



# BRIDGING THE GAP

Your Connection To Engineering Services

June 2024

## PERFORMANCE-GRADED ASPHALT BINDER TO WITHSTAND CALIFORNIA'S CLIMATE EXTREMES

Have you ever wondered how highways are built to withstand California's varied climate extremes and high traffic load? Caltrans uses performance-graded (PG) asphalt binder, an important component in its Mix Asphalt pavements.

Asphalt Binder is the binding agent, or "glue", that holds aggregate particles together to form a durable and cohesive pavement structure that can withstand California's high traffic loads. This cohesive pavement structure is referred to as Hot Mix Asphalt (HMA) and is widely used in newly constructed roadways and their eventual rehabilitation throughout the State.

Asphalt Binder is considered a viscoelastic material, which means its behavior is subject to both temperature (weather) and loading (vehicle loads). The binder characteristics can change from viscous to elastic depending on the environment and climate conditions. For example, binder is a semi-solid material at ambient temperatures and fluid when heated.

Caltrans uses the Performance Grade binder system to classify asphalt binders based on physical properties at different extreme temperatures such as the cold mountain winters and hot Death Valley summers. California has unique climate regions throughout the State, and Pavement Engineers must select a PG binder grade that will perform adequately for the best pavement results.

In the PG binder system, asphalt binders are identified by two temperature limits, high and low. The first number denotes the maximum pavement design temperature in degrees Celsius at which the binder should resist permanent deformation (rutting or wheel tracking).



The second number indicates the minimum pavement design temperature at which the binder should resist thermal cracking. For example, a PG 70-10 binder is expected to perform well in climate conditions where the pavement temperature reaches as high as 70°C and as low as -10°C, suitable for desert conditions.

The selection and quality of the asphalt binder are critical factors in designing and producing an HMA that meets the desired performance criteria and longevity. Ensuring the asphalt binder's quality and compatibility with the aggregate and environmental conditions is essential for a successful pavement. Caltrans Materials, Engineering, and Testing Services subdivision designs asphalt specific to the region's climate to ensure the longevity of our roads and the safety of California's travelers.

