



Turf & Soil Diagnostics

July 10, 2018

Michael Collins
The Hayden Group
55 JT Drive
Sheridan, AR 72150
TSD File #18070025

Enclosed are the results of the Premier White sample received by our laboratory on 7/10/2018. This sample was tested as received for potential use in sand bunkers. To evaluate bunker sands, we use the criteria published in a 1986 issue of Golf Course Management, and 1998 issue of the USGA Green Section Record.

The sample has a particle size distribution that is higher in very coarse sand content than bunker sand guidelines. The gradation is outside of the USGA particle size recommendations for greens. The results suggests it may present a layering risk from sand splashed from green-side bunkers onto nearby greens.

The sand is clean with a small amount of silt and clay present. As a result, there is no crusting of the sand after wetting and drying. This suggests that bunkers with this sand in place may not require significant raking after rainfall or irrigation events.

The sand particle shape is mostly angular. Generally angular sands are preferred for bunkers.

A minimum infiltration rate of 20 inches per hour is recommended for bunker sand. The infiltration rate is above this, so drainage should not be a problem initially.

To measure the potential of a sand to produce fried egg lies or buried balls, we measure the resistance of the sand to ball penetration using a penetrometer. Values of between 1.8 and 2.4 are considered acceptable, with values above 2.4 considered desirable. The sample has a penetrometer reading in the desirable range.

Despite this testing, bunker sand selection is highly subjective. Aside from playability, factors such as color and aesthetics are often weighed in the decision process. We recommend that golf course superintendents, pros, greens committee chairs, and any other interested parties visit a club with the sand in use. Play into and out of it to see how they like it.

If you have any questions or are in need of further assistance, please contact us. Samples are generally kept on the premises for 45 days after report date. Thank you for using Turf & Soil Diagnostics, Inc.

Sincerely,

Sam Ferro
President



Turf & Soil Diagnostics



The Hayden Group
 Michael Collins
 55 JT Drive
 Sheridan, AR 72150

Date Received Jul-10-2018
 Date Reported Jul-12-2018
 Facility Product Development

Particle Size Evaluation*

Lab ID#	Sample Name	% Sand 2.0 - 0.05 mm	% Silt 0.05-0.002mm	% Clay < 0.002mm	Gravel 4.0 (5)	Gravel 2.0 (10)	% Retained mm (US sieve)					
							V. Coarse 1.0 (18)	Coarse 0.5 (35)	Medium 0.25 (60)	Fine 0.15 (100)	Fine 0.10 (140)	V. Fine 0.05 (270)
18070025-1	Premier White	98.6	1.3	< 1.0	0.0	0.2	18.2	28.7	27.0	15.4	6.4	2.9
USGA Recommendations for Greens		≥ 92%	≤ 5% Silt	≤ 3% Clay	≤ 3% Gravel ≤ 10% Combined		≥ 60% Combined		≤ 20%	≤ 5%***		
Bunker Sand Guidelines ¹			≤ 3%		≤ 2%	≤ 15%	78 - 100%					≤ 5%

¹ From Golf Course Management 54:64-70, 1986

² From USGA Green Section Record 36:9-12, 1998

Lab ID#	Sample Name	Uniformity Coefficient Cu	D15 mm	D50 mm	D85 mm	Shape Angularity	Shape Sphericity	USDA Textural Classification	Acid Reaction	Infiltration Rate** in/hr	Infiltration Rate** cm/hr	Bulk Density g/cc
18070025-1	Premier White	4.1	0.17	0.46	1.14	Very Angular to Sub-Angular	Medium	Sand	Slight	34.1	86.6	1.56
USGA Recommendations for Greens		See Below	-	-	-	-	-	-	-	> 6	> 15	-
Bunker Sand Guidelines ²		-	-	-	-	-	-	-	-	> 20	> 50	-

*ASTM F1632 Method A & Determination of Size Factors SOP

**ASTM F1815 30 cm Tension

***Maximum of 10% combined on Very Fine Sand, Silt, and Clay fractions.

USGA Rootzone Coefficient of Uniformity Recommendations: 1.8 to 3.5 for Mixes with Peat; 2.0 to 3.5 for Mixes with Inorganic Amendment or Pure Sand.

Samples were tested as received and comments pertain only to the samples shown.

This report may not be reproduced in part, but only in full.

Sample condition upon receipt was normal.

Samples were received with a transmittal letter.

Reviewed by Sam Fero



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Bunker Sand Evaluation

Lab ID#	Sample Name	Dry Color	Wet Color	Penetrometer Value kg/cm ²
18070025-1	Premier White	N 8.5 White w/Black Specks	N 8.5 White w/Black Specks	4.5

Lab ID#	Sample Name	Shape Angularity	Shape Sphericity	Crusting	Set-Up
18070025-1	Premier White	Very Angular to Sub-Angular	Medium	None	None

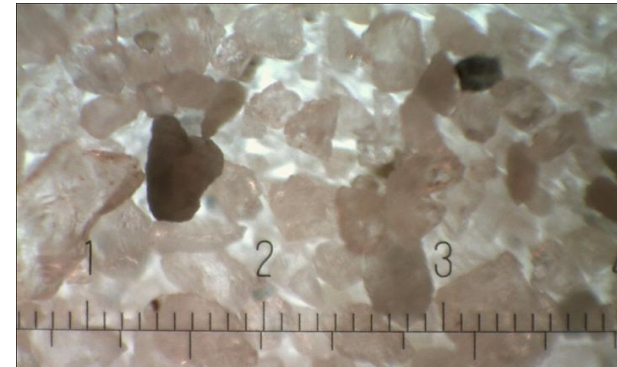
Bunker SOP

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Photomicrograph of Lab ID 18070025-1 Premier White.

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