SECTION 337

ASPHALT PAVEMENT CRACK SEALING AND CRACK FILLING

337.1 DESCRIPTION:

This work consists of furnishing and placing sealant or filler material in Contractor prepared cracks and joints of asphalt concrete ~~or Portland cement concrete~~ pavements. All cracks and joints, including the space between asphalt concrete pavement and concrete curb and gutter, which have a clear opening of one-quarter inch (¼") or greater, shall be sealed for the length of the crack that equals or exceeds one-eighth inch (⅛") in width. ~~All cracks and joints, including the space between asphalt concrete pavement and the curb and gutter, which have a clear opening of one-quarter inch (¼") or greater, shall be sealed for the length of the crack that equals or exceeds one-eighth inch (⅛") in width. The Contractor shall notify the Engineer when cracks are encountered that have an opening greater than one inch (>1"). The Engineer shall specify the treatment requirements for cracks having an average clear opening greater than one inch (>1").~~

337.2 MATERIALS:

337.2.1 Material for Category 1 Cracks: ~~All c~~Cracks and joints~~, including the space between asphalt concrete pavement and the curb and gutter,~~ which have a clear opening ~~of~~ ranging from one-quarter inch (¼") ~~or greater,~~ to one and one-half inches (1½") shall be classified as category 1 cracks. ~~sealed for the length of the crack that equals or exceeds one-eighth inch (⅛") in width.~~ Sealant materials for category 1 cracks shall be a premixed, single component mixture of asphalt cement, aromatic extender oils, polymers, and granulized rubber in a closely controlled manufacturing process. Materials shall conform to the following specifications when heated in accordance with ASTM D5078 and the manufacturer's maximum safe heating temperature.

TEST	REQUIREMENT
Cone Penetration (ASTM D5329)	20-40
Resilience (ASTM D5329)	30% Minimum
Softening Point (ASTM D113)	210°F (99°C) Minimum
Ductility, 77°F (25°C) (ASTM D113)	30 cm Minimum
Flexibility (ASTM D3111 *Modified)	Pass at 30°F (-1°C)
Flow 140°F (60°C) (ASTM D5329)	3 mm Maximum
Brookfield Viscosity 380°F (193°C) (ASTM D2669)	90 Poise Maximum
~~Brookfield Viscosity 400° (204°C) (ASTM D2669)~~	~~100 Poise Maximum~~
Asphalt Compatibility (ASTM D5329)	Pass
Bitumen Content (ASTM D4)	60% Minimum
Tensile Adhesion (ASTM D5329)	400% Minimum
Maximum Heating Temperature	400°F (204°C)
Minimum Heating Temperature	380°F (193°C)
Flash Point (ASTM D92)	450°F Minimum

*Specimen bent 90° over a 1-inch mandrel within 10 seconds.

337.2.2 Material for Category 2 Cracks: Cracks and joints which have a clear opening ranging from one and one-half inches (1½") to three inches (3") shall be classified as category 2 cracks. Filler material for category 2 cracks shall be hot applied, pourable, high bonding mastic for application in unconfined areas and for vertical-side recessed configurations. Upon curing the material shall provide a flexible waterproof seal. The material shall be traffic ready in thirty minutes or less when installed in accordance with the manufacturer's instructions. Agency approved material shall be used for sealing category 2 cracks.

337.2.3 Material for Category 3 Cracks: Cracks and joints which have a clear opening greater than three inches (>3") shall be classified as category 3 cracks. Material for filling category 3 cracks shall be asphalt concrete 3/8" Marshall mix compliant with Section 710 and have 100% of the aggregate passing the 3/8" sieve.

337.2.~~1~~ 4 ~~Certification and Quality Assurance~~Product Submittals: Prior to application of category 1 crack sealant and category 2 crack filler material, the Contractor shall submit to the Engineer for approval the material manufacturer's product specifications and installation recommendations. Installation recommendations shall include surface preparation, product

installation, and curing requirements. For sealant material a Certificat~~c~~ion of ~~compliance~~ Compliance (per Section 106) shall be submitted to the Engineer. Asphalt mix design for category 3 crack filler material shall be submitted to the Engineer for approval~~all materials to be used in the work~~.

Prior to and during production when requested by the Engineer, the Contractor shall provide material samples to the Engineer for testing to verify the quality of the materials and to ensure conformance with specifications.

~~337.3 EQUIPMENT:~~

~~The melter applicator unit shall be a self-contained double boiler device with the transmittal of heat through heat transfer oil. It must be equipped with an on board automatic heat controlling device to permit the attainment of a predetermined temperature, and then maintain that temperature as long as required. The unit shall also have a means to vigorously and continuously agitate the sealant to meet the requirements of Appendix X1.1 of ATSM D6690. The sealant shall be applied to the pavement under pressure supplied by a gear pump with a hose and wand and direct connecting applicator tip. The pump shall have sufficient pressure to apply designated sealant at a rate of at least three (3) gallons (11.4 L) per minute. Melter applicators shall be approved for use by the sealant manufacturer.~~

337.~~3~~4 CLEANING AND PREPARING CRACKS OR JOINTS:

Immediately prior to application of sealant, all cracks and joints shall be cleaned of debris and dust. Cracks and joints shall be vacuumed during final cleaning.

337.~~3~~4.1 Routing: ~~Routing, w~~When specified in contract documents, ~~shall~~ cracks shall be routed to ~~create a sealant reservoir~~ remove loose asphalt edges creating a stable surface for sealant attachment. ~~Cutting~~ Routing ~~should~~ shall remove at least ~~⅛"~~ 1/8" from each side and produce vertical, intact surfaces with no loosely bonded aggregate. Routing of joints and cracks shall produce clean stable edges extending to a depth of at least three quarters of an inch ~~a reservoir having a nominal size of ¾" wide x (¾") deep~~. ~~Variations from the nominal size~~Routed surfaces of cracks are subject to acceptance or rejection at the Engineer's discretion.

337.~~3~~4.2 Vacuuming: Final cleaning shall thoroughly clean cracks and joints to a minimum depth of 1" for cracks that are ¾" or narrower and to the full asphalt depth for cracks that are wider than ¾". Surfaces ~~will~~ are to be inspected to assure adequate cleanliness and dryness.

~~The vacuum unit shall use h~~High pressure, 90 psi minimum, dry oil free compressed air shall be used ~~to remove remaining~~ for final cleaning and dust removal from cracks. The high pressure tool shall be integral with a vacuum unit to collect the dust and residue. Both sides of the crack or joint shall be cleaned. ~~Surfaces will be inspected to assure adequate cleanliness and dryness.~~

337.~~4~~5 APPLICATION OF CRACK SEALANTS AND CRACK FILLERS:

337.~~4~~5.1 Weather: In no case shall crack sealant or fillers be placed during damp roadway conditions such as wet roadway surfaces or damp material inside the cracks. Operations stopped by the Engineer, due to weather, shall be at no additional cost to the contracting Agency. If installing at night, ensure that dew is not forming on the pavement surface.

Sealant and filler material shall only be applied when pavement temperature exceeds 40°F (4°C). If pavement temperature is lower than 40°F (4°C), it may be warmed using a heat lance that puts no direct flame on the pavement.

337.~~4~~5.2 Temperature: Sealant and category 2 filler material temperatures ~~should~~ are to be maintained at the maximum heating temperature recommended by the manufacture.

337.4.3 Sealant Equipment:

The melter applicator unit shall be a self-contained double boiler device with the transmittal of heat through heat transfer oil. – It ~~must~~ shall be equipped with an on board automatic heat controlling device to permit the attainment of a predetermined temperature, and then maintain that temperature as long as required. The unit shall also have a means to vigorously and continuously agitate the sealant to meet the requirements of Appendix X1.1 of ~~ATSM~~ ASTM D6690. The sealant shall be applied

to the pavement under pressure supplied by a gear pump with a hose and wand and direct connecting applicator tip. The pump shall have sufficient pressure to apply designated sealant at a rate of at least three (3) gallons (11.4 L) per minute. Melter applicators shall be approved for use by the sealant manufacturer.

337.4.45.3 Placement of Sealant and Crack Filler Materials: The sSealant and crack filler materials shall be applied in cracks, joints, and sealant reservoirs and joints uniformly from bottom to top and shall be filled without formation of entrapped air or voids.

Sealant placement in Ccracks and joints shall be slightly overfilled the crack or joint then be leveled with a 3" sealing disk or V-shaped squeegee to create a neat band extending approximately 1" on each side of the crack or joint for surface waterproofing. The band shall be as thin as possible and shall not extend more than ⅛ 1/8-inch above the pavement surface.

If the pavement is to be overlaid with hot mix asphalt within six months of sealant application, cracks shall be routed, and sealant placement shall be recessed ¼" in the crack or joint reservoir with no over band. If routing is not used, the sealant over band thickness and width should be kept as narrow and thin as possible.

Application of category 2 crack filler material shall comply with the material manufacturer's installation recommendations including but not limited to surface preparation, application equipment, and application procedures. No filler material shall be installed until all cracks to be filled have been inspected and approved by the Engineer.

All machines, tools, and equipment for installation of category 3 crack filler shall be subject to the Engineer's approval. Prior to application of category 3 crack filler the prepared crack shall be inspected and approved by the Engineer. Tack coat shall be applied to both sides of the crack. Hand tamp, vibratory plate compactor and rollers are acceptable for final compaction of filler material. Depending on depth of crack, lower lifts shall be compacted using a steel rod with a 1½" diameter head.

During and after placement of the sealant and crack filler materials, the Contractor shall protect against harm to persons or animals that may be exposed to the hot material.

337.5.4 Unacceptable Work: The Contractor, at no additional cost to the contracting Agency, shall correct unacceptable work.

Unacceptable work shall include, but not be limited to, unsealed cracks, material wastage on the sides of the roadway, and excess quantities of material on the roadway that adversely affects driving.

Correction of unacceptable work shall be accomplished within five working days after notification from the Engineer of the unacceptable work. The Contractor shall not progress to a new area until the unacceptable work is corrected to the satisfaction of the Engineer.

337.5.5 Reporting Requirements: The Contractor shall meet with the Engineer or the Engineer's designated representative on a daily basis and supply a signed daily report indicating the amount of crack sealant material applied for the day in total pounds and total square yards of pavement sealed. In addition, the Contractor shall supply the Engineer with the dates of completion of each road segment.

337.4.56 Opening to Traffic:

Sealant and mastic materials shall not be exposed to traffic until fully cured. If the sealed area must be opened to traffic, blotter material shall be applied to the surface of all uncured sealant material.

All sealant filled sealed cracks that have an average a clear opening of 1½ inches or greater shall have blotter material applied prior to opening to traffic.

337.6.1 Blotter: On two lane roads or where traffic may come in contact with the hot sealant or mastic before it cures, a blotter or specialized bond breaking material shall be used to prevent asphalt bleeding and/or pickup of sealant material by vehicular traffic. Blotter material shall be compatible with the crack sealant or mastic and any surface treatment being used.

337.55.4 UNACCEPTABLE WORK:

The Contractor, at no additional cost to the contracting Agency, shall correct unacceptable work.

Unacceptable work shall include, but not be limited to, unsealed or unfilled cracks, material wastage on the sides of the roadway, and excess quantities of material on the roadway that adversely affects driving.

~~Correction of unacceptable work shall be accomplished within five working days after notification from the Engineer of the unacceptable work.~~ The Contractor shall not progress to a new area until the unacceptable work is corrected to the satisfaction of the Engineer. Correction of unacceptable work shall be accomplished within five working days after notification from the Engineer of the unacceptable work.

337.~~6~~7 MEASUREMENT:

~~337.5.5 Reporting Requirements:~~ The Contractor shall meet with the Engineer or the Engineer's designated representative on a daily basis and supply a signed daily report indicating the date and identifying for each road segment:

- T~~t~~he ~~amount~~linear feet of crack routing performed.
- The amount of category 1 crack sealant material applied ~~for the day~~ in total pounds and the total square yards of pavement sealed.
- The amount in pounds of category 2 crack filler material installed~~In addition, the Contractor shall supply the Engineer with the dates of completion of each road segment~~.
- The linear feet of category 3 cracks filled.

Crack routing will be measured by the linear foot. The measurement length will be the length of routed crack, not the length of each routed side.

Measurement for payment of ~~Accepted pavement~~ Category 1 Crack Sealing ~~shall~~ will be ~~measured as indicated in the fee proposal by one of the following methods:~~by the square yards of pavement surface area crack sealed or by the pounds of sealant placed.

~~,~~ Category 2 Crack Filling will be measured by the pounds of ~~sealant~~ filler material placed or as otherwise indicated in the fee proposal.~~, or~~

Category 3 Crack Filling will be the measured linear feet of cracks ~~sealed~~filled.

337.~~8~~ 7 PAYMENT:

Payment for accepted pavement crack routing, sealing, and crack filling will be at the contracted unit prices. Payment shall be full compensation for furnishing all labor, materials, equipment, tools, and incidentals used for surface preparation, placement of ~~crack sealant and blotter~~ materials, and cleanup.

- End of Section -

SECTION 337

ASPHALT PAVEMENT CRACK SEALING AND CRACK FILLING

337.1 DESCRIPTION:

This work consists of furnishing and placing sealant or filler material in Contractor prepared cracks and joints of asphalt concrete pavements. All cracks and joints, including the space between asphalt concrete pavement and concrete curb and gutter, which have a clear opening of one-quarter inch (¼") or greater, shall be sealed for the length of the crack that equals or exceeds one-eighth inch (⅛") in width.

337.2 MATERIALS:

337.2.1 Material for Category 1 Cracks: Cracks and joints which have a clear opening ranging from one-quarter inch (¼") to one and one-half inches (1½") shall be classified as category 1 cracks. Sealant materials for category 1 cracks shall be a premixed, single component mixture of asphalt cement, aromatic extender oils, polymers, and granulized rubber in a closely controlled manufacturing process. Materials shall conform to the following specifications when heated in accordance with ASTM D5078 and the manufacturer's maximum safe heating temperature.

TEST	REQUIREMENT
Cone Penetration (ASTM D5329)	20-40
Resilience (ASTM D5329)	30% Minimum
Softening Point (ASTM D113)	210°F (99°C) Minimum
Ductility, 77°F (25°C) (ASTM D113)	30 cm Minimum
Flexibility (ASTM D3111 *Modified)	Pass at 30°F (-1°C)
Flow 140°F (60°C) (ASTM D5329)	3 mm Maximum
Brookfield Viscosity 380°F (193°C) (ASTM D2669)	90 Poise Maximum
Asphalt Compatibility (ASTM D5329)	Pass
Bitumen Content (ASTM D4)	60% Minimum
Tensile Adhesion (ASTM D5329)	400% Minimum
Maximum Heating Temperature	400°F (204°C)
Minimum Heating Temperature	380°F (193°C)
Flash Point (ASTM D92)	450°F Minimum

*Specimen bent 90° over a 1-inch mandrel within 10 seconds.

337.2.2 Material for Category 2 Cracks: Cracks and joints which have a clear opening ranging from one and one-half inches (1½") to three inches (3") shall be classified as category 2 cracks. Filler material for category 2 cracks shall be hot applied, pourable, high bonding mastic for application in unconfined areas and for vertical-side recessed configurations. Upon curing the material shall provide a flexible waterproof seal. The material shall be traffic ready in thirty minutes or less when installed in accordance with the manufacturer's instructions. Agency approved material shall be used for sealing category 2 cracks.

337.2.3 Material for Category 3 Cracks: Cracks and joints which have a clear opening greater than three inches (>3") shall be classified as category 3 cracks. Material for filling category 3 cracks shall be asphalt concrete 3/8" Marshall mix compliant with Section 710 and have 100% of the aggregate passing the 3/8" sieve.

337.2.4 Product Submittals: Prior to application of category 1 crack sealant and category 2 crack filler material, the Contractor shall submit to the Engineer for approval the material manufacturer's product specifications and installation recommendations. Installation recommendations shall include surface preparation, product installation, and curing requirements. For sealant material a Certificate of Compliance (per Section 106) shall be submitted to the Engineer. Asphalt mix design for category 3 crack filler material shall be submitted to the Engineer for approval.

Prior to and during production when requested by the Engineer, the Contractor shall provide material samples to the Engineer for testing to verify the quality of the materials and to ensure conformance with specifications.

337.3 CLEANING AND PREPARING CRACKS OR JOINTS:

Immediately prior to application of sealant, all cracks and joints shall be cleaned of debris and dust. Cracks and joints shall be vacuumed during final cleaning.

337.3.1 Routing: When specified in contract documents, cracks shall be routed to remove loose asphalt edges creating a stable surface for sealant attachment. Routing shall remove at least 1/8" from each side and produce vertical, intact surfaces with no loosely bonded aggregate. Routing of joints and cracks shall produce clean stable edges extending to a depth of at least three quarters of an inch (¾"). Routed surfaces of cracks are subject to acceptance or rejection at the Engineer's discretion.

337.3.2 Vacuuming: Final cleaning shall thoroughly clean cracks and joints to a minimum depth of 1" for cracks that are ¾" or narrower and to the full asphalt depth for cracks that are wider than ¾". Surfaces are to be inspected to assure adequate cleanliness and dryness.

High pressure, 90 psi minimum, dry oil free compressed air shall be used for final cleaning and dust removal from cracks. The high pressure tool shall be integral with a vacuum unit to collect the dust and residue. Both sides of the crack or joint shall be cleaned.

337.4 APPLICATION OF CRACK SEALANTS AND CRACK FILLERS:

337.4.1 Weather: In no case shall crack sealant or fillers be placed during damp roadway conditions such as wet roadway surfaces or damp material inside the cracks. Operations stopped by the Engineer, due to weather, shall be at no additional cost to the contracting Agency. If installing at night, ensure that dew is not forming on the pavement surface.

Sealant and filler material shall only be applied when pavement temperature exceeds 40°F (4°C). If pavement temperature is lower than 40°F (4°C), it may be warmed using a heat lance that puts no direct flame on the pavement.

337.4.2 Temperature: Sealant and category 2 filler material temperatures are to be maintained at the maximum heating temperature recommended by the manufacture.

337.4.3 Sealant Equipment: The melter applicator unit shall be a self-contained double boiler device with the transmittal of heat through heat transfer oil. It shall be equipped with an on board automatic heat controlling device to permit the attainment of a predetermined temperature, and then maintain that temperature as long as required. The unit shall also have a means to vigorously and continuously agitate the sealant to meet the requirements of Appendix X1.1 of ASTM D6690. The sealant shall be applied to the pavement under pressure supplied by a gear pump with a hose and wand and direct connecting applicator tip. The pump shall have sufficient pressure to apply designated sealant at a rate of at least three (3) gallons (11.4 L) per minute. Melter applicators shall be approved for use by the sealant manufacturer.

337.4.4 Placement of Sealant and Crack Filler Materials: Sealant and crack filler materials shall be applied in cracks and joints uniformly from bottom to top and shall be filled without formation of entrapped air or voids.

Sealant placement in cracks and joints shall slightly overfill the crack or joint then be leveled with a 3" sealing disk or V-shaped squeegee to create a neat band extending approximately 1" on each side of the crack or joint for surface waterproofing. The band shall be as thin as possible and shall not extend more than 1/8-inch above the pavement surface. If the pavement is to be overlaid with hot mix asphalt within six months of sealant application, sealant placement shall be recessed ¼" in the crack with no over band.

Application of category 2 crack filler material shall comply with the material manufacturer's installation recommendations including but not limited to surface preparation, application equipment, and application procedures. No filler material shall be installed until all cracks to be filled have been inspected and approved by the Engineer.

All machines, tools, and equipment for installation of category 3 crack filler shall be subject to the Engineer's approval. Prior to application of category 3 crack filler the prepared crack shall be inspected and approved by the Engineer. Tack coat shall be applied to both sides of the crack. Hand tamp, vibratory plate compactor and rollers are acceptable for final compaction of filler material. Depending on depth of crack, lower lifts shall be compacted using a steel rod with a 1½" diameter head.

During and after placement of sealant and crack filler materials, the Contractor shall protect against harm to persons or animals that may be exposed to the hot material.

337.4.5 Opening to Traffic: Sealant and mastic materials shall not be exposed to traffic until fully cured. If the area must be opened to traffic, blotter material shall be applied to the surface of all uncured material.

All sealant filled cracks that have a clear opening of 1½ inches or greater shall have blotter material applied prior to opening to traffic.

On two lane roads or where traffic may come in contact with hot sealant or mastic before it cures, a blotter or specialized bond breaking material shall be used to prevent asphalt bleeding and/or pickup of material by vehicular traffic. Blotter material shall be compatible with the crack sealant or mastic and any surface treatment being used.

337.5 UNACCEPTABLE WORK:

The Contractor, at no additional cost to the contracting Agency, shall correct unacceptable work.

Unacceptable work shall include, but not be limited to, unsealed or unfilled cracks, material wastage on the sides of the roadway, and excess quantities of material on the roadway that adversely affects driving.

The Contractor shall not progress to a new area until the unacceptable work is corrected to the satisfaction of the Engineer. Correction of unacceptable work shall be accomplished within five working days after notification from the Engineer of the unacceptable work.

337.6 MEASUREMENT:

The Contractor shall meet with the Engineer or the Engineer's designated representative on a daily basis and supply a signed daily report indicating the date and identifying for each road segment:

- The linear feet of crack routing performed.
- The amount of category 1 crack sealant material applied in total pounds and the total square yards of pavement sealed.
- The amount in pounds of category 2 crack filler material installed.
- The linear feet of category 3 cracks filled.

Crack routing will be measured by the linear foot. The measurement length will be the length of routed crack, not the length of each routed side.

Measurement for payment of Category 1 Crack Sealing will be by the square yards of pavement surface area crack sealed or by the pounds of sealant placed.

Category 2 Crack Filling will be measured by the pounds of filler material placed or as otherwise indicated in the fee proposal.

Category 3 Crack Filling will be the measured linear feet of cracks filled.

337.7 PAYMENT:

Payment for accepted pavement crack routing, sealing, and crack filling will be at the contracted unit prices. Payment shall be full compensation for furnishing all labor, materials, equipment, tools, and incidentals used for surface preparation, placement of materials, and cleanup.

- End of Section -