230. They shall be in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk or curb and gutter, except in case of a curved alignment when</p>

	<p>they will be constructed along the radial lines of the curve. The expansion joints shall be constructed to the full depth and width of the concrete and shall match the joints in the adjacent pavement, sidewalk or curb and gutter. The expansion joint material shall extend fully through the concrete from the surface to one inch into the subgrade. Joints shall be constructed at all radius points, driveways, alley entrances and at adjoining structures with a maximum interval of 50 feet between joints.</p> <p>Contraction joints, unless otherwise specified, shall be constructed in accordance with City of Phoenix Detail P1230 and in a straight line and vertical plane perpendicular to the longitudinal line of the sidewalk or curb and gutter, except in case of a curved alignment when they will be constructed along the radial lines of the curb. They shall be constructed to a depth of 1-1/2" at 10' intervals on all sidewalks regardless of the width. Unless an expansion joint is required, a contraction joint will coincide with each form joint. Sidewalk score marks, at least 1/2 inch deep are required at the mid-point of the contraction joint.</p>
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Municipality	Supplements
SC	<p><b>CONSTRUCTION METHODS:</b> <i>Is modified as follows:</i></p> <p><i>Delete the last sentence of paragraph 10 and insert the following:</i></p> <p>Joints shall be constructed at all radius points, driveways, alley entrances, and at adjoining structures with a maximum interval of 50 feet between joints, and shall provide for complete separation of adjoining structures.</p> <p><i>Add the following paragraph between paragraphs 16 and 17 (Added text is highlighted.):</i></p> <p>In the event water is found ponded in the gutter to a depth greater than 1/2-inch, or on the adjacent asphalt pavement, the defect or defects shall be corrected in a manner acceptable to the Engineer without additional cost to the Contracting Agency.</p> <p><b>In addition to the straightedge requirements specified herein, all finish concrete elevations shall not deviate from the elevations shown on the plans, or indicated by typical sections or standard details referenced within the construction documents, by more than 1/4 inch as determined by the Engineer. Areas between elevations shown on the plans shall be straight graded or smoothly transitioned through a vertical curve in a manner approved by the Engineer or as otherwise indicated on the construction documents.</b></p> <p><b>Sidewalk panels, all gutters, curbs, and aprons with cracks shall be replaced by the Contractor.</b></p> <p>Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency.</p>

**340.3.1 Detectable Warnings** The detectable warning surface shall be located so that the edge nearest the curb line is 6 inches minimum and 8 inches maximum back from the face of curb. Detectable warning surfaces for railroads shall be located so that the edge nearest the rail crossing is 6 inches minimum and 8 inches maximum from the vehicle dynamic envelope.

Detectable warnings shall be installed perpendicular to the direction of pedestrian/wheelchair travel and have a minimum width of 24 inches measured perpendicular to the edge of the roadway or rail crossing. The base surface of detectable warnings shall be installed flush with the adjacent walkway surface, the truncated domes shall extend above the walkway surface. The boundary between detectable warnings and the adjacent walkway shall provide a flush uniform surface that will not cause ponding of water nor present a tripping hazard.

Detectable warnings installed on sidewalk ramps shall modify the sidewalk concrete thickness at the detectable warning to provide a minimum thickness of four-inches (4"). When detectable warnings are modules inset into the sidewalk ramp, the bottom surface of the sidewalk shall be lowered a distance equal to or greater than the module thickness to maintain the minimum sidewalk thickness. The sidewalk bottom surface shall have a minimum transition taper length of 12" between the thickened and normal depth sections of sidewalk.

**340.4 BACKFILLING:**

Unless otherwise specified the Contractor shall backfill behind the curbs, sidewalk or sidewalk ramps with soil native to the area to the lines and grades shown on the plans.

**340.5 MEASUREMENT:**

Concrete curbs and gutters of the various types shown on the plans and in the proposal, will be measured along gutter flow line through inlets, catch basins, driveways, sidewalk ramps, etc., by the lineal foot to the nearest foot for each type, complete in place.

Concrete sidewalks, sidewalk ramps, driveways, alley intersections, valley gutters and aprons will be measured to the nearest square foot complete in place. When concrete sidewalk, sidewalk ramps, driveways, alley intersections, valley gutters, and/or aprons are cut during trenching operations, the square foot measurement for payment will be in accordance with Section 336.

Detectable warnings shall not be measured for payment. Detectable warning are considered integral to the walking surface that they form a part of and the cost is included in the related pay item.

**340.6 PAYMENT:**

Payment for the above named items will be made in accordance with the unit prices or lump sums as set forth in the proposal. Such payment shall include full compensation for furnishing all labor, material, tools and equipment and accomplishing all work in conformance with the contract documents.

## **TERRAZZO SIDEWALKS**

### **341.1 DESCRIPTION:**

Terrazzo consists of a mixture of grey or white portland cement, cement color pigments, abrasive aggregate and colored marble chips, with the surface ground to finish grade so as to expose approximately 75 percent of the marble granules.

Cement and concrete shall be in accordance with Section 725.

All applicable portions of Section 340 for construction of concrete sidewalks shall be adhered to.

The Contractor shall furnish all equipment, labor, materials, tools, services, transportation and incidentals necessary to construct a sidewalk with a terrazzo surface course.

### **341.2 MATERIALS AND COMPOSITION:**

Divider strips shall be of half-hard brass, white metal 99 percent zinc or alloy. The strips shall have a minimum thickness of 1/8 inch and shall be provided with proper anchoring devices. Pre-assembled decorative units may be used. Double divider strips or metal expansion joints shall be used in the terrazzo course directly above the expansion joints in the concrete base or slab.

Cement mortar colors shall be lime-proof non-fading pure mineral pigments.

Abrasive aggregate shall consist of alundum or other approved lime-proof abrasive.

Marble chips shall be of an exterior grade marble that will not weather nor discolor. The granule shall be of such proportions of size Nos. 1, 2, 3 as shall be hereafter determined. Samples of the terrazzo shall be made for approval of the Engineer.

Composition of the terrazzo shall be in the proportion of 200 pounds of marble aggregate to 100 pounds of gray or white portland cement, mixed dry. The marble aggregate shall consist of 4 parts of marble chips, and cement color pigments to 2 parts of abrasive aggregate.

(A) Add sufficient water to make the mixture plastic but not flowing, a water to cement ratio 0.44 to 0.49.

(B) All materials, including water shall be mixed in a mechanical mixer or in a mortar box for not less than 2 minutes. Only amounts shall be mixed which can be placed immediately.

### **341.3 CONSTRUCTION METHODS:**

Concrete base or slab shall be of Class B concrete, 4 inches thick, and reinforced with 6" x 6 inches No. 10 gage wire mesh fabric.

(A) The concrete base shall be separated from the natural ground surface by overlapping 15 pound asphalt impregnated roofing felt, plastic sheeting or other approved water-proofing material. In areas having excessive rise of ground water, the edges of the concrete shall also be water-proofed.

(B) Where a pitch in the finished surface is required, the concrete slab shall be pitched to the required degree.

(C) Premolded expansion joints of the type designated in Section 729, shall be placed in the concrete base or slab at 20 foot intervals and also against buildings and curbs. Double divider strips or metal expansion joints are to be used in the terrazzo course directly above the expansion joints in the concrete base slab.

(D) The top of the base slab shall be broom finished to leave a slightly roughened surface to insure a bond between the concrete and the terrazzo finish.

(E) While the base slab is still in a semi-plastic state, the divider strips shall be placed. The divider strips will form panels not more than 3 feet on a side. Where an expansion joint occurs in the concrete base or the type of construction changes, always use a divider.

(F) The concrete slab shall be cured according to the requirement of Section 505.

Bond between concrete base and terrazzo course: Before the terrazzo Contractor installs his work, he must see that the surface of the concrete slab is thoroughly cleaned of plaster droppings, wood chips, and all other debris. He should thoroughly slush it with neat cement grout to ensure a good bond.

**341.3.1 Installation:** Place the terrazzo mix in the spaces formed by the divider strips in such a manner that the marble chips match the chosen pattern in the National Terrazzo and Mosaic Association, Inc. catalog. The mix shall be rolled into a compact mass by means of heavy stone or metal rollers until the superfluous cement and water is extracted, after which it must be hand troweled to an even surface, disclosing the lines of the divider strips on a level with the terrazzo finish.

The finished course shall show at least 75 percent of marble granules and shall not vary in any direction more than 1/8 inch when tested with a 10 foot straightedge. The thickness of the terrazzo course shall be 2 inches. The temperature of the mix at time of placing shall be between 60° and 80°F. and shall be maintained above 70°F. for at least 3 days or above 50°F. for at least 5 days when using normal portland cement.

**341.3.2 Curing:** The terrazzo course must be cured by keeping it moist for at least 6 days by wet sand, paper, or curing mats.

**341.3.3 Surfacing:** When the terrazzo work has set sufficiently hard, it shall be machine rubbed, using No. 24 grit or finer abrasive stones for the initial rubbing. It shall then be resurfaced using a No. 80 grit or finer abrasive stone, after which a light grouting of neat portland cement of the same kind and color as the matrix shall be applied to the surface, filling all voids. The grouting shall then remain until the time of final cleaning. All grinding shall be done in the presence of an excess of water.

**341.3.4 Finishing:** The grouting shall be removed by machines, using a stone not coarser than No. 80 grit. This cleaning for fine-stoning shall not take place sooner than 7 days after the surface has been grouted, after which it must be cleaned thoroughly.

**341.3.5 Sealing:** After cleaning and drying, seal the terrazzo surface with one coat of Hornlux or other sealer approved by the National Terrazzo and Mosaic Association, Inc.

#### **341.4 MEASUREMENT:**

Terrazzo sidewalk will be measured to the nearest square foot complete in place.

#### **341.5 PAYMENT:**

Payment will be made at the unit price bid per square foot, and shall be compensation in full for all construction equipment, labor, materials, plant, services, transportation, and all incidentals necessary to construct a sidewalk with a terrazzo surface course.

**DECORATIVE PAVEMENT CONCRETE PAVING STONE OR BRICK**

**342.1 GENERAL:**

The Contractor shall furnish all necessary labor, material, tools and equipment to complete the proper installation of decorative concrete pavers used in medians, crosswalks, intersections or as otherwise noted in the Contract Documents. This includes furnishing a 10-foot straightedge to accomplish the level test when required by this specification.

The decorative pavement shall be true in line and grade and installed to coincide and align with the adjacent work elevation. All edges shall be retained to secure the pavers and sand laying course.

The Contractor shall construct a sample panel 10-feet by 10-feet for inspection and approval by the Engineer, prior to the actual installation for the project. Once approved, the panel shall be used as a standard for the remainder of the work. The panel shall remain undisturbed through out the construction of the pavers and final approval by the Engineer.

Municipality	Supplements
SC	<p><b>: GENERAL:</b>  <i>Delete the word "crosswalks" after pavement and add the sentence number two.</i></p> <p>The Contractor shall furnish all the necessary labor, material, tools and equipment to complete the proper installation of the concrete pavers used in decorative pavement, medians or as otherwise noted in the Contract Documents. Pavers in cross walks shall not be installed. This includes furnishing a 10-foot straightedge to accomplish the level test specified for the finished decorative pavement.</p> <p>The decorative pavement shall be true as to line and grade and installed to coincide and align with the adjacent work elevation. All edges shall be retained to secure the perimeter and sand laying course.</p> <p>The Contractor shall construct a 5 feet x 5 feet square minimum sample area which will be inspected and approved by the Engineer prior to any other decorative pavement placement</p>

**342.2 MATERIALS:**

**342.2.1 Aggregate Base Course:** Aggregate Base Course shall be per Table 702-1.

Municipality	Supplements
SC	<b>Aggregate Base Course:</b> The ABC shall be aggregate base as per MAG Table 702

**342.2.2 Portland Cement Concrete:** When the pavers are subject to vehicular traffic, Portland Cement Concrete shall be Class A per Section 725. All other locations, the Portland Cement Concrete shall be a minimum of Class B per Section 725.

Municipality	Supplements
SC	<b>Concrete Header and Base Slab:</b> The header and base slab shall be Class A concrete as per MAG Section 725

**342.2.3 Sand:** Sand used for laying course shall conform to ASTM C-33 except for the gradation. The gradation shall comply with Table 342-1.

TABLE 342-1								
SAND GRADATION								
Sieve Size	3/8 inch	No. 4	No. 8	No. 16	No.30	No. 50	No. 100	No. 200
Percent Passing	100	95-100	85-100	15-85	25-60	10-30	2-10	0-1

Municipality	Supplements												
SC	<p><b>Sand Laying Course:</b> Shall be a concrete sand conforming to ASTM C-33 and meeting the following gradation.</p> <table border="0"> <tr> <td><u>Sieve Size</u></td> <td><u>3/8 inch</u></td> <td><u>No. 4</u></td> <td><u>No. 8</u></td> <td><u>No. 100</u></td> <td><u>No. 200</u></td> </tr> <tr> <td>% passing</td> <td>100</td> <td>93-100</td> <td>61-100</td> <td>1-12</td> <td>0-7</td> </tr> </table>	<u>Sieve Size</u>	<u>3/8 inch</u>	<u>No. 4</u>	<u>No. 8</u>	<u>No. 100</u>	<u>No. 200</u>	% passing	100	93-100	61-100	1-12	0-7
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% passing	100	93-100	61-100	1-12	0-7								

**342.2.4 Concrete Pavers:** Pavers shall have a minimum of thickness of 80 mm (3.15) when installed in traffic bearing areas and 60 mm (2.36 in.) When installed in non traffic bearings areas. Pavers shall be of an interlocking design conforming to ASTM C-936-82. Pavers shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. The Contractor shall submit two samples of each type of pavers used on the project for review and approval by the Engineer prior to any work. The pavers and materials used in their manufacture shall conform to the following:

- (A) Compressive Strength: Pavers shall have a minimum compressive strength of 8,000 psi in accordance with ASTM C-140.
- (B) Absorption: The average absorption shall not be greater than 5 percent, with no individual unit absorption greater than 7 percent.
- (C) Portland Cement: Cement shall comply with Section 725.2, Type II.
- (D) Aggregates: Aggregates shall conform to ASTM C-33 (washed, graded sand and rock, no expanded shale or lightweight aggregates).
- (E) Other Constituents: Coloring pigments shall be applied integrally to the concrete. Air entraining admixtures, coloring pigments, integral water repellents, and finely ground silica shall be previously established as suitable for use in concrete and either shall conform to ASTM standards where applicable, or shall be shown by test or experience not to be detrimental to the concrete.
- (F) Physical Properties: The size, shape, design and color of the pavers shall be as noted in the Contract Documents.

Municipality	Supplements
SC	<p><b>Concrete Pavers:</b> The concrete paver thickness shall be 3-1/8 inches (80 mm). Pavers shall be of an interlocking design conforming to ASTM C-936-82. Pavers shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction. The pavers and materials used in their manufacture shall conform to the following:</p> <p>(A) Compressive strength: Pavers shall have a minimum compressive strength of 8000 psi in accordance with ASTM C-140.</p> <p>(B) Absorption: The average absorption shall not be greater than 5 percent, with no individual unit absorption greater than 7 percent.</p> <p>(C) Cement - ASTM C-150 (Portland Cement).</p>

	<p>(D) Aggregates: ASTM C-33 (washed, graded sand and rock, no expanded shale or lightweight aggregates).</p> <p>(E) Other Constituents: Coloring pigments shall be applied integrally to the concrete. Air entraining admixtures, coloring pigments, integral water repellents, and finely ground silica shall be previously established as suitable for use in concrete and either shall conform to ASTM standards where applicable, or shall be shown by test or experience not to be detrimental to the concrete.</p> <p>(F) The size, shape, design and color shall be as noted in the Contract Documents.</p> <p>(G) The Contractor shall submit two samples of the whole paving stone to the Engineer for approval prior to any work.</p> <p>(H) Length or width of units shall not differ by more than <math>\pm 1/6</math> inch (<math>\pm 4.2</math> mm) from approved samples. Heights of units shall not differ by more than <math>\pm 1/8</math> inch (<math>\pm 3.2</math> mm) from the specified standard dimension</p>
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**342.2.5 Expansion Joint:** Expansion joint filler material shall be 1/2-inch premolded and comply with Section 729 and ASTM D-1751.

Municipality	Supplements
SC	: <b>Expansion Joint:</b> Expansion joint filler shall be premolded and comply with MAG Section 729 and ASTM D-1751.

Municipality	Supplements
SC	: <b>342.2.6 Structural Metals:</b> Steel protection angles and bolts shall conform to the requirements of MAG Section 770.

Municipality	Supplements
SC	: <b>342.2.7 Reinforcing:</b> Welded wire fabric used as reinforcement in concrete shall conform to the requirements of MAG Subsection 727.3.

Municipality	Supplements
SC	: <b>342.2.8 Paint:</b> Paint color shall be Number 9 (Light Grey) and shall conform to the requirements of MAG

**342.3 CONSTRUCTION PROCEDURES:**

**342.3.1 Subgrade:** The subgrade shall be constructed true to grades and lines shown on the plans and compacted to a minimum dry density of 95% as specified in MAG Section 301.

Municipality	Supplements
SC	: <b>Subgrade:</b> The subgrade shall be constructed true to grades and lines shown on the plans and compacted to a relative density of 95 percent as specified in MAG Section 301.

**342.3.2 Aggregate Base Course:** When aggregate base course is specified, the aggregate base course shall be constructed true to grades and lines shown on the plans and compacted to a minimum dry density of 100% per Section 301 with the surface of the aggregate base course not varying by more than +1/8-inch in 10-feet.

Municipality	Supplements
<b>PH:</b>	<p>AGGREGATE BASE COURSE: delete in its entirety and substitute the following:</p> <p>The base course for decorative pavement shall consist of a cement-enriched aggregate base slurry consisting of one sack of Type II Portland cement per cubic yard of aggregate base course material. Aggregate base slurry shall be installed over subgrade soil compacted to a minimum of 95% density. The surface elevation of the aggregate base slurry shall be set to bring the 1-inch sand laying course, plus the thickness of the paving stones or bricks to the desired finished elevation of decorative pavement. The surface of the aggregate base slurry shall not vary more than +1/8 inch in 10 feet.</p>

Municipality	Supplements
<b>SC</b>	<p><b>Aggregate Base Course:</b> The aggregate base course shall be constructed true to grades and lines shown on the plans and compacted as specified in MAG Section 310. The surface of the ABC shall be tested with the 10 foot straightedge and shall not vary more than +1/8 inch in 10 feet</p>

**342.3.3 Concrete Header and Base Slab:** Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the Portland Cement concrete.

The Portland Cement concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to the forms. Compacted by mechanical vibrators may be used when approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate has been tamped below the surface.

All edges shall be shaped with a suitable tool to form a rounded edge of radius as directed in Detail 225.

The Portland Cement concrete header face form shall not be removed before the concrete has taken the initial set and has sufficient strength to carry its own weight. The concrete header outer form shall not be removed until the concrete has hardened sufficiently to prevent any damage to the concrete. Any porting of concrete damaged while stripping forms shall be repaired or if the damage is severe, replaced at no additional cost to the Contracting Agency. The face and top of the concrete header shall be tested with a 10-foot straightedge or curve template, longitudinally along the surface. Any deviation in excess of 1/4-inch in 10-feet shall be corrected at no additional cost to the Contracting Agency.

Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency.

Finishing and curing of the concrete shall be done in the manner specified in Section 340.

Municipality	Supplements
<b>SC</b>	<p><b>Concrete Header and Base Slab:</b> The concrete header and base slab shall be of Class A concrete and reinforced with 6 x 6 inch wire mesh fabric (6 inches x 6 inches 1.4 x 1.4 WWF designation). Steel Protection Angles, L 3/8 inch x 3 inches x 3 inches shall be cast-in-place and set to final line and grade as indicated on the plans and shall not cross expansion or contraction joints.</p> <p>Forms shall be thoroughly cleaned each time they are used, and shall be coated with a light oil, or other releasing agent of a type which will not discolor the concrete.</p> <p>The concrete shall be thoroughly spaded away from the forms so that there will be no rock pockets next to</p>

	<p>the forms. The concrete may be compacted by mechanical vibrators approved by the Engineer. Tamping or vibrating shall continue until the mortar flushes to the surface, and the coarse aggregate is below the concrete surface.</p> <p>All edges shall be shaped with a suitable tool so formed as to round the edges to a radius as indicated on the standard details.</p> <p>The concrete header face form shall not be removed before the concrete has taken the initial set and has sufficient strength to carry its own weight. The concrete header outer form shall not be removed until the concrete has hardened sufficiently to prevent any damage to the concrete. Any portion of concrete damaged while stripping forms shall be repaired or if the damage is severe, replaced at no additional cost to the Contracting Agency. The face and top of the concrete header shall be tested with a 10-foot straightedge or curve template, longitudinally along the surface. Any deviation in excess of 1/4 inch shall be corrected at no additional cost to the Contracting Agency.</p> <p>Any section of the work deficient in depth or not conforming to the plans or specifications shall be removed and replaced by the Contractor at no additional cost to the Contracting Agency.</p> <p>Finishing and curing of the concrete shall be done in the manner specified in MAG Section 505</p>
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**342.3.4 Expansion Joints:** Expansion joints shall be constructed to the full depth and width of the concrete with the top of the material one-half inch below the top surface as depicted in Detail 225 unless otherwise specified. After the concrete is cured, the top one-half inch shall be filled to the surface of the concrete with a premium-grade, high-performance, moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant, ASTM C-920, Type S, Grade NS, Class 25, Sikaflex-1A or equal.

Joints shall be constructed in a straight line and vertical plane perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. In the case of base slabs, pavers shall be placed continuously over the expansion joints.

Municipality	Supplements
SC	<p><b>Expansion and Construction Joints:</b> Premolded 1/2" joint filler strips, ASTM D-1751 per MAG Sec. 729, shall be placed 1/2" below the surface of the concrete, the full width of the expansion joint. The remainder of all joints shall be filled to the surface of the concrete with a premium-grade, high-performance, moisture-cured, single-component, polyurethane-based, non-sag elastomeric sealant, ASTM C-920, Type S, Grade NS, Class 25; Sikaflex-1a or equal.</p> <p>Joints shall be constructed in a straight line and vertical plane perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. They shall be constructed to the full depth and width of the concrete header and base slab. Pavers shall be placed continuously over the expansion joints.</p>

**342.3.5 Contraction Joints:** Contraction joints shall be constructed in a straight line and vertical plane perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. They shall be constructed to a depth of one inch with rounded edges and placed at 10-foot intervals. Contraction Joints shall be filled to the surface of the surrounding concrete with elastomeric sealant specified in 342.3.3.

Municipality	Supplements
SC	<p><b>Contraction Joints:</b> Contraction joints shall be constructed in a straight line and vertical plane perpendicular to the longitudinal line of the concrete header, except in cases of curved alignment when they will be constructed along the radial lines of the header. They shall be constructed to a depth of 1 inch with rounded edges and placed at 10 foot intervals. Contraction Joints shall be filled to the surface of the surrounding concrete with elastomeric sealant specified in 342.3.4.</p>

**342.3.6 Sand Laying Course:** The maximum thickness of the sand course shall be one-inch. Screeding boards shall be used to ensure a uniform thickness. The sand shall not be compacted, walked on or wet down.

Municipality	Supplements
SC	<b>Sand Laying Course:</b> The maximum thickness of the sand course shall be 1 inch. Screeding boards shall be used to ensure a uniform thickness. The sand shall not be compacted, walked on or wet down. The sand course shall be treated with a pre-emergent herbicide, such as Surflan, or equal. The application of the herbicide shall be made not earlier than 4 hours prior to actual placement of the decorative pavement

**342.3.7 Concrete Paving Stones:** The concrete pavers shall be clean and free of foreign materials before installation. Paving work shall be plumb, level and true to line and grade and shall be installed to properly coincide and align with adjacent work and elevations. All edges must be retained to secure the perimeter pavers and the sand laying course. The pavers shall be laid in such a manner that the desired pattern is maintained and joints between the pavers are as tight as possible.

The Contractor shall lay the pavers starting from the longest straight line and from a true 90-degree corner. The pavers shall be installed hand-tight and level on the undisturbed sand course in a manner that eliminates gaps between the stones and the edge retention header. String lines shall be used to hold all pattern lines true. The gaps at the edge of the paver surface shall be filled with pavers cut to fit. Cutting shall be accomplished to leave a clean edge to the traffic (vehicular or pedestrian) surface using a masonry saw cut.

After the pavers are in place, they shall be vibrated into the sand laying course using a vibrator capable of 3,000 to 5,000 pounds compaction force. This will require two passes at 90 degrees to each other. After vibration, approximately 1/4-inch of clean masonry sand containing at least 30 percent of 1/8-inch particles shall be placed over the paver surface, allowed to dry, and vibrated into the joints with additional vibrator passes and brushing so as to completely fill joints. Excess sand shall be swept from the surface.

The finished paver surface shall be tested longitudinally and transverse to the concrete header or curb with a 10-foot straightedge along the surface. Any deviation in excess of 1/8-inch shall be corrected at no additional cost to the Contracting Agency.

Any broken or damaged pavers shall be removed and replaced. Replacement pavers shall be tamped into place and the joints filled with masonry sand as specified herein. The completed installation shall be cleaned of all debris, surplus material and equipment.

Municipality	Supplements
GI	<p>Paving Blocks</p> <p>All paving blocks used within the public streets for crosswalks or to enhance the visual quality of the entry way to a development shall conform to the requirements of Detail G-328. Size, shape, design and colors shall be approved by the City's Community Development Group.</p> <p>A. Interlocking Paving Stones:</p> <ol style="list-style-type: none"> <li>1. All interlocking concrete paving stones shall be sound and free of defects that would interfere with the proper placing of the unit or impair the strength or permanence of the construction.</li> <li>2. Size, shape, design and colors shall be approved by the City's Community Development Group.</li> </ol> <p>B. Dry Set Mortar Bed: The thickness of the dry set mortar bed course shall be uniform to insure an even surface and shall be provided and installed by the paving stone installer.</p> <p>C. Installation:</p> <ol style="list-style-type: none"> <li>1. Paving work should be plumb, level and true to line and grade to properly coincide and align with adjacent work and elevations. All edges must be retained to secure the perimeter stones and the dry set mortar bed.</li> <li>2. Cutting of paving stones shall be done with a masonry saw.</li> <li>3. The completed paving stone installation shall be washed down and cleaned to provide a clean finished workmanlike installation.</li> </ol>

Municipality	Supplements
SC	<ul style="list-style-type: none"> <li data-bbox="380 308 1485 457">▪ <b>Concrete Pavers:</b> The concrete pavers shall be clean and free of foreign materials before installation. Paving work shall be plumb, level and true to line and grade and shall be installed to properly coincide and align with adjacent work and elevations. All edges must be retained to secure the perimeter pavers and the sand laying course. The pavers shall be laid in such a manner that the desired pattern is maintained and joints between the pavers are as tight as possible.</li> </ul> <p data-bbox="428 491 1485 667">The Contractor shall lay the pavers starting from the longest straight line and from a true 90 degree corner. The pavers shall be installed hand-tight and level on the undisturbed sand course in a manner that eliminates gaps between the stones and the edge retention header. String lines shall be used to hold all pattern lines true. The gaps at the edge of the paver surface shall be filled with pavers cut to fit. Cutting shall be accomplished to leave a clean edge to the traffic surface using a masonry saw cut.</p> <p data-bbox="428 701 1485 884">After the pavers are in place, they shall be vibrated into the sand laying course using a vibrator capable of 3,000 to 5,000 pounds compaction force. This will require two passes at 90 degrees to each other. After vibration, approximately 1/4-inch of clean masonry sand containing at least 30 percent of 1/8-inch particles shall be placed over the paver surface, allowed to dry, and vibrated into the joints with additional vibrator passes and brushing so as to completely fill joints. Excess sand shall be swept from the surface.</p> <p data-bbox="428 917 1485 1003">The finished paver surface shall be tested longitudinally and transverse to the concrete header or curb with a 10-foot straightedge along the surface. Any deviation in excess of 1/8 inch shall be corrected at no additional cost to the Contracting Agency.</p> <p data-bbox="428 1037 1485 1123">Any broken or damaged pavers shall be removed and replaced. Replacement pavers shall be tamped into place and the joints filled with masonry sand as specified herein. The completed installation shall be cleaned of all debris, surplus material and equipment.</p> <ul style="list-style-type: none"> <li data-bbox="380 1157 1485 1243">▪ <b>SC: 342.3.8 Painting:</b> Protection Angles shall be painted on all surfaces not in contact with concrete with one prime coat, a second coat and a finish coat. All painting shall be done after steel is fabricated and prior to installation.</li> </ul>

**342.4 MEASUREMENT AND PAYMENT:**

Measurement will be the square foot. Payment will be made at the unit bid price per square foot. This payment shall be full compensation for all labor, materials, tools and equipment required to complete the work.

Municipality	Supplements
PH:	<p data-bbox="331 1524 1268 1556">MEASUREMENT AND PAYMENT: delete in its entirety and substitute the following:</p> <p data-bbox="331 1585 1485 1703">Measurement for deco pavement shall be by the square foot. Payment for deco pavement shall be made at the unit bid price per square foot including subgrade preparation, cement-enriched aggregate base slurry, and sand base. This payment shall be full compensation for all labor, materials, tools and equipment required to complete the work</p>

Municipality	Supplements
SC	<p data-bbox="331 1806 1485 1923">Measurement will be by the square foot. Payment will be made at the unit bid price per square foot. This payment shall be full compensation for all labor, materials, tools and equipment required to complete the work for the concrete pavers, headers and base materials described herein and indicated in the standard details and contract documents</p>

## EXPOSED AGGREGATE PAVING

### 343.1 DESCRIPTION:

Exposed aggregate paving consists of placing a concrete slab with exposed aggregate in the surface of the finished concrete. This exposed aggregate paving is designed for decorative or pedestrian use only. It should not be used in areas subject to vehicular traffic.

### 343.2 MATERIAL:

**343.2.1 Concrete:** Concrete shall be Class A per Section 725 with a maximum slump of 3 inches.

**343.2.2 Exposed Aggregate:** The exposed aggregate shall be uncrushed riverrun rocks. The Contractor shall provide at least a 10-pound sample for approval by the Engineer prior to any aggregate paving.

(A) When the paving is for decorative use only, no pedestrian traffic, the aggregate shall not be larger than 3 inches or smaller than 1 1/2 inches.

(B) When the paving is to be used for pedestrian traffic, the aggregate shall be not larger than 2 inches or smaller than 1 inch.

Municipality	Supplements
SC	<p><b>ASPHALT PRINT PAVING GENERAL</b></p> <p>The Contractor shall furnish all the necessary labor, material, tools, and equipment to complete the proper installation of the asphalt print paving used in decorative pavement, cross-walks, medians or as otherwise noted in the Contract Documents. This includes furnishing a 10-foot straight edge to accomplish the level test specified for the finished decorative pavement</p>

Municipality	Supplements
SC	<p><b>Aggregate Base Course:</b> The ABC shall be aggregate base as per MAG Table 702</p>

Municipality	Supplements																																							
SC	<p><b>Asphalt Concrete Pavement:</b> Asphalt concrete pavements shall be MAG 321 and as specified in the Contract Documents.</p> <ul style="list-style-type: none"> <li> <p>▪ <b>343.2 StreetBond Traffic Formula or approved alternate</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Characteristics</th> <th style="text-align: left;">Test specification</th> <th style="text-align: left;">Standard</th> </tr> </thead> <tbody> <tr> <td>Solids by volume (%)</td> <td>ASTM D5201</td> <td>53±3%</td> </tr> <tr> <td>Solids by Weight (%)</td> <td>ASTM D1351</td> <td>75.5±2%</td> </tr> <tr> <td>Density (lbs/gal)</td> <td>ASTM D1475</td> <td>14.6±0.2 (1.75 gr/l)</td> </tr> <tr> <td>Flash Point</td> <td>ASTM D3278</td> <td>&gt;200<sup>0</sup>F (93<sup>0</sup>C)</td> </tr> <tr> <td>Percent Pigment (by weight Including cement)</td> <td>ASTM D3723</td> <td>62±2%</td> </tr> <tr> <td>Sheen (85<sup>0</sup>F)</td> <td>ASTM D523</td> <td>&lt;3@85<sup>0</sup>F</td> </tr> </tbody> </table> </li> <li> <p><b>343.2 StreetBond Sealer or approved alternate</b></p> <table style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left;">Characteristics</th> <th style="text-align: left;">Test specification</th> <th style="text-align: left;">Standard</th> </tr> </thead> <tbody> <tr> <td>Solids by volume (%)</td> <td>ASTM D5201</td> <td>24±3%</td> </tr> <tr> <td>Solids by Weight (%)</td> <td>ASTM D1353</td> <td>27±2%</td> </tr> <tr> <td>Density (lbs/gal)</td> <td>ASTM D1475</td> <td>8.59</td> </tr> <tr> <td>Specific Gravity</td> <td>ASTM D1475</td> <td>1.03</td> </tr> <tr> <td>Flash Point</td> <td>ASTM D3278</td> <td>&gt;200<sup>0</sup>F (93<sup>0</sup>C)</td> </tr> </tbody> </table> </li> </ul>	Characteristics	Test specification	Standard	Solids by volume (%)	ASTM D5201	53±3%	Solids by Weight (%)	ASTM D1351	75.5±2%	Density (lbs/gal)	ASTM D1475	14.6±0.2 (1.75 gr/l)	Flash Point	ASTM D3278	>200 <sup>0</sup> F (93 <sup>0</sup> C)	Percent Pigment (by weight Including cement)	ASTM D3723	62±2%	Sheen (85 <sup>0</sup> F)	ASTM D523	<3@85 <sup>0</sup> F	Characteristics	Test specification	Standard	Solids by volume (%)	ASTM D5201	24±3%	Solids by Weight (%)	ASTM D1353	27±2%	Density (lbs/gal)	ASTM D1475	8.59	Specific Gravity	ASTM D1475	1.03	Flash Point	ASTM D3278	>200 <sup>0</sup> F (93 <sup>0</sup> C)
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Characteristics	Test specification	Standard																																						
Solids by volume (%)	ASTM D5201	24±3%																																						
Solids by Weight (%)	ASTM D1353	27±2%																																						
Density (lbs/gal)	ASTM D1475	8.59																																						
Specific Gravity	ASTM D1475	1.03																																						
Flash Point	ASTM D3278	>200 <sup>0</sup> F (93 <sup>0</sup> C)																																						

VOC Coating	ASTM D3960	>200
Sheen (85°F)	ASTM D523	>75@85°F
<b>343.2 StreetBond Surfacing System or approved alternate</b>		
Characteristics	Test specification	Standard
Tensile Strength	ASTM D412	>650 psi
Flexibility Mandrel (High)	ASTM D1737	Pass 1" @ 70°F
Flexible Mandrel (Low)	ASTM D1737	Pass 2" @ 70°F
Dry Time (to recoat)	ASTM D711	20 mins-4 hours
Dry Time (for Traffic)(75°F/30%RH)	NA	≅80% Strength @6-8 hrs
Taber Abrasion (H-10)	ASTM D4060	<0.18 gr/1000 cycles
Adhesion (PLI) to an Asphalt Substrate	ASTM D4650	Cohesive failure of asphalt prior to adhesive failure
QUVΔE	ASTM G53	300 hours 2.35 CIE units
Hydrophobicity (3 Days)	ASTM D570	<12%wt. Gain
Shore Hardness	ASTM D 2240	80 D
Temperature Limits for Service	Dry, cured material	-30°F to 160°F
Surface Build	NA	20-25 mils (2 applications)
Color		Terracotta or as per plans

**343.3 CONSTRUCTION PROCEDURE:**

The Contractor shall construct a sample panel 3 feet by 3 feet for inspection and approval by the Engineer, prior to actual construction. When approved, this panel shall be used as a standard for the remainder of the work.

After the slab has been placed, screeded and darbied, the aggregate shall be hand-scattered so that the entire surface is evenly covered. The surface shall be reworked so that the aggregate will be embedded just beneath the surface. The concrete shall completely surround and lightly cover the aggregate leaving no holes or voids.

A non-staining surface retarder will be applied to provide a surface penetration of at least 1/8-inch and the surface will be lightly screed to ensure penetration. The surface will be covered with a protective material for the period of time recommended by the retarder manufacturer. After this time has elapsed, the upper, retarded layer of concrete will be removed using a water jet stream and a brush. The protective cover will be replaced and the concrete allowed to cure. After curing, the surface shall be cleaned and a silicone seal applied.

Municipality	Supplements
SC	<p><b>343.3.1 Surface Imprinting:</b> The contractor shall follow procedures detailed in the latest revision of StreetPrint Application Procedures as issued or as provided by the manufacturer of the approved alternate. The pattern shall be as shown on the Plans or as approved by the Engineer. Patterning shall begin once the asphalt has reached its final density and while there is still sufficient heat in the asphalt to permit imprinting. Patterning shall be achieved using steel rollers and/or vibratory plates and shall be of consistent depth. Maximum stamping depth shall be 1/2-inch.</p> <p><b>343.3.2 StreetBond Surfacing Systems or approved alternate:</b> Two applications of the StreetBond Traffic Formula in the color as indicated on the plans or approved by the Engineer shall be used. StreetBond Sealer or approved alternate shall be applied over the StreetBond Traffic Formula or approved alternate.</p> <p><b>343.3.3 Application of Asphalt Printing Paving:</b> The StreetBond Traffic Formula and StreetBond Sealer shall not be applied in temperatures below 45 °F and rising, or when precipitation can be expected within 24 hours. Installation shall be in accordance with the latest revision of the manufacturers procedures. The StreetBond Traffic Formula product shall be spray applied and broomed using a broom or brushes to cut in small areas where required. Once the StreetBond Traffic Formula products are fully dried, StreetBond Sealer shall be applied as a curing membrane. StreetBond Sealer shall be tinted using the resin from the</p>

	StreetBond Traffic Formula product, spray applied and broomed into the surface. Care shall be taken to ensure that the entire surface is covered, including the imprinted surfaces. Sufficient masking shall be used to ensure that the surfacing products are applied only where specified. Maximum reheating of asphalt shall be 200 degrees F.
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**343.4 MEASUREMENT AND PAYMENT:**

Measurement will be by the square foot. Payment will be made at the unit bid price per square foot. This price shall be full compensation for all labor, material, tools, and equipment required to complete the work.

<b>Municipality</b>	<b>Supplements</b>
SC	<b>MEASUREMENT AND PAYMENT:</b> This item will be measured and paid for at the contract price bid per square foot of Asphalt Printing Pavement. This bid price shall include all associated items of work involved in the asphalt printing pavement process.

## ADJUSTING FRAMES, COVERS, VALVE BOXES AND WATER METER BOXES

### 345.1 DESCRIPTION:

The Contractor shall furnish all labor, materials, and equipment necessary to adjust all frames, covers and valve boxes as indicated on the plans or as designated by the Engineer. The frames shall be set to grades established by the Engineer, in a manner hereinafter specified.

The Contractor may elect to remove old frames, covers and valve boxes and to install new frames and/or boxes without any additional cost to the Contracting Agency, in accordance with standard detail drawings.

### 345.2 ADJUSTING FRAMES:

The Contractor shall loosen frames in such a manner that existing monuments, clean outs or valve boxes will not be disturbed or manholes damaged. Debris shall not be permitted to enter sanitary or storm sewer conduits. All loose material and debris shall be removed from the excavation and the interiors of structures prior to resetting frames.

Frames shall be set to the elevations and slopes established by the Engineer and shall be firmly blocked in place with masonry or metal supports. Spaces between the frame and the old seat shall be sealed on the inside to prevent any concrete from entering the hand hole or manhole. Class AA concrete shall be placed around and under the frames to provide a seal and properly seat the frame at the required elevation and slope. Concrete shall be struck off flush with the top of the existing pavement.

Municipality	Supplements
SC	<p><b>ADJUSTING FRAMES:</b> <i>Add the following paragraph:</i></p> <p>Manholes outside of vehicle travel lanes shall be adjusted to 2-inches above finished grade. All manholes shall have a concrete collar around the ring and cover per COS Standard Detail No. 2270.</p> <p>Catch basin access frame and covers shall be round per MAG 536-2.</p>

### 345.3 ADJUSTING VALVE BOXES:

Valve boxes shall be adjusted to the new elevations indicated on the plans, or as established by the Engineer.

Adjustable cast iron boxes shall, if possible, be brought to grade by adjustment of the upper movable section. Any excavated area shall be filled with Class AA concrete to the level of the existing pavement, or as directed by the Engineer.

Concrete pipe valve boxes in areas not subject to vehicular traffic shall be adjusted to grades by installing a suitable length of metal or concrete pipe, of the same inside diameter as the present valve box, and reinforcing the outside with a concrete collar extending from at least 2 inches below the joint up to and flush with the top of the valve box extension. This collar shall be of Class AA concrete. The dimension from the outside of the box to the outside of the collar shall not be less than 2 inches. This adjustment will be known as Type B.

In areas subject to vehicular traffic and where the existing valve box is a Type B, the adjustment to the new elevation shall be made using the old cover and installing a new 8 inches frame in accordance with the standard detail for installation of valve boxes in vehicular traffic areas. This adjustment shall be known as Type BA.

Adjustment of existing Type A valve boxes to the new elevations shall be as described in Subsection 345.2 above. This adjustment shall be known as Type A.

Municipality	Supplements
SC	<p data-bbox="337 247 1015 279"><b>ADJUSTING VALVE BOXES:</b> <i>Add the following paragraph:</i></p> <p data-bbox="427 310 1482 369">All valve boxes shall be adjusted to finished grade upon completion of paving or related improvements in accordance with the following requirements:</p> <p data-bbox="427 401 1482 522">(A) When a valve box is new, adjusted, or replaced, it shall be an adjustable cast iron type with pentagonally-bolted lid, MAG Standard Detail No. 391-1, Type "C". In unpaved roads, the MAG Standard Detail No. 391-1, Type "C" installation shall include the concrete collar as shown in COS Standard Detail No. 2270, with an approved debris cap.</p> <p data-bbox="427 554 1482 642">(B) Existing type "A" or type "B" valve boxes located in areas which will remain unpaved when construction is completed may remain, but they must be adjusted to finished grade when grading is completed with a concrete collar installed as shown in COS Standard Detail 2270.</p> <p data-bbox="427 674 1482 735">(C) Existing type "A" valve boxes located in existing paved areas must be removed and replaced with type "C" boxes.</p> <p data-bbox="427 766 1482 827">(D) Existing type "B" valve boxes located in existing paved areas must be removed and replaced with type "C" boxes.</p> <p data-bbox="427 858 1482 919">(E) Existing type "A" or type "B" valve boxes in unpaved areas which will be paved when construction is completed must be removed and replaced by type "C" valve boxes.</p> <ul style="list-style-type: none"> <li data-bbox="380 951 1482 1066"> <p data-bbox="380 951 548 976">▪ <b>TE: 345.3:</b></p> <p data-bbox="427 982 1482 1066">No concrete pipe valve boxes will be permitted. All valve boxes will be in accordance with Maricopa Association of Governments Standard Detail No. 391-1, Type C. In heavy traffic areas, pentagonal bolted lids shall be required.</p> </li> </ul>

**345.4 ADJUSTING MANHOLE AND VALVE COVERS:**

Adjusting rings may be used to raise manhole covers in asphalt pavements when deemed acceptable by the Engineer. The amount of adjustment, thickness of seal or overlay, and cross slope will be considered when using adjusting rings. Each location where an adjusting ring is used must have a sufficient depth of asphalt to assure the proper installation and operation of the ring. The rings shall be made of a non-metallic, polypropylene or fiberglass material and installed per the manufacturer's specifications. The rings shall be approved by the Engineer.

**345.5 MEASUREMENT:**

The quantities measured will be the actual number of frames, covers and value boxes of each type, adjusted and accepted.

**345.6 PAYMENT:**

The quantities, as determined above will be paid for at the contract price per unit of measurement respectively, for each of the particular items listed in the proposal. The payment shall be compensation in full for all materials, labor, equipment and incidentals necessary to complete the work.

## REMOVAL OF EXISTING IMPROVEMENTS

### 350.1 DESCRIPTION:

This work shall consist of removal and disposal of various existing improvements, such as pavements, structures, pipes, curbs and gutters, and other items necessary for the accomplishment of the improvement.

### 350.2 CONSTRUCTION METHODS:

The removal of existing improvements shall be conducted in such a manner as not to injure utilities or any portion of the improvement that is to remain in place. See Section 107.

Sidewalks shall be removed to a distance required to maintain a maximum slope for the replaced portion of sidewalk, for one inch per foot and all driveways shall be removed to a distance as required by standard details.

Existing concrete driveway curbs and gutters shall be removed to the right-of-way line and the new end of curb faced.

Portland cement concrete pavements, curbs and gutters and sidewalks designated on the plans for removal shall be saw-cut at match lines, in accordance with Section 601 and removed.

Asphalt concrete pavements designated on the plans for removal shall be cut in accordance with Section 336.

Removal of trees, stumps, roots, rubbish, and other objectionable materials in the right-of-way shall be done in accordance with Section 201.

Backfill and compaction of all excavated areas shall be compacted to the densities as prescribed in Section 601.

All surplus materials shall be immediately hauled from the jobsite and disposed of in accordance with Section 205.

Municipality	Supplements
<b>GI</b>	<p><b>Pavement Cuts</b></p> <p>All trenches and pavement cuts shall be 4' minimum in width in order to mechanically compact the aggregate base course and lower lifts of asphaltic concrete.</p>

Municipality	Supplements
<b>SC</b>	<p><b>CONSTRUCTION METHODS:</b> <i>Add the following paragraphs:</i></p> <p>When roadway construction requires the removal or the revision of existing pavement striping or marking, it shall be the Contractor's responsibility to remove existing pavement striping or marking using sand, high pressure water, or reclaimed shot blasting. After removal, all area affected by the removal shall be resealed with a quick setting asphalt emulsion. Obliteration of pavement striping or marking will be allowed only when Type II slurry seal per MAG Section 332 is indicated in the contract documents or with written approval of the COS Traffic Engineering Division.</p>

### 350.3 MISCELLANEOUS REMOVAL AND OTHER WORK:

This work shall include, but not be limited to the following, where called for on the plans:

- (A) Relocate existing fence and gate.
- (B) Remove and reset mail boxes.
- (C) Remove signs and bases in right-of-way.

- (D) Remove planter boxes, block walls, concrete walls, footings, headwalls, irrigation structures, and storm water inlets.
- (E) Install plugs for pipes and remove existing plugs as necessary for new construction.
- (F) Remove wooden and concrete bridges.
- (G) Remove median island slabs.
- (H) Remove pavements and aggregate base where called for outside the roadway prism.

Municipality	Supplements
<b>PH:</b>	<p>MISCELLANEOUS REMOVAL AND OTHER WORK: delete the first sentence and substitute the following:</p> <p>The work shall include all items as stated in MAG Subsection 350.3 and City of Phoenix Supplement. Any other miscellaneous removal not listed or not shown on the plans will be considered incidental and no additional payment will be made.</p> <p>MISCELLANEOUS REMOVAL AND OTHER WORK: is modified to add:</p> <p>(K) Landscape Irrigation System Removal and Restoration: The Contractor shall remove the conflicting portion of all underground landscape irrigation systems that are within the right of way and/or easements that conflict with new work or any portion which may remain under proposed curb, gutter or sidewalk regardless of whether shown or not shown on the plans.</p> <p>The Contractor shall restore all affected landscape irrigation systems to an operational condition at least as good as existed prior to removal. Bubbler and/or sprinkler heads shall be installed behind the new sidewalk in areas where watering was accomplished by landscape irrigation heads which were removed. Specifically, all areas behind the new sidewalk which were watered by the existing irrigation system before relocation shall be watered after relocation without any accumulation of water on the sidewalk or pavement.</p> <p>The Contractor shall have the option of either providing all new materials or salvaging and reusing existing materials. Either new or salvaged irrigation heads shall be installed in a new location, as close as practical to the existing location. Either new or salvaged pipe shall be installed and all the necessary connections made to put the system back into operation.</p> <p>In the event it is not feasible to reinstall removed irrigation heads, the Contractor shall then make all the necessary connections to make the remaining portion of the system operational. Irrigation heads and pipe not reinstalled shall be given to the owner.</p> <p>The Contractor shall furnish all new irrigation heads, new pipe and fittings, and pipe compound necessary to supplement salvaged materials.</p> <p>The Contractor shall notify the affected property owners, at least fourteen days prior to removing and replacing underground landscape irrigation systems because some of the owners may desire to do this work themselves.</p> <p>(L) Lawn Restoration: When any construction by the Contractor encroaches into an improved yard, in or outside the right-of-way, the Contractor shall level any disturbed ground, resod all grass covered areas, and restore rock-covered areas with material to match existing in type and quality.</p> <p>(M) Precast Safety Curbs Inside Right-of-Way: Existing precast concrete safety curbs inside the right-of-way and approximately parallel to the new curb line shall be reset by the Contractor directly opposite their existing location, with the back edge on the right-of-way line.</p> <p>All other precast concrete safety cubs inside the right-of-way shall be salvaged and stockpiled by</p>

	<p>the Contractor at a location on the adjacent property agreeable to the property owner.</p> <p>(N) Encroachments Inside the Right-of-Way: The Contractor shall notify property owners, who have encroaching walls, fences, planters, plants, bushes, small diameter trees, and other improvements in the right-of-way that interfere with construction, at least fourteen days before clearing is necessary.</p> <p>Any encroaching items, not timely removed by the owner, shall be removed and disposed of by the Contractor in accordance with the Contract Documents.</p> <p>(O) Restoration of Temporary Construction Easements: The Contractor shall leave the easements in as good a condition or better after work is completed. Special care must be taken to replace any asphalt, trees, sprinklers, lights, walls, fences, etc., which were disturbed as a result of construction. Where grass is located within the easement such as a lawn, the Contractor shall remove the sod which would be in the path of any construction, store it, keep it moist, and replace it immediately after construction is complete.</p> <p>(P) Any removals called for on the Traffic Signal Plans.</p> <p>(Q) Any and all items not specifically set forth as a separate pay item.</p>
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**350.4 PAYMENT:**

Payment for removals will be made at the unit bid prices bid in the applicable proposal pay items, which price shall be full compensation for the item complete, as described herein or on the plans.

Municipality	Supplements
PH:	<p>PAYMENT: change to read:</p> <p>Measurement will be on a lump sum basis for the work done as described above and as included in MAG Section 350. Payment will be made on a lump sum price for proposal item - MISCELLANEOUS REMOVAL AND OTHER WORK which shall be full compensation for all work complete and to the satisfaction of the Engineer</p>

Municipality	Supplements
SC	<p><b>PAYMENT:</b> <i>Add the following paragraphs:</i></p> <p>Removal or obliteration of pavement striping and marking shall be measured and paid as described herein. Striping will be in linear feet of equivalent four (4) inch wide stripes, excluding lengths of skips. Pavement markings and markers will be measured each, as designated in the bid schedule.</p>

**Phoenix has added the following section:**

Municipality	Supplements
PH:	<ul style="list-style-type: none"> <li>▪ <b>Section 351 Traffic Signals</b></li> </ul> <p><b>351.1.1 GENERAL:</b></p> <p>(A) The following specifications will outline the obligations of the private developer and /or private contractor constructing or relocating City of Phoenix traffic signal equipment. This includes private contractors working for ADOT, other agencies, or other departments within the City of Phoenix. <b>Any deviations to these work responsibilities will need to be discussed with the City of Phoenix Traffic Signal Engineer (262-4693).</b></p>

(B) These specifications and approved, signed traffic signal plans are in addition to other applicable specifications and policies of the City of Phoenix, Maricopa Association of Governments and the Arizona Department of Transportation.

(C) The Contractor shall notify the City of Phoenix, Traffic Signal Shop (262-6733) a minimum of fourteen (14) calendar days prior to beginning any traffic signal work.

**351.2 PREPARATION:**

(A) Before starting any traffic signal work under the project, **read and review** all project documents and general notes to make certain understanding and agreement is clear with all conditions stated.

(B) **Be sure that the traffic signal plans are the final approved plans.** Final approved plans shall have the signatures of City of Phoenix, Street Transportation Department officials. An approved set of plan documents shall be present on the job site during construction.

(C) Work to be done shall mean all labor, materials, equipment and other incidentals necessary to complete the work in accordance with the project plans. In the event an error or omission is discovered, it should be brought to the attention of the Traffic Signal Engineer immediately. The Traffic Signal Engineer shall make such corrections and interpretations as may be deemed necessary.

(D) The Traffic Signal Engineer has the authority to suspend traffic signal work to correct conditions unsafe for the workers or the general public, for failure to carry out provisions of the contract and/or to carry out orders.

(E) The Contractor shall note that approval is required before ordering or installing any material that is to be used on the project. This approval also includes the paint color for traffic signal equipment. The Traffic Signal Engineer or his designee shall answer all questions that may arise as to quality and acceptability of materials furnished and work performed, interpretation of plans and specifications, and all questions related to acceptable completion of work. It is recommended that the Contractor set a pre-construction meeting to discuss any questions and/or concerns.

(F) The Contractor shall make arrangements with the Traffic Signal Engineer to reimburse the City of Phoenix for any materials and/or work performed under section 351.3 below prior to beginning work.

(G) Submit a list of materials and equipment for approval to the Signal Shop Supervisor (602) 262-6733. To be acceptable, the submittal shall be complete and contain all items supplied on the project by the contractor. The City of Phoenix reserves the right to reject an incomplete or unclear submittal.

**351.3 MAINTENANCE OF TRAFFIC:**

(A) Traffic, both vehicular and pedestrian shall be maintained in accordance with the City of Phoenix Traffic Barricade Manual and the Federal Manual on Uniform Traffic Control Devices. All temporary traffic control, including but not exclusive to barricades, signs, pavement markings, flagmen and Police Officers are the responsibility of the contractor. Contractor shall bear related expense for all aspects of temporary traffic control. Contractor activities shall be diligently planned to impose the minimum disruption of traffic service and adjacent land use.

(B) Existing traffic signal equipment shall remain operational and in full view of the intended traffic at all times until activation of new equipment. If necessary, temporary overhead cable shall be used to maintain operation of signal equipment, as

stated in Section V of the City Traffic Barricade Manual. The Contractor shall be responsible for all work and costs associated with temporary signal work. Traffic Signal Engineer or his designee shall approve any temporary signal work prior to beginning work.

**351.4 MATERIALS AND WORKMANSHIP:**

(A) Materials and construction details shall conform to the latest City of Phoenix Standard Traffic Signal Drawings, the Arizona Department of Transportation, Highways Division, Supplemental Specifications to Standard Specifications for Road and Bridge Construction, latest edition, and the Arizona Highway Department Traffic Signal and Highway Lighting Systems Standard Drawings, latest edition and the current National Electrical Code Standards will be unless otherwise specified herein or on the plans.

(B) The Contractor shall be responsible for all work to be done, except for:

1. *Supplying the controller cabinet, power service pedestal, controller, or any of these devices if they are specified on the approved plan:*
  - (a) *Illuminated street name signs*
  - (b) *Audible pedestrian devices*
  - (c) *Pre-emption equipment*
2. *Installation of the controller and related equipment*

The contractor shall be responsible for the cost of the supplied equipment and the work done by the City to install the equipment listed above.

(C) Any supplied equipment may be picked up from the Traffic Signal Shop, 2141 E Jefferson Street, seven (7) days after receipt of a written request. (Mechanical devices and/or personnel for loading equipment onto vehicles for transport shall be the responsibility of the contractor. All equipment and procedures shall conform to OSHA regulations.) Contact the Traffic Signal Warehouse, (602) 495-2083, twenty-four (24) hours in advance for an appointment to pick up materials.

(D) All electrical materials and workmanship shall conform to the requirements of the National Electric Code (NEC).

(E) The Contractor shall call the Blue Stake Center at least 48 hours prior to excavation for information relative to the location of buried utilities. The contractor shall also contact the City of Phoenix Traffic Signals Department at (602) 262-6204 for traffic signal locates.

(F) All underground conduits shall be schedule 40 rigid polyvinyl chloride (PVC) installed 24 inches to 30 inches below finished grade with the exception of loop lead-in conduits, which shall be schedule 40 rigid PVC installed in accordance with the latest City of Phoenix Standard Detail Sheet. All conduits shall be installed in straight lines (unless otherwise shown on the plans) junction box to junction box or junction box to signal equipment foundation with one 90 degree sweep on each end as specified in the plans. All conduits entering junction boxes shall be vertical, with the top of the conduit six inches below the bottom of the cover.

(G) Foundations shall conform in size, type, and location as shown on the plans. The foundation anchor bolts shall be installed square with the intersection. The top of the pole and power pedestal foundations shall be set at the finished grade of the back of sidewalk for each location unless otherwise shown of the plans. Concrete for foundations shall be Class A, 3000 psi concrete with a 5" slump, in accordance with Section 725 of the Uniform Standard Specifications for Public Works Construction. Minimum pole foundation curing times are NO EXCEPTIONS: A-Poles five (5) days, M-poles seven (7) days, Special M-poles (SM) and Special Combination poles

ten (10) days. **Quick curing compounds will not be acceptable.**

- (H) The Contractor shall have a Level II IMSA certified Technician/ Electrician on site at all times during construction/maintenance of traffic signal equipment. Conductor splices and terminations shall be made by a qualified Journeyman Electrician, who has successfully completed a recognized four (4) year apprenticeship program or equivalent training, or by a person enrolled in a recognized four (4) year apprenticeship program under the direct supervision of a Journeyman Electrician.
- (I) A separate loop lead-in cable shall be supplied for each inductive loop. Inductive loop lead-in cable shall be continuous without splices from the loop stub-out junction box to the controller cabinet. A minimum of five (5) feet of slack shall be provided in the controller cabinet and a minimum of three (3) feet of slack shall be provided in each junction box.
- (J) Detector loops shall be installed and tested ONLY in the presence of an authorized representative of the City of Phoenix Traffic Signal Shop. Detectors installed without said representative in attendance, for any reason, shall be removed from the pavement and new conductors installed, all at the Contractors expense. Each detector shall be installed according to the latest Traffic Signal Standard Drawing. Installations shall be made permanent with approved sealant after successful testing. The loop conductor shall be temporarily spliced to the lead-in cables, as directed by the Inspector, and tested at the controller cabinet. Loop sealant shall be injected into all cuts, before setting, surplus sealant shall be struck off flush with, and removed from the roadway surface.
- (K) All traffic signal heads shall be covered until activation. These coverings must be maintained in good repair.
- (L) The contractor shall maintain work and work site in an acceptable manner during the course of the project. Upon completion of the work all surplus earth, construction debris including abandoned foundations, and/or remnant equipment shall be removed and properly discarded by the Contractor and the work area shall be restored to a neat, orderly condition.

**351.5 INSPECTION:**

- (A) The City of Phoenix Traffic Signal Foreman or his designee shall inspect all work performed including these critical components: all trenches and conduit runs including splices before being covered, wiring, junction box installations, loop layout, saw cuts, loop installation, and traffic signal pole foundations before being poured. The contractor shall contact the appropriate Traffic Signal Foreman forty-eight (48) hours in advance to request inspection or call (602) 262-6733.
- (B) Inspections are typically at no cost to the Contractor. However, if the Contractor's performance results in the need for additional inspections or excessive inspection time for the Traffic Signal Foreman or his designee the Contractor will be put on notice and subsequent inspection costs shall become the Contractor's responsibility.
- (C) The Traffic Signal Foreman or his designee is authorized to inspect all work done and materials furnished and have the authority to reject work or materials until any questions at issue can be referred to and decided by the Traffic Signal Engineer.
- (D) In the event the Traffic Signal Engineer finds the materials furnished, work performed, or the finished product in which the materials are used or the work performed are not in reasonably close conformity with the plans and specifications and have resulted in work which is not reasonably acceptable, the work or materials

shall be removed and replaced or otherwise corrected by and at the expense of the Contractor.

**351.6 ACTIVATION OF TRAFFIC SIGNAL WORK:**

(A) Notify the traffic signal shop prior to pulling conductors and activating the ultimate traffic signal system. Activation of new traffic signal intersections shall be scheduled through the Traffic Signal Engineer. An off duty Police Officer supplied by the contractor is required to be present for the activation to provide traffic control. All traffic signal heads shall be covered until activation. These coverings must be maintained in good repair.

**351.7 SALVAGED MATERIALS:**

(A) Any existing equipment identified by the Traffic Signal Shop Foreman or his designee as salvageable shall be removed and delivered, in good order, to 2141 E. Jefferson Street and unloaded where designated. Contact the Traffic Signal Shop at (602) 495-2083, 24 hours in advance for an appointment to return salvaged equipment.

(B) The Contractor shall deliver remnants of obsolete traffic signal equipment to the Traffic Signal scrap yard. Contact the Traffic Signal project inspector 24 hours in advance for an appointment to deliver obsolete equipment to the scrap yard.

**351.8 WARRANTY:**

(A) The warranty period will begin the day the work is accepted by the City.

(B) There will be a two (2) year warranty on all Contractor supplied equipment and detector loops except as noted herein. The Contractor will warranty all materials and workmanship supplied in association with the installation of City supplied equipment for a two (2) year period following acceptance of the work. All LED indication modules furnished by the Contractor will be warranted for five (5) years following acceptance of the project.

**351.9 MEASUREMENT:**

(A) Measurement for foundations, junction boxes, and loops shall be of the number of units of each satisfactorily constructed.

(B) Measurement for conduit shall be the linear feet of conduit satisfactorily installed as measured along the centerline of the conduit through fittings from end of conduit to end of conduit. Measurement shall be made to the nearest 0.5 feet.

(C) Measurement for the temporary signal cable and the lead-in cable shall be the linear feet of cable satisfactorily installed as measured along the centerline of the cable from end to end. Measurement shall be to the nearest 0.5 feet. The temporary signal cable is a contingency item and may be eliminated without compensation by the Engineer.

**351.10 PAYMENT:**

(A) Payment for traffic signal work will be made at the unit prices bid in the applicable proposal pay item, which price shall be full compensation for all material and labor required to complete the work, as described and specified herein and on the plans.

**TELECOMMUNICATIONS INSTALLATION**

**360.1 DESCRIPTION:**

This work shall consist of the installation of underground telecommunications facilities within the public right-of-way.

Municipality	Supplements
SC	<p><b>DESCRIPTION:</b> <i>Add the following paragraph:</i></p> <p>All telecommunications facilities and non-municipal utilities placed within public rights-of-way shall bear an identification plaque bearing the company name, address and phone number of the facility owner. The plaque shall be stamped or engraved with letters 1/8” minimum in height. The identification plaque shall be aluminum, stainless steel or other non-corrosive metal. The plaque shall be permanently attached with stainless steel screws or rivets. The plaque shall be visibly placed on the top or as near as practicable to the top of the facility (cabinet, junction box, etc.)</p> <p>SAMPLE:</p> <p>FOR QUESTIONS REGARDING THIS FACILITY PLEASE CONTACT:</p> <p>NETLINK 3930 E. WATKINS RD, SUITE 200 PHOENIX, AZ 85034</p>

**360.2 TRENCHING, BACKFILL AND RESTORATION:**

All work shall be done in accordance with Section 601.

**360.3 CABLE INSTALLATION:**

(A) “Trunk Lines” Cable providing telecommunications service by connecting regions or states or by connecting central offices within a metropolitan area. Such cable shall be installed as described below:

- (1) If the cable is to be installed within an open trench, the cable shall be placed within schedule 40 PVC conduit or equal with a minimum inside diameter of 4 inches. The conduit shall be buried at a minimum depth of 48 inches below finished grade measured to the top of the conduit. A color coded plastic warning tape with a minimum thickness of 5 mil and a minimum width of 3 inches shall be installed in the trench and centered over the PVC conduit at a depth of from 18 to 30 inches below finish grade.
- (2) Cable crossings under existing paved streets shall be accomplished by jacking or boring unless open trenching is authorized by the Engineer or Agency. The cable shall be placed within a schedule 40 PVC conduit or better at a minimum depth of 48 inches.

(B) Telecommunications cables other than “trunk lines” shall be installed as described below.

- (1) If a cable is to be installed within the right-of-way of an arterial or collector street, it shall be placed at a minimum depth of 36 inches below finished grade. A color coded plastic warning tape as described in “A” shall be placed 18 inches below the surface.
- (2) If a cable is to be installed within the right-of-way of a local/residential street it shall be placed at a minimum depth of 24 inches below finished grade.
- (3) Cable crossings under existing, paved streets shall be accomplished by jacking or boring unless open trenching is authorized by the Engineer or Agency.

**360.4 CABLE LOCATING (FIBER OPTIC):**

If a cable which is to be installed is fiber optic a tracing or locating wire shall be installed with the cable.

**360.5 PAYMENT:**

Payment will be made at the contract unit price bid per lineal foot.

**Phoenix has added the following section:**

<b>Municipality</b>	<b>Supplements</b>
<b>PH:</b>	<ul style="list-style-type: none"><li>▪ <b>Section 361 Microseal Specifications</b></li></ul> <ol style="list-style-type: none"><li>1. <u>SCOPE</u> <p>The intent of this guideline is to specify the design, testing methods, and quality control procedures for the application of a "quick traffic solid/polymer microsurface."</p></li><li>2. <u>DESCRIPTION</u> <p>This specification covers the materials, equipment and construction procedures for rut filling and/or resurfacing of existing paved surfaces. The microsurface shall be a mixture of cationic polymer modified asphalt emulsion, mineral aggregates, mineral filler, water and other additives properly proportioned, mixed and spread on the pavement surface in accordance with this guideline and as directed by the Engineer.</p></li><li>3. <u>SUPPLY OF MATERIALS</u> <p>The Contractor shall supply all materials necessary for the performance of the work in accordance with the specifications.</p><p>The Contractor shall be responsible for the safety of all materials of which he has taken delivery, until they are in place on the road and shall take all necessary precaution to avoid loss by fire or theft or damage by water and shall bear the cost of replacing any such material that is lost, split, destroyed or damaged after delivery is effected.</p></li><li>4. <u>MATERIALS</u> <p>Materials shall be approved by the Engineer prior to the start of construction. Certificates of Compliance will accompany each delivery of emulsion.</p><ol style="list-style-type: none"><li>4.1 <u>ASPHALT EMULSION OF MICROSEAL</u> <p>The polymerized Cationic Emulsion is herein classified as CSS-1H, quick-setting, cationic type emulsion for mixing applications and seal coat. A minimum of 4% of saturated polymer shall be high sheared into the asphalt prior to the emulsification process. The Agency may choose to sample the polymerized asphalt for testing. The amount of polymer will be based on weight of polymer and asphalt (total wt.) and be certified by supplier. The polymerized emulsion will meet the following specifications listed in Table 1.</p></li></ol></li></ol>

TABLE 1

<u>TEST</u>	<u>AASHTO METHOD</u>	<u>SPECIFICATION LIMITS</u>
<u>Tests on Emulsion</u>		
Viscosity, SSF @ 77°F. sec.	T-59	15-100
Sieve Test, % Particle Charge	T-59	0.10 Max
Storage Stability Test. 24 h. %	T-59	Positive
Evaporation Residue %	Ariz 512	0.1 Max
<u>Tests on Evaporation Residue</u> Ariz 504		
Kinematic Viscosity 275°F. cst	T-201	650 Min.
Penetration, 77°F 100 g. @ 5 sec.	T-49	40-90
Softening Point degrees F.	T-53	140 Min.
Ductibility, 77% 5 cm/Min	T-51	60 Min.
<u>Tests on Evaporation Residue after RFTO</u>		
Kinematic Viscosity 275 degrees F. aging ratio, cst	T-201	2.5 Max.
Softening Point degrees F.	T-53	140 Min.

\* The emulsion upon standing undisturbed for a period of twenty-four (24) hours, shall show no white or milky colored substance on its surface, and shall be a homogeneous brown color throughout.

4.2 MODIFIER TYPE AND CONTENT

The modifier shall be saturated. The asphalt cement shall contain a minimum of 4% solid polymer by weight of asphalt residue, sheared into the asphalt prior to emulsification.

4.3 AGGREGATE

The mineral aggregate shall consist of sound, durable crushed stone or crushed gravel and approved material filler. The material shall be free from vegetable matter and other deleterious substances. Aggregates shall be 100% crushed with no rounded particles. No natural sand will be allowed. The percentage of composition by weight of the aggregate shall conform to the nominated gradation selected from the following:

PERCENT PASSING

<u>SIEVE SIZE</u>	<u>RUT FILLING</u>	<u>TYPE III</u>	<u>TYPE II</u>
1/2	100	100	100
3/8	85-95	100	100
No.4	55-75	70-90	85-100
No.8	45-55	45-70	65-90
No.16	25-10	28-50	45-70
No.30	19-34	19-34	30-50
No.50	10-20	12-25	18-30
No.100	7-18	7-18	10-21
No.200	5-15	5-15	5-15
Application Rate Pounds per Square Yard	30-35	24-35	18-24

The mineral aggregate and mineral filler shall have a sand equivalency value not less than 50 (ASTM D 2419) and be non-plastic.

If more than one kind of aggregate is used, the correct amount of each kind of aggregate to produce the required grading shall be proportioned separately in a manner that will result in a uniform and homogeneous blend. The final blended aggregate shall meet requirements for grading, sand equivalency and plasticity per above.

4.4 MINERAL FILLER

Mineral filler, required by the mix design, shall be any recognized brand of nonairentrained Type I normal Portland cement that is free of lumps and clods, with a minimum of 85% passing the #200 sieve added by weight of aggregate as specified by the mix design.

4.5 WATER

The water is to be potable water free from any injurious impurities. The Contractor shall state the source of water at the time of tendering.

4.6 ADDITIVES

Additives may be used to accelerate or retard the breaking point and set times of the microsurface mix, or improve the resulting finished surface.

The use of additives in the microsurface mix shall be supplied to quantities predetermined

4.7 PROPORTIONING

The microsurface shall be proportioned in accordance with the mix design. Calibrated sign flowmeters shall be provided to measure both the addition of water and additives to the pugmill. Emulsion and cement flow shall be tied directly to aggregate flow. All additive flows shall be calibrated.

4.7.1 The microsurface mixture shall be proportioned per the mix design to ensure:

- a. Trafficability - with a relative humidity at not more than 50% and ambient air temperature of at least 77 degrees F, the material will permit controlled traffic without damage to the surface within thirty (30) minutes and uncontrolled traffic without damage within sixty (60) minutes.

b. Prevent development of bleeding, raveling, separation or other distress for seven (7) days after placing the microsurface.

c. The finished mixture will be warranted against material defects for one year; existing conditions excluded.

5. MIX DESIGN

5.1.1 The Contractor shall provide a job mix formula from an approved laboratory and present certified test results for the Engineer's approval. Compatibility of the aggregate and polymer modified emulsion shall be certified by the emulsion manufacturer. All the materials used in the job mix formula shall be representative of the materials proposed by the Contractor for use in the project.

5.1.2 All the products used in the construction shall have certifications from the suppliers and shall be given to the Engineer upon delivery of the project.

5.1.3 Mix design and proportioning will be approved by the Engineer prior to the start of the project.

5.2 SPECIFICATIONS

5.2.1 The Engineer shall approve the mix design prior to use. The specification limits are as follows:

Residual Asphalt	6%- 11.5% by dry weight of agg.
Mineral Filler	.1% - 1% by dry weight of agg.
Polymer Content/Type	4% min. (see Section 5.2)
Additive	As required for mix properties
Water	As required for mix properties
Aggregate Grading	Type as specified meeting Sec. 5.3
Consistency	2.5 to 3.0 cm
Traffic Time	See Section 6.2.2
Abrasion Loss	75 g/sf max.
Adhesion	90% minimum
Loaded Wheel Sand Adhesion	See Section 6.2.3

5.2.2 MODIFIED COHESION TEST

Furnish laboratory test data showing the mix design to be trafficable thirty (30) minutes after application at 77 degrees F conforming to the following criteria in accordance with test methods described in the applicable specifications.

Set Time Test: 15 minutes 12 kg - cm minimum.

Early Rolling Traffic Time: 60 minutes 20 kg - cm minimum.

5.2.3 LOADED WHEEL SAND ADHESION TEST

Furnish laboratory test data showing the mix design conforming to the following criteria in accordance with test methods described in the appropriate specifications.

<u>Vehicles/day</u>	<u>Minimum Sand Adhesion</u>
0-30	70 g/ft
250-1500	60 g/ft
1500-3000	55 g/ft
greater than 3000	50 g/ft

5.3 The laboratory shall further report the quantitative effects of moisture content in the unit weight of the aggregate (bulking effect). The report must clearly show the theoretical recommended proportion of aggregate, mineral filler (Min. & Max.), water (Min. & Max.), additive(s), and asphalt and how the proportions are based (dry aggregate weight, total mix., etc.).

6. TESTING THE MICROSURFACE

Samples will be taken throughout the project for testing by the approved laboratory per ISSA TB101. Testing for asphalt content shall be at the expense of the Agency.

7. EQUIPMENT

7.1 GENERAL

All equipment, tools and machines used in the performance of this work shall be maintained in satisfactory working condition at all times to ensure a high quality product.

7.2 MIXING EQUIPMENT

The mixing machine shall be a self-propelled or truck-mounted mixing machine which shall be able to accurately deliver and proportion the aggregate, mineral filler, water, additive, and polymer-modified asphalt emulsion to a revolving multi-blade mixer capable of minimum speeds of 200 RPM and discharge the product on a continual flow basis. The machine shall have sufficient storage capacity for aggregate, polymer modified asphalt emulsion, mineral filler, water, and additive to maintain an adequate supply to the proportioning controls.

7.3 MATERIAL CONTROL

7.3.1 CALIBRATION

Each mixing unit to be used in the performance of the work shall be calibrated prior to construction. Calibration data, if done within the calendar year, using the same material, may be used, providing a verification of the aggregate feed agrees.

7.3.2 Individual volume or weight controls for proportioning each material to be added to the mix shall be provided, and shall be accessible to the Engineer. Each material control device shall be calibrated prior to work and documented for inspection by the Engineer.

7.3.3 AGGREGATE FEED

The aggregate feed to the mixer shall be equipped with a revolution counter or similar device so the

amount of aggregate used may be determined at any time.

7.3.4 EMULSION PUMP

The emulsion pump shall be the positive displacement type with a jacketed housing for uniform heating. A revolution counter or similar device shall be fitted so that the amount of emulsion used may be determined at any time.

7.3.5 FINES FEEDER

An approved fines feeder is required that will provide a uniform, positive, accurately metered range of 0 - 1 percent by dry aggregate weight. The fines feeder shall have a counter so the amount of mineral filler can be filler determined at any time.

7.3.6 LIQUID ADDITIVE

The mixing machine shall be equipped with a liquid additive system that provides a pre-determined amount of additive to the mixing chamber. This additive system must be equipped with a counter that can determine the amount used at any time.

7.3.7 WATER SYSTEM

The mixing machine shall be equipped with a water system that provides a pre-determined amount of water to the mixing chamber. This water system must be equipped with a counter that can determine the amount used at any time.

7.4 OPERATOR CONTROLS

7.4.1 Controls will allow the operator to sequence and proportion the material per the mix design.

7.5 SPRAY BARS

The mixing machine shall be equipped with a water pressure system that provides a water

7.6 SPREAD EQUIPMENT

7.6.1 The paving mixture shall be spread uniformly by means of mechanical type laydown box attached to the mixer, equipped with agitation, to spread the materials throughout the box without any dead zones. The paddles shall be designed and operated so all the fresh mix will be agitated. Flexible seals, front and rear, shall be in contact with the road surface to prevent loss of mixture from the box. The spreader box shall be equipped with hydraulic cylinders for controlling the thickness of the spread mixture.

7.6.2 The rut filling spreader box shall have 6 to 8 skids to provide for leveling and filing uneven depressed areas. The rut filling spreader box will require two adjustable steel strike-off plates. The rear flexible seal shall act a final strike-off and shall be adjustable. The steel strike-offs shall be controlled by hydraulic cylinders placed at the rear of the spreader box.

7.6.3 The spreading equipment shall be maintained free from build-up of the mixture on the paddles or side walls. Skips, lumps, or tears will not be allowed in the finished product.

8. APPLICATION

8.1 GENERAL

The microsurface shall be of the desired consistency when deposited in the spreading box and nothing more shall be added to it. The mixing time shall be sufficient to produce a complete and uniform coating of the aggregate and the mixture shall be chuted into the moving spreader box at a sufficient rate to maintain an ample supply across the full width of the strike-off squeegee at all times.

8.2 WEATHER

The microsurfacing shall be placed when the temperature is at least 45 degrees F and rising, and it is not raining. The surface temperature shall be 50 degrees F or higher when the mixture is applied.

8.3 PROTECTION OF EXISTING SERVICES

The Contractor shall take all necessary precautions to prevent microsurface or other material used from entering or adhering to gratings, hydrants, valve boxes, manhole covers, bridge or culvert decks, and other road fixtures. Immediately after resurfacing, the Contractor shall clean off any such material and leave any grating, manholes, etc. in a satisfactory condition.

8.4 FOGGING PAVEMENT

The surface should be pre-wetted by fogging ahead of the spreader box. The rate should be adjusted as dictated by the pavement temperatures, surface texture, humidity, and dryness of existing pavement.

8.5 MIX STABILITY

The modified mix shall possess sufficient stability so that premature breaking of material in the spreader box does not occur. The mixture shall be homogeneous during mixing and spreading; it shall be free of excess water or emulsion, and free of segregation of the emulsion and aggregate fines from the coarser aggregate.

8.6 APPLICATION RATE

The application rate, square yards per cubic yard of mix specified, are average rates; the surface texture variation throughout the work will dictate the actual spreading rates. The strike-off squeegee shall be adjusted to provide a microsurface thickness which will completely fill the surface voids and provide an additional thickness not exceeding one and one-half times the largest top-size stone. This requirement of 1-1/2 stone depth does not apply to rut filling operations as these depths vary greatly according to the surface irregularities.

8.7 JOINTS

No excessive build-up or unsightly appearance shall be permitted on longitudinal or transverse joints. A maximum of 4.0" overlap will be permitted on longitudinal joints. The Contractor shall provide suitable width spreading equipment to produce a minimum number of longitudinal joints throughout the work. Half passes and odd width passes will be used in minimal amounts. If half passes are used, they cannot be the last pass of any paved area. Care shall be taken to ensure straight lines along curbs and shoulders. No runoff on these areas will be permitted.

Construction joints shall be neat in appearance and shall be tapered or feathered to conform to the existing surfacing. All excess material shall be removed from the surface upon completion of each run.

8.8 HANDWORK

Approved squeegees and lutes shall be used to spread the mixture in areas inaccessible to the spreader box and other areas where hand spreading may be required.

8.9 PROTECTION OF MICROSURFACE

Adequate means shall be provided by the Contractor to protect the uncured product. Any damage done to the product shall be repaired at the Contractor's expense.

8.10 DAMAGE TO MICROSURFACE

The Contractor's responsibility to replace microsurface damaged by unexpected rain after spreading shall be limited to the period within four (4) hours of placement of the microsurface.

9. PAYMENT

The micro-surfacing shall be paid for by the weight of the aggregate and weight of emulsified asphalt, as shown on certified weight tickets from the supplies delivered to the project less weigh backs. The price shall be full compensation for furnishing, mixing and applying all materials; and for all labor, equipment, tools, design tests, and incidentals necessary to complete the job as specified herein.