CMS – Geotechnical Update
03/07/07

- Lime and Cement Testing Requirements
  - Will be posted April 20, 2007
- Foundation Improvement
  - Plan Note
- S-1015, SS-878 & SS-879 Compaction Testing Specifications
  - Posted April 21, 2006
- SS-840 MSE Wall Specification
  - Posted July 21, 2006 then January 19, 2007
Lime and Cement Testing

- Supplements to replace Section 206.06
  - S-1120 Lime and Lime Kiln Dust Percentage Design for Soil
    - Kiln Dust materials in Appendix
  - S-1121 Cement and Cement Mixture Percentage Design for Soil
- S-922 Certification Procedure for Hydrated and Quick Limes
General Changes

- Allowing more Chemicals
- Not Relying on PI as much
  - PI< 20 Cement & PI>20 Lime
  - Using Minimum Compressive Strengths

- Use in Design and Construction
  - More Testing Prior to Construction
General Changes (Cont.)

- Sampling Procedure Defined
- Expansion Testing
- More Detailed Reporting Requirements
- Verification Testing
  - Samples taken after mixing and retested
S-1120 Lime and Lime Kiln Dust Design

- Using Ph Testing & Strengths
- Minimum Compressive Strengths
  - Lime 100 psi & Kiln Dust 150 psi
  - Kiln Dust variable
    - Kiln Dust ‘Only’ allowed by Special Note
    - Kiln Dust 1/3 Cost of Lime
    - Testing Ensures Same Quality
S-1121 Cement and Chemical Mixtures

- Testing Cement, Cement & Lime and Cement and Kiln Ash
- Minimum Compressive Strength 150 psi
- Lime and Kiln Dust lowers the PI
- Cement increases strength
- Can be used for a Variety of Soils
  - Can use mixtures when PI > 20
- Mixtures ‘Only’ allowed by Special Note
S-922 Certification Procedure for Hydrated and Quick Limes

- Certified Test Data used in the Past
  - Material received with no verification checks
- Establishes QA/QC Procedure
  - Quality Control Plan Required
  - Plan Acceptance
  - Random Testing
Sample Ph Testing & (Supplier Training for Testing)

Eades - Grimm Testing

pH of Soil-Chemical Solution

% of Chemical Admixture (Lime or LKD)

A-7-6 Soil w/Lime
A-6a Soil w/Lime
A-7-6 Soil w/ Kiln Dust (Soaked 1 hr.)
A-7-6 Soil w/ Kiln Dust (Soaked 72 hrs)
Target (pH = 12.4)
Foundation Improvement
(Plan Note)

- Preventing Foundation and Benching Failures.
General Changes

- Fill Foundations < 30’ Scalped
- Fill Foundation > 30’ Scalped Under the Slopes Steeper than 4 to 1.
- Exposing the Foundation to Evaluate Soft Conditions.
- Remove, Plow, Disk or Compact
- Foundation Replacement Items
  - Embankment, granular materials etc…
Foundation Construction Methods

- Scalp
- Plow and Mix Top Foot
  - 10 passes then 10 Perpendicular Direction
- Disk top one foot
  - 5 passes then 5 Perpendicular Direction
- May use Power Driven Rotary Mixer
  - Instead of Plow, Mix and Disking Methods
- Compact with 25 ton Footed Roller
- Test Roll with 35 Ton Truck
- Test Pits used for the Investigation
New Pay Items

- Scalping, Foundation Plowing, Foundation Disking and Foundation Compaction Paid by the Square Yard
- Foundation Test Rolling and Test Pit by Hour
- Replacement Items
  - Excavation
  - Embankment
  - Granular Materials
  - Granular Types
  - Geotextile Fabric
S-1015 Compaction Testing for Unbound Materials

- Created one compaction and inspection table for S-1015, SS-878 and SS-879
- Same number and type of inspections and compaction tests are taken regardless of which specification is used in the contract.
- Created CA-EW-12 Inspection Form
Compaction and Inspection Table 1015.10-1

Details: Materials, Test or Method, Maximum Lot Size and Minimum Number of Tests

<table>
<thead>
<tr>
<th>Material</th>
<th>Test or Method</th>
<th>Maximum Lot Size*</th>
<th>Minimum Number of Tests</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item 203 and 204 Rock, Hard Shale, and Granular Material Types D and E</td>
<td>Roller Passes</td>
<td>2000 Cubic Yards (1530 Cubic Meters)</td>
<td>One per lot with at least one per lift</td>
</tr>
<tr>
<td>All Item 203 and 205 Materials except for: Rock, Hard Shale, and Granular Material Types D and E</td>
<td>Compaction and Moisture</td>
<td>2000 Cubic Yards (1530 Cubic Meters)</td>
<td>One per lot</td>
</tr>
<tr>
<td>All Item 204 and 206 Materials except for: Rock, Hard Shale, and Granular Material Types D and E</td>
<td>Subgrade Compaction and Moisture</td>
<td>3000 Square Yards (2500 Square Meters)</td>
<td>One per lot with at least one per lift</td>
</tr>
</tbody>
</table>
### Details

- **Location**
- **Equipment used**
- **Type of Soil**
- **Wetting or Drying**
- **Lift Thickness**
- **Estimated Quantities**
- **Tests and Results**
- **Instructions**

### Gives a Check list

<table>
<thead>
<tr>
<th>Details</th>
<th>Location</th>
<th>Equipment used</th>
<th>Type of Soil</th>
<th>Wetting or Drying</th>
<th>Lift Thickness</th>
<th>Estimated Quantities</th>
<th>Tests and Results</th>
<th>Instructions</th>
</tr>
</thead>
</table>

### Measures and Calculations

<table>
<thead>
<tr>
<th>Measures</th>
<th>How measured</th>
<th>Uniform Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measured loose lift thickness</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Was fill rolled to full width?</td>
<td>Yes / No</td>
<td></td>
</tr>
<tr>
<td>Average round trip time:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Today’s load count</td>
<td></td>
<td>CY/Load:</td>
</tr>
</tbody>
</table>

### Instructions and Remarks

<table>
<thead>
<tr>
<th>Instructions given today (from whom to whom and what)</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Signatures and Dates

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Provide a copy to the Contractor.
SS-878 Inspection & Testing of Unbound Materials

- New Specification
- Used when ODOT needs inspection help
- SS 878 and 879 similar specifications
- SS-878 pays for the inspection and compaction testing as a lump sum pay item
  - Covers Items 203, 204, 205, 206, 304, 307, 411, 503, 603 and MSE wall select granular backfill
- SS-879 pays for the work as an incentive pay to the contract
  - Only covers Items 203 and 204
SS-878 Inspection & Testing of Unbound Materials (Cont.)

- Full time ‘qualified’ inspection and compaction testing
  - NICET-Level 2-(National Institute for Certification of Engineering Technologies)
  - Similar Qualifications allowed until July 1, 2007
  - All compaction tests after this date NICET is required
- Compaction tests according to S-1015
- Documented on Department forms
- Daily and summary documentation reports every two weeks
- Department takes QA compaction tests
- Lump sum payment for this work
- Past notes required compaction testing only
- SS-878 requires inspection and compaction testing
SS-879 QC/QA for Embankment Construction

- Several references made in 879 to 878
  - Same work with payment mechanism different
- Full time ‘qualified’ inspection and compaction testing for Items 203 and 204
- Compaction tests according to S-1015
- Documentation performed on Department forms
- Same qualifications requirements as 878
- Department performs QA compaction tests.
- Pay adjustment plus or minus 4 % to the amount bid for Items 203 and 204
  - Based on the percentage passing of the QA tests
The method for calculating pay adjustments is:

Calculate the Percentage of Passing Quality Assurance Tests (PPQAT):

$$\text{PPQAT} = \left( \frac{\text{Number of Passing QA Compaction Tests}}{\text{Total Number of QA Compaction Tests}} \right) \times 100$$

Determine the appropriate Pay Factor Formula:

<table>
<thead>
<tr>
<th>Applicable Range of PPQAT</th>
<th>Pay Factor Formula (PFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>90 to 100%</td>
<td>$1.00 + 0.04 \left( \frac{(\text{PPQAT}-90)}{10.0} \right)$</td>
</tr>
<tr>
<td>70 to 90%</td>
<td>$1.00-0.04 \left( \frac{90-\text{PPQAT}}{20.0} \right)$</td>
</tr>
<tr>
<td>Below 70%</td>
<td>0.96</td>
</tr>
</tbody>
</table>
The Department will adjust the following items by the Pay Factor Formula:

- Item 203 Embankment,
- Item 203 Granular Embankment,
- Item 203 Granular Material Type____,
- Item 204 Embankment,
- Item 204 Granular Embankment,
- Item 204 Granular Material Type____
- Item 204 Subgrade Compaction.

The Department will not apply the PFF to any other Item 203 or 204 quantities.
SS-840 MSE Wall Construction (Geotechnical Changes)

- Combined all of the Old Special Provisions
- Direct shear testing for select granular backfill.
- Foundation evaluation during construction
  - Original Design Consultant paid thru Construction Services
- Select granular inspection and compaction testing
  - Refers to SS-878….
Construction Administration
Training and Reports

Construction Administrations Web Site:
- [http://www.dot.state.oh.us/construction/OCA/training/training.htm](http://www.dot.state.oh.us/construction/OCA/training/training.htm)
Construction Training and Reports

- HT Training:
  - Basic Earthwork Manual and Presentations 1-8
  - Advanced Earthwork Manual and Presentations 1-5
- Rock Blasting
- Subgrade for Engineers
- Soft Foundations
- Drainage for Landslides
- MSE Wall Presentations and Reports
- LAW-7-7.25 Geotechnical Summary
- Old Pipe Construction Training