


asphalt institute

## Multiple Stress Creep Recovery (MSCR) Task Force

SEAUPG Annual Meeting  
November 17, 2011  
Savannah GA

Bob Horan, P.E.  
Regional Engineer  
Asphalt Institute – Virginia Office



www.asphaltinstitute.org

asphalt institute

## Our visit today

- What is MSCR test?
- Why do we need MSCR?
- What is going on in SEAUPG with evaluation and/or implementation of MSCR?
  - MSCR Task Force
  - MSCR State Survey
  - MSCR ILS (Round Robin testing)
  - Free AI Webinar
- National Binder Technician Certification




www.asphaltinstitute.org


asphalt institute


## Alumni of SDSM&T

SOUTH DAKOTA



SCHOOL OF MINES & TECHNOLOGY






www.asphaltinstitute.org

asphalt institute

## MSCR Task Force



- SEAUPG 2010 Annual Meeting in OK City Binder Task Group – proposed forming a MSCR Task Force to start looking at MSCR test/specification from a regional standpoint
  - Move evaluation of MSCR along more rapidly
  - Asphalt Institute volunteered to facilitate
  - Meet using AI WebEx
  - Conduct round robin testing program
  - Provide regular updates at SEAUPG annual meetings



www.asphaltinstitute.org

asphalt institute

## Early Asphalt Plant


www.asphaltinstitute.org

asphalt institute

## What is MSCR?

The MSCR test is a new test for measuring high temperature properties of an asphalt binder which:

- can replace the existing high temp. test for short term aged binder in AASHTO M 320 ( $G^*/\sin\delta$ )
- can better relate predicted laboratory polymer-modified binders' high temperature properties to actual rutting performance of in-service pavements




www.asphaltinstitute.org

### What is MSCR?

asphalt institute

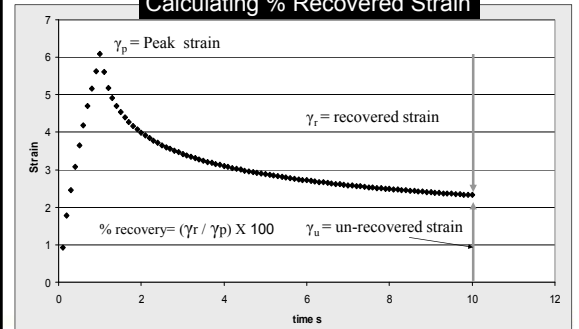
- Sample prep is exactly the same as the existing RTFOT Dynamic Shear Rheometer



### What is MSCR?

asphalt institute

#### Calculating % Recovered Strain



$\gamma_p = \text{Peak strain}$

$\gamma_r = \text{recovered strain}$

$\% \text{ recovery} = (\gamma_r / \gamma_p) \times 100$

$\gamma_u = \text{un-recovered strain}$

### What is MSCR?

asphalt institute

*Definitions:*

**Creep and recovery** – a standard test protocol whereby a specimen is subjected to a constant load for a fixed time period and then allowed to relax (recover) at a zero load for a fixed time period

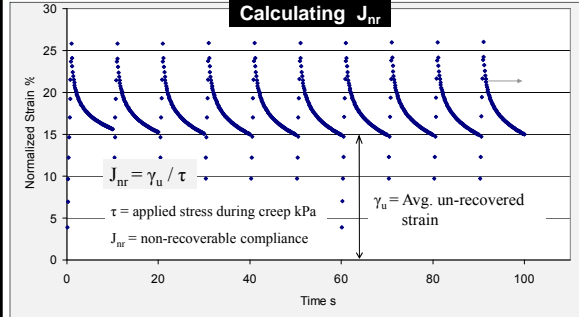
**Percent Recovery** – A measure of how much the sample returns to its previous shape after being repeatedly stretched and then relaxed

**Non-Recoverable Creep Compliance ( $J_{nr}$ )** – a measure of the amount of residual strain left in the specimen after repeated creep and recovery, relative to the amount of stress applied

### What is MSCR?

asphalt institute

#### Calculating $J_{nr}$



$J_{nr} = \gamma_u / \tau$

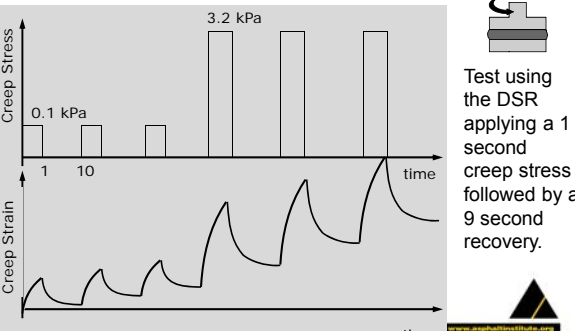
$\tau = \text{applied stress during creep kPa}$

$J_{nr} = \text{non-recoverable compliance}$

$\gamma_u = \text{Avg. un-recovered strain}$

### What is MSCR?

asphalt institute



Test using the DSR applying a 1 second creep stress followed by a 9 second recovery.

### Why Do We Need MSCR?


asphalt institute

- $J_{nr}$  is better correlated with rutting potential than  $G^*/\sin\delta$
- Reducing  $J_{nr}$  by half typically reduced rutting by half
- The effect is seen in the lab on ALF sections and Hamburg Rut Testing
- More importantly, it is also seen in the field, for example the Mississippi I-55 research

### Why Do We Need MSCR?

asphalt institute

- May eliminate the need for “PG Plus” tests for modified binders
  - Elastic Recovery, Phase Angle, etc.



www.asphaltinstitute.org

### MSCR Task Force Members

asphalt institute

- MSCR Task Force members
  - 3 Binder Suppliers
  - 3 DSR Equipment Suppliers
  - 2 Commercial Labs (including NCAT)
  - 13 State DOTs
  - Asphalt Institute




www.asphaltinstitute.org

### Barriers to Implementation?

asphalt institute

- Consensus that MSCR is an improved technology that can replace the existing high temp. test in M 320 ( $G^*/\sin\delta$ )
- However, barriers exist to implementation
  - Lack of equipment and manpower to do necessary transitional testing to validate MSCR test/specs
  - Concern about how MSCR will affect binder supply and polymer modification
  - Lack of guidance from regional partners/ suppliers
  - Poor correlation between existing PG Plus tests and MSCR tests




www.asphaltinstitute.org

### WebEx Meetings

asphalt institute

- MSCR TF has met 6 times in 2011
- Meetings are well attended and interest is good
- Early WebEx meetings provided background
- Later WebEx meetings included states presenting their data and interpretation of data (GA, OK, FL)




www.asphaltinstitute.org

### MSCR Task Force

asphalt institute



- Purpose?
  - To move evaluation of MSCR test and specification forward
  - To provide a resource and information for all SEAUPG states
  - To identify and address any barriers to implementation
  - To conduct MSCR ILS (Round Robin)
  - To consider possible implementation of MSCR in the future



www.asphaltinstitute.org

### State Survey MSCR Task Force

March 2011

www.asphaltinstitute.org

### MSCR State Survey

asphalt institute

- Purpose of the survey was:
  - To invite participation in MSCR Task Force
  - To determine status of MSCR testing for each state
  - To determine readiness for round robin testing program
  - To determine training needs
  - To determine the barriers that exist to implementation

www.asphaltinstitute.org

### MSCR Task Force

asphalt institute

#### What Comes Next?

- Evaluate MSCR ILS data
- Continue regular MSCR Task Force WebEx meetings
- TF work together to identify next steps
  - Address identified barriers
- Continue to provide updates at SEAUPG Annual meetings

www.asphaltinstitute.org

### Results - MSCR State Survey

asphalt institute

- Some states experienced and proficient in performing MSCR testing
- Some states just getting started with equipment and performing MSCR testing
- Most states said they would like some training in MSCR theory and testing
- All states said that they were willing to participate in round robin testing

www.asphaltinstitute.org

### Free MSCR Webinar

asphalt institute

- “Understanding the MSCR Test and its Use in the PG Asphalt Binder Specification”
  - Background into the Development of the MSCR Test
  - Performing the MSCR Test
  - Measurement Parameters: Jnr, Recovery, and Stress Sensitivity
  - Use of the MSCR in Performance-Graded Asphalt Binder Specification

www.asphaltinstitute.org

### 2011 SEAUPG MSCR ILS

asphalt institute

- Twenty-seven (27) labs given samples (18 labs reported results as of Nov. 9, 2011)
  - 15 Users
  - 10 Producers
  - 2 Others
- Three Asphalt Binders
  - PG 64-22 (unmodified)
  - PG 70-22
  - PG 76-22
- Two Aged Conditions
  - Original (unaged)
  - RTFO-aged

www.asphaltinstitute.org

### Free MSCR Webinar

asphalt institute

- [http://www.asphaltinstitute.org/public/asphalt\\_academy/Webinars/MSCR\\_Test\\_and\\_its\\_Use\\_Recording.asp](http://www.asphaltinstitute.org/public/asphalt_academy/Webinars/MSCR_Test_and_its_Use_Recording.asp)
- Or follow these steps:
  - [www.asphaltinstitute.org](http://www.asphaltinstitute.org)
  - Click on: Education
  - Click on: Asphalt Academy Training
  - Click on: On-Line Webinar Training
  - Under Recorded Webinar Library, click on: “Understanding MSCR...”
  - Register
  - Watch and Listen

www.asphaltinstitute.org

asphalt institute

## National Binder Technician Certification Program (NBTC)

www.asphaltinstitute.org

asphalt institute

## What is the Asphalt Institute?

**An international trade organization of petroleum asphalt producers, manufacturers, and affiliated businesses**

www.asphaltinstitute.org

asphalt institute

## NBTC Program

- NBTC is an Asphalt Institute initiative to promote a national certification program for binder technicians
- 3 day course of classroom instruction, hands-on equipment testing, written and practical exams
- AI is looking for volunteers to host two NBTC courses in the SE in 2012
- VA and OK have hosted courses so far

www.asphaltinstitute.org

asphalt institute

## SEAUPG MSCR Task Force

### Questions? Discussion?

www.asphaltinstitute.org

asphalt institute

## Hauling Asphalt Mix 1910

www.asphaltinstitute.org

asphalt institute

## Asphalt Institute Mission

The mission of the Asphalt Institute is to promote the use, benefits and quality performance of petroleum asphalt through:

- **Engineering**
- **Research**
- **Marketing**
- **Environmental Development**
- **Technical Development**
- **Resolution of issues affecting the industry**

www.asphaltinstitute.org