

FORTA-FI®

FORTA Corporation

Guide Specification for Fiber-Reinforced Asphalt Cement Concrete

Engineers, architects, and specification writers should edit this entire document carefully to meet their specific, quality control, project requirements. They must determine suitability of this document in whole or part for a particular project. The not italicized information is common and may or may not be relevant. The italicized information is directional about how this information can best be understood. This document is not for use as a construction document. The following only describes requirements specific to using FORTA-FI® fibers with Imperial units. Other requirements for the mixture design specifications and proportions, job mix formula, design, and construction may be specified in other Sections and documents.

Asphalt materials manufacturer suppliers are referred to Part 2.

Asphalt materials transporters, placers, compactors, and constructors are referred to Part 3.

Division 32 – Exterior Improvements

32 12 16.27 Fiber Reinforced Asphalt Paving

Part 1 General

1.1 Section Includes

- A. Fiber reinforcement for asphalt cement concrete

1.2 Related Sections

- A. Section 32 12 16 Asphalt Paving
- B. Section 32 12 19 Asphalt Paving Wearing Courses

1.3 References

- A. American Society for Testing and Materials (ASTM)
 - 1. To be determined or from other sections reference
- B. National Asphalt Paving Association
 - 1. To be determined or from other sections reference

1.4 Submittals

- A. Submit copies of manufacturer's literature for fibers including:
 - 1. Product data
 - 2. Brochures
 - 3. Written instructions to suppliers
 - 4. Written instructions to installers
 - 5. Material Safety Data Sheets (MSDS).
- B. Submit copies of a certificate prepared by asphalt material supplier, under provisions of Division 01, stating that the specified fibers were added to each batch of asphalt delivered to the project site. Each certificate should be accompanied by one copy of each batch delivery ticket indicating product name, manufacturer and quantity of fiber-reinforcement added to each asphalt load.

1.5 Quality Assurance

- A. Fiber manufacturer to provide technical assistance from design through construction for use of fiber reinforcement.

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Delete paragraph B if a mock-up is not necessary. References to other local projects may be enough or make the mock-up not necessary.

- B. Mock-up: Provide mock-up(s) of pavement using fiber-reinforcement specified in this Section. Mock-up(s) shall be representative of Work of Related Sections and techniques specified in this Section. Mock-up(s) is (are) to be approved by [architect/engineer] [owners representative]. Use mock-up(s) for reference during project.

1.6 Delivery, Storage, and Handling

- A. Deliver fiber-reinforcement in sealed, undamaged containers with labels intact and legible, indicating material name and lot number.
- B. Deliver fiber-reinforcement to location where it will be added to each batch or loaded into the mixer.
- C. Store materials covered and off the ground. For ease of handling, do not allow boxes to become wet.

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Part 2 Products

2.1 Manufacturer

- A. FORTA Corporation
100 FORTA Drive
Grove City, PA 16127
(800) 245-0306
www.fortacorp.com
www.forta-fi.com

2.2 Materials

Paragraph A below specifies a fiber combination that is preferred for paving applications. Please note this fiber is not for drain down but for reinforcement. It is however, compatible and supplementary with any drain down fibers.

- A. FORTA-FI® (HMA, WMA, PAT) fiber reinforcement with virgin polyolefins and virgin aramids.
- B. Fiber Reinforcement: FORTA-FI® fibers with the following typical physical properties:
 - 1. Nominal Specific Gravity (Bulk Relative Density): 0.91 and 1.44
 - 2. Nominal Material Types: Virgin Polyolefins and Virgin Aramid

The fiber length is about double most aggregate size. Basically, longer fibers do more work and the notable difference in behavior is after the asphalt has cracked. The 0.75 inch long fiber is our product code 19 for 19 mm in length. Refer to (FIHMA191.0SM)

- 3. Maximum Length: 0.75 inch

Choose an application type as the fibers are blended materials for applications in Hot Mix Asphalt HMA, Warm Mix Asphalt WMA, and Patching PAT.

- 4. Match fiber blend of materials to application installation types:
 - i. Hot Mix Asphalt is designated blend HMA,
 - ii. Warm Mix Asphalt is designated blend WMA, and
 - iii. Patching is designated blend PAT.

2.3 Batching and Mixing

Coordinate fiber loading with batching process. Not mixed fibers or fiber balls are extremely unusual and only practically observable and determined after placements in the field. If not mixed fibers are observed, it is primarily due to procedures, process timing including adequate mixing time – how, and when the fibers were added in the mixing operation into the pug mill or into the drum mixer.

- A. To avoid the formation of fiber balls or not mixed fibers, add sealed plastic bags of fibers into the mixer.

Paragraph B below specifies the recommended fiber reinforcement dosage for normal asphalt cement concrete mixture proportions to obtain material property improvements. Contact FORTA Corporation for technical assistance for dosages different from specified herein.

- B. Add fiber-reinforcement at 1.0 pound per ton.

Fibers are supplied in 1, 2, and 3 pound bags for batching convenience (0.5, 1.0, and 1.5 kg bags for use in metric tones). For pug mill operations, the convenience is linking the pounds per bag to the mass in even tons per batch. For example, if operations do 3-ton batches, one 3-pound bag, two bags of 2 and 1-pound, or three 1-pound bags could accomplish the dosage. Order pounds per bag accordingly per operational procedures.

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- C. Order product for Pug Mill Mixers for minimum batch size regarding tons per batch to pounds per bag of product.

Fibers are supplied in 1-pound bags for drum mixer convenience. The maximum “diameter” of a (flexible malleable, tubular shape) plastic bag is 6-inch and the length is about 12 inch. Ensure the opening to the mixer can accommodate the bag addition. For drum type operations, the convenience is linking the 1-pound bag to the rate or tons per hour production speed. For example, if operations produces 300 tons per hour, the dosage rate is 3600 seconds (60 minutes times 60 seconds per minute) per 300 tons equals 12 seconds per ton. This would be accomplished by a 1-pound bag every 12 seconds. Adding 2 bags of 1-pound each every 24 seconds is not recommended.

- D. Order product for Drum Type Mixers and the anticipated production rate of tons per hour (typically seconds per ton, dosage timing) regarding 1-pound per bag of product.

Ensure that the tons ordered are correct for the application. No fiber asphalt can be tons for a given thickness and assumed life or additional tons for longer life with thicker asphalt. Fiber reinforced asphalt can have 3 results: 1) longer life with less tons and thinner asphalt than the given no fiber asphalt for the same material costs, 2) longest life with the given thickness, same tons, and additional cost of the fibers, and 3) equivalent life with less tons and thinner asphalt for less cost.

- E. Order fiber reinforcement materials for 1 pound per ton of asphalt materials and allowing for overages, mock-ups, production, and occasional errors based on your experience.

2.4 Pug Mill Mixers and Mixing Operations

- A. Ensure adequate start, stop, and dosage change information is easily communicated between batch control operations and fiber addition activities.
- B. Add complete bags of fibers just before aggregate is discharged into the pug mill mixer.
- C. Immediately before or immediately after the dried aggregate is added to the pug mill, the bags of fibers should be added and discharged into the pug mill with the aggregate.
- D. Add complete bags of fibers at the general nominal batch size agreed to by operations and mixture design specifications.
- E. Do NOT open the bags and add or discharge into the pug mill.
- F. Dry mixing proceeds for the standard length of time as specified in the mixture design specifications.

Any regular quality aggregate and bitumen will be acceptable.

- G. The proper quantity of bitumen (asphalt cement, liquid) is added to the pug mill and wet mixing proceeds for the standard length of time as specified in the design mixture specifications.
- H. The asphalt batch is accumulated and discharged normally.
- I. The asphalt batch is discharged to a haul vehicle or storage.

2.5 Drum Type Mixers and Mixing Operations

- A. Ensure adequate start, stop, and rate change information is easily communicated between drum control operations and fiber addition activities.

Fiber addition locations on Drum Type Mixers vary significantly. The fibers can become airborne. The bags of fibers will not “gum” up the works.

- B. Add complete bags of fiber at a point in the mixing process after fines collection and before the addition of liquid asphalt.
- C. Add fibers after the fines collection to ensure the fibers do not clog filters.
- D. Add fibers before the liquid asphalt addition.

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- E. Add complete bags of fibers at the general nominal rate agreed to by operations and mixture design specifications.
- F. Do NOT open the bags at any point in the loading process.
- G. Mixing should proceed for the standard length of time as specified in the mixture design specifications.

Any regular quality aggregate and bitumen will be acceptable.

- H. The proper quantity of bitumen (asphalt cement, liquid) is added to the drum and wet mixing proceeds for the standard length of time as specified in the mixture design specifications.
- I. The asphalt batch is accumulated and discharged normally.
- J. The asphalt batch is discharged to a haul vehicle or storage.

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Part 3 Execution

3.1 Placement

- A. Discharge fiber reinforced asphalt cement concrete into locations as directed and in accordance with the project.
- B. Place asphalt cement concrete in accordance with provision of other Sections and with additional instructions as follows.
- C. Avoid over-using long tine rakes or other tools that will align fibers or disrupt the homogeneous, uniform 3-dimensional, fiber dispersion when moving asphalt cement concrete.
- D. Using a lute, “come along”, or a flat tined pitch-fork (potato-fork) may be useful for moving asphalt cement concrete.

Fiber balls do not usually occur when using FORTA- FI® fibers and are obvious primarily during discharge for final placement of fiber reinforced asphalt cement concrete.

- E. Remove any observed fiber balls from mixture if they occur.
- F. Adjust operations regarding any observed fiber balls.

3.2 Compaction

No changes in procedure or compaction are required.

- A. Verify timing for initial and final compaction on more than a visual determination.
- B. Hand Compaction/Finishing: use appropriate tools as required.

3.3 Schedules

A schedule may be needed to coordinate no fiber and fiber reinforced asphalt specified in this section with drawings indicating areas for placements and especially if a no fiber dosage is also specified in this Section. Schedule the fiber blend to placements regarding hot, warm and patching asphalt mixtures.

- A. Use fiber-reinforced asphalt cement concrete in these locations scheduled as follows:
 - 1. FORTA-FI® HMA fibers: Location or description
 - 2. FORTA-FI® WMA fibers: Location or description
 - 3. FORTA-FI® PAT fibers: Location or description

END OF SECTION