resulting in any measurable safety benefits over the proposal."

Advocates argued that the agency's argument represents an unsupported rationalization of an European standard with much less of a discernible safety benefit. That commenter stated that on any reasonable intuitive basis, it is clear that FMVSS No. 105 was aimed at a higher level of safety and that the agency's original NPRM would have strengthened FMVSS No. 105 and established improved safety for the American motorist. That organization argued that NHTSA has made no effort at any time over the life of FMVSS No. 105 to collect real-world data on the safety benefits of its parking brake performance requirements.

In contrast, Kelsey-Hayes commented that manufacturers will have to make design changes since the 500 N (112 lbs) maximum foot operated pedal force is a significant difference from the 556N (125 lbs) permitted in FMVSS No. 105. Fiat stated that the agency should consider a grade of 18 percent, which would be consistent with R13H.

The comments of Advocates and Kelsey-Hayes relate to proposals made in the original NPRM (Notice 1) and the 1987 SNPRM (Notice 4). Those arguments were already addressed by the agency in the second SNPRM (Notice 5), and no new arguments have been presented by the commenters. The requirements adopted in this final rule are unchanged from the two SNPRMs.

Fiat is mistaken in its assertion that the grade should be 18%, to be consistent with R13H. Although the gradient specified in R13 has been changed to 18%, a corresponding change has not been made in the latest proposal for R13H, the ECE's most recent statement about brake harmonization. Therefore, the gradient and parking brake application force levels adopted in this final rule are consistent with R13H.

Ford commented that the agency should substitute the phrase "with the average pedal force determined from the shortest GVWR cold effectiveness stop" for the phrase "the service brake applied sufficiently to just keep the vehicle from rolling." Ford believes the actual force applied will vary greatly from driver to driver, and the language as it presently stands is not an objective measure of the amount of force.

NHTSA believes such a modification is not necessary. The agency notes that the requirement is derived from the language in FMVSS No. 105, which has not presented any problem. The minimum force necessary to keep the vehicle from rolling is a function of the vehicle, tires, and roadway. The driver

just keeps increasing the force until that point is reached, and it will not vary from driver to driver.

Bendix requested that NHTSA specify whether the brake linings can be heated up to an initial brake temperature before the static parking brake test; and if so, to specify a procedure. Bendix stated that the procedure would be especially important for vehicles with parking systems that do not utilize the service friction elements.

NHTSA has decided to clarify the initial brake temperature requirements in S7.12.2(a), because the proposal did not distinguish the maximum initial brake temperature for the parking brake test by the type of friction element and did not state how the initial brake temperature should be achieved for the parking brakes. In the final rule, the agency has decided to specify that the parking brakes with service brake friction materials are to be tested with the initial brake temperature less than or equal to 100°C (212°F), while parking brakes with non-service brake friction materials are to be tested at ambient temperature at the start of the test.

10. Fade and Recovery

In the 1985 NPRM (Notice 1), NHTSA proposed a fade and recovery test to ensure adequate braking capability during and after exposure to the high brake temperatures caused by prolonged or severe use. Such temperatures are typically experienced in long, downhill driving. Specifically, the agency developed a heating sequence for this proposal based on SAE Recommended Practice J1247 (Apr 80), "Simulated Mountain Brake Performance Test Procedure." Among its provisions was reducing the interval between snubs from 45 seconds to 30 seconds. 12 The agency stated that the proposed sequence was similar to those in FMVSS No. 105, but produced a temperature cycle that more closely approximates an actual mountain descent than either FMVSS No. 105 or the ECE draft test procedure. Accordingly, the agency decided not to propose the ECE's draft proposed heating sequence.

In the 1991 SNPRM, NHTSA specified a heating sequence in S7.14, a hot performance test in S7.15, a cooling sequence in S7.16, and a recovery requirement in S7.17. The agency proposed that the required stopping distance during the hot performance test be the shorter of 89 meters from a test speed of 100 km/h or 60 percent of the deceleration achieved on the shortest fully loaded cold effectiveness stopping

distance. In addition, the agency revised certain test conditions and procedures in the NPRM and 1987 SNPRM to reflect changes in performance agreed to by the ECE and EEG. For instance, the agency proposed that the pedal force be adjusted as necessary during each snub to maintain the specified constant deceleration rate, rather than applying a specific pedal force. The 1991 SNPRM also proposed that the interval between the start of the snubs would be 45 seconds. The proposed modifications to the fade and recovery test were consistent with modifications made to other road tests being introduced in FMVSS No. 135. These include permitting momentary wheel lockup and a longer reaction time in calculating the maximum stopping distance.

a. Heating snubs. In response to the proposal in S7.14 about heating snubs, JAMA, MVMA, Chrysler, Ford, GM, and the GRRF stated that the 45 second interval between snubs is appropriate. Chrysler submitted test data showing that brake temperatures and brake lining temperatures at 30 second intervals were significantly higher than under test conditions in FMVSS No. 105, addressing fade.

In contrast, CAS and Advocates favored a 30 second interval, as proposed in the NPRM. The advocacy groups claimed that by allowing cooler brakes the stopping distance requirements will be less stringent. Advocates stated that increasing the time interval between heating snubs from 30 seconds in the NPRM to 40 seconds in the 1987 SNPRM, to 45 seconds in the 1991 SNPRM contradicted NHTSA's earlier proposals and would not result in brake temperatures comparable to those obtained in FMVSS No. 105.

Based on its testing and other available information, NHTSA has determined that the 45 second interval is appropriate. As a result of this time interval and other changes, the requirement will be closer in stringency to ECE R13 and FMVSS No. 105. NHTSA believes that FMVSS No. 135's heating snub procedure is roughly equivalent to the requirements in FMVSS No. 105. The agency notes that in the 1987 SNPRM, the agency lengthened the time interval between snubs to 40 seconds, but shortened the stopping distance on the hot stop test to compensate.

b. Hot performance. In response to the proposal in S7.15 about hot performance, commenters addressed such issues as the stopping distance requirement, the pedal force, and the number of stops. In Notice 5, the agency increased the stopping distance in the

 $^{^{\}rm 12}$ In the 1987 SNPRM, NHTSA proposed an interval of 40 seconds.