



TECHNICAL DATA SHEET USE OF RARX®

RARX® is an ELASTOMERIC ASPHALT EXTENDER produced with crumb rubber powder obtained from ELT's (End Life Tires), which is pretreated in factory and will provide final asphalt mixture excellent technical performance (no cracking, no rutting, longer useful life, better fatigue behavior, soundless effectiveness, ...). **RARX®** modifies the plain bitumen by increasing its PG grading, resilience, and recovery properties.

RARX® can be added to any type of Hot Mix Asphalt [HMA] - Dense, Open Graded, Gap graded, SMA, etc., at different percentages previously defined in the study of the rubberized asphalt mix design. In the mixing plant **RARX®** is added directly to the pug mill or dryer drum, right after the aggregates, using existing feeders [i.e. Fiber feeders for SMA mixes, etc.) or from one of the filler silos of the asphalt plant

PRODUCT AND COMPANY IDENTIFICATION

Identification of the substance or preparation:

Product Name:	RARX®
Material Applications:	Elastomeric Asphalt Extender
Company Identification:	CIRTEC
Company Registered Name:	Círculo Tecnológico 2020 S.L.

GENERAL DESCRIPTION

RARX® is composed of fine rubber granules, conventional bitumen, and by mineral fillers reacted at properly optimized percentages and at appropriate temperatures and time.

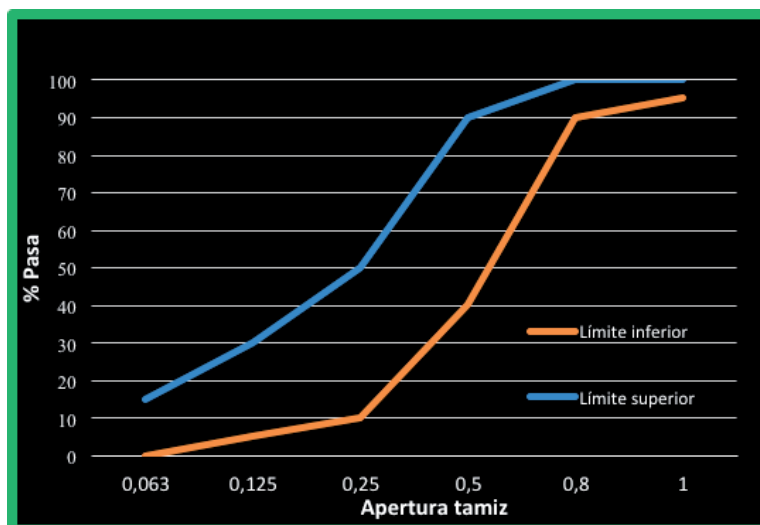
Physical State:	Solid, Black powder
Odor and Appearance:	Mild Rubber, Black with Brownish color granules
Bulk density:	0.6 [+/- 0.03] gr/cm ³
Specific Gravity:	1.031 gr/cm ³ [± 0.03]
Flash Point [°C]:	>300 (°C)
Solubility:	Insoluble in water
Chemical stability:	Incompatible with strong oxidizing





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SIEVE OPENING (mm)	LOWER LIMIT (% passing)	UPPER LIMIT (% passing)
1,000	95	100
0,800	90	100
0,500	40	90
0,250	10	50
0,125	5	30
0,063	0	15



Typical RARX® gradations should be within the limits showed above.

RARX® COMPOSITION

Composition to be considered when making asphalt mixture design:

Crumb rubber powder from ELT's:	60%
Bitumen:	16% ($\pm 3\%$)
Filler and other additives:	24% ($\pm 3\%$)

SHELF LIFE

One year from production date. It is recommended to get a vibrating metal net on its bottom to disaggregate any agglutinations that may occur.

STORAGE

Keep big bags closed in ventilated warehouses when not in use. Avoid direct sun lights. Keep in dry place.

TRANSPORTATION

No need a special transportation.



GUIDELINES FOR USE

In the production of bituminous mixtures with **RARX®** a normal filler silo with a proper feeder may be used to add the **RARX®** in the mixer used in asphalt plants. However it should be considered that **RARX®** has a 0.6 density does requiring a high-volume throughput system. In order to ensure a homogeneous mixture, **RARX®** is added to the mixer together with the aggregates and before bitumen. To ensure a homogeneous mixture, **RARX®** should be mixed for about 10 seconds with the aggregate, before the addition of bitumen, and about 20 to 30 seconds afterwards.

It is recommended the aggregates to be overheated by 5 to 15° C, compared to the normal temperature used in similar type of mixing (but without exceeding 195° C) in order to compensate for the fact that **RARX®** is added at regular ambient temperature. It is recommended that the heating of the bitumen, is 5° C above the normal temperature used for this kind of mixtures (but without exceeding 195° C or the temperature recommended by bitumen producer).

It is recommended a mixing temperature between 175° C and 180° C. It is recommended compaction temperature between 160° C and 170° C with steel rollers cylinder, wet with water with about 2% hydrated lime. The compaction must be done with at least three roller compactors, and one of them should always be close to the paver at maximum distance of 10 meters.

The percentage of **RARX®** to be added to the final rubberized asphalt mixture must be defined in the formulation study, being this value variable between 0,5% and 4,5% over total asphalt mix weight, depending on the type of bituminous mixture to be manufactured. **RARX®** can be applied to the most diverse types of hot bituminous mixtures such as, open, dense, for thin layers, conventional, Stone Mastic Asphalt, gap graded and thingap, etc.

The exact percentage of **RARX®**, the mixing temperature, as well as the minimum mixing time, shall be determined by the mixture formulation study prepared by an Independent Testing Laboratory, experienced in the formulation of such bituminous mixtures, and approved by the Supervision.

Once the exact percentage of **RARX®** to be used is set, deviations of more than $\pm 0.5\%$ from that value cannot be accepted.



RARX® GENERAL CONCEPT

RARX® has been formulated so that, when added to an unmodified bitumen in suitable quantities, it can meet the requirements of a Rubber Asphalt - according to ASTM D 6114 - Standard Specification for Asphalt-Rubber Binder, (i.e. having an initial viscosity, at 5 minutes at 175 ° C, between 1500 and 5000 cPoises (according to EN 13302), a softening temperature value by Ring and Ball method, greater than 65 °C (by EN 1427) and a Resilience value higher than 30% (by ASTM D 5329)). It should also maintain the viscosity of the binder for 2 hours between the initial viscosity plus or minus 30%. Preferably, this viscosity should show stabilization signals during the last hour.

