familiar in Europe. They requested NHTSA to consider other methods of determining adhesion or PFC, but suggested no specific test method or procedure.

NHTSA is aware that the ASTM trailer and test method are not widely used outside of the United States. However, any method of determining PFC specified in the standard must be objective and repeatable. Those commenters that requested consideration of other methods did not provide any evidence that there are other standardized methods in existence that are as objective, repeatable, and universally accepted as the ASTM method that has been specified.

NHTSA also notes that the concerns expressed by several European entities about compliance need not adversely affect them, since the agency does not insist that any manufacturer use a specific test method or procedure. Rather, the individual manufacturer must determine whether to test exactly to the specifications of FMVSS No. 135 or to use its own methods of determining that its braking systems will meet the requirements of the standard. NHTSA, as stated earlier, will use the procedures established in FMVSS No. 135 in its own testing. The agency has decided to specify the ASTM test procedure for all of its compliance tests. The agency emphasizes that GRRF's suggested wording (i.e., ''a surface affording good adhesion'') would be inappropriate for a Federal safety standard since it is not objective. The two specifications are not in conflict with each other, however. Because NHTSA's goal is to define ''good adhesion'' objectively, the agency has decided to specify a surface measured with a standard test method to a specific adhesion level.

Honda recommended that the test condition state ''PFC shall be situated between the slip ratio of 10 to 30 percent and the friction coefficient of the road surface.'' It stated that this slip ratio was appropriate because most roads are within this range. It stated that slip ratios can vary even if PFC value remains constant.

NHTSA believes that slip ratios are not appropriate for defining a pavement surface to be used for stopping distance tests, because the minimum stopping distance is obtained at the maximum traction value, which is defined directly by the PFC. The agency believes that it is most important to provide a surface with the available traction defined so that all vehicles have an equal chance for achieving the shortest stop, regardless of the optimum vehicle slip ratio for each vehicle. For a given PFC, the vehicle slip ratio at which maximum traction is achieved varies depending on the vehicle characteristics. Accordingly, slip ratio cannot be used to define a test surface, because it is vehicle-dependent.

3. Instrumentation

In the 1991 SNPRM (Notice 5), NHTSA specified in S6.4, the instrumentation to measure brake temperature, brake line pressure, and brake torque.

The GRRF, Ford, Fiat, and VW recommended that NHTSA allow alternative methods to measure brake temperature. Ford stated that plug type thermocouples develop problems as brake pad wear occurs and that use of rubbing-type thermocouples would reduce cost and time.

NHTSA notes that a standard must include a specific method to ensure objectivity, so that the requirements are the same for all vehicles. In addition, a specific method ensures uniformity and thus facilitates compliance testing. The specification of plug-type thermocouples is the same as specified in Society of Automotive Engineers' (SAE) Recommended Practices and is identical to that specified in FMVSS No. 105, FMVSS No. 121, and FMVSS No. 122. The agency is not aware of any problems resulting from use of this procedure. NHTSA further notes that while the agency will use plug type thermocouples specified in S6.4.1 for its own testing, a manufacturer may use whatever type of brake temperature measuring device it prefers for its own testing. Nevertheless, NHTSA does not recommend using rubbing-type thermocouples in FMVSS No. 135, based on agency testing that indicates that the two types of thermocouples give different readings for brake temperature.

Bendix recommended that NHTSA specify whether brake linings can be heated up to an initial brake temperature (IBT) before the static parking brake test and that a procedure be specified. The procedure would be important for vehicles with parking systems not utilizing the service friction elements.

NHTSA notes that IBT as defined in S4, and S6.5.6, describes the procedure for establishing IBT, and S7.12.2(a) sets the maximum IBT (no minimum) for the parking brake test regardless of the type of friction elements. The non-service brake friction materials should not be heated because under normal driving circumstances they are never used (heated up) until the parking brake is applied after the vehicle stops. This is not necessarily the case with service brake friction materials. Therefore, it would be unrealistic to describe a heating procedure.

However, the agency has decided to revise section S7.12.2(a) as follows to clarify the requirements on IBT for both service and non-service parking brake friction materials. Specifically, the revised language makes clear that IBT applies to both service and parking brake friction materials.

''7.12.2(a) IBT.

(1) Parking brake systems utilizing service brake friction materials shall be tested with the IBT ≤ 100°C (212°F) and shall have no additional burnishing or artificial heating prior to the start of the parking brake test.

(2) Parking brake systems utilizing non-service brake friction materials shall be tested with the friction materials at ambient temperature at the start of the test. The friction materials shall have no additional burnishing or artificial heating prior to or during the parking brake test.''

F. Road Test Procedures and Performance Requirements

1. Permissible Wheel Lockup

In the 1991 SNPRM (Notice 5), NHTSA proposed to allow wheel lockup of 0.1 seconds or less of any wheel during several road tests. This differed from earlier proposals that prohibited any type of lockup. The agency concluded that, due to pavement irregularities, it would be extremely difficult for a test driver to achieve maximum deceleration without causing momentary lockup of one or more wheels. The agency believed that the brief lockup time permitted would not result in vehicle instability, especially considering that, even ABS controlled brakes occasionally undergo nominal, self-correcting lockup conditions for very short periods of time.

Advocates and CAS opposed permitting any lockup, stating that it may result in vehicle instability. Advocates believed that allowing momentary lockup would result in the sale of more rear-biased vehicles that are susceptible to skidding. Bendix recommended a revised wheel lock criteria to increase the permitted lockup time, stating that it would take longer than 0.1 seconds for a driver to detect and react to wheel lock up. It believed that this would lead to less aggressive driver performance in testing to FMVSS No. 135 specifications, as drivers tried to avoid any type of lockup.

NHTSA has decided to permit a minimal amount of wheel lock up to facilitate vehicle testing. The agency believes that it will not be detrimental to safety as alleged by Advocates.