

Future Direction for Specs.

John D'Angelo
Federal Highway Administration
AMAP 2006

Modified Binders Affect Performance

- Study same mix different binders.

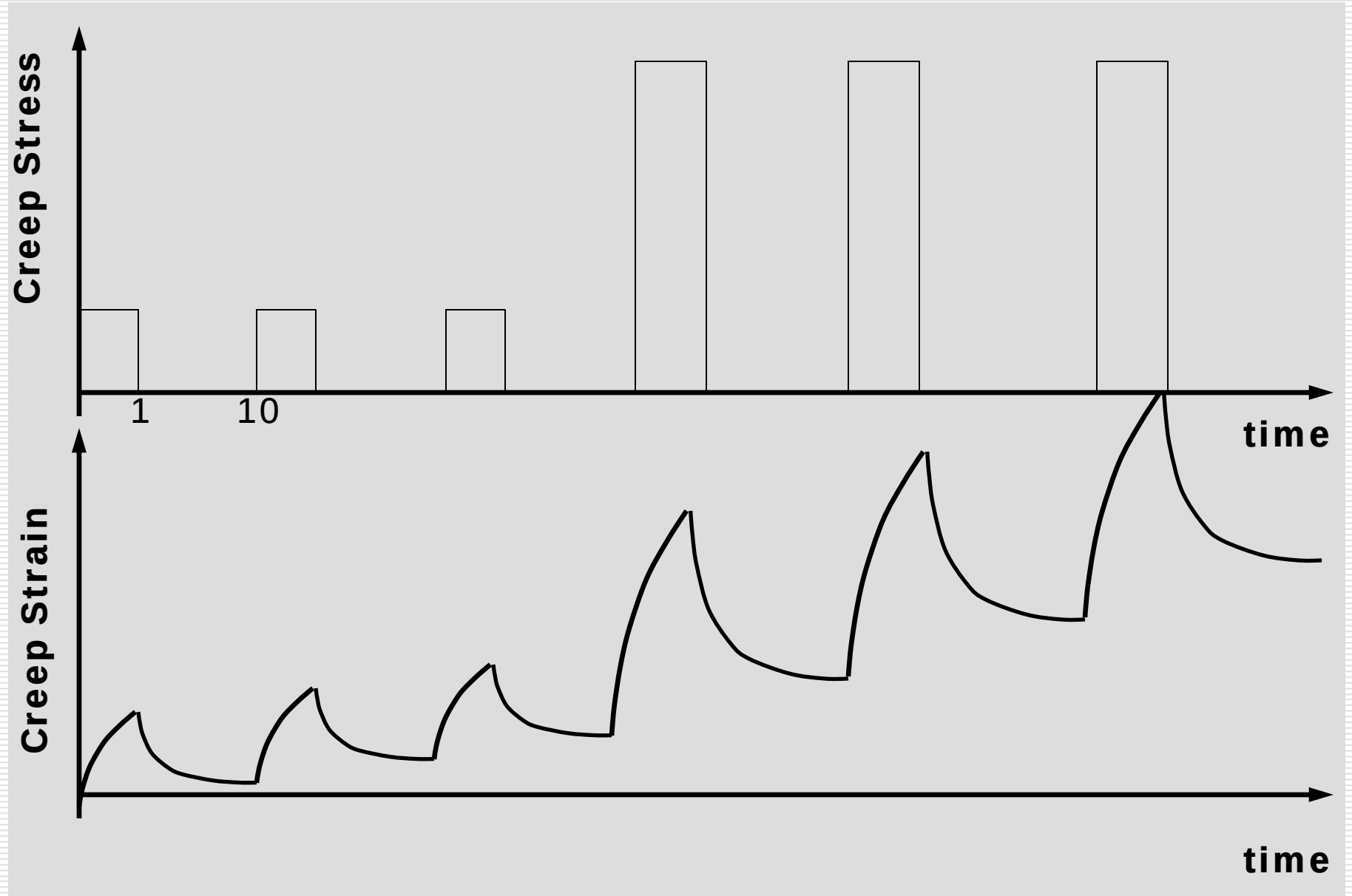
PG 63-22 mod. no rutting



PG 67-22 unmod. 15mm rutting



Proposed MSCR TEST Protocol

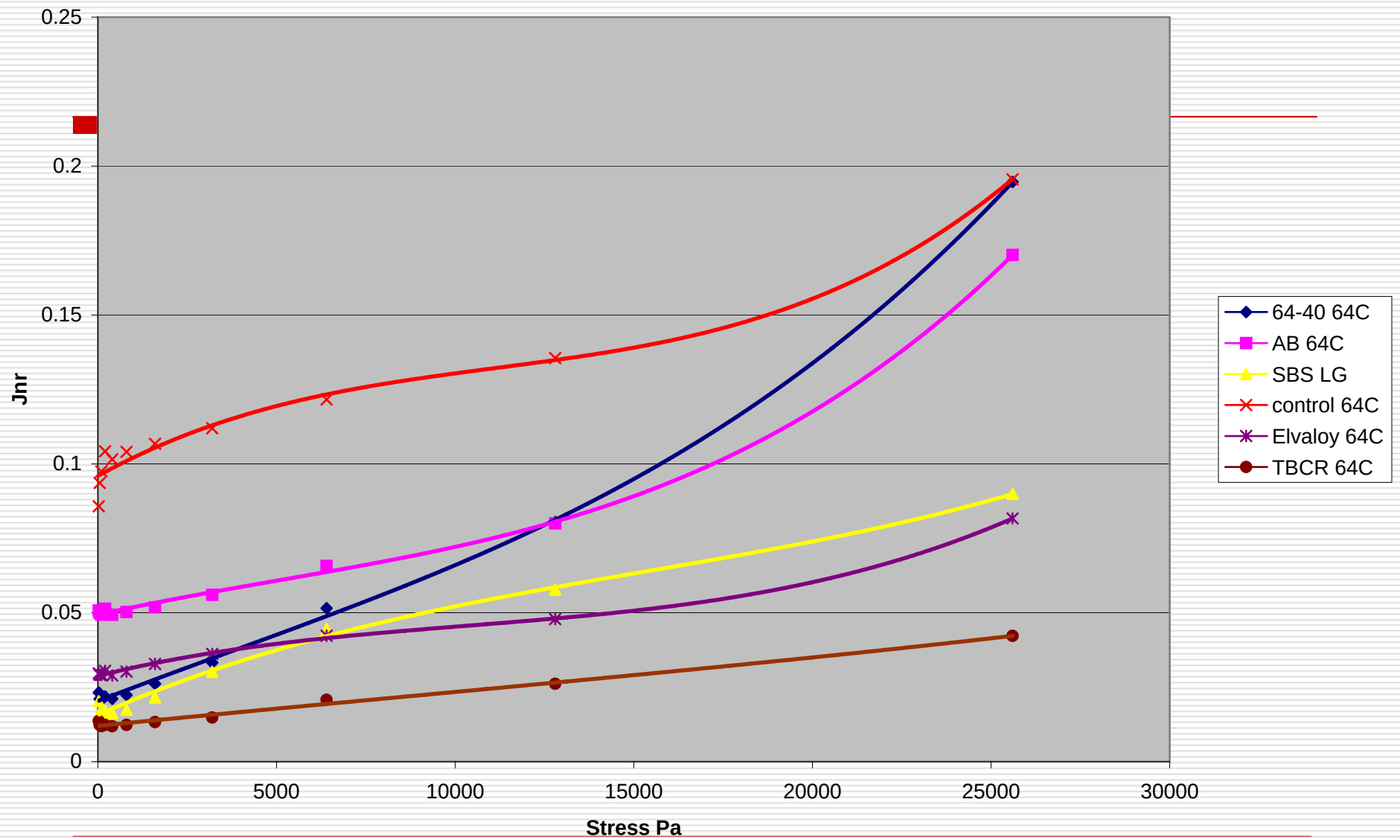


High Temperature Binder Test

☐ New test criteria:

- Perform multiple stress levels on the same sample at reduced number of cycles.
 - Stress levels: 25, 50, 100, 200, 400, 800, 1600, and 3200 Pa.
 - Run 10 cycles at each stress level no rest periods
 - Total cycles per test 80.
-

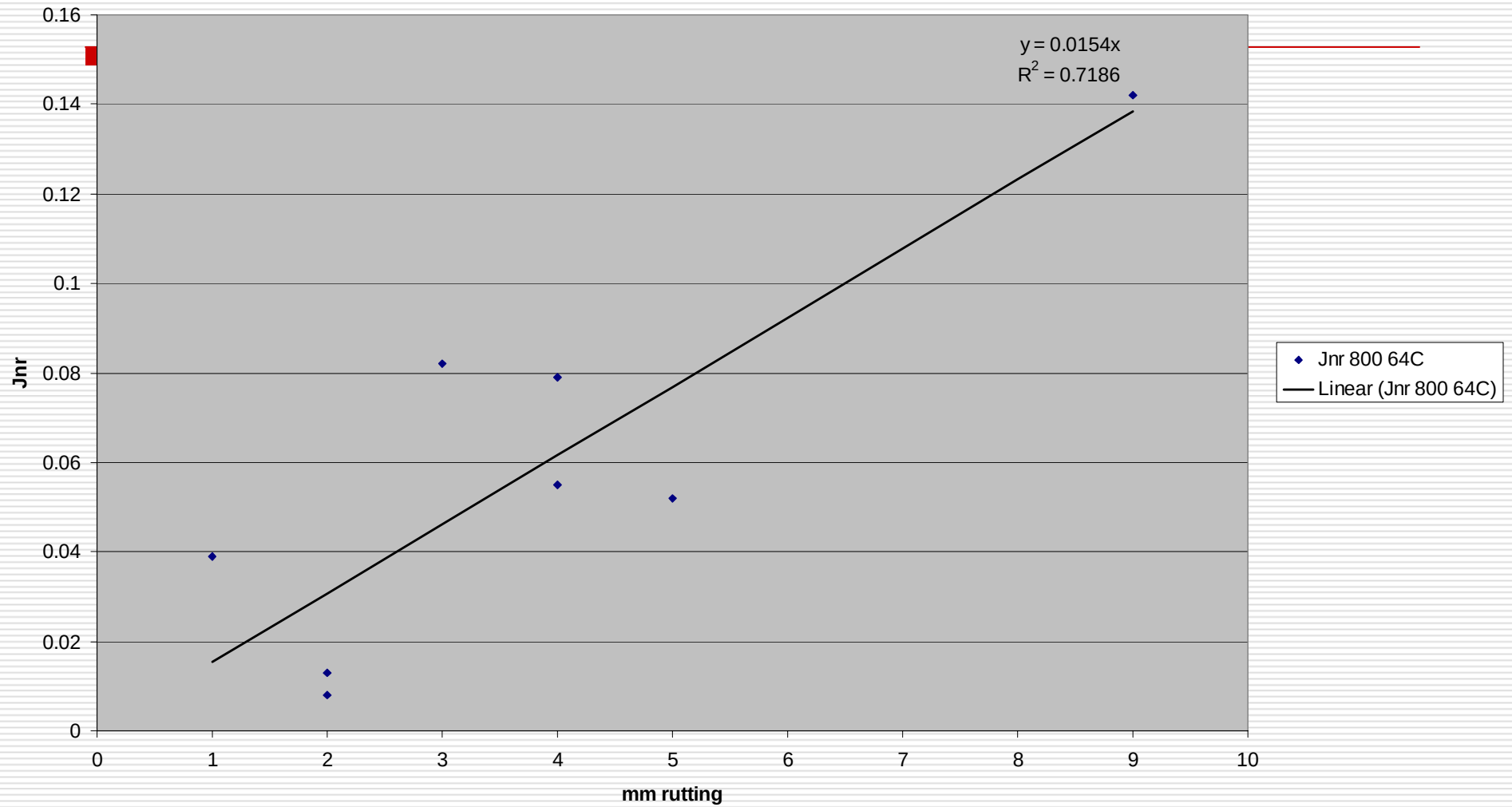
Jnr ALF binder 64C



ALF and C&R ranking

	ALF	Binder test
TBCR	1	1
SBS LG	2	2
TP	2	2
AB	3	3
Control	3	4
64-40 SBS	4	4

I55 Mississippi test sections 6 yr rutting
vs Non recoverable compliance



High Temperature Binder Criteria

☐ Study

- Refine the Multi-Stress Creep and Recovery Test
 - Evaluate multiple binders
 - Evaluate binder and mix properties to develop specification criteria.
-

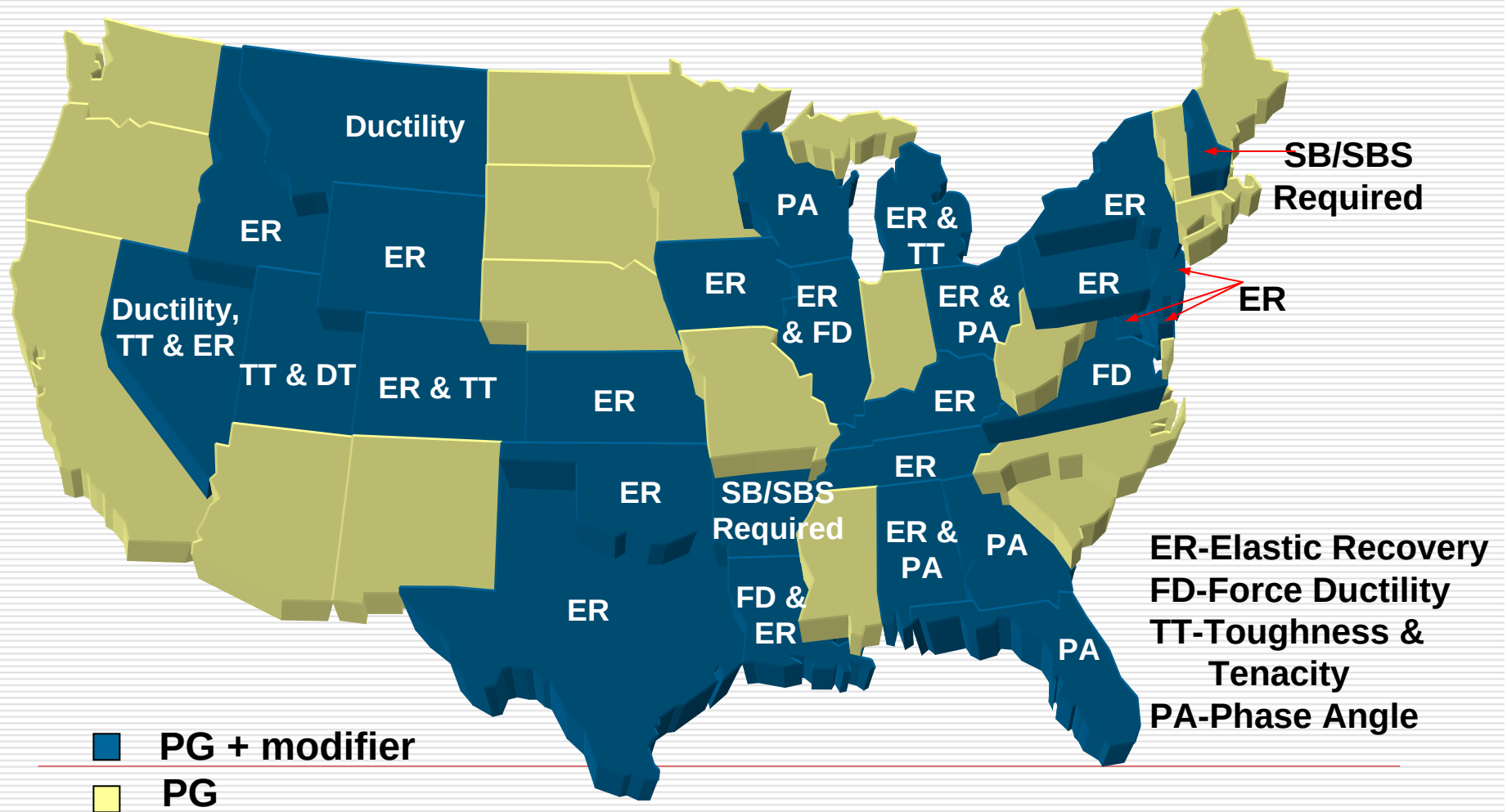
Development of Standard Practice for Superpave Plus Specifications

Use of DSR in Place of ER and
Ductility

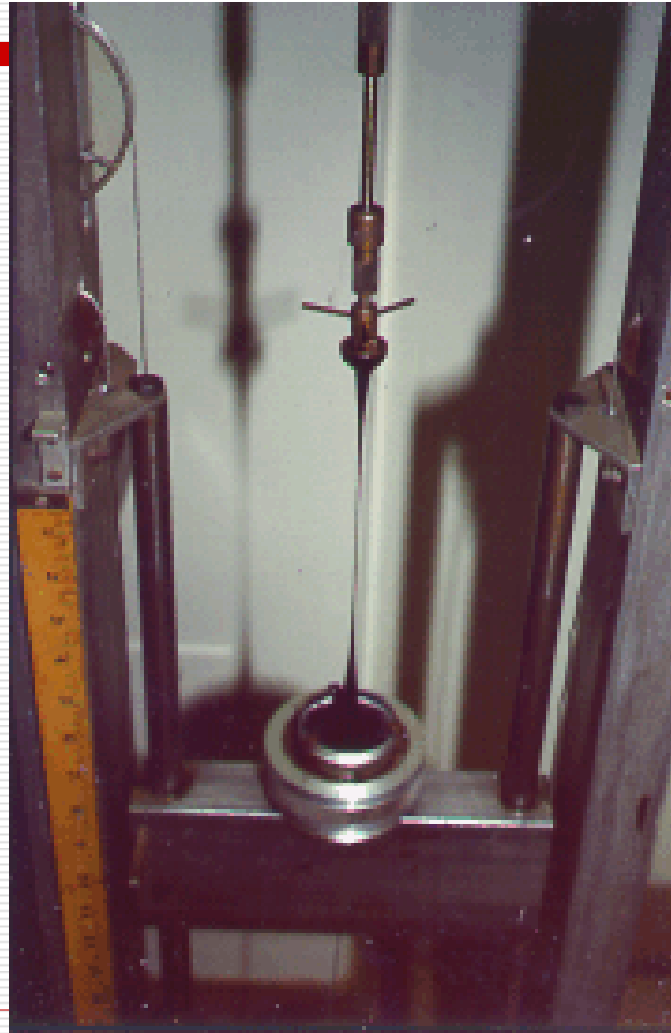
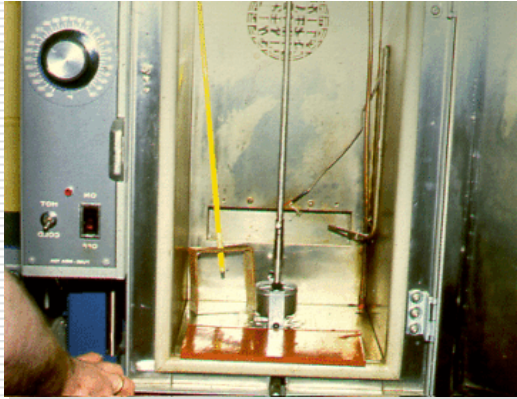
Why Superpave Plus Specs.

- ❑ The existing specifications do not identify the performance characteristics of modified binders.
 - ❑ The existing specifications do not have a criteria for fatigue or durability.
 - ❑ Agencies look to other tests to identify modifiers
 - Elastomeric polymer modifiers are desired
-

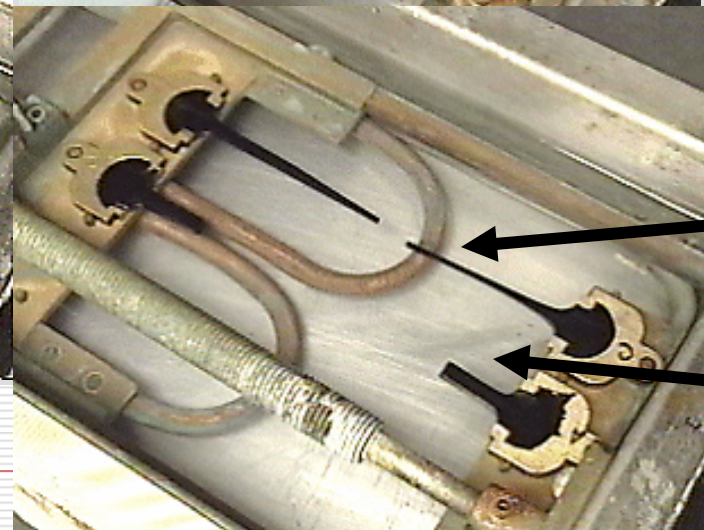
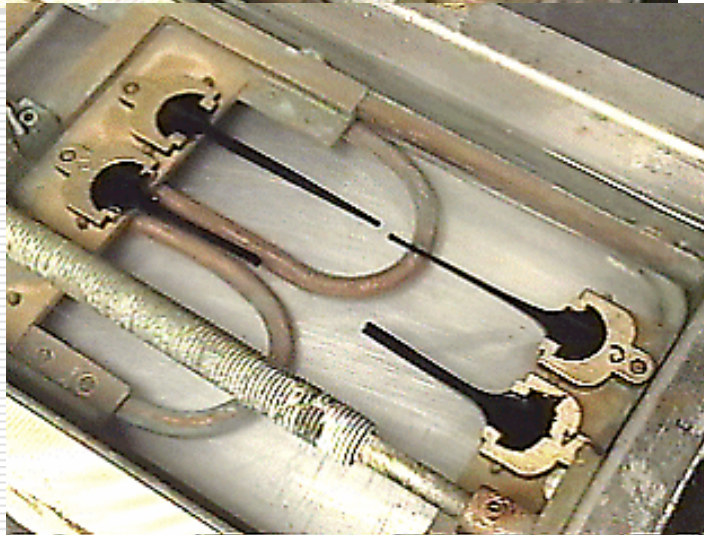
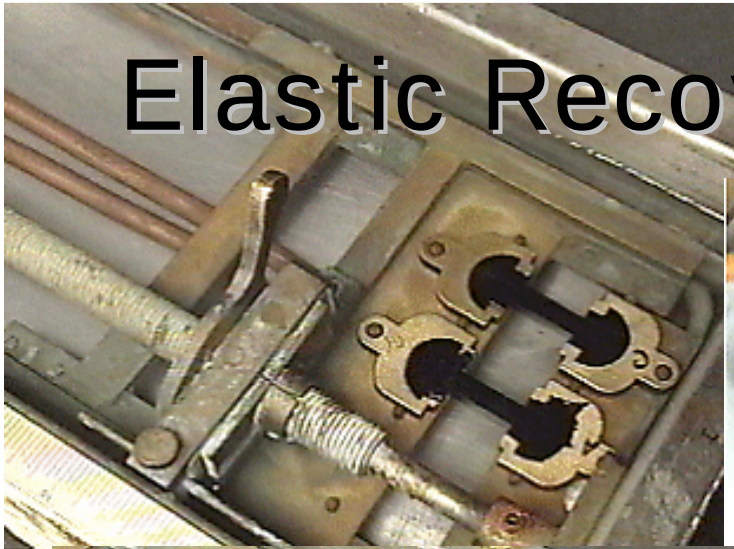
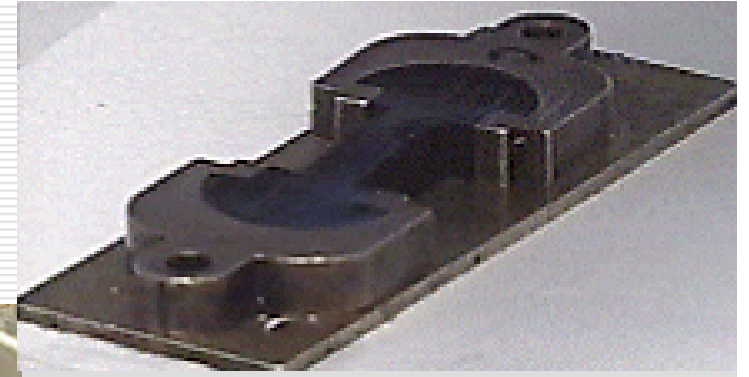
State DOT's Specifying Polymer PG (PG+)



Toughness & Tenacity



Elastic Recovery



**AC doesn't
recover**

**SB modified
AC recovers**

Problem Statement

- ☐ Provide Users with alternatives to the empirical Superpave Plus tests
 - Elastic Recovery
 - Ductility/ Force Ductility
 - Toughness and Tenacity
 - ☐ Approach: Develop AASHTO/ASTM Standard Practice for Superpave Plus Specifications
 - DSR
 - ☐ Multiple Stress Creep Recovery
-

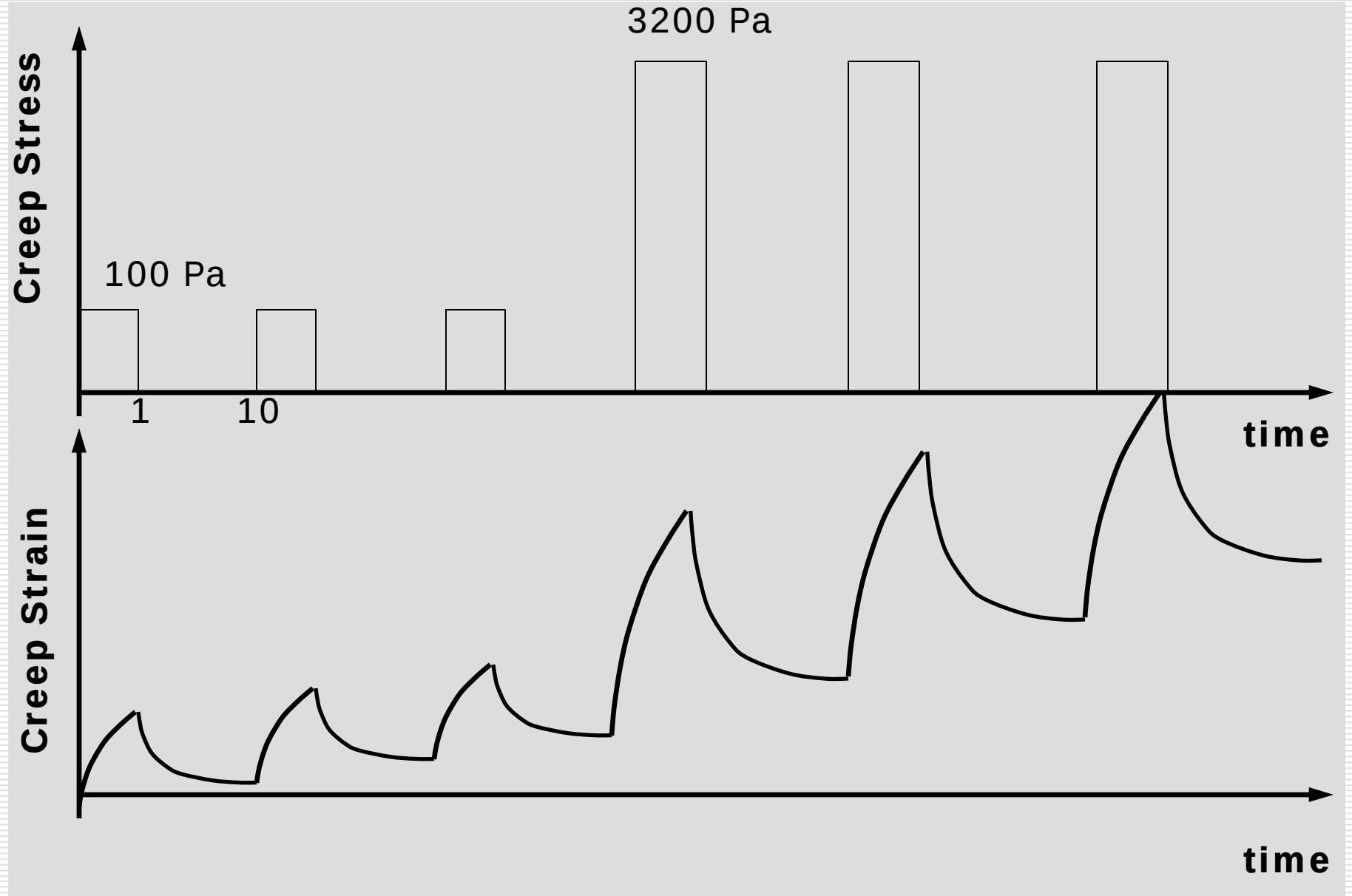
So What Do We Do? – Use DSR Approach

☐ Use DSR

■ Muti Stress Creep Recovery Test

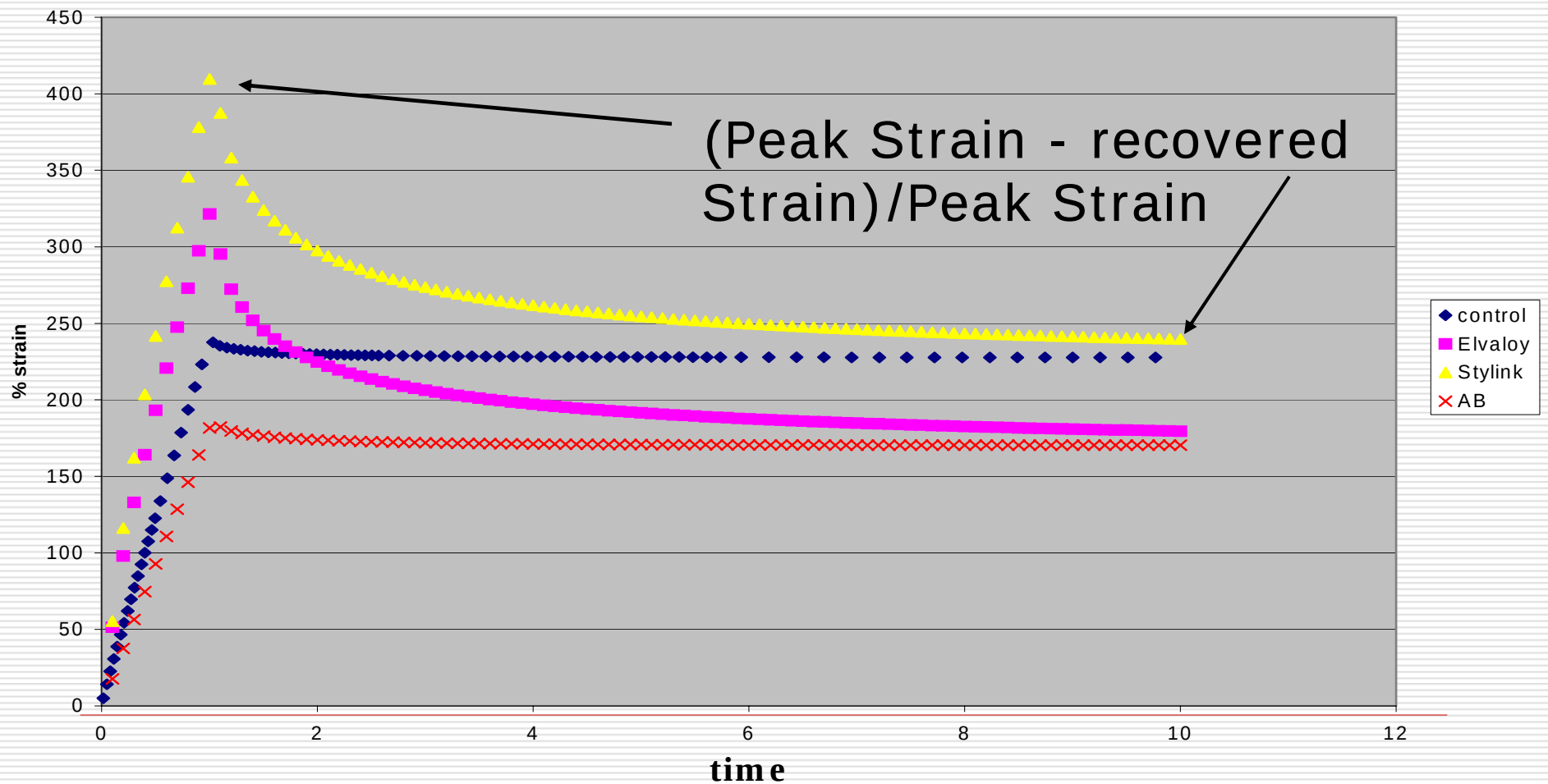
- ☐ One or two creep stress levels
 - ☐ Four to ten cycles per stress level
 - ☐ For Elastomeric modifiers Specify:
 - % strain recovery > 15% or 20%
-

Proposed MSCR TEST Protocol

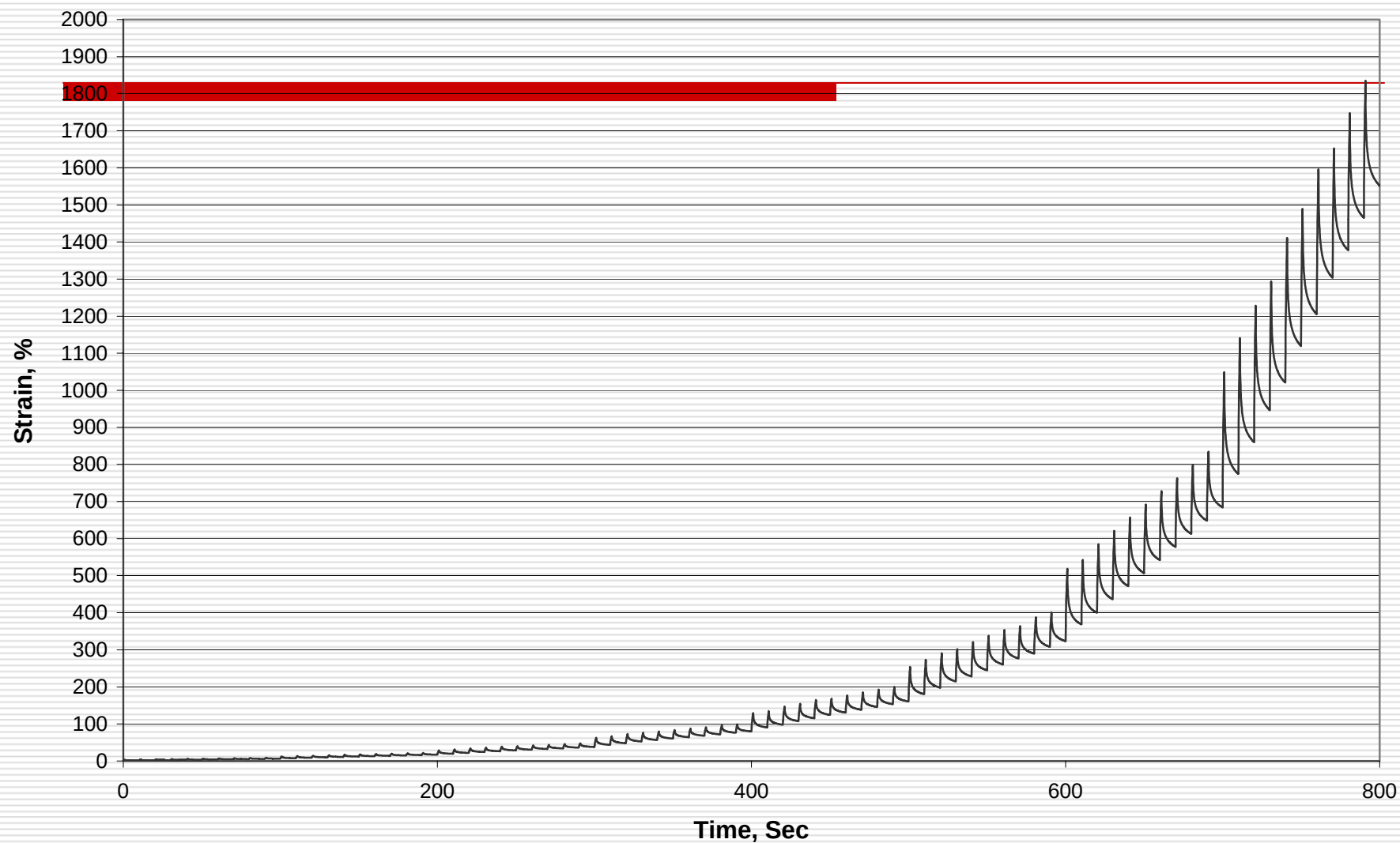


What criteria? % recovered strain

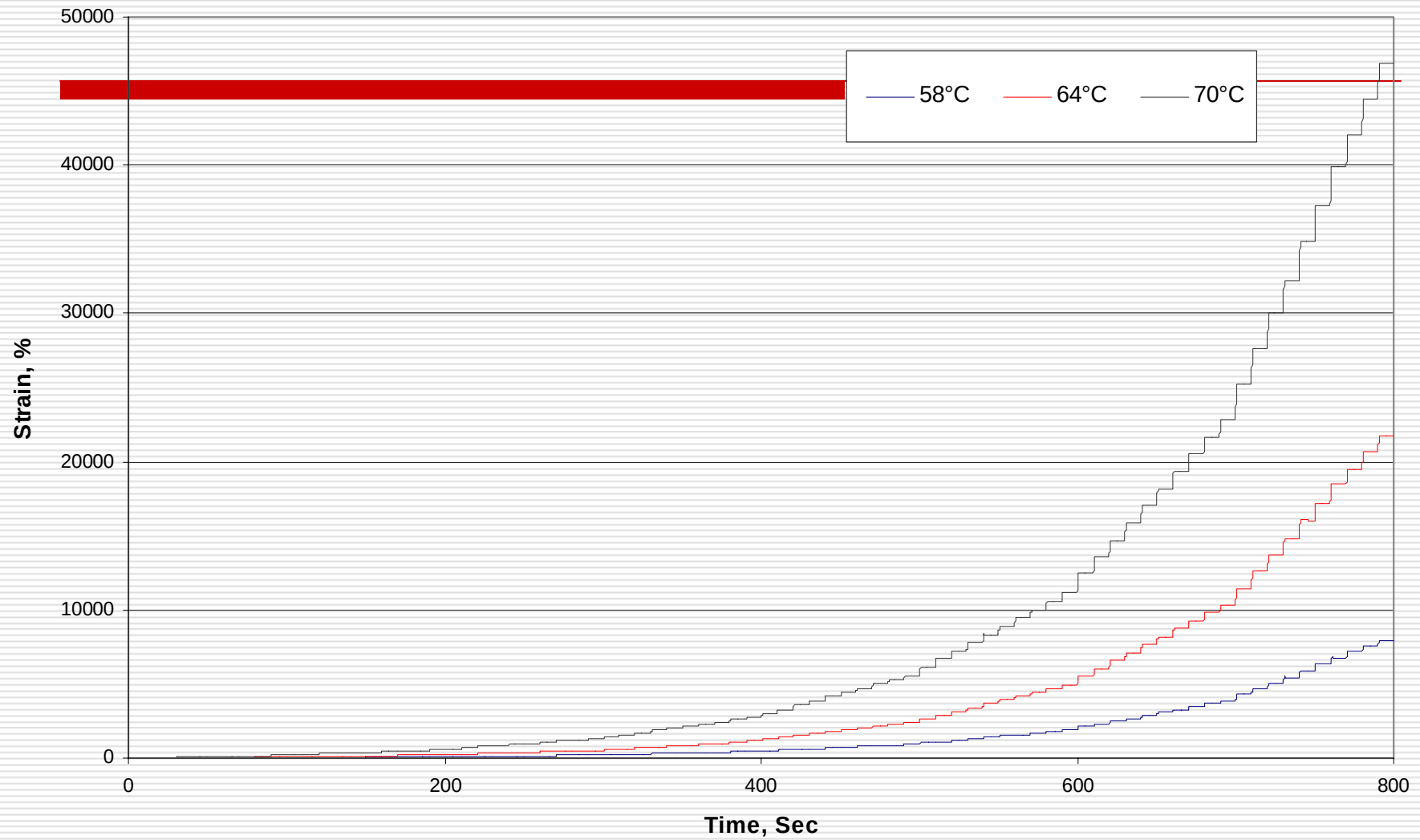
Creep 1st cycle 70C 1000 Pa



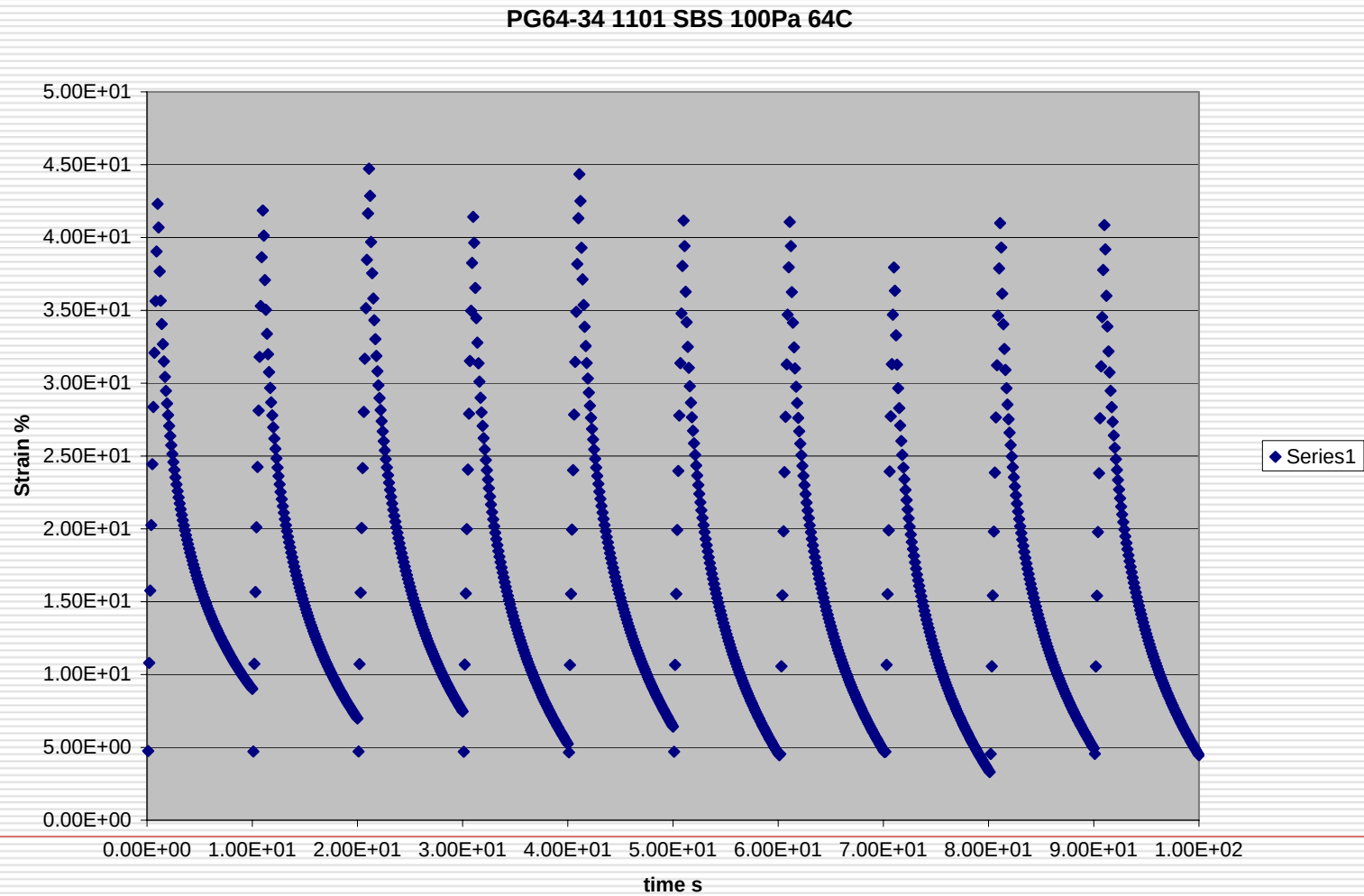
Sample B6280, Multi-Stress (25-3200Pa) Creep Recovery Data at 70°C



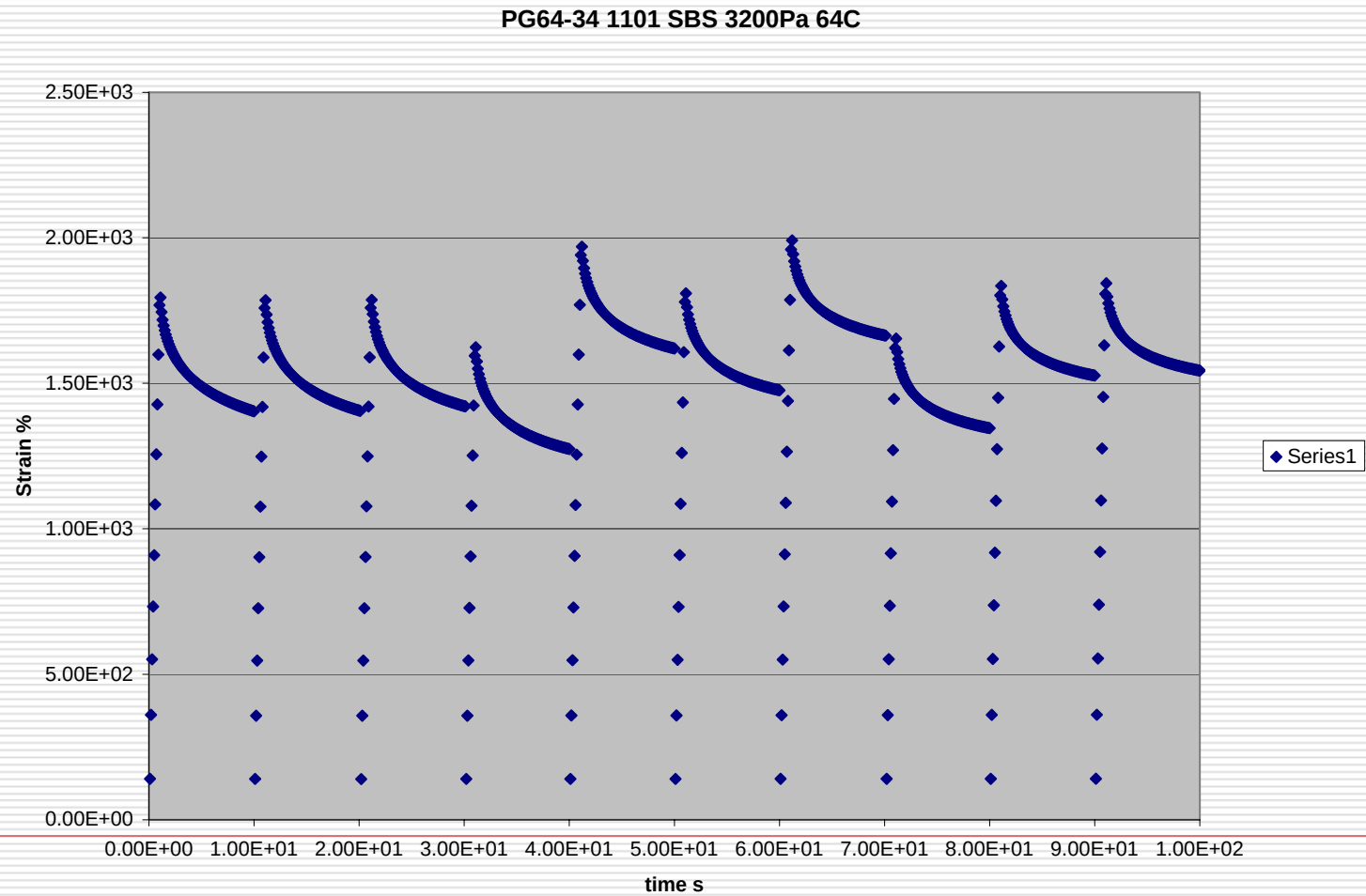
MTE-64-22, Multi-Stress (25-3200Pa) Creep Recovery Data Comparison



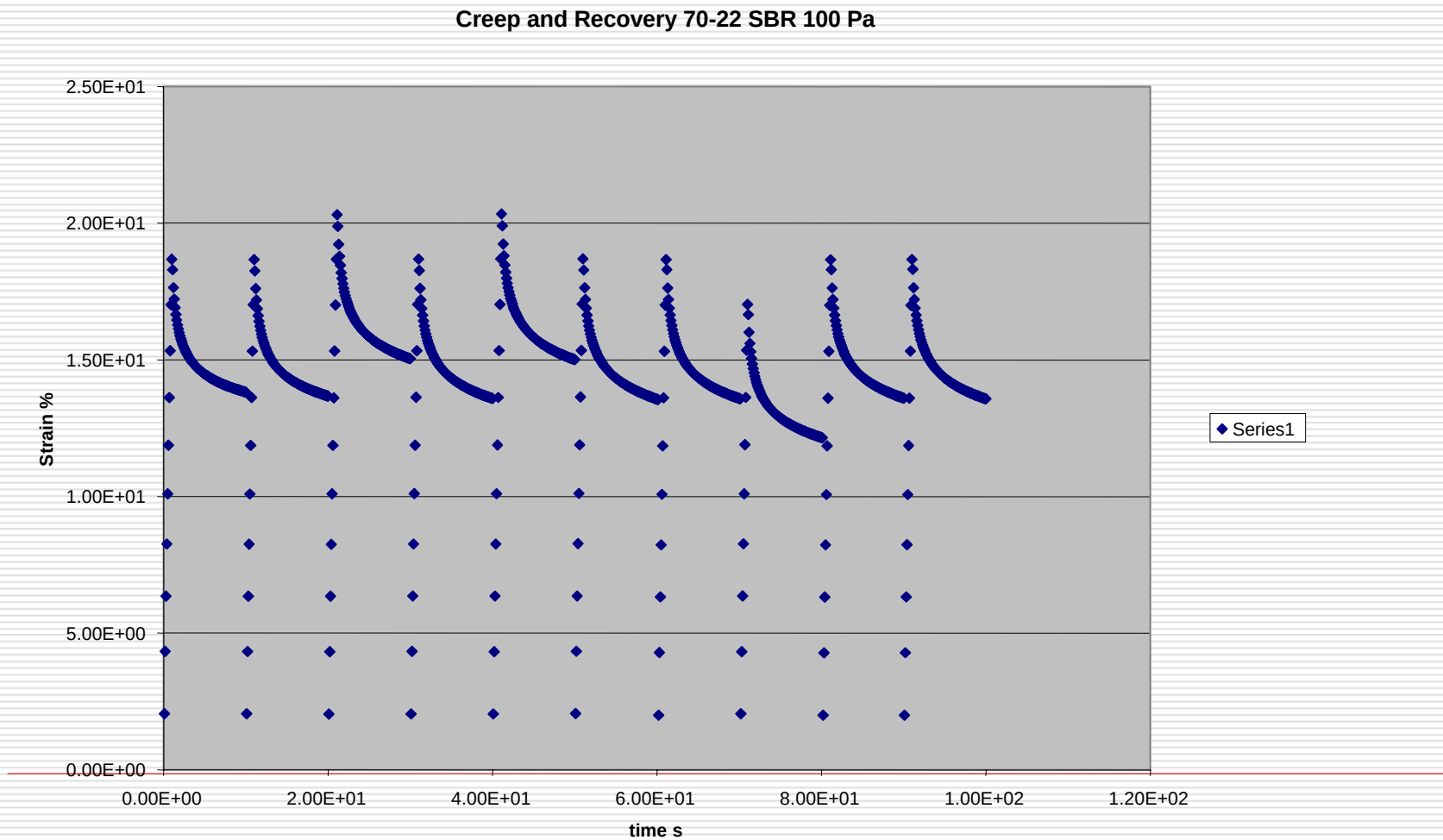
PG 64-34 1101 SBS 83% recovery 100Pa



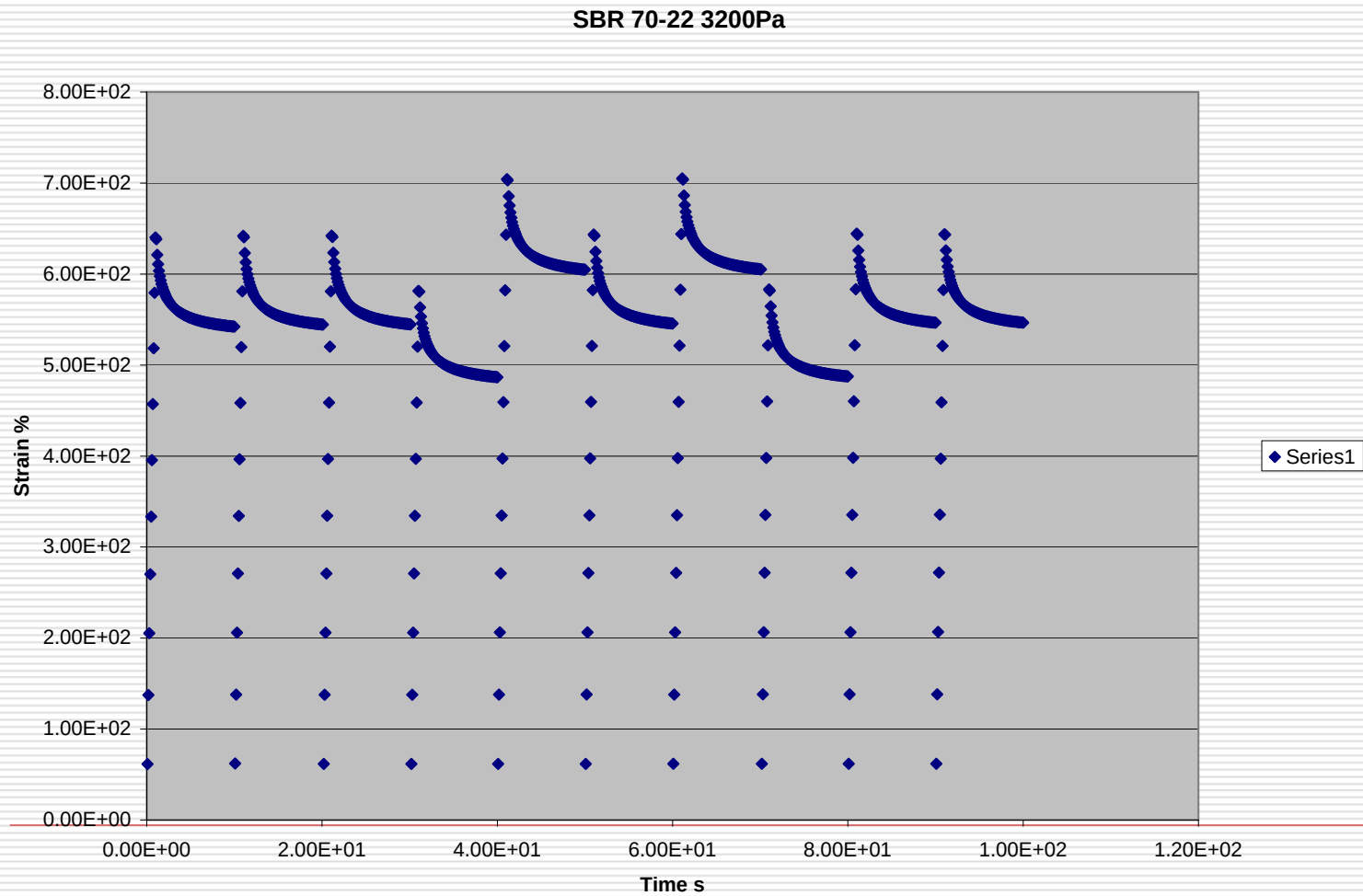
PG 64-34 1101 SBS 21% recovery 3200Pa



70-22 3% SBR 26% recovery 100Pa

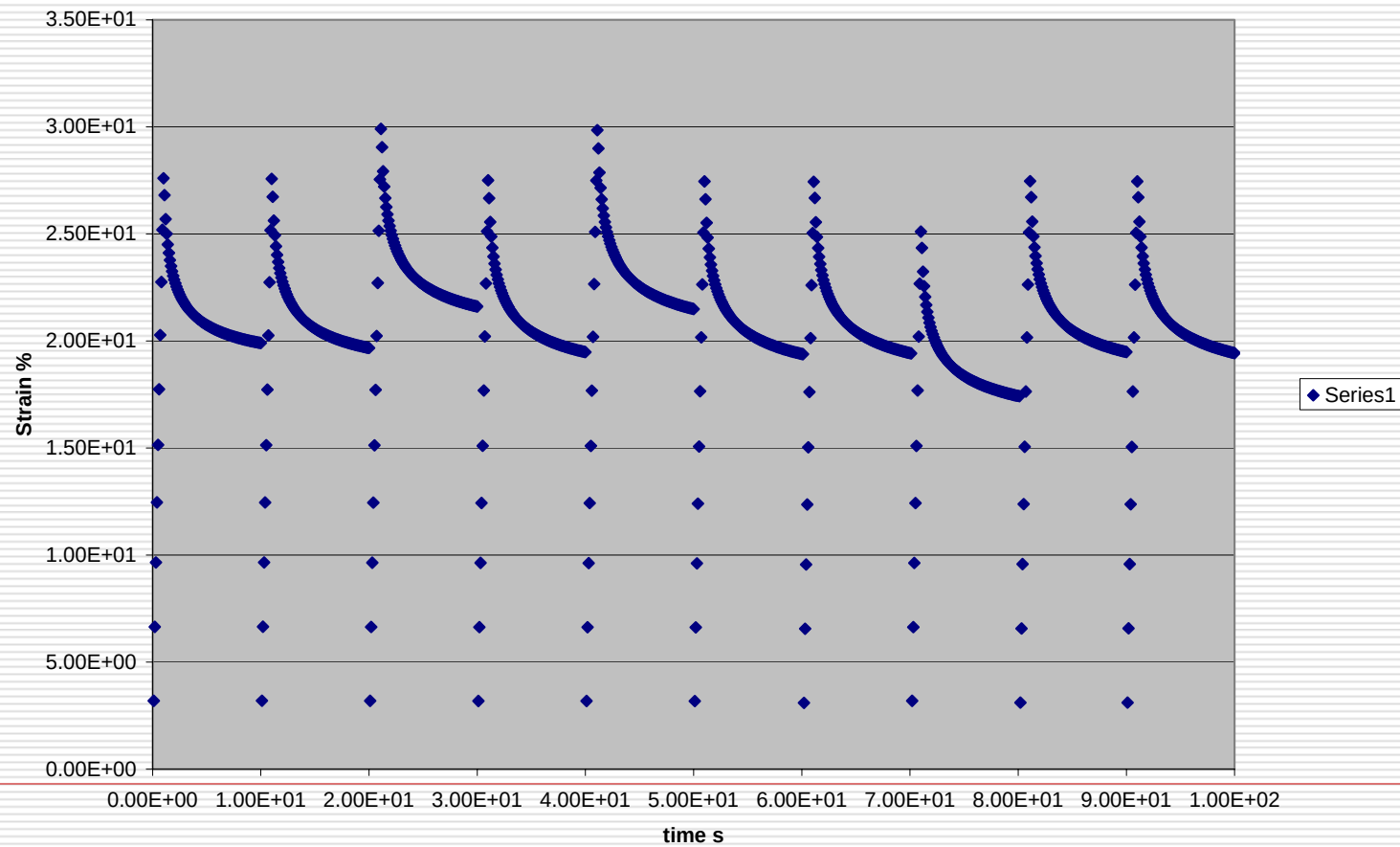


70-22 3% SBR 15% recovery 3200Pa

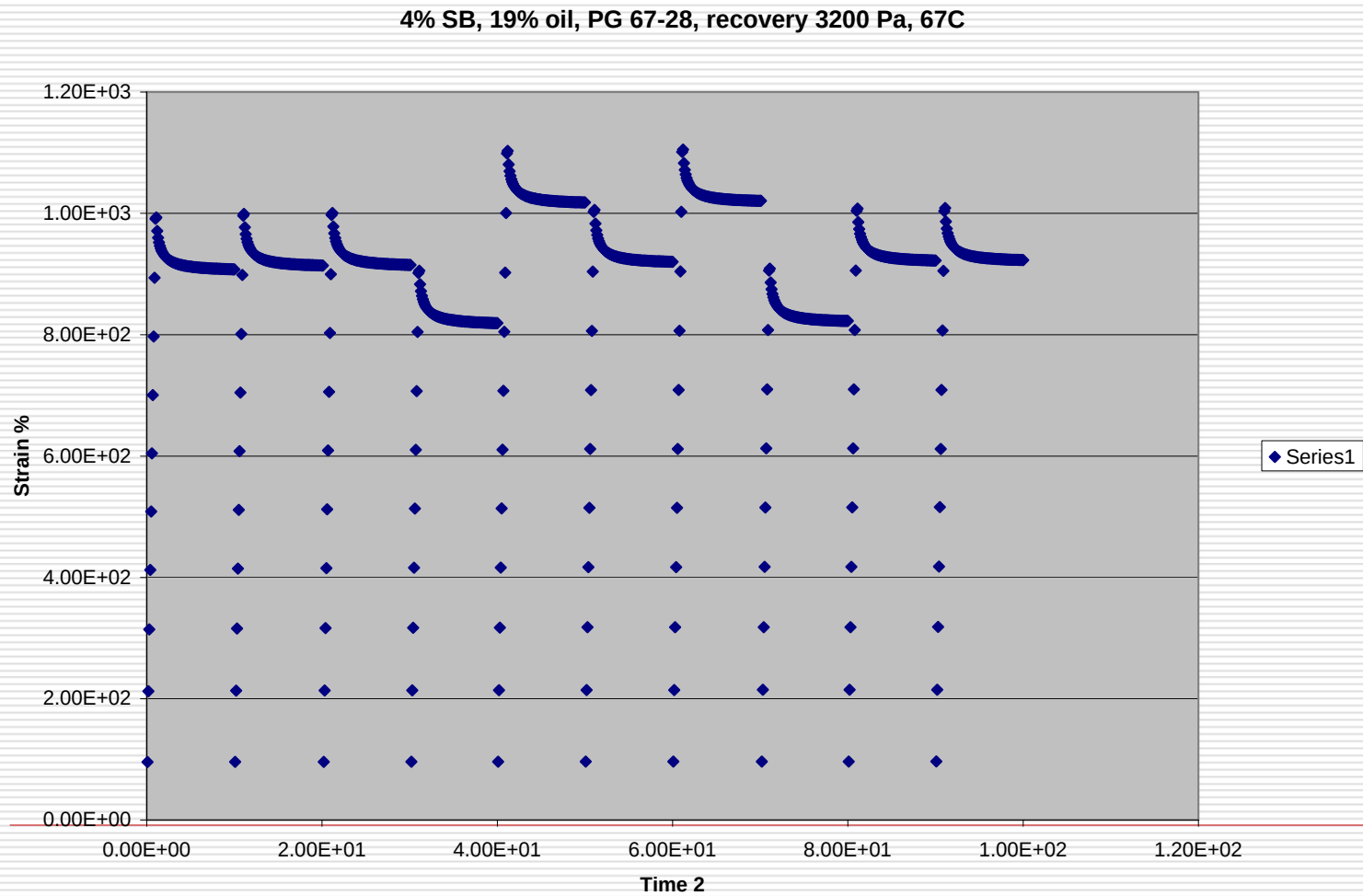


67-34 28% recovery 100Pa

4% SB, 19% oil, PG 67-28, recovery 100 Pa, 67C



67-34 9% recovery 3200Pa, 75% ER



Findings to date

- ❑ The DSR MSCR percent strain recovery criterion can replace the FD, ER, or T&T.
-

Future Steps

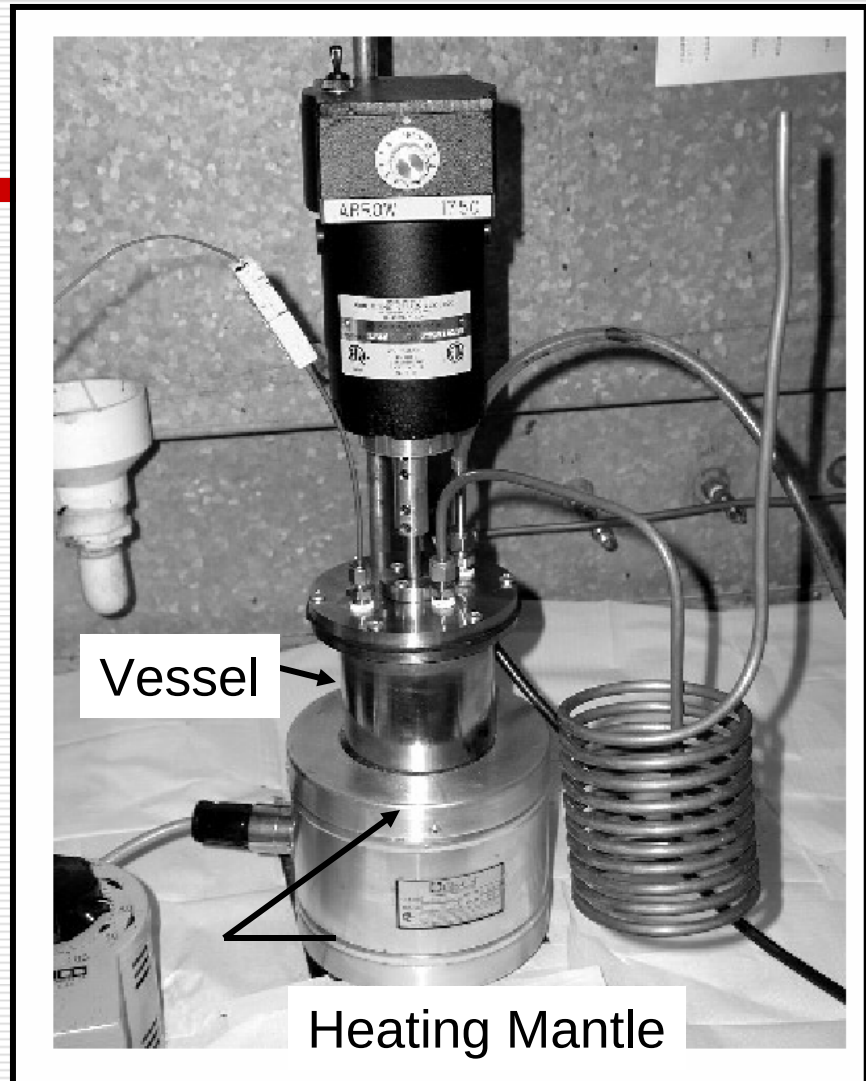
- ❑ Analyze available MSCR percent recovered strain data to finalize creep stress level and test protocol
 - ❑ Where available, show relationships with existing ER, FD, Duct., and T&T data
-

NCHRP 9-36: Improved Procedure for Laboratory Aging of Asphalt Binders

- Improved procedure for short-term laboratory aging usable in a purchase specification such as AASHTO M320.
 - Apply to neat and modified binders.
 - Quantify binder volatility.
 - Extend to long-term aging.
 - Mimic PP2 mix aging.
 - Advanced Asphalt Technologies (August 2005)
-

Original SAFT Apparatus (Glover)

- Aging Conditions
 - 163°C
 - 30 minutes
 - Atmospheric air
 - 2 liters /minute

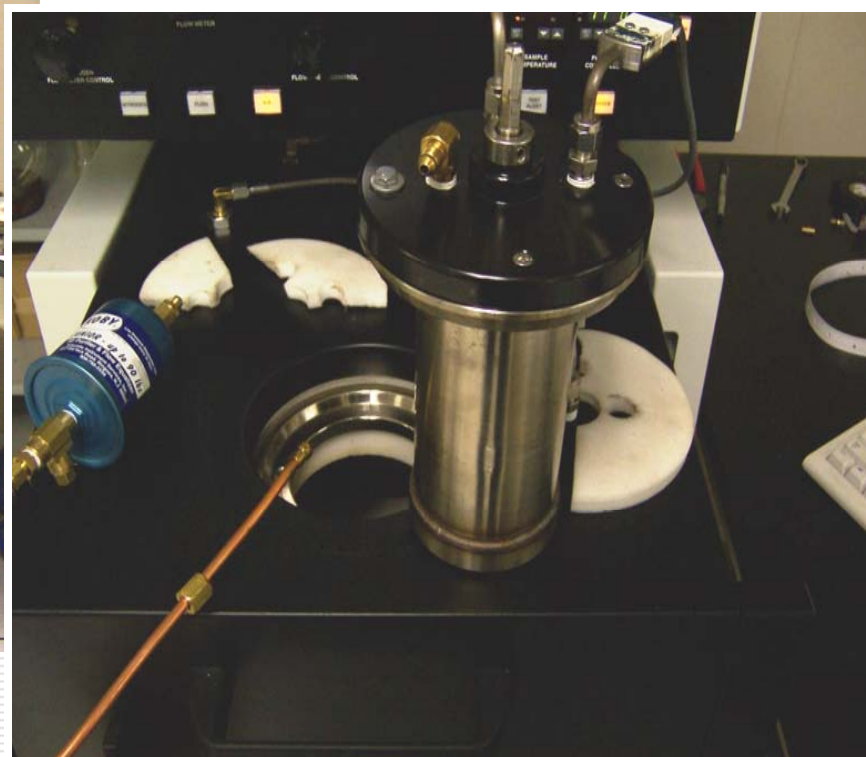


SAFT by COX



Sits on bench at
convenient height

Vessel top fully enclosed



(4) Verification Study

- ❑ Mixtures with 12 binders
 - Mixtures aged in laboratory
 - Physical properties
 - ❑ Binders aged with SAFT and RTFOT
 - Physical properties
 - Volatile collection and analysis
 - ❑ Binder and mixture aging to be compared
 - Comparison using Hirsch model
 - ❑ Status
 - Mixture work underway
 - Binder aging to follow optimization study
-

Questions
