



200 White Mountain Drive
New Bremen, OH 45869
Tel: (419) 977-2766
Fax: (419) 977-2767

Date: 5/30/2024

Client Name: Freestone Club

File Number: 91984

Consultant: Soil and Water Consulting

Greensmix : Lab #1327 KS&G CAPPING MATERIAL

Gravel: Lab #1296 HOLSEY PEA GRAVEL

GREENSMIX/GRAVEL COMPATIBILITY

Rootzone Sieve Analysis	Particle Diameter (%)							
	2.0 mm	1.0 mm	0.5 mm	0.25 mm	0.15 mm	0.106 mm	0.053 mm	Silt/Clay
% Retained	4.3	1.7	4.5	45.0	34.0	5.7	1.5	3.3

Gravel Sieve Analysis	Particle Diameter (%)							
	12.5 mm	9.5 mm	6.35 mm	4.75 mm	2.36 mm	2.0 mm	1.0 mm	< 1.0 mm
% Retained	0.0	15.6	61.5	18.5	3.6	0.1	0.2	0.5

1. For Bridging to Occur. $D_{15}(\text{gravel}) \leq 8 \times D_{85}(\text{rootzone})$ $D_{15}(\text{gravel}) = 5.67$

$D_{85}(\text{rootzone}) = 0.47$

$5.67 \text{ mm} \leq 3.76 \text{ mm}$

These Results show that the $D_{15}(\text{gravel})$ at 5.67 mm **IS NOT** less than or equal to ($\leq$) $8 \times D_{85}(\text{rootzone})$, which was $8 \times 0.47 \text{ mm} = 3.76 \text{ mm}$. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD NOT** occur with the finest 15% of gravel particles. This gravel **IS NOT** compatible with sand.

2. For Adequate Permeability. $D_{15}(\text{gravel}) \geq 5 \times D_{15}(\text{rootzone})$ $D_{15}(\text{gravel}) = 5.67$

$D_{15}(\text{rootzone}) = 0.16$

$5.67 \text{ mm} \geq 0.80 \text{ mm}$

These Results show that the $D_{15}(\text{gravel})$ at 5.67 mm **IS** $\geq 5 \times D_{15}(\text{rootzone})$, which was $5 \times 0.16 \text{ mm} = 0.80 \text{ mm}$. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. Uniformity Coefficient of Gravel $D_{90}(\text{gravel})/D_{15}(\text{gravel}) \leq 3.0$ $D_{90}(\text{gravel}) = 10.58$

$D_{15}(\text{gravel}) = 5.67$

$1.87 \text{ mm} \leq 3.00 \text{ mm}$

These Results show that the $D_{90}(\text{gravel})/D_{15}(\text{gravel})$ is 1.87 mm which **IS** less than or equal to 3.0. Therefore, the Uniformity Coefficient of gravel **PASSES** this criterion.

Furthermore, the gravel should have 100% particles < 12mm, $\leq 10\%$ particles < 2mm, and $\leq 5\%$ particles < 1mm.

Reviewed by:



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Client Name: Freestone Club

File Number: 91984

Consultant: Soil and Water Consulting

Greensmix : Lab #1327 KS&G CAPPING MATERIAL

Gravel: Lab #1061 CS&G PEA GRAVEL

GREENSMIX/GRAVEL COMPATIBILITY

Rootzone Sieve Analysis	Particle Diameter (%)							
	2.0 mm	1.0 mm	0.5 mm	0.25 mm	0.15 mm	0.106 mm	0.053 mm	Silt/Clay
% Retained	4.3	1.7	4.5	45.0	34.0	5.7	1.5	3.3

Gravel Sieve Analysis	Particle Diameter (%)							
	12.5 mm	9.5 mm	6.35 mm	4.75 mm	2.36 mm	2.0 mm	1.0 mm	< 1.0 mm
% Retained	0.0	1.1	37.0	35.0	26.5	0.3	0.1	0.0

1. **For Bridging to Occur.** $D_{15}(\text{gravel}) \leq 8 \times D_{85}(\text{rootzone})$ $D_{15}(\text{gravel}) = 3.68$
 $D_{85}(\text{rootzone}) = 0.47$
 $3.68 \text{ mm} \leq 3.76 \text{ mm}$

These Results show that the $D_{15}(\text{gravel})$ at 3.68mm **IS** less than or equal to ($\leq$) $8 \times D_{85}(\text{rootzone})$, which was $8 \times 0.47\text{mm} = 3.76\text{mm}$. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD** occur with the finest 15% of gravel particles. This gravel **IS** compatible with sand.

2. **For Adequate Permeability.** $D_{15}(\text{gravel}) \geq 5 \times D_{15}(\text{rootzone})$ $D_{15}(\text{gravel}) = 3.68$
 $D_{15}(\text{rootzone}) = 0.16$
 $3.68 \text{ mm} \geq 0.80 \text{ mm}$

These Results show that the $D_{15}(\text{gravel})$ at 3.68mm **IS** $\geq 5 \times D_{15}(\text{rootzone})$, which was $5 \times 0.16\text{mm} = 0.80\text{mm}$. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** $D_{90}(\text{gravel})/D_{15}(\text{gravel}) \leq 3.0$ $D_{90}(\text{gravel}) = 8.74$
 $D_{15}(\text{gravel}) = 3.68$
 $2.38 \text{ mm} \leq 3.00\text{mm}$

These Results show that the $D_{90}(\text{gravel})/D_{15}(\text{gravel})$ is 2.38mm which **IS** less than or equal to 3.0. Therefore, the Uniformity Coefficient of gravel **PASSES** this criterion.

Furthermore, the gravel should have 100% particles < 12mm, $\leq 10\%$ particles < 2mm, and $\leq 5\%$ particles < 1mm.

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