BROOKSIDE LABORATORIES INC. EST. 1951

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

Date: 6/21/2024
Client Name: Freestone Club
File Number: 91984
Consultant: Soil and Water Consulting

Greensmix : Lab #16 CS&G GREENS-M SAND #3
Gravel: Lab #1580 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	0.0	6.3	27.4	52.6	12.3	0.8	0.2	0.4

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	1.5	41.9	33.0	23.2	0.2	0.1	0.1

1. **For Bridging to Occur.** D15(gravel) <= 8 x D85(rootzone)

   D15(gravel) = 3.86

   D85(rootzone) = 0.84

   3.86 mm <= 6.72 mm

   These Results show that the D15(gravel) at 3.86mm **IS** less than or equal to (<=) 8 x D85(rootzone), which was 8 x 0.84mm = 6.72mm. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD** occur with the finest 15% of gravel particles. This gravel **IS** compatable with sand.

2. **For Adequate Permeability.** D15(gravel) >= 5 x D15(rootzone)

   D15(gravel) = 3.86

   D15(rootzone) = 0.26

   3.86 mm >= 1.30 mm

   These Results show that the D15(gravel) at 3.86mm **IS** >= 5 x D15(rootzone), which was 5 x 0.26mm = 1.30mm. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** D90(gravel)/D15(gravel) <= 3.0

   D90(gravel) = 8.86

   D15(gravel) = 3.86

   2.30 mm <= 3.00mm

   These Results show that the D90(gravel)/D15(gravel) is 2.30mm 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, <= 10% particles < 2mm, and <= 5% particles < 1mm.

Reviewed by: _____

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Date: 6/21/2024
Client Name: Freestone Club
File Number: 91984
Consultant: Soil and Water Consulting

Greensmix : Lab #14 CS&G GREENS-M SAND #2
Gravel: Lab #1580 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	0.0	5.6	24.5	54.1	13.2	1.7	0.2	0.7

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	1.5	41.9	33.0	23.2	0.2	0.1	0.1

1. **For Bridging to Occur.** D15(gravel) <= 8 x D85(rootzone)

   D15(gravel) = 3.86
   D85(rootzone) = 0.81

   3.86 mm <= 6.48 mm

   These Results show that the D15(gravel) at 3.86mm **IS** less than or equal to (<=) 8 x D85(rootzone), which was 8 x 0.81mm = 6.48mm. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD** occur with the finest 15% of gravel particles. This gravel **IS** compatable with sand.

2. **For Adequate Permeability.** D15(gravel) >= 5 x D15(rootzone)

   D15(gravel) = 3.86
   D15(rootzone) = 0.24

   3.86 mm >= 1.20 mm

   These Results show that the D15(gravel) at 3.86mm **IS** >= 5 x D15(rootzone), which was 5 x 0.24mm = 1.20mm. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** D90(gravel)/D15(gravel) <= 3.0

   D90(gravel) = 8.86
   D15(gravel) = 3.86

   2.30 mm <= 3.00mm

   These Results show that the D90(gravel)/D15(gravel) is 2.30mm 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, <= 10% particles < 2mm, and <= 5% particles < 1mm.

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Date: 6/21/2024
Client Name: Freestone Club
File Number: 91984
Consultant: Soil and Water Consulting

Greensmix : Lab #17 CS&G GREENS-M SAND #4
Gravel: Lab #1580 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	0.0	5.2	23.8	55.4	13.2	1.2	0.1	1.1

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	1.5	41.9	33.0	23.2	0.2	0.1	0.1

1. **For Bridging to Occur.** D15(gravel) <= 8 x D85(rootzone)

   D15(gravel) = 3.86
   D85(rootzone) = 0.79

   3.86 mm <= 6.32 mm

   These Results show that the D15(gravel) at 3.86mm **IS** less than or equal to (<=) 8 x D85(rootzone), which was 8 x 0.79mm = 6.32mm. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD** occur with the finest 15% of gravel particles. This gravel **IS** compatable with sand.

2. **For Adequate Permeability.** D15(gravel) >= 5 x D15(rootzone)

   D15(gravel) = 3.86
   D15(rootzone) = 0.25

   3.86 mm >= 1.25 mm

   These Results show that the D15(gravel) at 3.86mm **IS** >= 5 x D15(rootzone), which was 5 x 0.25mm = 1.25mm. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** D90(gravel)/D15(gravel) <= 3.0

   D90(gravel) = 8.86
   D15(gravel) = 3.86

   2.30 mm <= 3.00mm

   These Results show that the D90(gravel)/D15(gravel) is 2.30mm 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, <= 10% particles < 2mm, and <= 5% particles < 1mm.

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Date: 6/21/2024
Client Name: Freestone Club
File Number: 91984
Consultant: Soil and Water Consulting

Greensmix : Lab #18 ENNIS PLANT CAPPING MATERIAL
Gravel: Lab #1580 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	0.2	0.3	2.5	48.0	37.4	8.6	1.0	2.0

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	1.5	41.9	33.0	23.2	0.2	0.1	0.1

1. **For Bridging to Occur.** D15(gravel) <= 8 x D85(rootzone)

D15(gravel) = 3.86
D85(rootzone) = 0.44

3.86 mm <= 3.52 mm

These Results show that the D15(gravel) at 3.86mm **IS NOT** less than or equal to (<=) 8 x D85(rootzone), which was 8 x 0.44mm = 3.52mm. Therefore, bridging of the coarsest 15% rootzone particles **SHOULD NOT** occur with the finest 15% of gravel particles. This gravel **IS NOT** compatable with sand.

2. **For Adequate Permeability.** D15(gravel) >= 5 x D15(rootzone)

D15(gravel) = 3.86
D15(rootzone) = 0.16

3.86 mm >= 0.80 mm

These Results show that the D15(gravel) at 3.86mm **IS** >= 5 x D15(rootzone), which was 5 x 0.16mm = 0.80mm. Therefore, adequate permeability **SHOULD** occur with this gravel and rootzone sand.

3. **Uniformity Coefficient of Gravel** D90(gravel)/D15(gravel) <= 3.0

D90(gravel) = 8.86
D15(gravel) = 3.86

2.30 mm <= 3.00mm

These Results show that the D90(gravel)/D15(gravel) is 2.30mm 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, <= 10% particles < 2mm, and <= 5% particles < 1mm.

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