



*Pacific Gas and
Electric Company™*

Gas Transmission & Distribution, Gas Engineering

BACKFILL SAND

Engineering Material Specification No. 4123

Date of Specific Issue: May 1, 2009

Supersedes Engineering Guideline 4123, Dated May 1, 1999

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1.0 PURPOSE AND SCOPE

This specification covers the requirements for imported sand used in bedding and backfill in trenches for electric cable, electric conduit, and gas pipe where the minimum 95% dry-in-place density, as determined by ASTM D-1557 or equivalent, is required.

2.0 INTERPRETATION

All questions that may arise concerning interpretation of this specification or acceptability of materials furnished and delivered to PG&E under this specification must be resolved in a manner agreeable with PG&E's Gas Transmission & Distribution, Gas Engineering departments.

3.0 APPLICABLE STANDARDS

Sand shall be free of constituents that could cause adverse environmental impact. Used blasting abrasives containing toxic constituents at or above State or Federal hazardous waste levels shall not be used as backfill material. Backfill material shall consist of natural sand, manufactured sand, existing native material, or combinations thereof, and shall conform to the physical properties listed below:

3.1 **Organic Impurities - ASTM C-40**

Supernatant shall not be darker than Plate 3 when compared to standard Gardiner Color Series.

3.2 **Sand Equivalent - ASTM D-2419**

Equal to or greater than 20.

3.3 **pH value - ASTM G-51-77**

Equal to or greater than 4.5 and less than 9.

3.4 **Resistivity R - ASTM G-57**

Equal to or greater than 5,000 Ohms-cm.

If Resistivity R is *smaller* than 5,000 Ohms-cm, the following chemical contents limits shall apply:

- Total chloride content shall be equal to or less than 500 parts per million as determined by EPA Method 300.0 prepared by Parr O₂ bomb combustion.
- Total sulfate content shall be equal to or less than 150 parts per million as determined by EPA Method 300.0 prepared by Parr O₂ bomb combustion.

3.5 **Compaction - ASTM D-1557**

When material is compacted to a relative compaction of 95% or greater, as determined by ASTM D-1557, the material shall not slough when cross trenched.

3.0 APPLICABLE STANDARDS, continued

3.6 Gradation - ASTM C-136 & ASTM C-117

Sieve Size	Percent Passing (By Weight)
½"	100
No. 4	75-100 ¹
No. 50	0 - 70
No. 100	0 - 30
No. 200	0 - 15

¹ For grains retained on No. 4 sieve, the grain shape shall be rounded or sub-rounded as defined by ASTM D-2488.

3.7 Coefficient of Uniformity, $C_U \geq 2.5$

$$C_U = D_{60} / D_{10}$$

D_n = Diameter of grain size which n % of the total sample is passing

3.8 Standard Specifications

- ASTM C-40 Test for Organic Impurities in Fine Aggregates for Concrete
- ASTM D-2419 Test for Sand Equivalent Value of Soil and Fine Aggregate
- ASTM G-51-77 pH of Soil for Use in Corrosion Testing
- ASTM G-57 Soil Resistivity Field Measurement Using Wenner Four Electrode Technique
- EPA Method 300.0 . Determination of Inorganic Anions in Water by Ion Chromatography
- ASTM D-1557 Test Methods for Moisture-Density Relations of Soils and Soil-Aggregate, Mixtures Using 10-lb. Rammer and 18-in Drop
- ASTM C-136 Sieve Analysis of Fine and Coarse Aggregate
- ASTM C-117 Test for material Finer than No. 200 Sieve by washing
- ASTM D-2488 Practice for Description and Identification of Soils (Visual-Manual Procedure)
- ASTM D-75 Practice for Sampling Aggregate

4.0 TESTING

- 4.1 Supplier shall submit samples of Backfill Sand from each source for testing at an independent lab in accordance with all listed specifications. The lab results must be signed by a Registered Civil Engineer. Supplier shall provide certified tests reports to PG&E on request.
- 4.2 Sand sampling shall follow ASTM D-75.
 - The minimum sample size that will be accepted for testing is 100 pounds.
 - Each sample shall be representative of the material from a single source.
 - Each sample shall be marked with a unique identifier and the location where it was procured.

4.0 TESTING, continued

- 4.3 Supplier shall obtain new test results when there is a change in the original approved source.
- 4.4 PG&E reserves the right to procure samples from the source for internal testing at any time.