

## SECTION XXXXX - HOT-MIX ASPHALT PAVING ALTERNATIVE

### ARAMID REINFORCED COMPOSITE ASPHALT - ARCA

#### PART 1 - GENERAL

##### 1.1 SECTION REQUIREMENTS

- A. Related Documents: Drawings and general provisions of the Contract, including Division 1 Specification Sections and the Geotechnical Engineering Report, apply to this Section.
- B. Provide asphalt paving materials according to Geotechnical Engineering Report and standard specifications of department of transportation of state or local agency where project is located.
- C. Provide pavement marking prior to Substantial Completion and subsequent reapplication of pavement marking six (6) months after store opening date.
- D. Comply with Asphalt Institute publication MS-22, "Construction of Hot Mix Asphalt Pavements" unless more stringent requirements are indicated.
- E. As required by the Engineer of Record or if indicated on approved plans or specifications, Contractor shall retain a qualified testing firm for the purpose of providing Quality Control to evaluate that actual products incorporated into the Work and completed construction substantially comply with construction documents.

##### 1.2 SUBMITTALS

- A. Provide product data and asphalt design mixes for all pavement materials proposed for use on the project for review by the Architect, Civil Engineer and the Geotechnical Engineer of Record at least 30 days prior to beginning asphalt paving operations.
- B. Provided the following information for asphalt mixtures:
  - 1. Design method: Gyratory method based on minimum of 50 design gyrations; Marshall method by minimum of 50 blows per side. Mix design compaction effort shall be determined by pavement traffic level and local specifications.
  - 2. Name of supplier, identification name/number for mix.
  - 3. Source and grade of asphalt cement binder and any modifiers
  - 4. Source and description of aggregates and mineral fillers
  - 5. Gradation and bulk specific gravity of each aggregate bin size
  - 6. The percentage of each bin size used in the mix; combined aggregate gradation; and combined bulk specific gravity.
  - 7. Aggregate quality test results for all aggregates used in the mix.
  - 8. Plotted mix property curves showing the following mix properties for at least four (4) levels of asphalt cement content: unit weight; percent air voids; percent voids filled (VFA); and percent voids in mineral aggregates (VMA).

9. Recommended asphalt cement content for the mix.
10. The following mix properties at the recommended asphalt cement content:
  - a. Unit weight (pcf)
  - b. Air voids (%)
  - c. Voids filled with asphalt (VFA, %)
  - d. Voids in mineral aggregates (VMA, %)
  - e. Theoretical maximum specific gravity of the mix
  - f. Mixing temperature ranges
  - g. Compaction temperature ranges

C. Provide the following information for aramid fiber reinforcement:

1. Identify the mixing plant and type (batch or continuous drum).
2. Material data sheet for the treated aramid fiber describing aramid fiber and treatment properties, including the type, weight, and flash point of treatment material.
3. A certified QA/QC mixing plan includes procedures for continuously feeding the aramid fiber into the asphalt. The aramid fiber supplier must approve the QA/QC mixing plan of the asphalt plant producing the mix. In addition, the fiber supplier shall provide training to the asphalt producing plant personnel who are responsible for the continuous feeding of the aramid fiber into the HMA. Feeding can be accomplished by using either manual or machine operated equipment for the entire fiber mixing process but shall be done in a continuous flow-like manner.
4. Pre-Approved Products & Supplier.

Product: ACE XT Fiber™ and AQU Fiber™ Supplier: Surface Tech LLC Contact: Pat Weaver, COO / CRO Phone: (602) 919-4851 Email: <a href="mailto:Pat.Weaver@surface-tech.com">Pat.Weaver@surface-tech.com</a> Address: 312 S. Cedros Ave, S200 Solana Beach, CA 92075
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### 1.3 QUALITY ASSURANCE

- A. Owner will retain an independent testing firm for the purpose of providing Quality Assurance testing and inspection of paving materials, placement and compaction.
- B. Pre-Paving Meeting: Convene a meeting at the site at least two weeks prior to commencing work of this Section. Require attendance of parties directly affecting work of this Section, including, but not limited to, the Owner's representative, Contractor, paving sub-contractor and job foreman, and independent testing firm.

1. Contact Field Construction Manager three weeks prior to pre installation conference to confirm the schedule.
2. Record discussions of meeting and decisions and agreements (or disagreements) reached and furnish copy of record to each party attending. Review foreseeable methods and procedures related to paving work, including the following:
  - a. Review preparation and installation procedures and coordinating and scheduling required with related work.
  - b. Review proposed sources of paving materials, including capabilities and location of plant that will manufacture hot-mix asphalt.
  - c. Tour, inspect and discuss condition of subgrade, drainage structures, and other preparatory work.
  - d. Review requirements for protecting paving work, including restriction of traffic during installation period and for remainder of construction period.
  - e. Review and finalize construction schedule and verify availability of materials, installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - f. Review paving requirements (drawings, specifications and other contract documents).
  - g. Review required submittals, both completed and yet to be completed.
  - h. Review required inspections, testing procedures.
  - i. Review weather and forecasted weather conditions, and procedures for coping with unfavorable conditions.
  - j. Review safety precautions relating to placement of paving

#### 1.4 WEATHER LIMITATIONS

- A. Comply with department of transportation specifications weather condition limitations for placement of paving materials including tack coats.
- B. When weather conditions are not met, do not proceed without prior approval of Field Construction Manager.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Aggregates: Use locally available materials and gradations that meet local state department of transportation specifications and exhibit satisfactory records of previous installations. All aggregate requirements, including those for quality, shall meet those in AASHTO M323 for the specified traffic level

B. Asphalt Mixture:

1. Provide dense, temperature optimized asphalt plant mixes approved by Engineer of Record and meeting local agency or State Department of Transportation (DOT) specifications.
2. Asphalt Cement: Asphalt cement shall be Performance Grade (PG) binder oil per ASTM D 6373. The PG binder grade shall be determined based on the Federal Highway Administration's LTPPBind program version 3.0/3.1 or the most recent version, to provide the following:
  - a. The high-end temperature rating shall be the grade with 98 percent reliability
  - b. The low-end temperature rating shall be the grade with a minimum 90 percent reliability
  - c. If a polymer modified binder is needed to achieve a and/or b above, a single dose (2.1 oz per plant ton) or double dose (4.2 oz. per plant ton) of aramid fiber with a non-polymer binder can be substituted depending on the specific binder grade specified.
3. The PG binder grade requirement may be superseded by the project Geotechnical Engineering Report or as approved by Engineer of Record.

C. Aramid Fiber Reinforcement: Aramid Fiber shall meet ASTM D8395 – 23, "Aramid Fibers in Asphalt Mixtures" and have a verified published Environmental Product Declaration available within National Asphalt Pavement Association's Emerald Eco-label EPD Program.

D. Tack Coat: ASTM D 977, emulsified asphalt or ASTM D 2397, cationic emulsified asphalt, slow setting, diluted in water, of suitable grade and consistency for application.

E. Pavement-Marking Paint:

1. Product: Latex, waterborne emulsion, lead and chromate free, ready mixed, complying with FS TT-P-1952, with drying time of less than 45 minutes.
2. Color: Yellow except white at 12" wide truck pull forward line.
3. Striping Stencils: Verify usage with Owner prior to paint application. Stencils may be available from, and their use required by restaurant franchises of Project.

F. Wheel Stops: Precast, air-entrained concrete, 2500-psi minimum compressive strength, 4-1/2 inches high by 9 inches wide by 72 inches long. Provide chamfered corners and drainage slots on underside and holes for anchoring to substrate.

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. General: Immediately before placing asphalt materials, remove loose and deleterious material from substrate surfaces. Sweep loose granular particles and dust from surface of unbound-

aggregate base course or previous pavement layer. Remove any standing water from the existing surface.

- B. Verify that the subgrade and aggregate base materials have been inspected, tested, and are dry and properly prepared in accordance with Section xxxx EARTHWORK.
- C. Verify that grades and elevations are within tolerance limits provided in Section xxxx.
- D. Proof roll prepared aggregate base material surface to check for unstable areas in accordance with Section xxxx including documentation and re-proof rolling as required. Paving work shall begin only after unsuitable areas have been corrected and are ready to receive pavement.
- E. Density Control Strips: Prior to beginning placement of asphalt, construct density control strips to establish rolling patterns to achieve maximum density:
  - 1. Source and type of material, material requirements, and laydown and compaction equipment used for compaction shall be the same as that to be used in the project.
  - 2. The subgrade or pavement layer upon which the control strip is constructed shall be tested prior to construction of the control strip.
  - 3. The control strip shall be a minimum of 250 linear feet long and one paver width wide.
  - 4. Rolling the control strip shall continue until no appreciable increase in density is obtained by additional coverages.
  - 5. Upon completion of rolling, the Contractor shall use a nuclear testing device to establish the mean density of the control strip. The mean density will be based on 10 tests taken at randomly selected sites within the control strip area. The nuclear gauge will be calibrated with the average of 3 cores taken from the same area. The average of the cores shall meet the specified density requirements. The calibration factor between the average nuclear density and average core density shall be applied to the Contractor's nuclear gauge for Contractor's density monitoring.
- F. Equipment:
  - 1. Equipment necessary for the paving of asphalt concrete shall be present on the project site prior to beginning paving operations.
  - 2. Maintain equipment in satisfactory operating condition and correct breakdowns in manner that will not delay or be detrimental to the schedule of paving operations.

### 3.2 TACK COAT

- A. Apply tack coat to contact surfaces of previously constructed asphalt concrete base courses, Portland cement concrete surfaces, and surfaces of curbs, gutters, manholes and other structures on which the asphalt concrete mixture will be placed.
- B. Apply tack coat in a thin, uniform layer at rate which produces a residual of asphalt cement between 0.04 and 0.06 gal per sq. yd of surface, or per manufacturer specifications. Where the asphalt concrete mixture will be placed against the vertical face of an existing pavement, clean the vertical face to remove foreign substances and apply tack coat at a rate of approximately 0.25 gallons per square yard.

- C. Allow tack coat to cure undisturbed per manufacturer's specifications.

### 3.3 ARAMID FIBER DOSAGE AND MIXING

- A. Store treated aramid fiber product in a dry environment and do not allow it to be in contact with moisture.
- B. Treated aramid fiber shall be continuously fed and mixed into HMA per dosage and mixing requirements of this specification. A plant QA/QC mixing technician (personnel provided by or trained by the aramid fiber supplier) shall perform continuous feeding of the treated aramid fibers into the asphalt during plant mixing operations for all of the Aramid Fiber Reinforced HMA quantities required for the project.
- C. Aramid fiber single dosage rate is 2.1 ounces (+/- 5%) per ton of HMA, and a double dosage is 4.2 ounces (+/- 5%) per ton of HMA. This does not include the treatment weight. Dosage rates shall be determined either by local performance mix design criteria or manufacturer recommendation for the specific mix application. For uniform disbursement, treated aramid shall be metered and continuously fed in a constant flow-like manner. Fiber shall be mixed with the heated aggregates and RAP before injection of the liquid asphalt during the asphalt mixing process at the Batch or Continuous Drum Plant as follows:
  - 1. Batch Plant: Feed treated aramid fiber manually, or with machine operated equipment, directly into the pug mill or weigh hopper. Standard project HMA batch mixing times apply. Metering shall be based on batch size (tons) and dosage rate (ounces/ton). Feeding shall occur in a constant flow-like manner during the heated aggregate mixing batch time. If necessary, increase the mixing time with heated aggregates to ensure the aramid fibers are uniformly distributed.
  - 2. Continuous Drum Plant: Feed treated aramid manually, or with machine operated equipment, onto the RAP belt (when RAP is being used) or directly into the mixing drum through the RAP Collar. Standard project HMA asphalt production rates apply. Metering shall be calibrated based on the asphalt production rate (tons/hr), and the dosage rate (oz/ton). Feeding shall occur in a constant flow-like manner. If necessary, increase the mixing time with heated aggregates to ensure the aramid fibers are uniformly distributed.

### 3.4 ASPHALT CONCRETE PLACEMENT

- A. Place hot-mix asphalt to required grade, cross section, and thickness. Promptly correct surface irregularities in paving course. Spread mix at minimum temperature of 250° F or at the minimum ambient temperature that will allow the required density to be achieved.
- B. Spread asphalt by finishing machine unless inaccessible by equipment where hand methods are required. Spread hot mixture uniformly to required depth and smooth hot mixture to remove segregated coarse aggregate and rake marks. Equipment used for hand spreading shall be type designed for use with asphalt materials. Do not dump loads faster that they can be properly spread. Workers shall not stand on loose mixture while spreading.
- C. Placement and routing of hauling and placing equipment shall be conducted in a manner to avoid tire tracking of bituminous material onto existing paved surfaces.
- D. Apply successive lifts of asphalt concrete in transverse directions except when within small areas or confined areas where parallel lifts are considered more practical. Joints of successive parallel lifts shall be offset a minimum of 2 feet. Place surface course parallel to expected flow of traffic.

- E. Place asphalt paving in typical strips not less than 10'-0" wide. Asphalt concrete pavement, including base and surface course, shall be placed in lifts per state department of transportation specifications or as indicated on drawings.

### 3.5 ROLLING AND COMPACTION

- A. Begin compaction as soon as placed hot-mix paving will bear roller weight without excessive displacement. The quantity, weight, types of rollers, and sequences of rolling operations shall be such that the required density and surface are consistently attained while the mixture is in workable condition.
- B. Compact hot-mix paving with hot, hand tampers or vibratory-plate compactors in areas inaccessible to rollers. Complete compaction before mix temperature cools to 185° F.
- C. Complete breakdown or initial rolling immediately after rolling joints and outside edge. Examine surface immediately after breakdown rolling for indicated crown, grade, and smoothness.
- D. Begin intermediate rolling immediately after breakdown rolling while hot-mix asphalt is still hot enough to achieve specified density. Continue rolling until hot-mix asphalt course has been uniformly compacted to 92 percent of reference maximum theoretical density according to ASTM D 2041 with no individual test less than 90 percent nor greater than 97 percent.
- E. Finish roll paved surfaces to remove roller marks while hot-mix asphalt is still warm.
- F. Remove and restore paved areas that are defective or contaminated with fresh, hot asphalt concrete. Compact by rolling to maximum surface density and smoothness.
- G. Apply pavement-marking paint with mechanical equipment to a minimum wet film thickness of 15 mils.
- H. Securely attach wheel stops into pavement with two galvanized-steel dowels embedded in precast concrete.
- I. Restripe **entire project six (6) months after store opening date.**

### 3.6 JOINTS

- A. General: Place each asphalt paving layer as continuous as possible to keep the number of joints to a minimum. Between successive workdays or where the mixture has become cold (less than 140°F) construction joints in such a manner as to create a continuous bond between the old and new pavement construction courses.
- B. Construction joints shall have same texture, density, and smoothness as other sections of asphalt concrete course.
- C. Transverse Joints: When placement is discontinued or if asphalt materials becomes cold, construct a joint running perpendicular to the paver travel direction. Prior to continuation of placement, trim the edge of the in-place pavement to a straight line perpendicular to the paver travel direction and cut back to expose an even vertical surface for the full thickness of the course. Position the paver on the transverse joint so that sufficient hot mixture will be spread in order to create a joint after rolling that conforms to the required smoothness. If the temperature of the

previously placed pavement material falls below 140° F, apply a thin coat of liquid asphalt on the vertical joint surface immediately prior to further paving.

- D. Longitudinal Joints: If the temperature of the previously placed pavement material falls below 140° F, apply a thin coat of liquid asphalt on the longitudinal joint surfaces immediately prior to further paving.

### 3.7 FIELD QUALITY CONTROL

- A. Field quality control testing and inspection shall be the responsibility of the Contractor and shall be performed as necessary to assure compliance with contract requirements.
- B. Owner-provided quality assurance inspection and testing shall not be considered a substitute for the Contractor's responsibility to perform similar routine, necessary, and customary testing and inspection of the methods and frequency suitable for the type of work involved. Testing and inspection by the Owner shall not relieve the Contractor of responsibility to control the work quality and performance.
- C. Pavement Thickness: Measure pavement thickness behind the paver at the beginning of and during pavement placing operations to assure proper thickness.
- D. Compact each course to produce thickness meeting the following tolerances:
  - 1. Aggregate base course: +/- 0.5"
  - 2. Asphalt concrete base or surface course: 0 to +1/4"
- E. Areas of deficient paving, including compaction, smoothness, thickness, and asphalt mixture, shall be delineated, removed, and replaced in compliance with specifications requirements. Alternative remedial or corrective measures for repair of deficient paving may be allowed provided a plan of corrective action is submitted in the form of a Request for Information (RFI) and the plan is approved by the Engineer of Record.

### 3.8 FIELD QUALITY ASSURANCE

- A. The Owner's independent inspection firm will perform quality assurance testing and inspection only as a means of verification to the Owner of contractor's quality control performance.
- B. The contractor shall be responsible for coordinating paving activities with the Owner's inspection firm to allow field inspection and testing in conformance with these specifications.
- C. The inspection firm shall prepare daily test reports, and state in each report whether the tested work complies with the specified requirements. Any additional testing required to verify compliance of corrected work shall be at the contractor's expense.
- D. Thickness: In-place compacted thickness of hot-mix asphalt will be determined in accordance with ASTM D 3549.
- E. Surface Smoothness: Finished surface of each hot-mix asphalt course shall be tested for compliance with smoothness tolerances and shall include a "visual" inspection of the asphalt pavement surface by the Owner or the Owner's representative.
- F. Quality assurance testing shall be divided into lots and sublots. A lot will be equal to the quantity of paving completed in one working day.



1. For each lot, a sample of HMA will be obtained in accordance with ASTM D 3665 random sampling procedure by the Owner's inspection firm and tested for the following mix properties:
  - a. Asphalt Cement Content, ASTM D2172.
  - b. Aggregate Gradation, ASTM C136 and C 117.
  - c. Maximum Specific Gravity, ASTM D 2041.
2. For the first lot of the project and every third lot thereafter, the following additional properties shall be determined:
  - a. Air Voids, percent.
  - b. Voids Filled, percent.
  - c. Voids in Mineral Aggregate, percent.
3. One location within each lot shall be randomly selected using ASTM D 3665 procedures for coring and density testing.
  - a. Three cores shall be obtained at each location and their density determined in accordance with ASTM D 3665a and their thicknesses determined in accordance with ASTM D 3549.
  - b. In-place density tests shall be conducted at each core sample location in accordance with ASTM D1188 or D2726 (AASHTO T166, T275, T331) as applicable.
  - c. The density and thickness for each location shall be the average of the core samples. The compaction of each lot shall be the percentage of the average density compared to the maximum density of the sample lot determined in accordance with ASTM D 2041.

END OF SECTION XXXXX