

Determining Laboratory Mixing and Compaction Temperatures

Asphalt Institute Technical Advisory Committee

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The Asphalt Institute recommends that, *for unmodified asphalt binders*, the laboratory mixing and compaction temperatures should be determined where the viscosity-temperature line crosses the viscosity ranges of 0.17 ± 0.02 Pa-s (mixing temperature range) and 0.28 ± 0.03 Pa-s (compaction temperature range). The corresponding temperatures may be reported as a range of values (e.g., 155-163°C) or as a single point representing the mid-point of the range (e.g., 159°C). The viscosity-temperature line is determined using the procedure described in ASTM D2493, “Standard Viscosity-Temperature Charts for Asphalts”, with one of the following two options:

- 1) the rotational viscosity procedure (AASHTO T316 or ASTM D4402) at two test temperatures; or
- 2) the rotational viscosity procedure at 135°C in combination with the dynamic shear rheometer procedure (AASHTO T315 or ASTM D7175) at a single high test temperature (e.g., the PG high temperature of the asphalt binder).

For modified asphalt binders, the procedures described above often result in unreasonably high temperatures for both laboratory mixing and compaction. As such, *for modified asphalt binders*, the Asphalt Institute recommends two options:

- 1) follow the recommendation of the supplier, as many suppliers have determined mixing and compaction temperatures for their individual products that have proven to be appropriate; or
- 2) conduct testing using one of the two procedures recommended by NCHRP Report 648, Mixing and Compaction Temperatures of Asphalt Binders in Hot-Mix Asphalt – the DSR Phase Angle or DSR Steady Shear Flow – and determine the appropriate temperatures from that testing and analysis.

Additionally, it should be noted that the recommended procedures for determining laboratory mixing and compaction temperatures do not apply to asphalt binders that have been modified with ground tire rubber (GTR) using the traditional “Wet Process” and which do not meet typical solubility requirements. Users should refer to other existing practices to determine appropriate laboratory mixing and compaction temperatures for these types of GTR-modified asphalt binders. GTR-modified asphalt binders which are produced by means other than the traditional “Wet Process” and which do meet typical solubility requirements should follow the procedures recommended above for modified asphalt binders.

Regardless of the procedure chosen to determine mixing and compaction temperatures, the Asphalt Institute recommends that laboratory mixing temperatures do not exceed 177°C (350°F).

Finally, the Asphalt Institute reminds the reader that laboratory mixing and compaction temperatures are intended for determining design volumetric properties of the asphalt mixture and are not intended to represent actual field mixing and compaction temperatures at the project level.

For general guidance on storage and field mixing temperatures based on different asphalt binder grades, please refer to Asphalt Institute’s EC-101, Best Management Practices to Minimize Emissions during HMA Construction.