

Tifton Physical Soil Testing Laboratory, Inc.

1412 MURRAY AVENUE
TIFTON, GEORGIA 31794
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www.tiftonsoillab.com



TESTING CERT #1014.01

Date Received: April 11, 2011
Date Reported: April 14, 2011
Sample Number: L87A-11

Test Report For: Pearl Aggregate Materials, LLC
P.O. Box 6345
Diamondhead, MS 39525
Attn: Christopher Hayes

RE: Topdressing Sand Test

PHYSICAL ANALYSIS¹

MIXES ANALYZED (% by Volume)			SATURATED HYDRAULIC CONDUCTIVITY in/hr	POROSITY (%)			BULK DENSITY g/cm ³	WATER RETENTION AT FIELD CAPACITY %	CHEMICAL	
SOIL	SAND	AMENDMENT		NON-CAPILLARY (air-filled)	CAPILLARY (water-filled)	TOTAL			pH ²	EC ³ mmhos/cm
Sand #4			44.5	30.9	9.8	40.7	1.57	6.2	7.7	
USGA Recommendations for a Topdressing Sand:			Minimum of 6 in/hr.	15 - 30	15 - 25	35 - 55				

PARTICLE DENSITY⁴ 2.65 g/cm³

PARTICLE SIZE ANALYSIS

SAMPLES	GRAVEL 2 mm %	SAND FRACTIONS (% Retained) ⁵					SAND ⁶ 0.05-2 mm %	SILT ⁶ .002-.05 mm %	CLAY ⁶ <.002 mm %	ORGANIC MATTER ⁷ % by wt.
		VERY COARSE 1 mm	COARSE 0.5 mm	MEDIUM 0.25 mm	FINE 0.15 mm	VERY FINE 0.05 mm				
Sand #4	0.0	0.0	8.7	79.4	9.2	1.4	98.7	0.9	0.4	
← Topdressing Sand →										
USGA Recommendations for a Topdressing Sand	≤ 10% (≤3% gravel)		60% minimum		≤ 20%	≤ 5%		≤ 5%	≤ 3%	

Note: Total 'fines' (very fine sand, silt, and clay) in a root zone mix should be less than (<) 10%.

1. Determined at 30 cm tension by USGA testing protocol (ASTM F1815) 2. ASTM D4972 3. SSSA Soluble Salts 4. SSSA Particle Density
5. ASTM C136 and F1632 6. Bouyoucos, 1962 7. ASTM F1647 8th Revision 05/17/2010

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Attn: Christopher Hayes

RE: Topdressing Sand Test

Revised 05/17/2010

Recommendations:

Sand #4 from Pearl Aggregate Materials, LLC was evaluated on April 13, 2011, to determine if it meets USGA recommendations for a topdressing sand as requested. The condition of the sample as received was normal.

Sand #4 is a medium sand with 97.3% particles within the USGA range of 1.0 to 0.15mm for a topdressing sand. This is a very, very high percentage of particles within this range with a majority of the particles (79.4%) in the medium sand fraction range. The USGA has recognized for many years that the medium sand fraction is the best sand fraction for a topdressing sand. This topdressing sand has no particles larger than 1.0mm and only 2.7% "fines" (1.4% very fine sand, 0.9% silt, and 0.4% clay). This sand meets USGA particle size recommendations for a topdressing and rootzone mix (greensmix) sand.

Sand #4 is a silica sand with a soil water pH of 7.7.

Sand #4 had a water permeability rate of 44.5 in/hr. when compacted by the USGA procedure ASTM F1815 to simulate a compacted golf green. This is a very adequate rate for a topdressing sand. A topdressing sand should have a rate >20 in/hr. to allow for adequate drainage.

Conclusion: According to USGA guidelines for selecting a topdressing sand, this is an excellent topdressing sand. This topdressing sand is very compatible with any green that meets USGA particle size recommendations and will greatly benefit those that don't. This is as good as a topdressing sand gets.

Powell Gimes

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P.O. Box 6345
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Attn: Christopher Hayes

RE: Bunker Sand Test

PHYSICAL ANALYSIS¹

MIXES ANALYZED (% by Volume)			SATURATED HYDRAULIC CONDUCTIVITY in/hr	POROSITY (%)			BULK DENSITY g/cm ³	WATER RETENTION AT FIELD CAPACITY %	CHEMICAL	
SOIL	SAND	AMENDMENT		NON-CAPILLARY (air-filled)	CAPILLARY (water-filled)	TOTAL			pH ²	EC ³ mmhos/cm
Sand #4			44.5	30.9	9.8	40.7	1.57	6.2	7.7	
USGA Recommendations for a Bunker Sand:			Minimum of 20 in/hr.							

PARTICLE DENSITY⁴ 2.65 g/cm³

PARTICLE SIZE ANALYSIS

SAMPLES	GRAVEL 2 mm %	SAND FRACTIONS (% Retained) ⁵					SAND ⁶ 0.05-2 mm %	SILT ⁶ .002-.05 mm %	CLAY ⁶ <.002 mm %	ORGANIC MATTER ⁷ % by wt.
		VERY COARSE 1 mm	COARSE 0.5 mm	MEDIUM 0.25 mm	FINE 0.15 mm	VERY FINE 0.05 mm				
Sand #4	0.0	0.0	8.7	79.4	9.2	1.4	98.7	0.9	0.4	
USGA Recommendations for a Bunker Sand		← Bunker Sand →							≤ 3%	

1. Determined at 30 cm tension by USGA testing protocol (ASTM F1815) 2. ASTM D4972 3. SSSA Soluble Salts 4. SSSA Particle Density
5. ASTM C136 and F1632 6. Bouyoucos, 1962 7. ASTM F1647 Created 05/17/2010

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Attn: Christopher Hayes

RE: Bunker Sand Test

Revised 05/17/2010

Recommendations:

Sand #4 from Pearl Aggregate Materials, LLC was evaluated on April 13, 2011, to determine if it meets USGA recommendations as described in the enclosed USGA guidelines for selecting a bunker sand. The condition of the sample as received was normal.

Sand #4 is a medium sand with 88.1% particles within the USGA recommended range of 1.0 to 0.25mm for a bunker sand. The USGA recommends a minimum of 65% particles within this range. Therefore, this sand meets the USGA particle size recommendation for selecting a bunker sand.

Sand #4 has a minimal amount ($\leq 3\%$) of silt and clay at 1.3%, so crusting of the surface layer should not be a problem.

Sand #4 is mostly sub-angular in the coarse sand fraction, sub-rounded in the medium and fine sand fractions, and medium sphericity in particle shape.

Sand #4 has a good slight off-white color.

Sand #4 has a penetrometer reading of 2.2 kg/cm² which means it has a slight tendency to bury based on this fried-egg lie potential test.

Sand #4 is a silica sand and not a calcareous sand with a soil water pH of 7.7.

Sand #4 had a high water permeability rate of 44.5 in/hr. when compacted by the USGA procedure ASTM F1815 to simulate a compacted golf green. This is a very adequate rate for a bunker sand. The USGA recommends a rate > 20 in/hr. for a bunker sand.

Conclusion: According to USGA guidelines for selecting a bunker sand, this Sand is a very good bunker sand. This Sand is outstanding in the seven guidelines the USGA recommends for selecting a bunker sand (enclosed).

Powell Gaines

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RE: Bunker Sand Test

Revised 05/17/2010

Recommendations:

The USGA offers the following seven guidelines for selecting a bunker sand.

1. Minimum of 65% sand particle size between 0.25mm and 1.0mm.
2. Sharp, angular sand preferred to round particle shape to reduce fried-egg lie potential.
3. Minimal amount ($\leq 3\%$) of silt and clay to prevent crusting of the surface layer.
4. Silica sand preferred over calcareous sand.
5. A minimum infiltration rate of 20 in/hr.
6. Lighter colored sands are preferred for aesthetics.
7. Playability consisting of consistency and good management.

Reprinted from USGA Green Section Record. Jan/Feb, 1998.

Powell Gimes

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