GEOTECHNICAL REPORTS 201 – ONSITE PRELIMINARY PROCEDURES FOR SPORTS FIELD CONSTRUCTION

ASBA Technical Meeting
Scottsdale, AZ
December 3, 2018

Todd Smith, P.E., LEED-AP, CFB; Academy Sports Turf
Courtney Rousseau, P.E., QSD; Verde Design Inc.
• 2017 “demystifying...” covered what to look for in the report

• 2018 “…201” covers visual and hands on evaluations to help verify conditions
1. Rudimentary On-site Soils Classification Techniques
2. Rudimentary Percolation Analyses (Natural)
3. New Construction Of
   1. Natural Fields
   2. Synthetic Fields
4. Rudimentary Percolation Analyses (Synthetic)
5. Remediation Of
   1. Natural Fields
   2. Synthetic Fields
6. Subgrade Stabilization Techniques
1. Hands-on methods to determine general soils classification
2. How to determine drainage & permeability characteristics
3. How to apply potential needs for subgrade stabilization
4. Learn key factors in field base Remediation and pitfalls to avoid
1. Hands-on methods to determine general soils classification (Soils report recommended)
SOIL CLASSIFICATION
DETERMINATION METHODS

1. Hands-on methods to determine general soils classification

- Gravel
- Sand
- Silt
- Clay
1. Hands-on methods to determine general soils classification

- Gravel
- Sand
2.5” = 64

1. Hands-on methods to determine general soils classification

- Gravel
- Sand

<table>
<thead>
<tr>
<th>Millimeters (mm)</th>
<th>Micrometers (µm)</th>
<th>Phi (φ)</th>
<th>Wentworth size class</th>
<th>Rock type</th>
</tr>
</thead>
<tbody>
<tr>
<td>4096</td>
<td></td>
<td>-12.0</td>
<td>Boulder</td>
<td>Conglomerate/Breccia</td>
</tr>
<tr>
<td>256</td>
<td></td>
<td>-8.0</td>
<td>Cobble</td>
<td>Gravel</td>
</tr>
<tr>
<td>64</td>
<td></td>
<td>-6.0</td>
<td>Pebble</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td>-2.0</td>
<td>Granule</td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td></td>
<td>-1.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.00</td>
<td></td>
<td>0.0</td>
<td>Very coarse sand</td>
<td></td>
</tr>
<tr>
<td>0.50</td>
<td>500</td>
<td>1.0</td>
<td>Coarse sand</td>
<td></td>
</tr>
<tr>
<td>0.25</td>
<td>250</td>
<td>2.0</td>
<td>Medium sand</td>
<td>Sand</td>
</tr>
<tr>
<td>0.125</td>
<td>125</td>
<td>3.0</td>
<td>Fine sand</td>
<td></td>
</tr>
<tr>
<td>0.0625</td>
<td>63</td>
<td>4.0</td>
<td>Very fine sand</td>
<td></td>
</tr>
<tr>
<td>0.031</td>
<td>31</td>
<td>5.0</td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.0156</td>
<td>15.6</td>
<td>6.0</td>
<td>Coarse silt</td>
<td>Silt</td>
</tr>
<tr>
<td>0.0078</td>
<td>7.8</td>
<td>7.0</td>
<td>Medium silt</td>
<td></td>
</tr>
<tr>
<td>0.0039</td>
<td>3.9</td>
<td>8.0</td>
<td>Fine silt</td>
<td></td>
</tr>
<tr>
<td>0.0006</td>
<td>0.06</td>
<td>14.0</td>
<td>Very fine silt</td>
<td></td>
</tr>
<tr>
<td>0.00006</td>
<td></td>
<td></td>
<td>Clay</td>
<td></td>
</tr>
<tr>
<td>0.00006</td>
<td></td>
<td></td>
<td>Mud</td>
<td></td>
</tr>
<tr>
<td>0.00006</td>
<td></td>
<td></td>
<td>Claystone</td>
<td></td>
</tr>
</tbody>
</table>
SOIL CLASSIFICATION
DETERMINATION METHODS

1. Hands-on methods to determine general soils classification

- Gravel
- Sand
- Silt
- Clay
SOIL CLASSIFICATION
DETERMINATION METHODS

1. Hands-on methods to determine general soils classification

- Silt
- Clay
### Hands-On Methods:

<table>
<thead>
<tr>
<th>Silt</th>
<th>Clay</th>
</tr>
</thead>
<tbody>
<tr>
<td>Settles in jar 15-60 min</td>
<td>Settles in hours/days</td>
</tr>
<tr>
<td>Textured</td>
<td>Smooth</td>
</tr>
<tr>
<td>Wet = feels Silky</td>
<td>Wet = Feels sticky</td>
</tr>
<tr>
<td>Stains hands</td>
<td>Non-staining</td>
</tr>
<tr>
<td>Non-plastic (no 3mm dia. roll)</td>
<td>Plastic (Can make 3mm dia. ‘snake’)</td>
</tr>
<tr>
<td>Dry = No strength</td>
<td>Dry = Feels like concrete</td>
</tr>
</tbody>
</table>

**Note:** Sand will settle-out in 30-60 seconds
RELATIVE PERMEABILITY BY SOIL TYPE

- U.S. Dept. OF AGRICULTURE GROUPS AS... A, B, C, or D

- A = Sand or sandy loam
  High infiltration
- B = Silt or silt loam
  Moderate infiltration
- C = Sandy clay loam
  Slow infiltration
- D = Clay
  Very slow infiltration
RELATIVE PERMEABILITY BY SOIL TYPE

• U.S. Dept. OF AGRICULTURE GROUPS AS... A, B, C, or D

• A = Sand or sandy loam
  High infiltration
• B = Silt or silt loam
  Moderate infiltration
• C = Sandy clay loam
  Slow infiltration
• D = Clay
  Very slow infiltration
DRAINAGE AND PERMEABILITY CHARACTERISTICS – NATURAL FIELDS

- Onsite testing methods

1. Simple hand dig
   1. Same depth as drainage trench
   2. Fill with water
   3. Record time water level dropping (or not)
DRAINAGE AND PERMEABILITY CHARACTERISTICS – NATURAL FIELDS

2. ASTM D3385-03
Is the on site soil(s) suitable for this type of construction?

If not suitable, what can we do to make it suitable?
NEW CONSTRUCTION- GOALS FOR THE BASE

1. Uniform area “pad”
2. Minimize potential movement to _____
3. Minimize runoff
4. Maximize BMPs
NEW CONSTRUCTION – COMPARISON TO PAST SOILS REPORT

1. Does it match the type/size/classification?
2. Can it be stabilized enough?
3. How will it handle water?
4. Does the recommendation make sense?
NEW CONSTRUCTION – COMPARISON TO PAST SOILS REPORT

1.
2.
3.
4.
REMEDIATION PROJECTS – EVALUATING NATURAL GRASS FIELDS

- Start at turf surface
- Visit site during/after irrigation cycle and large storm event
- Surface conditions
  - Turfgrass
  - Drains
  - Planarity
- Ask turf manager (if there is one)
REMEDIATION PROJECTS – EVALUATING NATURAL GRASS FIELDS

- Turf management program
  - Fertilizer schedule and variance
    - Aeration? Frequency?
    - Dethatching
    - Irrigation cycle
- Take core samples
  - Thatch layer thickness
  - Clay/organics present?
Once turf surface issues ruled out....

- Assess existing drainage system
- Request as-builts and verify them in the field as allowable
- Video storm drain lines
- Is soil profile conducive for percolation?
REMEDIATION PROJECTS – EVALUATING SYNTHETIC TURF FIELDS
• Less issues with surface here – almost always with base
• Conduct site visit after large rain event
• Contact turf manager for historical data on problem areas
• Gather as-builts, design drawings/ specs, and construction test reports as available
  • Base material type?
  • Prescribed compaction versus actual?
  • Shock pad present?
• Video storm drain lines
REMEDIATION PROJECTS – PERCOLATION TESTING ON SYNTHETIC TURF

• RUN BUCKET TEST!
  • ASTM F2898-11 non-confined area flood test report
  • Easy and quick way to understand how field is performing
  • Ideally drainage results in 30 in/hr or greater

Designation: F2898 – 11

Standard Test Method for Permeability of Synthetic Turf Sports Field Base Stone and Surface System by Non-confined Area Flood Test Method

FIG. 4 Wetted Area Diagram
REMEDIATION PROJECTS – PERCOLATION TESTING ON SYNTHETIC TURF

Test on existing field base.

Test area with grid for accuracy.
If collector and perimeter drains present, run tests over both sections

- Different rocks
- Different suppliers
- Different compactions
- Different rates of degradation
REMEDINATION OF NATURAL GRASS FIELDS

1. Blending and mods of rootzone
   1. Add gypsum
   2. Reduce thatch layer
   3. Remove organics

2. Replace rootzone
REMEDIATION OF NATURAL GRASS FIELDS

3. Install slit sand drainage system

- Turf management rules all
  - Proper fertilization
  - Aeration
  - Dethatching
  - Topdressing
1. Widen/replace collector trench sections
2. Incorporate shock pad
3. Replace field base materials (see pitfalls)
PITFALLS TO AVOID – IMPROPER BASE MATERIALS

- Permeable Rock Base vs. Drain Rock vs. Class II Base
  - Shape
  - Uniformity
  - Color
PITFALLS TO AVOID – IMPROPER BASE MATERIALS

• Suppliers
  • Ideally all rock comes from same quarry
  • Issues with different degradation rates (abrasion and hardness)
  • May compact differently from different sources

• Moisture
PITFALLS TO AVOID – IMPROPER BASE MATERIALS

Compaction/placement

- Place/grade rock once – limit extra spreading
- Do not overwork
- Do not overcompact

Max 93% compaction
PITFALLS TO AVOID – IMPROPER BASE MATERIALS
SUBGRADE STABILIZATION TECHNIQUES

• Jameson Sheley, Byrne & Jones
  ASBA 2017 Session 7C = subgrade prep
  fly ash, lime, cement, replace.
*Not all types work with all soils...
3. How to apply potential needs for subgrade stabilization

• Fly ash
3. How to apply potential needs for subgrade stabilization

- Lime
3. How to apply potential needs for subgrade stabilization

- Cement
3. How to apply potential needs for subgrade stabilization

- Replace
3. How to apply potential needs for subgrade stabilization

- fly-ash
- lime
- cement
- Replace
1. Rudimentary On-site Soils Classification Techniques
2. Rudimentary Percolation Analyses (Natural)
3. New Construction Of
   1. Natural Fields
   2. Synthetic Fields
4. Rudimentary Percolation Analyses (Synthetic)
5. Remediation Of
   1. Natural Fields
   2. Synthetic Fields
6. Subgrade Stabilization Techniques