least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows the agency to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the agency publishes with the final rule an explanation of why that alternative was not adopted.

This final rule will not result in the expenditure by State, local, or tribal governments or the private sector, in the aggregate, or more than $100 million annually. Thus, this final rule is not subject to the requirements of sections 202 and 205 of the UMRA.

I. National Environmental Policy Act

NHTSA has analyzed this rulemaking action for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action will not have any significant impact on the quality of the human environment.

J. Regulatory Identifier Number (RIN)

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

K. Privacy Act

Please note that anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (Volume 65, Number 70; Pages 19477–78), or you may visit *http://dms.dot.gov.*

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Reporting and recordkeeping requirements, Tires.

■ In consideration of the foregoing, NHTSA is amending 49 CFR Part 571 as follows:

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

■ 1. The authority citation for Part 571 of Title 49 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.50.

■ 2. Section 571.118 is amended by revising paragraph S2 and by adding paragraph S6 to read as follows:

§ 571.118 Standard No. 118; Power-operated window, partition, and roof panel systems.

* * * * *

S2. *Application.* This standard applies to passenger cars, multipurpose passenger vehicles, and trucks with a gross vehicle weight rating of 4,536 kilograms or less. This standard's requirements for actuation devices, as provided in S6, need not be met for vehicles manufactured before October 1, 2008.

* * * * *

S6. *Actuation Devices.*

(a) Any actuation device that is mounted in the occupant compartment of a vehicle and can be used to close a power-operated window, partition, or roof panel, shall not cause such window, partition, or roof panel to begin to close from any open position when tested in accordance with paragraphs (b) and (c) of S6.

(b)(1) Using a hemisphere with a smooth, rigid spherical surface and a radius of 20 mm ± 1 mm, place the spherical surface of the hemisphere against any portion of the actuation device.

(2) Apply a force not to exceed 135 Newtons (30 lbs.) to the geometric center of and perpendicular (± 3 degrees) to the flat face of the hemisphere.

(3) While this force level is being applied, the plane of the flat face of the hemisphere may be at any angle.

(c) For actuation devices that cannot be contacted by the hemisphere specified in S6(b)(1) prior to the application of force, apply a force up to the level specified in S6(b)(2) at any angle in an attempt to make contact with the actuation device. The hemisphere is directionally applied in such a manner that, if unimpeded, it would make contact with the actuation device.

(d) The requirement in S6(a) does not apply to either—

(1) Actuation devices that are mounted in a vehicle's roof, headliner, or overhead console and that can close a window, partition, or roof panel only by continuous rather than momentary switch actuation, or

(2) Actuation devices for closing power-operated windows, partitions, and roof panels that comply with S5 of this standard.

Issued: September 9, 2004.

Jeffrey W. Runge,

Administrator.

[FR Doc. 04–20714 Filed 9–13–04; 9:30 am]

BILLING CODE 4910–59–P

DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA 2004–19076]

RIN 2127–AF83

Federal Motor Vehicle Safety Standards; Power-Operated Window, Partition, and Roof Panel Systems

AGENCY: National Highway Traffic Safety Administration (NHTSA), DOT.

ACTION: Final rule.

SUMMARY: This final rule amends the test procedures in our standard on power-operated window, partition, and roof panel systems to accommodate and ensure effective evaluation of new technology, specifically automatic reversal systems that operate by infrared reflectance. The standard's existing test procedures are more suitable for other types of technology (*e.g.,* contact/force sensing systems and light beam interruption systems). In addition, the final rule clarifies the procedures for testing automatic reversal systems using a light beam interruption sensing method by specifying that rods used in testing such systems are not transparent.

DATES: *Effective Date:* The amendments made in this final rule are effective September 1, 2005. Voluntary compliance is permitted before that date.

Petitions: If you wish to submit a petition for reconsideration for this rule, your petition must be received by November 1, 2004.

ADDRESSES: Petitions for reconsideration should refer to the docket number above and be submitted to: Administrator, Room 5220, National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590.

See the **SUPPLEMENTARY INFORMATION** portion of this document (Section IX; Rulemaking Analyses and Notice) for DOT's Privacy Act Statement regarding documents submitted to the agency's dockets.

FOR FURTHER INFORMATION CONTACT: For non-legal issues, you may call Mr. Michael Pyne, Office of Crash Avoidance Standards (Telephone: 202–366–2720) (Fax: 202–366–4329).

For legal issues, you may call Mr. Eric Stas, Office of the Chief Counsel (Telephone: 202–366–2992) (Fax: 202–366–3820).

You may send mail to these officials at National Highway Traffic Safety Administration, 400 Seventh Street, SW., Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

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I. Executive Summary

This final rule amends FMVSS No. 118, *Power-Operated Window, Partition, and Roof Panel Systems,* to specify test procedures for a new type of non-contact automatic reversal system. Specifically, these amendments accommodate and effectively evaluate automatic reversal systems based on infrared reflectance (IR) technology, which is capable of stopping and reversing a window prior to contacting an obstruction (*e.g.,* a head or arm). NHTSA determined that the existing test procedures were inappropriate for IR-based systems.

This rulemaking arose out of a petition for rulemaking submitted by Prospects Corporation, which the agency granted. Subsequently, NHTSA issued a notice of proposed rulemaking [1] that proposed test procedures for testing of IR-based automatic reversal systems. We received seven public comments on this proposal. These comments were generally supportive of the rulemaking, but sought modification of certain technical aspects of the proposed amendments.

Based upon all available information, the agency has decided to issue a final rule that replaces the standard's current single set of test procedures for contact and non-contact reversal systems with one set for reversal systems designed to detect obstructions by physical contact or by light beam interruption and a second set for reversal systems designed to detect proximity of obstructions using infrared reflectance. The first set of requirements and procedures is the same as the current set; the second set is new.

Thus, the final rule does not substantively modify or eliminate existing requirements in FMVSS No. 118 that relate to contact reversal systems based on force-sensing and non-contact reversal systems based on light beam interruption, nor does it change the circumstances under which power windows, roof panels, and partitions must automatically reverse direction, with one minor exception. This rulemaking amends the standard to specify that rods used for testing window reversal systems based on beam interruption are not transparent.

Although a more detailed discussion is provided later in this notice, the following summarizes the provisions of this final rule related to IR-based automatic reversal systems. The final rule accommodates those systems by specifying that the agency will test them using a different rod than the ones used in testing other types of reversal systems. Instead of a rod with a constant diameter as small as 4 mm, the agency will use a rod that has a tip with a length of 40 mm and a diameter of 10 mm, followed by a segment with a length of 300 mm and a diameter of 20 mm, followed by an additional length to permit the rod to be held during testing (*see* Figure 3).

The final rule ensures the effective evaluation of IR-based reversal systems by specifying that the test rod will have a reflectance of 1 percent. We believe that these size and reflectance specifications are reasonably representative of a small child (approximately 15 months in age) whose arm is reaching for a window opening from inside a vehicle with hand held flat and on edge relative to the emitter/sensor of the IR system, and whose hand is covered by snug-fitting fabric. The covering of the hand represents, for example, the situation of a child whose sleeves are too long or who has pulled his or her sleeves down. When an IR system senses an obstacle with the above characteristics, it must halt the window's closing and reverse direction to one of the specified positions under S5.2 of the standard.

These requirements apply to power-operated windows, roof panels, and interior partitions. However, we note that powered interior partitions represent a special case, because they can have occupant compartment space on both sides of the partition. Therefore, it is necessary that interior partitions be capable of reversing when obstacles enter from either side of the partition.

We do not expect this final rule to have a significant impact on the standard's expected benefits and costs. Because these IR-based systems are required to meet the same performance requirements as other automatic reversal systems (although in a different manner), the level of benefits under the standard is expected to remain unchanged. As to costs, because IR-based automatic power window reversal systems are not required under FMVSS No. 118, there are not expected to be any compliance costs imposed by this final rule. Further, manufacturers may utilize any technology that meets the performance requirements in paragraph S5 of the standard as tested in accordance with the procedures in paragraph S7.

II. Background

Federal Motor Vehicle Safety Standard (FMVSS) No. 118, *Power-Operated Window, Partition, and Roof Panel Systems,* regulates power-operated windows, partitions, and roof panels by specifying requirements for such systems designed to minimize the likelihood of death or injury from their inadvertent operation. Of particular concern, the standard addresses the threat to unsupervised children of being strangled or suffering limb-crushing injuries by closing power windows.[2] The standard applies to passenger cars, multipurpose passenger vehicles, and trucks with a gross vehicle weight rating of 4,536 kg (10,000 lbs.) or less.

FMVSS No. 118 has undergone periodic revision in order to accommodate technological developments related to power window systems. Originally, the standard required that the activation of power windows be linked to an ignition interlock. The standard prohibited the activation of power windows unless the key was in the ignition and turned to the ''On,'' ''Start,'' or ''Accessory'' position, based upon the presumption that this precondition would ensure that a driver was present to supervise children. It also ensured that the driver is provided with a simple means of disabling the power windows of a parked vehicle (*i.e.,* key removal).

Over the years, however, paragraph S4 of the standard has been amended to permit power windows closing in situations in which the key is not in the ignition, but the existence of adult supervision could be presumed for other reasons. Most recently, in 1991, NHTSA issued a final rule that responded to the interest of manufacturers in offering remote controls for window closing (*see* 56 FR 15290 (April 16, 1991)). In doing so, the agency was mindful that the unrestricted allowance of remote

[1] 61 FR 28124 (June 4, 1996) (Docket No. NHSTA–2004–18944–6).

[2] For the sake of simplicity, the preamble to this final rule collectively refers to these three types of systems as ''power windows.'' However, we note that amendments to the standard apply equally to powered partitions and roof panels as well.

controls, especially ones that activated windows using radio frequency signals that can penetrate obstructing walls, could pose a danger to child occupants because the person activating the window might not be able to see a child in the window opening. Therefore, in an effort to ensure the presence of a supervising person, the agency amended the standard to permit power windows to be operable through the use of remote controls only if the controls had a very limited range (*i.e.,* not more than 6 meters (m)). A longer range, up to 11 m, was permitted for remote controls that were operable only if there were an unobstructed line of sight between the control and the vehicle. (We note that the power windows of all vehicles sold in the U.S. are still linked to an ignition interlock or one of the exceptions under S4.)

Further, in that rulemaking, the agency reasoned that the provisions permitting remote control of a power window need not be premised on the likely existence of supervision if the window were equipped with an automatic reversal system.[3] If the system could sense a child's hand or head when it became trapped between the window and the window frame, and thereupon stop and reverse to release the child, then supervision would not be necessary. Similarly, if the window closing system could sense a child's hand or head and reverse before making contact, supervision would not be necessary. Therefore, the agency also established a provision (S5) permitting power windows equipped with an automatic reversal system meeting certain performance requirements to be closed in any manner desired by the manufacturer (*e.g.,* with or without a key). In addition, the rule permitted power windows equipped with such a system to be closed by remote controls of unrestricted range, as well as by sensors of adverse environmental conditions (*e.g.,* devices to open and close windows automatically in response to heat and rain) because the automatic reversal system would provide protection in those situations.

S5 specifies a single set of performance requirements and test procedures for all automatic reversal systems. The systems must reverse a closing power window either before the window contacts a semi-rigid cylindrical rod from 4 mm to 200 mm in diameter or before it exerts a squeezing force of 100 Newtons on the rod. The rods represent portions of a person's body, ranging in size from infant fingers to juvenile heads, inserted in the window openings. Further, the systems are required to open the window to any one of several specified points for the purpose of enabling a child to remove his or her hand or head from the window opening.

NHTSA worded S5 so as to allow the use of not only ''force-sensing'' systems, but also ''proximity-sensing'' systems by allowing automatic reversal systems that reversed the power window at any time prior to contact with the test rods in response to a commenter on the proposed 1991 amendments. That commenter expressed interest in developing reversal systems triggered by the blockage of light by a child's body (the same principle used by automatic reversal mechanisms on some garage doors with remote controls).

III. Petition for Rulemaking From Prospects Corporation

On November 4, 1994, Prospects Corporation (Prospects) submitted a petition for rulemaking[4] to NHTSA requesting that the agency amend FMVSS No. 118 to provide alternative testing requirements for non-contact automatic reversal systems. Prospects sought this change because the company had developed an automatic power window reversal system that operates on the principle of detecting the proximity of some portion of a person's body by sensing the reflection (instead of the blockage) of reflected infrared light. According to Prospects, the existing test procedure is inappropriate for non-contact automatic reversal systems that do not rely on light-blocking technology.

As described in its petition, the Prospects system employs an infrared emitter and a detector within the interior of the vehicle that are not aligned with one another. According to the petitioner, its system operates as follows. When no object is present in or near the plane of the window, the reflector receives a constant background level of infrared radiation reflected by the inside of the vehicle. In that situation, the window may close. However, when an occupant's head, hand or foot approaches the window, it will reflect a certain amount of additional radiation from the emitter to the detector. The detector senses the increase and electronically stops or reverses the window, even before the occupant's hand reaches the plane of the window.

To work properly under a variety of circumstances, an IR system must be sufficiently sensitive to detect a variety of materials, such as skin, hair, and clothing fabrics. Different materials have different abilities to reflect infrared radiation, a property called ''reflectance.'' The amount of radiation reflected is affected by the wavelength of the radiation, the angle of incidence of the radiation, the color and texture of the material, and the amount of surface area exposed.

Prospects was correct that, in amending FMVSS No. 118, NHTSA had not contemplated non-contact reversal systems that use IR technology. As a result, the associated requirements and test procedures were not designed to accommodate and effectively evaluate such systems. For example, the standard currently does not specify the amount of reflectance of the test rods.

NHTSA decided to grant the Prospects petition in order to facilitate the development and ensure the effective evaluation of automatic reversal systems based on IR principles, a potentially promising new technology. The agency believes that an IR system could provide safety benefits, because it does not require any contact between the window (or window frame) and an obstruction (*e.g.,* a person's hand, arm, or head) in order to reverse.

Because an IR-based system might not be able to detect a rod with constant diameter of 4 mm, and because such a system can detect light reflected from an area large enough to include a child's whole hand, the use of a rod representative of a child's hand would appropriately accommodate such a system. Because the standard currently does not specify the infrared reflectance of the test rods, it cannot adequately assess the safety of an automatic window reversal system based on infrared reflectance. Use of a test rod with a higher reflectance than that of a child's hand might allow a system to pass NHTSA's compliance test even though that system might not be sufficiently sensitive to detect a child's hand placed in or near the window opening. To promote safety, test requirements should simulate unfavorable conditions that are likely to occur in a motor vehicle. Further, without a specification for test rod reflectance, results of tests conducted by

[3] At the time of the 1991 amendments to the standard, automatic reversal systems for power windows did not exist on U.S. vehicles. The most detailed comments on that rulemaking indicated that companies were contemplating reversal systems triggered by force measurement, and NHTSA assumed that manufacturers would produce power window automatic reversal systems based on force-sensing technology. However, the development of automatic reversal systems has not proceeded as NHTSA has anticipated. NHTSA is not aware of any force-sensing systems currently being certified to meet FMVSS No. 118. Instead, manufacturers continue to certify their systems under paragraph S4 of the standard.

[4] Docket No. NHTSA–2004–18944–1.

different laboratories or manufacturers are likely to be inconsistent. Therefore, the agency decided to initiate rulemaking to modify the test procedures for IR-based systems.

IV. Notice of Proposed Rulemaking (NPRM) and Response to Public Comments

The NPRM

On June 4, 1996, NHTSA published a notice of proposed rulemaking (NPRM) in the **Federal Register** (61 FR 28124) proposing to amend FMVSS No. 118 to permit the use of an automatic reversal system based upon infrared reflectance technology. The NPRM was summarized in the NPRM itself as follows:

> In response to a petition from Prospects Corporation (Prospects), this document proposes to amend Standard 118, Power-Operated Window, Partition, and Roof Panel Systems, to accommodate power windows, partitions, and roof panels which automatically reverse when closing if an infrared system detects an object in or near the path of the closing window, partition, or panel. Since infrared systems may fail to detect an object the size of a very young child's finger, but can detect the child's hand, the agency is proposing to test those systems using a rod representing the side profile of a child's hand. The proposal also specifies the infrared reflectance of the rods used for testing those systems. This document also proposes to amend the requirements for systems that stop the window, partition, or panel before an appendage or other body part could become trapped by it by eliminating the requirement that those systems reverse after stopping. Reversal is not necessary unless there is a risk that a person may become trapped.

The NPRM provided a detailed discussion of a number of relevant issues, including the size of the target inboard of the window plane, the reflectance of the target (discussing both testing methods and results), protection of persons outside the vehicle, the presumption of supervision, and the need for reversal. The notice also asked a series of seven questions, most of which related to the details for addressing the Prospects petition; however, two of the questions dealt with the topics of ''express-up'' operation (*i.e.*, a closing mode which requires only momentary switch contact to close the window, rather than continuous activation) and the possibility of requiring a driver-controlled rear lock-out of the rear power windows.

Regarding the size of the target, the NPRM stated that because the existing standard does not specify the size of the portion of the test rod that is inboard of the window (*i.e.*, the area in or near the plane of the window when it is closed), it does not specify one of the most important test conditions for the IR proximity detection system developed by the petitioner. The NPRM proposed 15 mm as a reasonable worst-case dimension for targets inboard of the plane of the window, which corresponds to the thickness of the edge view of a 15-month-old infant's hand, as reported by the petitioner. The agency considered this to be a reasonably conservative estimate, because newborn babies with somewhat smaller hands would be incapable of raising themselves up to an exposed position, and even the smallest hands would present a target wider than 15 mm in most orientations. Although the petitioner suggested a hand-shaped test rod, the agency tentatively decided that the use of cylindrical test rods remains preferable, because they are easier to manufacture and they remove the need to consider the orientation of the target along its axis.

Regarding reflectance of the target, the agency proposed a minimum reflectance of 0.7 percent for the test rods, a conservative value that equals the minimum reflectance of black cotton/polyester. As discussed in the NPRM, ''reflectance'' is a critical concept for IR systems, with the term being defined as the ratio of the intensity of the light (measured by a detector as energy) reflected by the surface of a material to that of the light that strikes the surface of the material. As noted above, without a specification for test rod reflectance, the safety of an IR-based automatic reversal system could not be assessed, because use of a test rod with a higher reflectance than a child's hand might allow the system to pass NHTSA's compliance test even though the system might not be sufficiently sensitive to detect a child's hand placed in or near the window opening.

The proposed value for test rod reflectance was based upon supplementary data provided by the petitioner. Because color affects reflectance, the reflective properties of skin of different shades and colors are important, as are the reflective properties of gloves and clothing, which may be more difficult to detect than bare skin. Consequently, the petitioner provided measurements of the infrared light reflected from human skin and a large variety of leathers and fabrics, using the following methodology.

Measurements of reflectance were conducted by the petitioner with an apparatus incorporating an infrared light source (nominal wavelength 950 nanometers (nm)) and a light sensor of the type used in the prototype window reversal system appearing in Appendix 1 of the petitioner's report.[5] According to the petitioner, its reflectance testing was conducted as follows. The apparatus projected infrared light on the skin or material sample and received the reflected (or scattered) light at an equal angle of reflection. The angle of incidence was 16 degrees. The distance from the source to the sample, and the distance from the sample to the light sensor, were the same (about 135 mm). The light reaching the sensor was measured with and without the sample in place, so that the light reflected from the sample holder could be discounted.[6]

In order to ensure that NHTSA's test procedures are as general and as design-independent as possible, the agency sought to propose requirements that express the infrared reflective properties of skin and other materials in terms that are not specific to a particular light source and sensor. Accordingly, we decided to propose the use of a high reflectance mirror as a comparison medium. A mirror that reflects 99.99 percent of infrared light was mounted in the apparatus as a sample. The presence of the mirror caused the infrared sensor to receive 47 microwatts. The power measured with the sample materials was divided by this power, and the resulting ratio was multiplied by 100 percent to produce a value that is characteristic of each sample. When normalized by the mirror measurement in this way, the skin and material measurements become independent of the power, beam size and dispersion of the light source, and the size and sensitivity of the infrared sensor.

This method of normalizing the power measurements also has the benefit of producing results of general utility, regardless of the size of the sample. The sensitivity of the reflectance determination to changes in the light path length of the apparatus is low, because measurements using the sample and the mirror would be affected in the same proportion by a change in light path length. Therefore, the length of the light path need not be specified.

However, NHTSA specified a proposed angle of incidence and reflection (16 degrees) to be used when determining the reflectance of the test

[5] Docket No. NHTSA–2004–18944–2.

[6] Although the light reaching the sensor can be thought of as having been reflected by the sample, it arrives by the combination of reflection from the surface of the sample and scattering by the texture of the sample. Since both the test apparatus and any in-vehicle devices that might be produced measure the sum of reflection and scatter, there is no need to distinguish between the two mechanisms that result in light reaching the sensor. Therefore, the term ''reflection'' is used in a broad sense to refer to all light reaching the sensor as a consequence of the presence of the sample.

rods, in order to avoid changes in the relative composition of reflected and scattered light from textured samples. We note that specifying these angles does not restrict vehicle design in any way, but only defines the parameters to be used when producing test rods.

In conducting its testing, the petitioner measured the skin of Caucasian, African-American, and Asian persons at the back of the hand and at the palm, and the total range of reflectance was determined to be from 2.04 to 2.96 percent. The petitioner also tested 37 samples of potential skin coverings, including various colors, textures, and types of fabric and leather (*e.g.*, wool, silk, cotton, polyester, and a 35% cotton/65% polyester blend). The range of reflectance for these samples was 0.70 to 6.09 percent, with the worst case being a black cotton/polyester material. NHTSA's proposed reflectance level for the test rods was intended to provide protection in this worst-case scenario.

In the NPRM, NHTSA also considered whether IR-based systems would provide protection to a person who is outside the vehicle and is reaching toward or into the vehicle. Such consideration is important because paragraph S5 of the Standard No. 118 relieves power window systems with automatic reversal from the presence-of-supervision-assuring restrictions of S4. It cannot be assumed that an infrared proximity detector will operate on objects shielded by window glass, and thus, the proposal was drafted such that only portions of a person's body inside the window would be capable of triggering the system.

However, the agency's analysis suggested that IR-based systems do not pose a great danger to persons outside of the vehicle. Although the agency recognized the possibility for abuse of the system (*e.g.*, children on either side of the window playing ''chicken'' with the system), we stated our belief that that possibility is not serious enough to warrant declining to facilitate the use of power window systems with infrared sensors. This belief was based on the assumption that manufacturers would not make automatic window closing possible in the absence of the ignition key, except possibly for rain protection or for a limited time after key removal. In addition, children who can reach the top of the window from the ground are old enough to possess some level of experience and judgment, and a very slight withdrawal motion is all that is necessary for self-protection.

In response to public concerns about the safety of the existing standard, we thought it appropriate to address such concerns in the NPRM, particularly because the proposal would make the standard more permissive. The agency expressed its intention, before proceeding to a final rule, to examine certain design possibilities, not prohibited by S4, that may reduce either the likelihood or the effectiveness of driver supervision. Specific examples include: (1) The possibility of windows closing when the ignition key is in the ''accessory,'' as well as the ''on'' and ''start'' positions, and (2) an ''express up'' closing mode, which requires only momentary switch contact rather than continuous activation to close the window.

The NPRM also discussed the reversal requirement in the context of IR-based systems. The existing standard requires that closing power windows halt to avoid applying excessive squeezing force on a passenger, and then reverse their travel to release the person so that the person does not remain trapped by the window. However, because non-contact window systems can detect the proximity of a person over a large interior space and can halt the window before the person enters the pinch zone, the NPRM proposed to exclude such systems from this reversal requirement. However, it was noted that systems with limited sensitivity must be able to reverse in order to avoid the possibility of trapping a child's head.

Finally, NHTSA proposed to make the proposed amendments effective 30 days after publication of a final rule, and manufacturers offering IR-based window systems would have to comply with the requirements on the same date. The agency stated that there would be good cause for such an effective date because the amendments would not impose any new requirements but would instead relieve a restriction.

Summary of Public Comments

Overview

Comments on the NPRM were received from six organizations (Prospects Corporation, Advocates for Highway and Auto Safety, BMW of North America, Chrysler Corporation, Pektron Ltd., and Toyota Motor Corporate Services) and one individual (Mr. Thomas P. Flanagan).[7] Issues raised by the commenters generally can be categorized into five key topics: (1) Size and shape of the test rods; (2) reflectance of the test rods; (3) material reflectance test methods; (4) sunlight and other ambient factors; and (5) need for reversal. These subject areas (corresponding to specific questions raised in the NPRM) each will be discussed in turn, along with a brief discussion of one or two unrelated comments.

This notice also discusses additional clarifying information provided by the petitioner at the request of the agency after the comment period was over. That information was needed in order to supplement the petitioner's NPRM comments and to clarify a number of details.

Test Rod Size and Shape

Only Prospects Corporation commented on the proposed size and shape of the test rods. In general, Prospects agreed with the intent of the NPRM to further refine the standard's test procedures to accommodate new types of detection systems, stating that requirements should focus on the safety of heads, necks, arms and hands. Prospects supported the agency's position in the NPRM that the smallest relevant obstruction that must be detected by an infrared reflectance system would not be a single finger, but a hand as a whole held on edge. Prospects again suggested that the agency should adopt a hand-shaped test device, but as we noted in the NPRM, in a worst-case scenario, a hand could be held flat and oriented to the sensor such that only the edge of the hand is exposed. Prospects acknowledged the possibility of a child's hand being oriented in this way, and it agreed that test rod orientation in compliance tests would be easier with a cylindrically shaped device.

However, Prospects expressed concerns that the test requirements outlined in the proposal, in an attempt to be conservative, may be overly strict and could rule out further development of infrared reflection systems. Specifically, Prospects stated its belief that a 15 mm test rod is conservative and that combined with a surface reflectance of 0.7 percent, the test would not be representative of any real world situation. The company stated that by combining the worst case values for the two key test rod characteristics (*i.e.*, cross-sectional diameter and IR) would make it nearly impossible for an IR-based system to detect the test rod in all locations in a vehicle window opening. Further, Prospects argued that to the extent the proposed requirements retard the development of IR-based systems, the safety benefits of such non-contact systems may be lost (*i.e.*, recognizing a person's head/neck/arm/hand before exerting a potentially injurious force).

Ultimately, Prospects did incorporate the 15 mm cylindrical test rod size and

[7] All comments and other correspondence discussed in this notice are available under Docket No. NHTSA–2004–18944.

shape proposed in the NPRM into at least one of its own suggested options for amending FMVSS No. 118.

Infrared Reflectance of Test Rods

The issue of test rod reflectance characteristics was discussed in the comments of both Prospects and Pektron. Pektron, a British firm that manufactures power window sensors, asked whether the petitioner had conducted exhaustive testing of materials to determine the lowest reflectance level. It also questioned whether it would be acceptable to use the petitioner's lowest measured reflectance level (0.7 percent, as proposed in the NPRM) without a safety factor.

Prospects expressed concern about the low value of reflectance (0.7 percent) proposed for the test rods in the NPRM. It instead suggested adoption of a test procedure incorporating a reflectance of 2.2 percent, which was the lowest average reflectance measurement for a bare hand. Prospects reasoned that materials used for gloves would likely have an even higher reflective value.

As mentioned above, Prospects stated that the material with a 0.7 percent reflectance, on which the NPRM based its proposed reflectance value, was a very thin, 35 percent cotton/65 percent polyester blend that would not be appropriate for making gloves. Instead, the material was partially transparent, allowing infrared energy to pass through it easily. Prospects argued that the material with the second lowest reflectance (1.5 percent) also was not glove material.

Prospects stated that the fabric used in gloves is thicker, and more importantly, has a more woven texture, especially on a microscopic level. For example, Prospects asserted that actual wool gloves would have reflectance signals that are approximately double the signal of the tested sample of thin, black wool. Color also makes a difference in terms of reflectance, as both of the above materials reported much higher reflectances for colors other than black.

According to Prospects, the next lowest reflectance measurement was for a bare hand, which had a low value of 2.04 percent reflectance and a three-sample average of 2.2 percent. All of the other materials tested by the petitioner reported higher reflectance values. Based upon the above reasoning, Prospects expressed its belief that if the standard specifies a small diameter test rod designed to represent a child's finger or hand edge, then only the reflectance value of bare skin or materials likely to be worn on the hands should be considered when determining the reflectance of the test rods.

Test Rod Size and Reflectance Values in Combination

The NPRM asked specific questions regarding whether the proposed test rod size and reflectance value are appropriate, when considered in combination. A follow-up question asked whether, under those circumstances, the prototype IR-based system developed by Prospects would be capable of detecting an obstruction at all points in a vehicle window opening.

Prospects stated that under the proposed procedure (*i.e.*, a 15 mm test rod combined with 0.7 percent surface reflectance), it would be nearly impossible for the system to detect an obstruction in all locations of a vehicle window opening. Specifically, Prospects stated that at the furthest corner from the IR sensor (*i.e.*, an extreme standoff distance of 750 mm (30 inches)), the IR signal reflected from an obstruction would likely be too weak for the system to distinguish from background levels. Prospects argued that it is highly unlikely that these worst-case conditions of test rod size, reflectance, and location would occur simultaneously, and therefore, the test is unnecessarily strict.

Prospects also stated that in a real world situation, it is unlikely that a hand would continuously be held in a worst-case orientation, and that eventually, the window itself is likely to push on the hand, change its orientation, and expose a larger profile to the sensor. As a result of such contact in such unusual situations, it is argued that the IR-based system would automatically reverse the window.

Reflectance Measurement Technique

Prospects and Pektron both commented on the NPRM's proposed method for measuring the characteristic reflectance of the test rod material and whether a nominal test value of 950 nm wavelength (*i.e.*, in a range of 950 nm +mn; 100 nm) is appropriate.

Regarding wavelength test values, Prospects commented that it had chosen infrared devices operating at the 950 nm wavelength in order to maximize the sensitivity of its current system. However, the company expressed a willingness to test at other wavelengths outside this corridor, if the agency so requests.

Regarding the 16-degree angle of incidence/reflection used to measure the IR of materials, Pektron commented that scatter effects might influence the validity of reflectance values measured by the techniques proposed under the NRPM. It stated that while the proposed technique might be acceptable for obtaining a reference level from a mirror, it may not adequately account for the differing scatter characteristics of tested materials. Pektron also argued that relative measurements could vary depending upon the absolute size of the exposed sample area in the test fixture as a result of scatter. However, Pektron did not provide any quantitative information to support its assertion, nor did it suggest an alternative test method.

Pektron commented that the installed angle of the IR emitter and receiver may be important, but is currently undefined. However, Prospects stated that the 16-degree angle was not intended to represent the actual angle between the IR emitter and the sensor to be used in a vehicle. Although the system was initially tested at a 16-degree angle, Prospects stated that upon actual installation, the angle would be expected to be closer to zero degrees, thereby resulting in greater direct reflection from obstructions. Prospects added that it subsequently ran verification tests, during which the incidence/reflection angle was adjusted to 10 degrees and 20 degrees. According to Prospects, while the absolute reflectance intensities did change, the relationship among the values of the various materials remained approximately the same.

Need for Reversal

Both Advocates and Mr. Flanagan commented on the NPRM's proposed exclusion of IR reflectance systems from the automatic reversal requirement of paragraph S5 of the standard. The proposed exclusion was premised on the fact that an IR-based system could halt the closing motion of a power window prior to an obstruction entering the window opening. Because these systems can activate before entrapment can occur, it was tentatively decided that there would be no need for the window to reverse direction.

Advocates generally supported the NPRM's position on reversal for IR-based systems, provided those systems operate with proven reliability. However, Advocates stated that for windows with express-up capability, the reversal requirement should be maintained, regardless of the type of obstacle sensing device installed on the vehicle.

Mr. Flanagan opposed excluding IR-based systems from the reversal requirement of S5, arguing that such a

change could endanger children.[8] He commented that the size of the 100 mm vertical dimension of the detection zone specified in S5(b) of the proposed amendment is inadequate. To support his contention, Mr. Flanagan described two scenarios in which a child might still be injured unless IR-based systems are subject to a reversal requirement. In the first, he described a situation in which a child's head could become entrapped in a vehicle window opening, even if the window was equipped with an IR-based detection system that complied with the NPRM's proposed detection zone requirements. Mr. Flanagan also described a scenario in which a child sitting in the vehicle's window opening could be pushed backward out of the vehicle and onto the ground by the closing window.

Testing in Sunlight

BMW, Pektron, and Prospects all commented on the issue of testing of IR-based systems in sunlight. Generally, the commenters supported the idea of testing in sunlight, but they argued that the requirement, as presented in the NPRM, was not sufficiently objective and that test results could be influenced by a variety of factors.

BMW stated that the proposed regulatory text regarding testing in sunlight is not specific enough to be objective. Instead, BMW recommended that the standard specify a uniform sunlight simulation in order to eliminate discrepancies in defining direct sunlight.

Pektron stated that the proposed rule's test requirements do not offer sufficient detail, such as specifying the direction from which the sun would be coming. Pektron also commented that a constant, ambient level of sunlight is not as difficult for a system to cope with as a rapidly changing level as might occur when a vehicle is passing by trees or fences.

Although Prospects agreed that testing should include the effect of sunlight, it stated that test results in natural sunlight may be inconsistent, because natural sunlight varies with incidence angle and intensity, which in turn, depends upon the time of year, time of day, longitude, and latitude. Prospects recommended that NHTSA solve these potential problems by defining a laboratory test using artificial sunlight. In its comments, Prospects stated that a repeatable test method could be developed by specifying light source intensity, incidence angle, and spectral content, although recommended values for these parameters were not provided.

Regarding suitable specifications for indoor solar simulation when conducting testing, Prospects stated that the worst case for sunlight interference occurs when the sun's rays are perpendicular to the system's sensor, and it recommended a lighting simulation based on the following. First, Prospects stated that, at the longitude and latitude of its offices in Massachusetts, a worst-case angle occurs at approximately 5 p.m. (time of year unspecified). The measured solar intensity at that time was said to be 35,300 lux with a handheld meter. In its own laboratory experimentation, Prospects subjected its system to 35,000 lux by using two 1M candlepower lamps placed 2.5 meters from the sensor. (Prospects did not specify the type of lamps, nor did it mention what the spectral content of their lighting arrangement was compared to natural sunlight, particularly in the infrared range.)

Operation With Key in Accessory Position, Express-Up Operation, and Rear Window Lock-Out

As discussed below, commenters generally opposed agency amendment of FMVSS No. 118 in the areas of power window operation with the key in the accessory position, express-up operation, and rear window lock-out, as part of this rulemaking. However, different reasons were offered, as discussed below.

Advocates opposed operation of power windows when the ignition switch is in the accessory position, a feature that currently exists on some vehicle models. Further, Advocates stated that some vehicles permit power window operation for a period of time without a key in the ignition, providing the example of a Mitsubishi passenger car that has windows with retained power operation for thirty seconds after key removal (unless the passenger door is opened, at which time power window operation is immediately canceled).

Regarding the NPRM's questions about rear window lock-out, Advocates strongly supported giving drivers the capability of locking out rear power windows to prevent use by children. However, Advocates stated that express-up power closure of side windows should be permitted only if the system can detect an intervening obstacle (even a small child's finger) and stop closure before contact is made.

Advocates stated that the agency lacks appropriate safety information on which to base a specific proposal in the areas of ignition switch settings, lock-out of rear seat power windows, and express-up operation. Accordingly, Advocates argued that NHTSA should not move to a final rule in these areas without an adequate basis for rulemaking, including issuance of proposed regulatory text for public review and comment.

Mr. Flanagan stated his opinion that the safety risk increases when an unsupervised child is no longer afforded the protection of an ignition lock-out, and he also argued that adequate child supervision should not be presumed, citing numerous cases of children being killed or injured by power windows, even with adults present. Mr. Flanagan stated his belief that remote operation of power windows is unsafe, and he advocated prohibiting express-up window operation because it is prone to inadvertent actuation, especially if operated by remote control.

In their comments, vehicle manufacturers generally opposed regulation in the areas of ignition switch settings, lock-out of rear seat power windows, and express-up operation. BMW stated that there is not a recognized safety problem and that regulation in these areas would not produce any quantifiable safety benefits. BMW stated that its passenger cars have had rear power window lock-out for twenty years, and it commented that express-up operation is already adequately regulated under the existing conditions of S4 of the standard. Chrysler also commented that the express-up feature should be permitted as a manufacturer design option. Toyota also expressed opposition to any amendment of the standard that would prohibit either power window closure with the key in the accessory position or express-up closure, because Toyota believes that the standard currently permits and should continue to permit these two operations.

Other Comments and Issues

Pektron commented that the fail-safe aspects of an IR reflectance system should be considered, and it stated that in order to achieve a fail-safe mode for the petitioner's system, it would be necessary to confirm the presence of an active beam. Pektron also commented regarding the potential for radio frequency interference and electromagnetic compatibility failures, and it recommended that a power window system should be required to tolerate a minimum level of ambient electromagnetic radiation.

BMW stated that, under the current standard, any non-contact system could

[8] Further, Mr. Flanagan commented that the agency should concentrate on requiring push-pull switches and eliminating the use of ''rocker'' or ''toggle'' type switches. NHTSA has addressed that topic in a separate rulemaking (see Docket No. NHTSA–2004–17216).

be certified for compliance under S5 as long as the system could detect the test rods and reverse as required. However, BMW commented that, as proposed, the amendment to the standard would limit the applicability of the existing test procedures to contact detection systems, but at the same time, the new test procedures for non-contact detection systems would limit such systems to those using IR reflectance technology. Accordingly, BMW recommended that any new provisions added to the standard for non-contact systems should apply equally to all types of non-contact systems, whether or not they utilize IR reflectance technology. Pektron also urged the agency to afford equal treatment to other types of non-contact automatic reversal systems, including its beam blockage system.

Pektron commented that any final rule amending FMVSS No. 118 should give equal consideration to other types of non-contact systems, such as its own IR beam interruption system. In addition, Prospects stated that the same test specified for IR reflectance systems should be required for systems with infrared emitters and receivers in line with each other (*i.e.*, systems that use beam interruption rather than reflectance).

Subsequent Correspondence With Petitioner

As mentioned earlier, the agency contacted Prospects after the close of the comment period to obtain additional information in order to clarify three unanswered questions related to testing of IR-based systems. Both the agency's letter and the company's response have been filed in the docket.[9] The first question posed by the agency involved the influence of sunlight on testing of IR reflectance systems, a topic discussed earlier in this notice.

The agency's second question asked what the aggregate reflectance would be if a hand were covered by material with the lowest measured reflectance (*i.e.*, 0.7 percent for the 35-percent cotton/65-percent polyester fabric). We sought this information because the fabric by itself, without a hand behind it, would never need to be detected. Therefore, the lowest reflectance value that is significant for occupant safety is that which represents a hand covered by the fabric. If the low reflectance of that fabric was due in part to its translucency, then the presence of a hand having higher reflectance behind the fabric might increase the measured value.

According to Prospects' response, placing a hand behind the 35-percent cotton/65-percent polyester fabric did result in an increase in measured reflectance from 0.7 percent to nearly 1.0 percent.

The agency's third question asked what would be a reasonable safety factor for the reflectance value. According to available data, the lowest reflectance of human skin in a single measurement was reported as 2.04 percent. Consequently, we believe that two-percent reflectance for the test rods would be an inappropriate minimum value, because it would leave no margin of safety to account for the presence of gloves or clothing that might decrease overall reflectance.

Prospects stated that it is very difficult to quantify a safety factor for an IR reflectance system, but the petitioner provided a number of reasons why it believes that a reasonable safety factor is already included in the test specifications included in its earlier comments (*i.e.*, 15 mm test rod diameter with 2.2 percent test rod reflectance). It stated that the black 35-percent cotton/65-percent polyester fabric with a 0.7 percent reflectance was an outlier in the data compared to other materials tested. Samples of the same fabric in other colors had reflectances of 2.8 percent or more. Similarly, Prospects stated that its measurement of human skin reflectance ranged as high as 2.89 percent, with only one measurement as low as 2.04 percent. According to Prospects, the next lowest skin reflectance measurement, 2.23 percent, was considerably higher than the 2.04 percent low value, and the average for all the skin measurements was higher still. Thus, Prospects argued that 2.2 percent is a conservative reflectance value that would provide an adequate margin of safety.

In its supplemental submission, Prospects also elaborated on the characteristics of the detection area covered by the IR sensor. Prospects had previously stated that the detection area of the IR-based system installed on a vehicle would be three dimensional rather than planar. The petitioner stated that the detection area would extend a considerable distance into the vehicle occupant compartment and that the system could detect objects anywhere inside of the three-dimensional space.

Information provided by Prospects suggests that the width of the detection zone would be substantial compared with the dimensions of a child's hand, and the detection capability would be greatest near the top of the window opening (farther from the sensor) where the pinch potential for small appendages is greatest. Prospects stated that the width of the detection zone for its system would be at least 15 cm (5.9 inches).

V. The Final Rule [10]

Overview

After considering comments on the proposed rule and the information provided by the petitioner, we have decided to amend FMVSS No. 118 to specify test procedures for non-contact detection systems that use an infrared reflection technique.[11] Accordingly, this notice modifies paragraph S5 of the standard and also adds new paragraphs S7, S8, and S9 to make explicit the test procedures and test rod characteristics that are applicable to different types of automatic reversal systems.

The final rule does not modify or eliminate existing requirements in FMVSS No. 118 which relate to contact/force sensing reversal systems and light beam interruption, nor does it change the circumstances under which power windows, roof panels, and partitions must automatically reverse direction, with the exception of the following change.

In light of the comments submitted by Pektron and BMW about the need to accord fair treatment to other types of non-contact automatic reversal systems (*e.g.*, light beam interruption systems), we decided to undertake a general review of the standard's test procedures in the course of modifying those procedures to accommodate systems using IR reflectance technology. After

[9] Docket No. NHTSA–2004–18944–15.

[10] Although there has been a long interval between the NPRM and the resulting final rule, we have decided to proceed now with issuing a final rule, instead of seeking new comments, for several reasons. First, the technology for automatic power window reversal systems based upon IR reflectance remains available in the marketplace, and amendments to the standard are still required to accommodate and effectively evaluate such systems. Second, we believe that IR-based systems have not changed appreciably in any way that would change our decisions about the nature of the amendments necessary to accommodate and effectively evaluate those systems. Third, other than relatively minor technical changes, the requirements of this rulemaking are largely the same as presented in the NPRM. For these reasons, we do not see any significant possibility that obtaining further public comment would change the information before this agency. Accordingly, we have decided that it is in the public interest to proceed at this time to a final rule.

[11] NHTSA recognizes that in the future, there may be new power window systems based on still other principles, which use techniques for sensing obstacles different from those mentioned in this notice. However, although we strive to make our safety standards as general and widely applicable as possible, the agency cannot propose to amend the standard to regulate the safety of those systems until their underlying principles are identified and adequately defined. As a result, further amendment of FMVSS No. 118 may be required in the future in order to respond to additional new technology.

conducting this review, we determined that one additional, minor modification to the standard was necessary, as follows. This rulemaking amends FMVSS No. 118 to require that test rods used for testing window reversal systems using a beam interruption sensing method not be transparent (*i.e.*, made of a material that allows significant infrared, visible, or ultraviolet light to pass through).

In actual use, these systems depend on blockage of a light beam by an obstruction in order to sense the obstruction, so it is possible that a transparent obstruction would not be detected. However, any obstruction relevant to safety (*i.e.*, a human limb) will always be opaque. Prior to this rulemaking, FMVSS No. 118 had been silent as to test rod transparency. Therefore, if a transparent test rod were used and the system failed to activate as a result, this would not be an indication of an unsafe system, but merely an artifact in the standard. This amendment will ensure that FMVSS No. 118 test procedures better correspond to actual operating conditions and will prevent the discouragement of this technology.

The following provides more in-depth discussion of the standard's new requirements and rationale related to automatic window reversal systems based on infrared reflectance technology.

Need for the Rulemaking

In response to comments on the need for the present rulemaking action, we would clarify that the standard currently permits and specifies requirements for power window systems that reverse direction ''before contacting, or before exerting a maximum squeezing force'' on an obstruction (*see* S5(a)(1)). Thus, the existing test procedures in the standard are applicable to non-contact systems using IR beam interruption technology.

However, as discussed earlier, we have determined that the test procedures in the current standard are not appropriate for IR reflectance systems. While it is true that the amended standard will contain separate test procedures for different types of power window reversal systems, we do not see any problem with having two sets of test procedures, in light of the dissimilar technologies responsible for automatic reversal of the power windows. Accordingly, under the amended standard, one set of test procedures will apply to non-contact systems using IR reflection, and another set of test procedures (*i.e.*, the procedures previously in S5) will apply to contact systems and non-contact systems using beam interruption. Other than one clarification regarding test rod opaqueness, we are not requiring beam interruption systems to meet any requirements different from those that apply to contact systems.

Specifications for Test Rods

After consideration of the public comments and new information presented to the agency, we believe that the NPRM's proposed test rod with a 15 mm diameter (equivalent to the size of the palm edge of a 15-month-old) should be revised. We selected the proposed specifications for the proposed test rod based on the assumption that an IR-based system would need to detect an object as small as a small child's hand held on edge relative to the IR beam emitter. We assumed that only the hand of a small child would fall within the system's field of view and would be the only source of reflected IR energy in a worst case situation. However, it is evident from the information submitted by Prospects on the width of the detection zone, that a portion of the arm of a small child, in addition to the hand, would be exposed to the IR beam. Accordingly, in this final rule, we have decided to increase the test rod diameter to more adequately account for the wider cross-sectional area contributed by the forearm.

Therefore, we are specifying test rod dimensions as provided in Figure 3. Specifically, the tip of the test rod has a length of 40 mm and a diameter of 10 mm, and the next segment of the test rod has a length of 300 mm and a diameter of 20 mm. (Additional length is provided at the end of the test rod in order to hold and position the rod during testing.)

We are also specifying that the test rods will have an IR reflectance of 1 percent. As discussed in further detail below, we believe that these specifications are reasonably representative of a small child (approximately 15 months in age) reaching for a window opening from inside a vehicle with hand held flat and on edge relative to the emitter/sensor of the IR reflectance system, and whose hand is covered by snug-fitting fabric such that the relative reflectance rate of the covered hand is 1 percent, as measured by the procedure set forth in this final rule. Although some commenters may believe that these requirements are overly conservative, we believe that a desire to accommodate new technologies does not justify safety trade-offs that might permit certain injuries to fingers, even in rare cases (such as when a child's hand is covered with low reflectance materials and is held in an unfavorable orientation).

Testing is conducted at a 16-degree angle of incidence, using a flat sample, with an incandescent light source and sensor with a nominal wavelength of 950 nm (*i.e.*, 950 nm ± 100 nm). In order to ensure an objective standard with repeatable test results, we believe that the test fixture incidence/reflection angle must be specified. Further, it is our understanding that bare skin and clothing materials are reasonably uniform, such that their measured reflectance should not be overly sensitive to whatever incidence/reflection angle is selected. This conclusion is supported by the results of the petitioner's experimentation using angles other than 16 degrees.

We believe that the proposed method of infrared reflectance measurement will achieve the goal of comparing the relative (rather than absolute) reflectance of different materials for use in test rods and that it will provide the requisite level of repeatability. Because there was not any information provided that would indicate that another angle would better serve this purpose, the 16-degree test angle proposed in the NPRM has been adopted as part of this final rule (see S8). Further, since no other commenter besides Prospects addressed the wavelength issue, we believe that a 950 nm nominal value (range of 850–1050 nm) is appropriate.

Testing is conducted under simulated sunlight conditions using lighting which projects 64,500 lux (6,000 foot candles) onto the infrared sensor. We agree with the commenters that requiring a test in actual sunlight would create an unnecessary burden on manufacturers and test laboratories, particularly after considering the potential effects of background infrared energy from sunlight on an IR-based power window reversal system. Therefore, in order to reasonably duplicate ambient sunlight, we have decided to specify the amount of background light to which the IR reflectance system's sensor must be subjected during testing. The selected value is based upon actual measurements of horizontal luminance made at 5 p.m. in San Diego, California, in August 1989 during evaluations of the conspicuity of daytime running lights.[12] Although this value is higher than the value recommended by the petitioner, we believe that it is necessary for the system to operate

[12] ''Evaluation of the Conspicuity of Daytime Running Lights,'' (DOT HS 807 613) (April 1990) (Docket No. NHTSA–2004–18944–17).

under such circumstances, which are foreseeable in many parts of the U.S.

The amended requirements also state that the lamps used for testing are arranged as close to perpendicular as possible to the plane of the lens of the IR sensor. This placement would account for the worst case test condition, which occurs when the sunlight is perpendicular to the IR emitter/sensor.

The following rationale serves as the basis for selecting the parameters for the test rod and other test requirements.

1. Detection Zone Width

As a preliminary matter, we note that the purpose of estimating a detection zone width is to facilitate the selection of an appropriate test rod diameter that would reasonably represent the limb of a small child in a worst-case scenario. This final rule does not impose any requirement for detection zone width as part of the standard.

With that background, we note that Prospects indicated that the width of the three-dimensional detection zone covered by the IR reflection system (*i.e.*, the distance from the plane of the window opening to a plane inside the vehicle representing the outer functional limit or edge of the detection zone) is at least 15 cm. Presumably, that width estimate corresponds to a location near the top of the window opening where the pinch potential is greatest.

However, we have decided that for the purpose of selecting a test rod diameter, it is inappropriate to rely on that suggested 15 cm dimension for two reasons. First, the IR reflectance systems tested by Prospects were prototypes, so it is uncertain whether the performance of systems in actual production would have the same detection zone width. Second, the 15 cm value was the distance to the limit of the detection zone, not to some intermediate point within it. If the rod size were selected based upon the portion of a child's arm at the limit of the detection zone, it would probably overestimate the reflective area of the arm. Instead, the test rod diameter should emulate the portion of a small child's arm that is situated well within the detection zone when the fingertip just reaches the window opening. In this way, the test rod will represent the predominant reflective cross-sectional area of the entire exposed forearm.

In selecting a test rod diameter, we estimated that a point 10 cm from the window opening is an appropriate intermediate point in the detection zone. Thus, the test rod would need to have the same diameter as a 15-month-old child's arm measured at a distance of 10 cm from the fingertip. We believe that this value is a conservative estimate that will provide a substantial margin of safety under foreseeable conditions.

2. Child Anthropometry and the Relative Size of Hands and Arms

With the above detection zone in mind, we then examined available information to determine the average size of a 15-month-old child's arm at a point 10 cm from the fingertip. Prospects provided anthropometric data on cross-sectional widths of the hands and arms of children of various ages, including those as young as two years of age. However, the petitioner's data did not include a value for the size of a 15-month-old's forearm at the desired measurement point, and we were similarly unable to find an exact figure in any published reference materials. Instead, we extrapolated available data to arrive at a suitable dimensional specification, utilizing Prospect's data and a scientific paper published by the Society of Automotive Engineers (SAE).[13] The SAE paper contains pertinent measurements of children's hands and arms which, when combined with data provided by Prospects for two-year-old children, gives a reasonable estimate of the appropriate test rod size.

According to the SAE report, the difference in the maximum forearm diameters of a 15-month-old and a two-year-old is small (45 mm vs. 48 mm, respectively), while the difference between the forearm lengths of those same children is more significant (203 mm *vs.* 237 mm). The report also states that the length of an outstretched hand of both a 15-month-old and a two-year-old is approximately 10 cm (9.3 cm and 10 cm, respectively). Therefore, a point 15 cm from each child's fingertip would fall well onto the forearm of both, and we estimate that the diameter at 15 cm for the 15-month-old would be roughly the same as for the two-year-old (37 mm according to Prospect's data). We expect that the widths would also be very similar at a point 10 cm from the fingertip (19 mm according to Prospect's data). However, at the 10 cm distance, the 15-month-old's cross-sectional width could be estimated to be slightly greater than that of the two-year-old, because that point falls closer to the wrist of the older child, while falling somewhat beyond the wrist, on a thicker part of the forearm of the younger child, due to the somewhat shorter length of the younger child's hand and forearm. Based upon this information, we are adopting a dimension of 20 mm (measured at 10 cm from the fingertip) for the test rod as part of this final rule, which reflects our assumption that the cross-sectional width of a 15-month-old would be 1 mm greater than the 19 mm measurement provided by Prospects for a two-year-old.

Although a test rod with a cylindrical shape and a continuous diameter of 20 mm is a reasonable representation of the predominant reflective area of a small child's hand and arm, we decided that unmodified, it would not be sufficiently realistic, because it would lack the dimensional features to represent a small child's fingers. A child's finger or, more appropriately, the cross-section of a child's hand profile measured at the fingers, is much smaller than 20 mm. Therefore, in order to better simulate a child's hand, we are specifying in the final rule that the test rod will have a smaller diameter at one end. The length of this reduced-diameter section is to be 40 mm, which is equivalent to the length of a 15-month-old's longest finger, according to the data provided by Prospects.

However, further analysis was necessary to determine the diameter of that narrower section of the test rod. While the diameter of a 15-month-old's finger averages 8 mm, we have decided that a somewhat larger diameter would be appropriate, taking into account the contribution of hand coverings (*e.g.*, gloves) to the overall hand profile size. Our analysis of the effect of hand coverings is discussed immediately below.

3. Effect of Hand Coverings on Test Rod Size

Our next step in determining the parameters of an appropriate test rod for testing IR-based automatic reversal systems involved taking into account the additional thickness resulting from fabric that might cover a child's arm or hand (*e.g.*, gloves, long shirt sleeves). Previously discussed dimension represented values for bare skin, but added thickness could be substantial for loose-fitting articles of clothing. Even thin, snug-fitting fabrics could be expected to add between 2 mm to 3 mm of cross-sectional area.

Based upon the information before us, we have decided to add 2 mm to the 8 mm width that is representative of a 15-month-old child's bare fingers. Thus, the resulting profile dimension of the smaller diameter portion of the test rod is set at 10 mm, as shown in Figure 3. We believe that such dimension would simulate the worst-case scenario of a

[13] See ''Anthropometry of U.S. Infants and Children,'' Society of Automotive Engineers (SAE) SP–394 (1975) (Instructions on how to view a copy of this document are provided at Docket No. NHTSA–2004–18944–16).

small child's hand covered in a thin fabric.

Although these diameter measures are arguably the most critical aspect of the test rod's design, we have also specified length requirement for the various segments of the test rod as follows. We have determined that the length of small diameter section (representing the finger) should be 40 mm in length, which is derived from the data provided by the petitioner for a 15-month-old child. For the thicker part of the test rod (representing the arm), we have determined that the length should be 300 mm. An additional, undefined length would be permitted, in order for the test rod to be hand-held during a test without the test operator's own hand interfering with the test or influencing the amount of reflected infrared energy.

4. Other Test Rod Reflectance Considerations and the Effects of Hand Coverings

In addition to the dimensions of the test rod, another factor that has a significant bearing on an IR-based system's detection capabilities is the infrared reflectance of the obstacle. As discussed previously, some fabrics that might cover hands may have a lower IR reflectance than bare skin. Therefore, in order to be representative of actual conditions, test rods would need to have reflectance corresponding to either an uncovered hand (*i.e.*, bare skin) or a hand covered in fabric. The reflectance value of any fabric by itself is irrelevant, as power window on fabric alone would not be expected to result in injury.

In setting a reflectance value for the test rod, we sought a value that represents the worst case likely to be encountered in the real world. When petitioner's test fabric with the lowest reflectance value (*i.e.*, a black 35-percent cotton/65-percent polyester fabric with a 0.7 percent reflectance) was measured over bare skin using the original test procedure and apparatus, the resulting combination had a reflectance of approximately 1 percent. Bare skin, in contrast, had about a 2-percent reflectance.

Based upon this data, we are adopting a 1-percent surface reflectance as the minimum for rods used for testing IR reflectance systems. We have decided that the 1 percent value for the fabric-covered hand constitutes the appropriate specification for the safety standard, because it represent the worst case scenario relevant to the injury prevention purpose of FMVSS No. 118.

We disagree with Prospect's assertion that thin black polyester/cotton fabric (0.7 percent reflectance) and thin black wool material are not appropriate choices in setting an appropriate lower limit on relative IR reflectance of test rod materials. Although evidence has not been presented regarding the likelihood of such materials being worn on the hands, the possibility exists. For example, such fabrics may be used in children's costumes or ''dress up'' clothing, or in other cases, sleeves may be worn long, draping over a child's hands. Accordingly, we believe that an IR-based system may encounter thin black polyester/cotton fabric, so the system should be sufficiently sensitive to detect a target with a 0.7 percent IR reflectance.

It should be noted that we have decided to apply the 1 percent reflectance specification to the entire test rod, which would represent a forearm and hand covered by thin, low-reflectance fabric. We acknowledge that the diameter of the wider portion of the test rod assumed an uncovered forearm. However, for practical considerations, we have decided to adopt a 1 percent reflectance value for the entire test rod, without the slight size increase that the fabric would contribute.

We reason that producing a test rod that has different reflectances for its larger and smaller diameter segments would be difficult and potentially costly. By contrast, test rods with uniform reflectance should be easily obtainable. Further, we believe that uniform test rod reflectance may enhance the margin of safety under the standard.

5. Need for Reversal

We have decided to change our approach related to the need for reversal of IR reflectance-based systems under S5. Upon further consideration, we can envision certain worst-case situations, in which the size, orientation, reflectance, and location of a small child's hand could combine in a way that the IR-based system could potentially trap the hand, in which case it would be necessary for the window's motion to be reversed, rather than simply stopped. Therefore, we have decided that, as an extra safeguard, it would be advantageous to safety to require that all systems, regardless of detection method, reverse the window to one of the required positions upon detection of an obstacle. We believe that this change will not impose a significant burden on manufacturers, because reversal of the window, as opposed to halting it, should entail only minor changes in the power window circuitry. Further, this modification will simplify the standard by eliminating differences in performance requirements for different types of systems.

6. Powered Roof Panels and Partitions

We note here that the same rationale discussed above also applies to powered roof panels (sun roofs) and interior partitions, which are similar to power windows in their operation. The primary difference is that they normally operate in planes of motion that are at right angles to powered side windows in motor vehicles.

However, powered interior partitions present a special case, because they can have occupant compartment space on both sides of the partition. Therefore, it is necessary to require that interior partitions be capable of reversing when obstacles (*e.g.*, test rods) enter from either side of the partition. Accordingly, we have decided to include a requirement as part of this final rule that would account for powered interior partitions equipped with IR reflection sensing.

7. Other Issues

At least one commenter raised the issue of a fail-safe design requirement. Although fail-safe operation may be a useful aspect of power window design, we are not including a fail-safe requirement as part of this final rule. The standard does not currently contain a fail-safe requirement for any type of power window system, and there is not any specific reason to believe that the reliability of an IR reflectance automatic reversal system would be different from that of a contact/force sensing system. Thus, we believe that adopting a fail-safe requirement would unnecessarily add to the scope of the standard and increase burdens.

Regarding the issue of electromagnetic interference, we note that in theory, such interference has the potential to affect a variety of vehicle systems (*e.g.*, the air bag system). However, the agency has not received any information that would support setting a specific tolerance level as part of this rulemaking.

Regarding comments on the express-up operation of side windows, we believe that some of these comments demonstrate a misunderstanding of the current requirements of FMVSS No. 118. The current standard does not distinguish express-up operation from other permissible closure modes, except that S4 prohibits one-touch activation by remote or exterior controls. Currently, power windows equipped with an express-up feature must meet either the requirements of S4 or S5. The NPRM asked questions about ignition switch settings, lock-out of rear seat power windows, and express-up operation, in order to provide

information that may be relevant to future rulemakings. However, in issuing this final rule, we are not amending any of the existing requirements or establishing any new requirements related to ignition switch settings, driver-controlled lock-out, or express-up operation.

VI. Effective Date

The amendments to FMVSS No. 118 contained within this final rule are effective September 1, 2005. Voluntary compliance is permitted before that date. We have determined that this timeframe is appropriate because this final rule does not change any substantive requirements of the standard, but instead, it offers an additional option for compliance under Standard No. 118 based upon new technology.

We note that the NPRM originally contemplated an effective date 30 days after publication of the final rule. However, in recognition of the fact that this final rule adopts new test procedures specific to power window automatic reversal systems based upon infrared reflectance technology, we have decided to grant lead time until September 1, 2005, for manufacturers who choose to equip vehicles with such systems. Accordingly, vehicles equipped with automatic reversal systems using IR reflectance technology that are certified under S5 must meet the requirements of S5.3 no later than that date. Voluntary compliance is permitted prior to that date.

VII. Benefits

As noted above, this final rule amends FMVSS No. 118 to permit automatic reversal systems based upon infrared reflectance, a new technology. Because these IR-based systems are expected to meet the same functional requirements of other automatic reversal systems (although in a different manner), the standard's overall level of benefits is expected to remain unchanged. It is possible that there may be some marginal additional benefit provided by these systems, in that they may stop and reverse a window prior to any contact (thereby preventing any pinching), but such benefits are difficult to quantify.

VIII. Costs

Because IR-based automatic power window reversal systems are not required under FMVSS No. 118, there are not expected to be any compliance costs associated with this final rule. Manufacturers are not required to install automatic reversal systems, and if they do, they are free to utilize any permissible technology under paragraph S5 of the standard.

IX. Rulemaking Analyses and Notices

A. Executive Order 12866 and DOT Regulatory Policies and Procedures

Executive Order 12866, ''Regulatory Planning and Review'' (58 FR 51735, October 4, 1993), provides for making determinations whether a regulatory action is ''significant'' and therefore subject to OMB review and to the requirements of the Executive Order. The Order defines a ''significant regulatory action'' as one that is likely to result in a rule that may:

(1) Have an annual effect on the economy of $100 million or more or adversely affect in a material way the economy, a sector of the economy, productivity, competition, jobs, the environment, public health or safety, or State, local, or Tribal governments or communities;

(2) Create a serious inconsistency or otherwise interfere with an action taken or planned by another agency;

(3) Materially alter the budgetary impact of entitlements, grants, user fees, or loan programs or the rights and obligations of recipients thereof; or

(4) Raise novel legal or policy issues arising out of legal mandates, the President's priorities, or the principles set forth in the Executive Order.

This rulemaking document was not reviewed under E.O. 12866. Further, this action has been determined to be ''non-significant'' under the Department of Transportation's Regulatory Policies and Procedures. The amendments to FMVSS No. 118 contained in this final rule do not impose any new requirements, but simply provide appropriate test procedures for a new technology, thereby allowing manufacturers to certify vehicles employing that technology as meeting the existing requirements of the standard. Therefore, the impacts of these amendments are so minimal that a full regulatory evaluation is not required.

B. Regulatory Flexibility Act

Pursuant to the Regulatory Flexibility Act (5 U.S.C. 601 *et seq.*, as amended by the Small Business Regulatory Enforcement Fairness Act (SBREFA) of 1996), whenever an agency is required to publish a notice of rulemaking for any proposed or final rule, it must prepare and make available for public comment a regulatory flexibility analysis that describes the effect of the rule on small entities (*i.e.*, small businesses, small organizations, and small governmental jurisdictions). The Small Business Administration's regulations at 13 CFR part 121 define a small business, in part, as a business entity ''which operates primarily within the United States.'' (13 CFR 121.105(a)). No regulatory flexibility analysis is required if the head of an agency certifies the rule will not have a significant economic impact on a substantial number of small entities. SBREFA amended the Regulatory Flexibility Act to require Federal agencies to provide a statement of the factual basis for certifying that a rule will not have a significant economic impact on a substantial number of small entities.

NHTSA has considered the effects of this final rule under the Regulatory Flexibility Act. I certify that this final rule will not have a significant economic impact on a substantial number of small entities. The rationale for this certification is that the rule does not impose any new requirements, but instead relieves a restriction resulting from a lack of specificity in the current requirement. Further, the infrared sensing technologies that will be permitted as a result of this final rule are only likely to be offered on a small number of vehicles produced by major automobile manufacturers.

C. Executive Order 13132 (Federalism)

Executive Order 13132, ''Federalism'' (64 FR 43255, August 10, 1999), requires NHTSA to develop an accountable process to ensure ''meaningful and timely input by State and local officials in the development of regulatory policies that have federalism implications.'' ''Policies that have federalism implications'' are defined in the Executive Order to include regulations that have ''substantial direct effects on the States, on the relationship between the national government and the States, or on the distribution of power and responsibilities among the various levels of government.'' Under Executive Order 13132, the agency may not issue a regulation with federalism implications, that imposes substantial direct compliance costs, and that is not required by statute, unless the Federal government provides the funds necessary to pay the direct compliance costs incurred by State and local governments, the agency consults with State and local governments, or the agency consults with State and local officials early in the process of developing the proposed regulation. NHTSA also may not issue a regulation with federalism implications and that preempts a State law unless the agency consults with State and local officials

early in the process of developing the regulation.

NHTSA has analyzed this final rule in accordance with the principles and criteria contained in E.O. 13132 and has determined that the rule will not have sufficient federalism implications to warrant consultations with State and local officials or the preparation of a federalism summary impact statement. This final rule will not have any substantial effects on the States, or on the current distribution of power and responsibilities among the various local officials.

D. Executive Order 12988 (Civil Justice Reform)

Pursuant to Executive Order 12988, ''Civil Justice Reform'' (61 FR 4729, February 7, 1996), the agency has considered whether this rulemaking will have any retroactive effect. This final rule does not have any retroactive effect. Under 49 U.S.C. 30103, whenever a Federal motor vehicle safety standard is in effect, a State may not adopt or maintain a safety standard applicable to the same aspect of performance which is not identical to the Federal standard, except to the extent that the State requirement imposes a higher level of performance and applies only to vehicles procured for the State's use. 49 U.S.C. 30161 sets forth a procedure for judicial review of final rules establishing, amending, or revoking Federal motor vehicle safety standards. That section does not require submission of a petition for reconsideration or other administrative proceedings before parties may file a suit in court.

E. Executive Order 13045 (Protection of Children From Environmental Health and Safety Risks)

Executive Order 13045, ''Protection of Children from Environmental Health and Safety Risks'' (62 FR 19855, April 23, 1997), applies to any rule that: (1) Is determined to be ''economically significant'' as defined under Executive Order 12866, and (2) concerns an environmental, health, or safety risk that the agency has reason to believe may have a disproportionate effect on children. If the regulatory action meets both criteria, the agency must evaluate the environmental health or safety effects of the planned rule on children, and explain why the planned regulation is preferable to other potentially effective and reasonably feasible alternatives considered by the agency.

Although this final rule is expected to have a positive safety impact on children, it is not an economically significant regulatory action under Executive Order 12866. Consequently, no further analysis is required under Executive Order 13045.

F. Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA), a person is not required to respond to a collection of information by a Federal agency unless the collection displays a valid OMB control number. There are not any information collection requirements associated with this final rule.

G. National Technology Transfer and Advancement Act

Section 12(d) of the National Technology Transfer and Advancement Act of 1995 (NTTAA), Public Law 104–113, (15 U.S.C. 272) directs the agency to evaluate and use voluntary consensus standards in its regulatory activities unless doing so would be inconsistent with applicable law or is otherwise impractical. Voluntary consensus standards are technical standards (*e.g.*, materials specifications, test methods, sampling procedures, and business practices) that are developed or adopted by voluntary consensus standards bodies, such as the Society of Automotive Engineers (SAE). The NTTAA directs us to provide Congress (through OMB) with explanations when the agency decides not to use available and applicable voluntary consensus standards. The NTTAA does not apply to symbols.

Currently, there are no voluntary consensus standards specifically addressing infrared reflectance-based automatic reversal systems for power-operated window and their unique operating characteristics. However, NHTSA will consider any such standards as they become available.

H. Unfunded Mandates Reform Act

Section 202 of the Unfunded Mandates Reform Act of 1995 (UMRA) requires federal agencies to prepare a written assessment of the costs, benefits, and other effects of proposed or final rules that include a Federal mandate likely to result in the expenditure by State, local, or tribal governments, in the aggregate, or by the private sector, of more than $100 million annually (adjusted for inflation with base year of 1995). Before promulgating a NHTSA rule for which a written statement is needed, section 205 of the UMRA generally requires the agency to identify and consider a reasonable number of regulatory alternatives and adopt the least costly, most cost-effective, or least burdensome alternative that achieves the objectives of the rule. The provisions of section 205 do not apply when they are inconsistent with applicable law. Moreover, section 205 allows the agency to adopt an alternative other than the least costly, most cost-effective, or least burdensome alternative if the agency publishes with the final rule an explanation of why that alternative was not adopted.

This final rule will not result in the expenditure by State, local, or tribal governments or the private sector, in the aggregate, or more than $100 million annually. Thus, this final rule is not subject to the requirements of sections 202 and 205 of the UMRA.

I. National Environmental Policy Act

NHTSA has analyzed this rulemaking action for the purposes of the National Environmental Policy Act. The agency has determined that implementation of this action will not have any significant impact on the quality of the human environment.

J. Regulatory Identifier Number (RIN)

The Department of Transportation assigns a regulation identifier number (RIN) to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. You may use the RIN contained in the heading at the beginning of this document to find this action in the Unified Agenda.

K. Privacy Act

Please note that anyone is able to search the electronic form of all comments received into any of our dockets by the name of the individual submitting the comment (or signing the comment, if submitted on behalf of an association, business, labor union, etc.). You may review DOT's complete Privacy Act Statement in the **Federal Register** published on April 11, 2000 (volume 65, number 70; pages 19477–78), or you may visit *http://dms.dot.gov.*

List of Subjects in 49 CFR Part 571

Imports, Motor vehicle safety, Reporting and recordkeeping requirements, Tires.

■ In consideration of the foregoing, NHTSA is amending 49 CFR part 571 as follows:

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

■ 1. The authority citation for Part 571 of Title 49 continues to read as follows:

Authority: 49 U.S.C. 322, 30111, 30115, 30117, and 30166; delegation of authority at 49 CFR 1.50.

■ 2. Section 571.118 is amended as follows:

■ A. In S3, by revising the heading and adding a definition for ''infrared reflectance'' in alphabetical order;

■ B. By revising S5; and

■ C. By adding new paragraphs S5.1, S5.2, S5.3, S7, S7.1, S7.2, S8, S8.1, S8.2, S8.3, S9, Figure 2 and Figure 3.

The revised and added text reads as follows:

571.118 Standard No. 118; Power-operated window, partition, and roof panel systems.

* * * * *

S3. Definitions.

* * * * *

''Infrared reflectance'' means the ratio of the intensity of infrared light reflected and scattered by a flat sample of the test rod material to the intensity of infrared light reflected and scattered by a mirror that reflects 99.99 percent of the infrared radiation incident on its surface as measured by the apparatus show in Figure 2.

* * * * *

S5. *Automatic reversal systems.* A power-operated window, partition, or roof panel system that is capable of closing or of being closed under any circumstances other than those specified in S4 shall meet the requirements of S5.1, S5.2, and, if applicable, S5.3.

S5.1. While closing, the power-operated window, partition, or roof panel shall stop and reverse direction either before contacting a test rod with properties described in S8.2 or S8.3, or before exerting a squeezing force of 100 newtons (N) or more on a semi-rigid cylindrical test rod with the properties described in S8.1, when such test rod is placed through the window, partition, or roof panel opening at any location in the manner described in the applicable test under S7.

S5.2. Upon reversal, the power-operated window, partition, or roof panel system must open to one of the following positions, at the manufacturer's option:

(a) A position that is at least as open as the position at the time closing was initiated;

(b) A position that is not less than 125 millimeters (mm) more open than the position at the time the window reversed direction; or

(c) A position that permits a semi-rigid cylindrical rod that is 200 mm in diameter to be placed through the opening at the same location as the rod described in S7.1 or S7.2(b).

S5.3. If a vehicle uses proximity detection by infrared reflection to stop and reverse a power-operated window, partition, or roof panel, the infrared source shall project infrared light at a wavelength of not less than 850 nm and not more than 1050 nm. The system shall meet the requirements in S5.1 and S5.2 in all ambient light conditions from total darkness to 64,500 lux (6,000 foot candles) incandescent light intensity.

* * * * *

S7. *Test procedures.*

S7.1. *Test procedure for testing power-operated window, partition, or roof panel systems designed to detect obstructions by physical contact or by light beam interruption:* Place the test rod of the type specified in S8.1 or S8.2, as appropriate, through the window, partition, or roof panel opening from the inside of the vehicle such that the cylindrical surface of the rod contacts any part of the structure with which the window, partition, or roof panel mates. Typical placements of test rods are illustrated in Figure 1. Attempt to close the power window, partition, or roof panel by operating the actuation device provided in the vehicle for that purpose.

S7.2. *Test procedure for testing power-operated window, partition, or roof panel systems designed to detect the proximity of obstructions using infrared reflectance:*

(a) Place the vehicle under incandescent lighting that projects 64,500 lux (6,000 foot candles) onto the infrared sensor. The light is projected onto the infrared sensor by aiming the optical axis of a light source outside the vehicle as perpendicular as possible to the lens of the infrared sensor. The intensity of light is measured perpendicular to the plane of the lens of the infrared sensor, as close as possible to the center of the lens of the infrared sensor.

(b) Place a test rod of the type specified in S8.3 in the window, partition, or roof panel opening, with the window, partition, or roof panel in any position. While keeping the rod stationary, attempt to close the window, partition, or roof panel by operating the actuation device provided in the vehicle for that purpose. Remove the test rod. Fully open the window, partition, or roof panel, and then begin to close it. While the window, partition, or roof panel is closing, move a test rod so that it approaches and ultimately extends through (if necessary) the window, partition, or roof panel opening, or its frame, in any orientation from the interior of the vehicle. For power partitions that have occupant compartment space on both sides of the partition, move the test rod into the partition opening from either side of the partition.

(c) Repeat the steps in S7.2(a) and (b) with other ambient light conditions within the range specified in S5.3.

S8. *Test rods.*

S8.1. *Rods for testing systems designed to detect obstructions by physical contact:*

(a) Each test rod is of cylindrical shape with any diameter in the range from 4 mm to 200 mm and is of sufficient length that it can be hand-held during the test specified in S7 with only the test rod making any contact with any part of the window, partition, or roof panel or mating surfaces of the window, partition, or roof panel.

(b) Each test rod has a force-deflection ratio of not less than 65 N/mm for rods 25 mm or smaller in diameter, and not less than 20 N/mm for rods larger than 25 mm in diameter.

S8.2. *Rods for testing systems designed to detect obstructions by light beam interruption:* Each test rod has the shape and dimensions specified in S8.1 and is, in addition, opaque to infrared, visible, and ultraviolet light.

S8.3. *Rods for testing systems designed to detect the proximity of obstructions using infrared reflection:*

(a) Each rod is constructed so that its surface has an infrared reflectance of not more than 1.0 percent when measured by the apparatus in Figure 2, in accordance with the procedure in S9.

(b) Each rod has the shape and dimensions specified in Figure 3.

S9. *Procedure for measuring infrared reflectance of test rod surface material.*

(a) The infrared reflectance of the rod surface material is measured using a flat sample and an infrared light source and sensor operating at a wavelength of 950 ± 100 nm.

(b) The intensity of incident infrared light is determined using a reference mirror of nominally 100 percent reflectance mounted in place of the sample in the test apparatus in Figure 2.

(c) Infrared reflectance measurements of each sample of test rod surface material and of the reference mirror are corrected to remove the contribution of infrared light reflected and scattered by the sample holder and other parts of the apparatus before computation of the infrared reflectance ratio.

* * * * *

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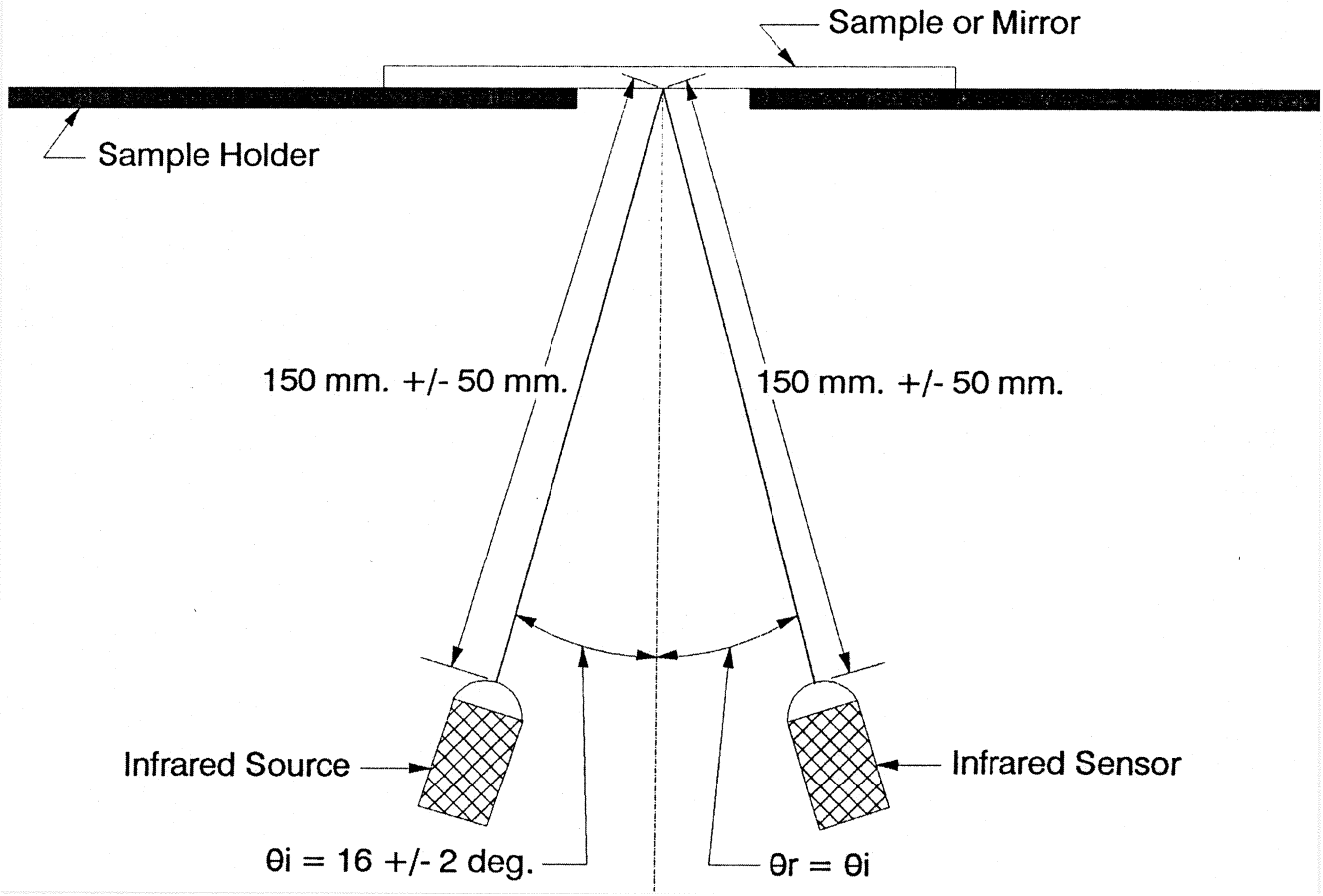
FIGURE 2 - REFLECTANCE TEST APPARATUS



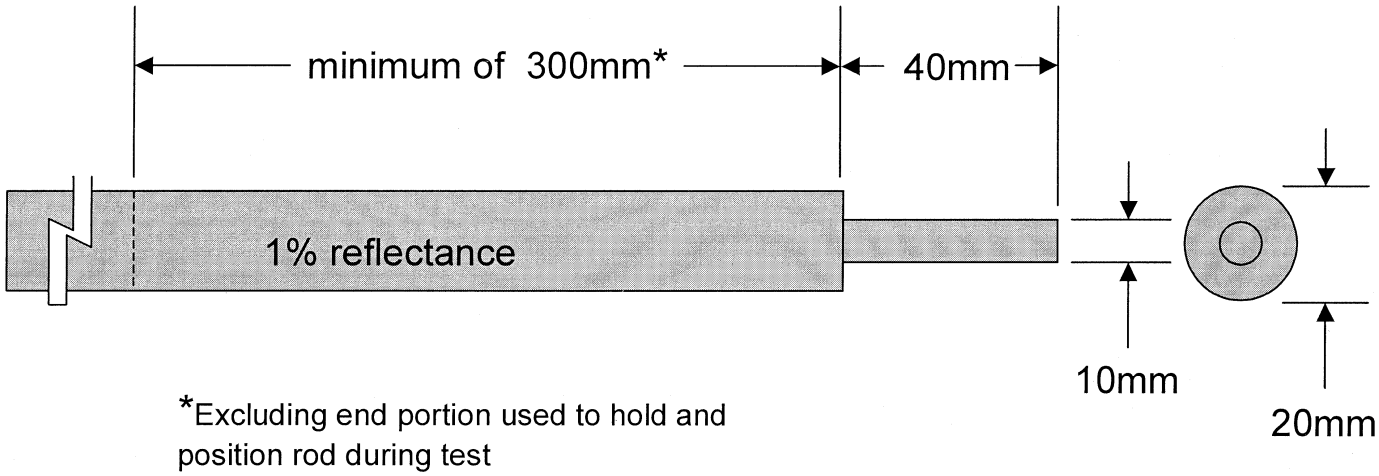


Figure 3

Cylindrical Rod

for Testing Non-Contact Infrared Reflection Systems

Issued: September 8, 2004.

Jeffrey W. Runge,

Administrator.

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