

FOSTERING THE IMPLEMENTATION OF FIBRE-REINFORCED ASPHALT
MIXTURES BY ENSURING ITS SAFE, OPTIMIZED AND COST-EFFICIENT
USE (FIBRA)

PROTOCOL FOR THE MANUFACTURING OF FIBER
REINFORCED ASPHALT MIXTURES AT THE ROADS
LABORATORY OF THE UC

(Laboratory work carried out from September to December 2018)

- February 2019 -



In this document, the laboratory procedure used by GITECO (UC) for the manufacturing of asphalt mixes containing fibers is described.

1. EQUIPMENT

MIXER DRUM

A Pavelab mixer from Controls is used. Around 15 kg of asphalt mixture was produced per batch.



Figure 1. Laboratory Mixer

2. MATERIALS

2.1. BITUMEN:

A conventional 50/70 penetration grade bitumen has been used to dose the mixtures. Its properties are included in Table 1.

Conventional binder 50/70

	Result	Standard
Density (g/cm ³)	1.035	EN 15326
Softening point (°C)	51.6	EN 1427
Penetration (0,1 mm)	57	EN 1426
Fraass Point (°C)	-13	EN 12593

Table 1. Properties of conventional bitumen

2.2. AGGREGATES:

Main properties of the aggregates used in this protocol are presented in Table 2, Table 3, and Table 4.

Coarse aggregate: Ophitic

	Result	Standard
Specific weight (g/cm ³)	2.794	EN 1097-6
Angels coefficient	15	EN 1097-2
Polished stone value (PSV)	> 56	EN 1097-8
Flakiness Index (FI)	< 1%	EN 933-3

Table 2. Properties of coarse aggregate

Fine aggregate: limestone

	Result	Standard
Angels coefficient	28	EN 1097-2
Specific weight (g/cm ³)	2.725	EN 1097-6
Sand equivalent	78	EN 933-8

Table 3. Properties of fine aggregate

Filler: limestone

	Result	Standard
Specific weight (g/cm ³)	2.700	EN 1097-6

Table 4. Properties of filler

3. MANUFACTURING PROCESS

The laboratory protocol for the manufacturing of fiber reinforced asphalt mixtures is based on the indications provided by the fiber's suppliers. The production process is defined considering the characteristics of the equipment available at the Roads Laboratory of the UC, especially the mixer drum and the ovens.

The laboratory protocol is summarized in the following steps:

1. The aggregates are heated up to 175 °C for 6 hours approximately*.
2. The bitumen is heated up to 150 °C for approximately 3 hours*.

3. The mixer drum is pre-heated at 150 °C, the same temperature of the bitumen*.
4. In the case of **Panacea Fibers**, the fibers are added to the mixer drum just after the aggregates and both components are mixed for 1 minute. Immediately after, the bitumen is incorporated to the mixer drum. It is mixed for 1 minute with the aggregates and the fibers. Then, the filler is incorporated, and all the components are mixed for 3-4 minutes.
5. In case of the **Forta-fi fibers**, the procedure is similar but aramid fibers and polyolefin fibers are incorporated separately:
 - 5.1. The aramid fibers are added to the mixer drum just after the aggregates and both components are mixed for 1 minute.
 - 5.2. Then, the bitumen is incorporated to the mixer drum. Immediately after, the polyolefin fibers are added to the mixer directly on the bitumen. Then, the components are mixed for 1 minute before adding the filler.
 - 5.3. Finally, when the filler is incorporated, all the components are mixed for 3-4 minutes.

****Working temperatures for the aggregates, bitumen and mixer drum will depend on the type of bitumen to be used. In this case, the temperatures for a 50/70 penetration grade bitumen are shown.***