Use of MSCR Recovery to Replace PG Plus Tests In the Southeast Asphalt User-Producer Group

To ensure polymer modification in premium asphalt binders, many user agencies require that one or more "PG Plus" tests be performed as supplemental tests to the requirements of the current performance-graded (PG) asphalt binder specification, AASHTO M320. In the SEAUPG, for premium asphalt binders (i.e., PG 70-28, PG 76-22, and PG 76-28) many user agencies require that the asphalt binder either meet a minimum elastic recovery value (usually performed on RTFO-aged binder) or maximum DSR phase angle (usually performed on unaged binder).

There are two major advantages to using the MSCR Recovery versus the current PG-Plus tests. First, while it is similar to Elastic Recovery in that it indicates the presence of an elastomeric modifier, testing has indicated that the MSCR Recovery may be more discriminating in assessing how the polymer network is performing within the asphalt binder. Second, the MSCR test is much quicker, requiring no additional equipment, less preparation time, and less effort than running a separate sample for Elastic Recovery by either AASHTO T 301 or ASTM D 6084, while losing none of the reliability. Although the DSR phase angle determination does not require any additional time (since the value is determined as a normal part of the AASHTO T315 procedure), the Elastic Recovery procedure (either AASHTO T301 or ASTM D6084) can take several hours to complete.

To use the MSCR Recovery value as a replacement PG-Plus test for premium asphalt binders in the SEAUPG, the following procedure is recommended:

1. Perform the MSCR test (AASHTO TP70) on RTFO-aged asphalt binder at 64°C.
2. Use the average MSCR Recovery value calculated from the test at 3.2kPa shear stress (MSCR Rec-3.2).
3. Compare the MSCR Rec-3.2 value to the suggested criterion below.

Data from the Asphalt Institute's research suggests the following:

- If using the Elastic Recovery (AASHTO T301) value at 25°C, an appropriate MSCR Rec-3.2 criterion at 64°C is 15 percentage points less than the current Elastic Recovery criterion. For example, a user agency that has a minimum requirement of 75% for Elastic Recovery would instead require a minimum MSCR Rec-3.2 value of 60%.
    - If the Elastic Recovery value is based on testing performed at 10°C, a limited analysis by AI suggests that an appropriate MSCR Rec-3.2 criterion at 64°C is 5% less than the current Elastic Recovery criterion.
- If using DSR Phase Angle (AASHTO T315) of the *Original (unaged)* asphalt binder, with a requirement that the phase angle be a maximum of 75 degrees, an appropriate minimum MSCR Rec-3.2 value at 64°C is 55%.

The Asphalt Institute also suggests that the average MSCR Creep Compliance (J_{nr}) value calculated from the test at 3.2kPa shear stress (termed MSCR Jnr-3.2) be determined and used with the MSCR Rec-3.2 value to generate a data point on the Recovery-J_{nr} curve in AASHTO TP70 (shown in Figure 1 below). This point provides an indication of the delayed elastic response of the modified asphalt binder and should be above the curve.

The proposed MSCR Rec-3.2 criteria values shown above are intended to provide suggested initial specification values comparable to the Elastic Recovery and DSR Phase Angle criteria based on an analysis of a number of modified asphalt binders from 2007-2011. Please note that GTR-modified asphalt binders were not included in this evaluation, and, as such, the suggested values may not be appropriate for those binders. Please also note that users aren't "losing" recovery by going from an Elastic Recovery value of 75% to a MSCR Recovery value of 60%. The difference in recovery is due to the differences in temperature, extension, and recovery time between the two procedures and the recommended values are the results of correlations developed between the two methods. User agencies should work with producers to refine these proposed criteria as needed for their area.

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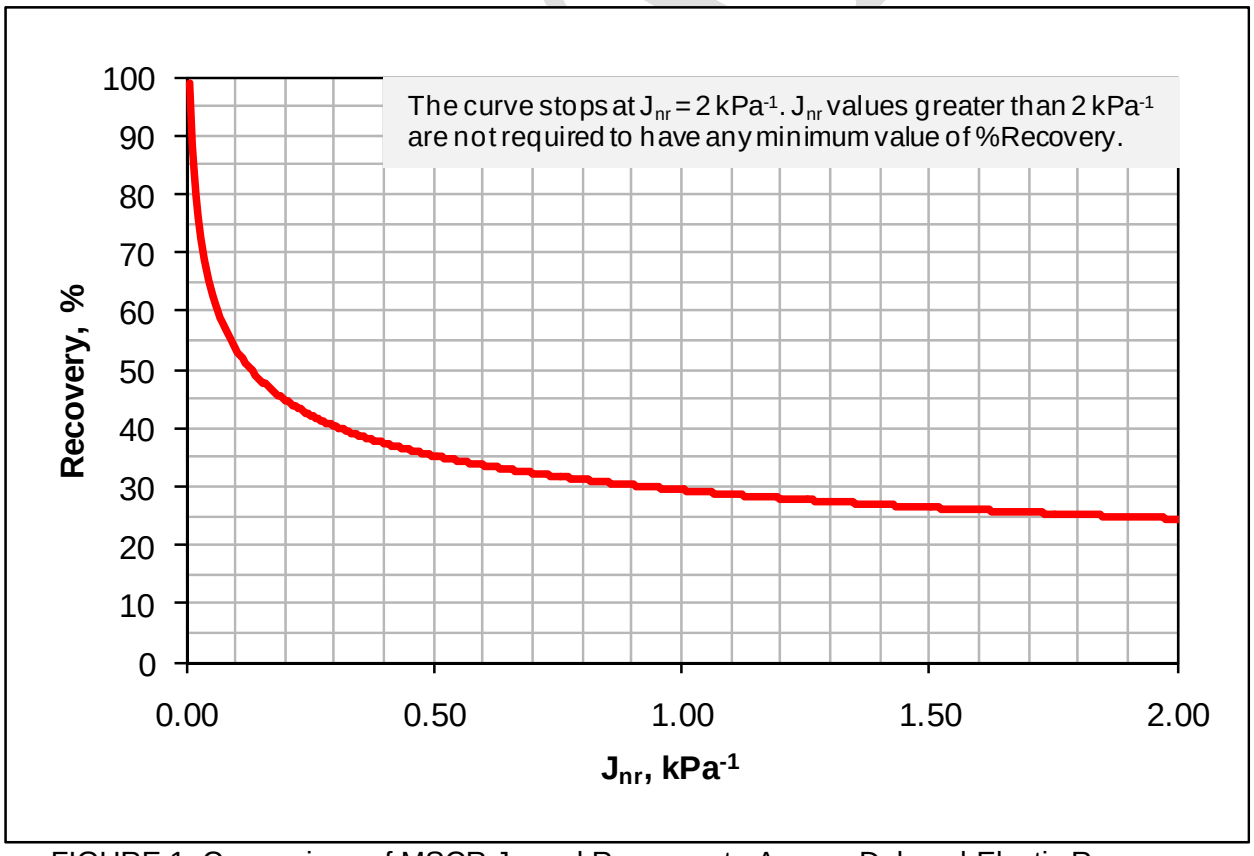

FIGURE 1: Comparison of MSCR J_{nr} and Recovery to Assess Delayed-Elastic Response