

SECTION 20110

BALLAST AND WALKWAY AGGREGATE

PART 1 – GENERAL

1.01 DESCRIPTION

- A. Section includes specifications for furnishing and placing ballast and walkway aggregate. For the purpose of this Section ballast refers to ballast for main tracks and walkway aggregate for maintenance of way walkway. Obtain ballast only from the sources or quarries already approved by Owner.

1.02 REFERENCE STANDARDS

- A. American Railway Engineering and Maintenance of Way Association (AREMA) Manual of Railway Engineering (Manual):
 - 1. Chapter 1, Roadway and Ballast
- B. American Society for Testing and Materials (ASTM International):
 - 1. C29 Test Method for Bulk Density (Unit Weight) and Voids in Aggregate
 - 2. C88 Test Method for Soundness of Aggregates by Use of Sodium Sulfate or Magnesium Sulfate
 - 3. C117 Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing
 - 4. C127 Test Method for Density, Relative Density (Specific Gravity), and Absorption of Coarse Aggregate
 - 5. C131 Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - 6. C136 Test Method for Sieve Analysis of Fine and Coarse Aggregates
 - 7. C142 Test Method for Clay Lumps and Friable Particles in Aggregates
 - 8. C535 Test Method for Resistance to Degradation of Large-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine
 - 9. C702 Practice for Reducing Samples of Aggregate to Testing Size
 - 10. D75 Practice for Sampling Aggregates
 - 11. D3744 Test Method for Aggregate Durability Index
 - 12. D4791 Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregates

- 13. E11 Specification for Wire Cloth and Sieves for Testing Purposes
- C. California Public Utilities Commission (CPUC) General Orders:
 - 1. 118 Construction, reconstruction and maintenance of walkways and control, of vegetation adjacent to railroad tracks

1.03 SUBMITTALS

- A. Submit Certificates of Compliance for ballast and walkway aggregate certifying that the materials meet the requirements specified herein including laboratory test results accompanied by a written report from the testing lab. The testing shall not be older than 90 days and performed on samples taken from production stockpile.
- B. Submit at least one 150-lb. ballast test sample.
- C. Submit name and location of ballast source, production rates, and production logistics.
- D. Submit detailed plans and descriptions for shipping, handling, and placing ballast.

1.04 DELIVERABLES

- A. Submit a report confirming the readiness of the subgrade for ballast placement including as-built subgrade elevations and compaction test results.
- B. Laboratory test results for all tests used in determining minimum property requirements of ballast.

1.05 QUALITY ASSURANCE

- A. Refer to Section 01400, Quality Control and Assurance. Ballast is subject to inspection and testing by the Engineer at any time between quarry production and acceptance of track.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Load ballast at the quarry, transport, and unload directly on the track. Engineer may allow transportation by truck if the Contractor can ensure that the segregation, degradation, or contamination of the ballast would not occur as a result of trucking and placing.

PART 2 – PRODUCTS

2.01 MATERIAL PROPERTY REQUIREMENTS OF BALLAST/WALKWAY AGGREGATE

- A. Ballast/walkway aggregate production and handling facilities shall conform to the AREMA Manual, Chapter 1, Section 2.5, Production and Handling.

- B. Ballast/walkway aggregate shall be crushed stone broken by the crusher and have at least 2 broken surfaces: angular, rough-surfaced, clean and free of sand, loam, clay, flat, elongated, soft or disintegrated pieces, and other deleterious substances.
 - 1. The Ballast/walkway aggregate shall conform to the property requirements shown in the following table.

**MINIMUM PROPERTY REQUIREMENTS
BALLAST/WALKWAY AGGREGATE**

Property	Minimum	Maximum	Test Method
Bulk specific gravity - Rock	2.75	--	ASTM C127
Degradation	--	20 %	ASTM C535/C131
Durability Test – Procedure A	65	--	ASTM D3744
Percent material passing No. 200 Sieve	--	1.0 %	ASTM C117
Absorption – Rock	--	1.0 %	ASTM C127
Clay lumps and friable particles	--	0.5 %	ASTM C142
Soundness - (Sodium Sulfate), 5 cycles	--	5 %	ASTM C88
Flat and/or elongated particles	--	5 %	ASTM D4791

- C. Unacceptable ballast/walkway aggregate materials: Round rocks, boulders, cobbles or gravels.
- D. Unacceptable ballast/walkway aggregate parent materials: Carbonates, sedimentary rock, alluvium, sandstone, limestone, and slag.
- E. Obtain ballast/walkway aggregate material from one quarry source throughout the duration of the Contract.

2.02 GRADATION REQUIREMENTS OF BALLAST

- 1. Ballast (AREMA Size No. 4A) shall fall within the following gradation requirements:

Nominal Sieve Size (Square Opening)	% Passing by Weight
2-1/2 inch	100
2 inch	90-100
1-1/2 inch	60-90
1 inch	10-35
3/4 inch	0-10
3/8 inch	0-3
No. 4	0-0.5

2. Walkway aggregate (AREMA Size No. 5) shall fall within the following gradation requirements:

Nominal Sieve Size (Square Opening)	% Passing by Weight
1-1/2 inch	100
1 inch	90-100
3/4 inch	40-75
1/2 inch	15-35
3/8 inch	0-15
No. 4	0-5

2.03 WASHING

- A. Wash processed ballast and walkway aggregate to remove fine particle contamination as defined by the specifications prior to delivery.

PART 3 – EXECUTION

3.01 EXAMINATION AND CORRECTION OF SUBGRADE

- A. Prior to placing ballast on track subgrade, perform a final check of the condition of the track subgrade as to line, grade, cross section, and compaction.
1. Verify that track subgrade or subballast does not vary more than 1/2 inch from the design elevations and the line cross sections.
 2. Repair uneven or settled subgrade with aggregate base or material approved by the Engineer in accordance with the requirements of Section 02310, Aggregate Base Courses, and Section 02300, Earthwork.
 3. Compact subgrade in accordance with the requirements of Section 02310, Aggregate Base Courses, and Section 02300, Earthwork.
 4. Prior to the placement of ballast, submit a report listed under Deliverables herein confirming the readiness of the subgrade.
- B. Do not place ballast on soft, muddy areas. Repair the unsuitable area for approval by the Engineer.

3.02 GENERAL

- A. At any time ballast is found to not conform to these specifications, stop ballast operations until ballast that does not conform to these specifications is removed and replaced.
- B. Remove and replace ballast that becomes contaminated with fines or other deleterious material with new ballast.

3.03 BALLAST DISTRIBUTION

- A. Obtain Engineer’s approval of subgrade prior to distributing ballast.

- B. Unload ballast directly from rail cars onto the track. Distribution by truck or loader is subject to the approval of the Engineer.
- C. When distributing ballast, prevent forming of ruts that would impair proper drainage of the subgrade surface. Level and re-grade ruts to drain prior to placing ballast.
- D. Unload ballast as close as possible to the point of use so to prevent unnecessary handling. Do not handle ballast more than two (2) times from the quarry to the track unless otherwise approved by the Engineer. Pick up excess ballast and ballast that is mixed with soil or fouled during distribution and replace with new ballast.
- E. Place ballast to the lines and grades as shown on the Contract Drawings.
- F. Salvaged excess or fouled ballast shall not be used as backfill, bedding or as fill materials unless otherwise approved by the Engineer.

3.04 WALKWAY AGGREGATE DISTRIBUTION

- A. Distribute walkway aggregate and place in areas of walkways in track and special trackwork as required by CPUC General Order 118 and in other areas as shown on the Contract Drawings and as described in Section 20500, Special Trackwork. Also place walkway aggregate around non-track underdrains and other areas as shown on the Contract Drawings.
- B. Place walkway aggregate only after ballast on main track has been completely surfaced, tamped, and dressed. Do not mix walkway aggregate with ballast for purposes of tamping of track structure.
- C. Place the walkway aggregate only after subgrade and backfill have been completely compacted and cleared of debris.

3.05 QUALITY CONTROL AND TESTING

- A. Refer to Section 01400, Quality Control and Assurance. Testing shall be performed by an approved Inspection and Testing Agency retained by the Contractor.
- B. Sample and test ballast material, during construction to ensure continued conformance with the requirements of this Section. The laboratory shall transmit test results directly to the Engineer with copies to the Contractor.
- C. Perform gradation tests ASTM C136 and C117 at least once every 500 tons, and perform tests in Table 1 of this Section no less than every 5,000 tons. Take ballast samples at the quarry, in stockpiles, in track, and at the Engineer's discretion.
- D. Ballast Samples:

1. Perform gradation tests plus all of the tests specified herein on at least five (5) separate ballast samples at the quarry for the first 1,000 tons produced.
 2. Test all samples of ballast material for conformance with ASTM D75. Sample sizes shall be sufficient to provide the minimum sample sizes required by the designated test procedures. Reduce test samples from field samples in conformance with ASTM C702.
 3. If the ballast consistently fails the gradation test for excess materials passing the No. 4 or No. 200 sieves, fully wash the ballast at the quarry. Consistent failure means three (3) or more failures per 500 tons sampled.
- E. Gradation Test:
1. Perform sieve analysis conforming to ASTM C117 and ASTM C136. Sieves shall conform to ASTM E11.
- F. Other Tests:
1. Determine bulk specific gravity and absorption in conformance with ASTM C127.
 2. Determine percentage of clay lumps and friable particles in conformance with ASTM C142.
 3. Perform resistance to degradation of materials test in conformance with ASTM C131 and ASTM C535. Materials with gradations with particles larger than one inch shall be tested in conformance with ASTM C535.
 4. Perform soundness test in conformance with ASTM C88.
 5. Perform durability test in conformance with ASTM D3744, Procedure A.
 6. Determine unit weight in conformance with ASTM C29.
- G. Materials Not Meeting Specified Requirements: In the event any individual samples fail to meet the gradation or material requirements specified herein, the Engineer may suspend placement of the ballast and require immediate corrective action be taken to restore the specified gradation and material requirements, prior to resuming ballast placement.

END OF SECTION