Key To MSCR Implementation in Oklahoma

Hilton Baton Rouge Capitol Center
November 12, 2013
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SEAUPG
Southeastern Asphalt User/Producer Group
Key Steps to MSCR Implementation

- **Education**
  - Asphalt Institute:

- **Equipment and Software**

- **Create Local Database**

- **University Level Research**
Key Steps to MSCR Implementation

• Write Specifications
  – Partial Adoption
  – Full Adoption
• Implementation
  – Short Term Goal
  – Long Term Goal
Education

- Oklahoma Participation in SEAUPG MSCR Task Force Work
  - Asphalt Institute Chaired WebEx Meetings
  - ILS Study
Equipment and Software

- 1 of 2 DSRs Could Perform MSCR Tests
- Error in an Excel Software Formula
- Replaced Both DSRs
  - MSCR Software Built-In
Create Local Database

- Perform AASHTO M 320 PG Tests
- Perform Traditional Elastic Recovery Tests
  - ASTM D 6084
- Perform MSCR Tests on RTFO Residue
  - Grade by MSCR Naming Convention
Create Local Database

• Excel UDF Code for Naming Convention

```
' = mscrgrade(E2, D2, M2, N2)
PG 64-28 E = "(76-28", 64.0, 0.01519, 3.333)
Function MSCRGrade(PG As String, TestTemp As Double, Jnr32 As Double, JnrDiff As Double) As String
    Dim iTestTemp As Double, iJnr32 As Double, iJnrDiff As Double
    Dim sColdTemp As String, suffix As String
    Application.Volatile
    iTestTemp = Round(TestTemp)
    sColdTemp = Split(PG, "-")(1)
    iJnr32 = WorksheetFunction.Round(Jnr32, 2)
    iJnrDiff = WorksheetFunction.Round(JnrDiff, 1)
    Select Case (True)
        Case iJnr32 < 0.5 And iJnrDiff <= 75:
            suffix = "E"
        Case iJnr32 <= 1 And iJnrDiff <= 75:
            suffix = "V"
        Case iJnr32 <= 2 And iJnrDiff <= 75:
            suffix = "H"
        Case iJnr32 <= 4 And iJnrDiff <= 75:
            suffix = "S"
        Case Else
            suffix = "NA"
    End Select
    If suffix = "NA" Then
        MSCRGrade = ""
    Else
        MSCRGrade = "PG " & iTestTemp & "-" & sColdTemp & " " & suffix
    End If
End Function
```
CREEP COMPLIANCE AND PERCENT RECOVERY OF OKLAHOMA CERTIFIED Binder USING THE MULTIPLE STRESS CREEP RECOVERY (MSCR) METHOD

ANNUAL PROJECT STATUS REPORT ~ FFY 2013
ODOT SP&R ITEM NUMBER 2248

Submitted to:
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AASHTO TP 70
MSCR % Recovery, R3200 vs. Jnr @ 3.2kPa

PG 76-28 OK

Line

PG 76-28

R3200, %

Jnr @3.2kPa

0 0.5 1 1.5 2 2.5

0 10 20 30 40 50 60 70 80 90 100

The UNIVERSITY of OKLAHOMA

SEAUPG
Southeastern Asphalt User/Producer Group
AASHTO TP 70
MSCR % Recovery, R3200 vs. Jnr @ 3.2kPa
MSCR Recovery vs. ER

PG 70-28

Fails % Rec., Fails ER

Meets % Rec., Meets ER (supplier risk)

PG70-28 OK
AASHTO TP 70
MSCR % Recovery, R3200Vs Jnr @ 3.2kPa

PG 64-22 OK
Write Specifications
Partial Adoption

OKLAHOMA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
FOR
PLANT MIX BITUMINOUS BASES AND SURFACES (SUPERPAVE)

These special provisions revise, amend, and where in conflict, supersede applicable sections of the 2009 Standard Specifications for Highway Construction, English and Metric.

(Replace Table 708:2)
708.03 ASPHALT MATERIALS

Provide asphalt cement in accordance with AASHTO M 320 and Table 708:2 for the grade required by the Contract.
### Additional Requirements to AASHTO M 320 for Asphalt Cement

<table>
<thead>
<tr>
<th>Test</th>
<th>PG 64-22 OK</th>
<th>PG 70-28 OK</th>
<th>PG 76-28 OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSCR Recovery (^a), 147.2°F [64°C], %</td>
<td></td>
<td>≥ 50</td>
<td>≥ 80</td>
</tr>
<tr>
<td>Separation (^b), %</td>
<td></td>
<td>≤ 10</td>
<td>≤ 10</td>
</tr>
<tr>
<td>Original DSR G*/sin(δ), kPa</td>
<td>≤ 2.50</td>
<td>≤ 2.50</td>
<td>≤ 2.50</td>
</tr>
<tr>
<td>RTFO DSR G*/sin(δ), kPa</td>
<td>≤ 5.50</td>
<td>≤ 5.50</td>
<td>≤ 5.50</td>
</tr>
<tr>
<td>Spot test (^c)</td>
<td>Negative</td>
<td>—</td>
<td>—</td>
</tr>
<tr>
<td>Solubility in trichloroethylene, %</td>
<td>≥ 99</td>
<td>≥ 99</td>
<td>≥ 99</td>
</tr>
</tbody>
</table>

**Note:** Asphalt binder suppliers will provide handling requirements and recommended field mixing and compaction temperatures for their product to the hot-mix producer.

\(^a\) AASHTO TP 70 average percent recovery at 3.2 kPA, R\(_3,2\).

\(^b\) Separation test samples are prepared in accordance with ASTM D 5976, but are reported as the difference in G* between the top and bottom samples.

\(^c\) Spot test using solvent blend of 65 percent heptane and 35 percent xylene by volume.
### 708.06 SAMPLING AND TESTING

(Add the following row to Table 708:13 under the Asphalt Materials section):

| Multiple Stress Creep Recovery (MSCR) Test of Asphalt Binder Using a Dynamic Shear Rheometer (DSR) | AASHTO TP 70 |

(Remove following row from Table 708:13, the footnote, and renumber footnotes):

| Elastic recovery test by means of ductilometer* | ASTM D 6084 |


Write Specifications
Partial Adoption

*Current*

<table>
<thead>
<tr>
<th>Test</th>
<th>PG 64-22 OK</th>
<th>PG 70-28 OK</th>
<th>PG 76-28 OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elastic recovery at 77°F [25°C], %</td>
<td>—</td>
<td>≥65</td>
<td>≥75</td>
</tr>
</tbody>
</table>

*January 1, 2014*

<table>
<thead>
<tr>
<th>Test</th>
<th>PG 64-22 OK</th>
<th>PG 70-28 OK</th>
<th>PG 76-28 OK</th>
</tr>
</thead>
<tbody>
<tr>
<td>MSCR Recovery a, 147.2°F [64°C], %</td>
<td>—</td>
<td>≥50</td>
<td>≥80</td>
</tr>
</tbody>
</table>
OKLAHOMA DEPARTMENT OF TRANSPORTATION
SPECIAL PROVISION
FOR
PERFORMANCE-GRADED ASPHALT BINDER
USING MULTIPLE STRESS CREEP RECOVERY (MSCR) TEST
NHY-013N(155), JP NO. 28678(04), BRYAN COUNTY

These special provision amends and where in conflict, supersedes applicable sections of the 2009 Standard Specifications for Highway Construction, English and Metric.

708.03 ASPHALT MATERIALS *(Add the following:)*

Provide PG binders in accordance with AASHTO M 320 and Table 708:2 or AASHTO MP19 and Table 708:2A for the grade required by the Contract.
# Write Specifications

## Full Adoption

<table>
<thead>
<tr>
<th>Test</th>
<th>PG 76-28 E</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recovery (^a), %</td>
<td>95</td>
</tr>
<tr>
<td>Separation (^b), %</td>
<td>≤10</td>
</tr>
<tr>
<td>Original DSR (G^*/\sin(\delta), kPa)</td>
<td>—</td>
</tr>
<tr>
<td>RTFO DSR (G^*/\sin(\delta), kPa)</td>
<td>—</td>
</tr>
<tr>
<td>PAV DSR Change in testing temperature, °F / °C/</td>
<td>77 [25]</td>
</tr>
<tr>
<td>Flash point, °F / °C/</td>
<td>≥500 [260]</td>
</tr>
<tr>
<td>Solubility in trichloroethylene, %</td>
<td>≥99</td>
</tr>
</tbody>
</table>

Note: Asphalt binder suppliers will provide handling requirements and recommended field mixing and compaction temperatures for their product to the hot-mix producer.

\(^a\) Percent recovery as determined by AASHTO TP 70 for \(J_m\) 3.2 kPa.

\(^b\) Separation test samples are prepared in accordance with ASTM D 5976, but are reported as the difference in \(G^*\) between the top and bottom samples.
Implementation

• Fully Adopted for PG 76-28 E in 2012
  – Minimum Recovery of 95%
• Partial Adoption January 1, 2014
  – Replace ASTM D 6084 with MSCR Recovery
• Full Adoption January 1, 2015?
MSCR will be Sooner in Oklahoma
Let’s Get Down the Road

Thank you!

Questions?
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