

**1 BALLAST****1.1****Scope**

This Specification covers the characteristics and physical property requirements of mineral aggregates to be used as crushed stone ballast, testing, acceptance criteria and other technical conditions for both the source material and the crushed stone ballast prepared there-from. This Specification also addresses the issues of locating the source of suitable and acceptable rock material, crushing of the material, handling, transporting and stockpiling the prepared ballast.

**1.2****General Requirements**

The Bidder, in his bid, shall mention the specific source(s) of rock ballast from which he proposes to supply the ballast along with brochures, test certificates and documentary proof that the ballast from this source has been used by Railways.

It will be the responsibility of the Contractor to locate a suitable source of rock material that will produce a product meeting with the requirements of these Specifications. The Contractor may note that rock ballast from India has been used in the Jamuna Bridge Rail Link Project. The Contractor shall consider suitable sources preferably more than one satisfying the requirements of the Specifications.

It will be the responsibility of the Contractor to obtain all necessary permits, licenses, acquisition of property, access to the property for the purpose of





obtaining the source material for crushing, payment of royalties, transport costs, and any other payment that may be necessary in the acquisition of ballast material, crushing operation, and transport to an approved site on or adjacent to the existing or new Railway Right of Way of the Project for stockpiling.

The sources from which the crushed rock ballast will be obtained shall have sufficient capacities to ensure the timely completion of the railway track structure installation. The selection of suitable quarry sites, either in Bangladesh or elsewhere, shall take into consideration both the quality of the rock material and the Contractor's ability to deliver crushed rock ballast from the selected source to the Project Site in sufficient quantities to meet the track construction schedule.

The Contractor shall submit a comprehensive plan for the production of crushed rock ballast from each primary source to be utilized. The plan shall designate the source of material, present the test data on that material and address issues such as acquisition, permits, quarrying and crushing equipment intended to be used and their source, the proposed means of transport, and stockpiling area(s) at the Project Site for subsequent distribution on the new rail track and quality control procedures intended to be adopted.

Testing at the source shall include all tests as specified below:

The Contractor shall also submit plans for alternative secondary source(s) of supply of crushed rock ballast. The plans, data, and information for the secondary source(s) of supply shall be to the same level of detail as for the primary source(s). The intent of this requirement is to ensure that no significant delay occurs in the event that any primary source of supply, should for any reason, becomes unavailable.

Crushed rock ballast shall be obtained from sources approved by the Engineer. The Contractor shall not obtain crushed rock ballast from other sources without the written approval of the Engineer.

## 2. Material

### General

The ballast shall conform to Indian Railways' RDSO (Research, Design and Standards Organisation) Specifications for Track ballast IRS GE-1 June 2004 including Correction slip No; 3 dated 5-01-09.

The ballast shall be composed of machine crushed stone or rock (Granite or Trap rock), and shall be hard, dense, strong, of an angular and durable particle structure providing sharp corners and cubical fragments with a minimum of flat and elongated pieces, free from clay, shale or an excess of dust or other undesirable or deleterious substances or materials.



The ballast shall have high wear and abrasion resistance qualities to withstand the impact of traffic loads and track maintenance by heavy tamping machines without excessive weathering and degradation.

The ballast shall provide high resistance to temperature changes, chemical attack, have low water absorption properties and be free from cementing properties.

## 2.2 Quality Requirements

### Size and shape

Ballast particles shall be angular to sub-angular, cubical and not flaky. Thin or elongated pieces shall be such that the length of the particle more than 3 times the average thickness shall be less than 10% by weight.

### Deleterious Substances

Deleterious substances shall not be present in the ballast in excess of the following amounts:

Material passing through No. 200 sieve 1% by weight

### Stability and Resistance to Breaking

The crushed rock ballast material shall meet the following limits:

- a) Weight loss as determined by the Los Angeles Abrasion test shall be less than 30%.

(Resistance to abrasion shall be determined by the Los Angeles Abrasion Machine in accordance with the IS 2386 Pt. IV- 1963.)

- b) Similarly the Aggregate Impact value tested in accordance with IS 2386 Pt. IV- 1963 shall be less than 20%.
- c) Bulk Specific Gravity (BSG) of the rock shall be more than 2.60.
- d) Water absorption shall not exceed 1.0% by weight tested in accordance with IS 2386 Part 3 1963

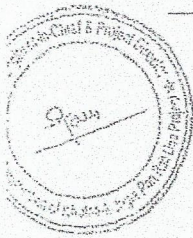
## 2.3 Grading Requirements

The grading of ballast shall be determined by sieving with laboratory sieves having square openings and conforming to IS Code-2386(Part-I)-1963

A set of IS Sieves of sizes -65mm, 40mm, and 20mm, shall be used to do the sieve analysis to measure the percentage of ballast passing through each sieve.

The ballast shall conform to the following size and gradation:





Nominal Sieve Size	% Passing through Each Sieve (by weight)
65 mm	100
40 mm	40-60
20 mm	2

## 2.4 Oversize Ballast

- i. Retention on 65mm square mesh sieve.

A maximum of 5% ballast retained on 65mm sieve shall be allowed without deduction in payment.

In case ballast retained on 65mm sieve exceeds 5% but does not exceed 10%, payment at 5% reduction in contracted rate shall be made for the full stack.

Stacks having more than 10% retention of ballast on 65mm sieve shall be rejected.

- ii. In case ballast retained on 40mm square mesh sieve exceeds 60% limit prescribed above, payment at the following reduced rates shall be made for the full stack in addition to the reduction worked out at i) above.

5% reduction in contracted rates if retention on 40mm square mesh sieve is between 60% (excluding) and 65% (including).

10% reduction in contracted rates if retention on 40mm square mesh sieve is between 65% (excluding) and 70% (including).

- iii. In case retention on 40mm square mesh sieve exceeds 70%, the stack shall be rejected.

## 2.5 Undersize ballast

The ballast is considered as undersize,

- a) If the ballast retained in 40 mm sieve is less than 40%  
b) If the ballast retained in 20 mm size sieve is less than 98%.

Undersize ballast shall be rejected and not paid. The ballast not conforming to this Specification shall be removed from the site within a week of its rejection.

## Method of Sieve Analysis

- i. Sieve sizes mentioned in this specification are nominal sizes. The following tolerances in the size of holes for 65, 40 and 20mm nominal sieves sizes shall be permitted.

65mm Square Mesh Sieve Plus Minus 1.5mm



40mm Square Mesh Sieve Plus Minus 1.5mm  
20mm Square Mesh Sieve Plus Minus 1.0mm

Mesh sizes of the sieves should be checked before actual measurement. The screen for sieving the ballast shall be of square mesh and shall not be less than 100cm in length, 70cm in breadth and 10cm in height on sides.

- ii. While carrying out sieve analysis, the screen shall not be kept inclined, but held horizontally and shaken vigorously. The pieces of ballast retained on the screen can be turned down with hand to see if they pass through but should not be pushed through the sieve.
- iii. The percentage passing through or retained on the sieve shall be determined by weight.

## 2.6 Approval of the source of ballast.

Three samples of a quantity of about 0.027 cu.m per sample shall be taken on supply of first 100 Cu.m. of ballast. They shall be tested in an approved laboratory for their suitability for its use as ballast and the source approved if the ballast satisfies the requirements of the Specifications.

## 2.7

### Checks and Tests by the Contractor

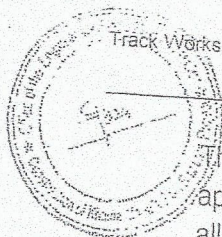
Upon acceptance by the Engineer of the source of rock material to be used in the production of crushed ballast and upon commencement of crushing, it is the responsibility of the Contractor to ensure continued compliance with this Specification for which he shall take samples periodically (at least once for every 2000 cu.m. of production) and conduct the full range of tests, as defined in this Specification.

If the Contractor changes the location of the source or encounters changes within the supply source, laboratory testing shall be performed again on the new material to ensure compliance with this Specification.

He shall also conduct sieve analysis to ensure the requirements of size and gradation for every 100 cu.m. In the event of any two individual samples failing to meet the gradation requirement, the Contractor shall take immediate corrective action to review and restore the production process to acceptable gradation. The Engineer shall be advised in writing of the corrective action being taken.

In the event of repeated failures, i.e. two or more samples failing consecutively, the Engineer reserves the right to reject the material and direct the Contractor to cease the crushing operation, remove the portion of material represented by the tests and take corrective action to once again produce crushed rock ballast that fully complies with this Specification.





The Contractor shall maintain the records of the results of the tests in an approved format and make available for inspection by the Engineer. Results of all the tests shall be submitted to the Engineer promptly but not later than a week of the tests.

**2.8****Inspection, Testing and Acceptance**

The Contractor shall submit an Inspection and Test Plan (ITP) based on the requirements of this Specification. The Contractor shall obtain approval of the Engineer for the Testing Laboratory and ITP prior to performing the tests prescribed in this Specification.

All the tests under this Clause shall be conducted in Contractor's Site laboratory under the supervision of the Engineer. Samples for testing shall be obtained in accordance with the RDSO Specifications referred to above.

**2.9****Handling, Stockpiling and Transporting**

The contractor shall dispatch to the Site only such ballast that meets the requirements of the Specification.

The locations of the stockpile(s) with respect to the railway formation (embankment) and the manner or method used in stockpiling shall require the approval of the Engineer. Stockpiles shall be located on a level and hard ground above Flood level and shall be cleaned before stacking ballast. It shall be the responsibility of the Contractor to make his own arrangements for stockpile areas, as well as for transporting the crushed rock ballast to the final stockpile area(s) at the Project Site.

Height of each stockpile shall not exceed two 2 meters and not less than 1m. The top width of the ballast stack shall not be less than 1m and the side slope of the stack shall not be flatter than 1.5 H to 1V and quantity of ballast in a stockpile shall not be less than 30 cum.

Every precaution shall be taken to avoid particle segregation and loss of material while loading into the wagons or trucks for transporting the ballast from the stockpile for distribution on the formation

*Signature*  
GM (Project)  
Bangladesh Railway

