

## ANNEX A

### TECHNICAL SPECIFICATIONS FOR RAILWAY BALLAST

#### Description

The ballast to supply should consist of hard stone particles starting from the broken and / or crushed igneous or metamorphic rocks, the particles will be free of aggressive substances, cracks and crevices. The material should have a hard, strong, angular and durable structure, providing sharp corners and cubic fragments with a minimum of smooth and straight parts, free from clay, shale or any excess dust or other undesirable organic material or substance.

The ballast must have high abrasive and wear properties to withstand impact loads exerted by traffic and alignment equipment - Leveling - Rolling (Plasser or similar) used for railway maintenance. It must also possess high resistance to changing temperatures, chemical attack, low absorption properties and be free from cementing properties.

The ballast will be extracted from healthy banks (bedrock) from the quarry, excluding those banks or variety of rocks that present alteration (soft material).

It must not have certain fragile components such as glass of cementing magmatic origin as part of the mass.

The ballast must be free of dust, sand, clay cores, earth or other contaminating material.

The ballast must show a polyhedral shape, prismatic or pyramidal, with sharp edges.

#### Granulometry

The ballast granulometric curves must be located at all points between the limit values stated below:

| Designation of sieve according to<br>UNIT standard (in microns) | Material passing<br>(% in mass) |
|---|---------------------------------|
| 63500 (2.5 ")   | 100                             |
| 50800 (2")  | 85 to 100                       |
| 38100 (1.5")  | 35 to 70                        |
| 25400 (1")  | 0 to 15                         |
| 19050 (0.75 ")  | 0                               |

The resulting granulometric curves must be between the curves determined by the limits adopted.

**Tolerances**

The percentage of broken stone retained by the 63500 (2.5") sieve must not exceed 5% of the mass, but it must pass through the 88900 (3.5") sieve.

The percentage of broken stone that goes through the 19050 (0.75") sieve must not exceed 5% of the mass but it must be retained by the 12700 (0.5") sieve.

**Clay cores**

The clay core or similar material, strangers to the ballast, are only allowed up to 0.5% of the total mass.

**Flattened particles**

The ballast must not contain slabs at a higher rate to 5% of the mass, by slab meaning those flattened particles whose largest dimension is greater than 5 (five) times its average thickness.

**Wear Test**

The percentage of broken stone wear tested by the Los Angeles method (ASTM C 535 Abrasion degradation of large aggregates, gradation F [2]), will not be greater than 22% as the maximum allowable percentage.

**Durability Test**

Durability of the stone used is determined by the A.A.S.H.T.O. test 104. For materials of basaltic origin less than 65% degradation is required when tested in dimethyl sulfoxide solution according to the UY 26 standard (provisional).

For other materials less than 12% degradation is required when tested in sodium sulfate solution according to the UY 25 standard (provisional).