DEPARTMENT OF TRANSPORTATION

National Highway Traffic Safety Administration

49 CFR Part 571

[Docket No. NHTSA–2007–29349]

RIN 2127–AK01

Federal Motor Vehicle Safety Standards; Brake Hoses

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

ACTION: Final rule; technical amendments; response to petitions.

SUMMARY: This document, together with a companion notice of proposed rulemaking (NPRM) published in today's edition of the **Federal Register**, responds to petitions for reconsideration of a December 2004 final rule that updated the Federal motor vehicle safety standard on brake hoses, and to a related petition for rulemaking. In that rule, we incorporated updated versions of substantive specifications of several Society of Automotive Engineers (SAE) Recommended Practices relating to hydraulic brake hoses, vacuum brake hoses, air brake hoses, plastic air brake tubing, and end fittings.

In this document, we deny several of the petitions and explain why. We also correct typographical errors in, and inadvertent omissions from, the December 20, 2004 final rule.

In the companion NPRM, we respond to additional issues raised in the petitions, and propose a number of amendments to the brake hose rule in response to the petitions.

DATES: *Effective date:* This final rule becomes effective December 21, 2007.

Compliance date: Optional early compliance is permitted as of October 9, 2007.

Comments: Any petitions for reconsideration of today's final rule must be received by NHTSA not later than November 23, 2007.

ADDRESSES: Petitions for reconsideration should refer to the docket number for this action and be submitted to: Administrator, National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590, with a copy to DOT Docket Operations, U.S. Department of Transportation, Rm. W12–140, 1200 New Jersey Avenue, SE., Washington, DC 20590. Please see the Privacy Act heading under Rulemaking Analyses and Notices.

FOR FURTHER INFORMATION CONTACT: For non-legal issues, Mr. Jeff Woods, Vehicle Dynamics Division, Office of Vehicle Safety Standards (Telephone: 202–366–6206) (Fax: 202–366–4921).

For legal issues, Ms. Dorothy Nakama, Office of the Chief Counsel (Telephone: 202–366–2992) (Fax: 202–366–3820).

You may send mail to both of these officials at: National Highway Traffic Safety Administration, 1200 New Jersey Avenue, SE., Washington, DC 20590.

SUPPLEMENTARY INFORMATION:

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I. Background

On October 30, 1998, a joint petition for rulemaking was filed by Elf Atochem North America, Inc., Mark IV Industrial/Dayco Eastman, and Parker Hannifin Corporation, three brake hose manufacturers. The petitioners petitioned for certain requirements relating to brake hoses, brake hose tubing, and brake hose end fittings administered by the Federal Motor Carrier Safety Administration (FMCSA) to be incorporated into the brake hose standard that is currently administered by the National Highway Traffic Safety Administration (''NHTSA'' or the ''agency''). Specifically, the petitioners sought incorporation of the requirements in section 393.45 (Brake tubing and hose, adequacy) and section 393.46 (Brake tubing and hose connections) of the Federal Motor Carrier Safety Regulations (FMCSR) into section 571.106 (Brake hoses) of the Federal motor vehicle safety standards (''FMVSS''). The petition requested that the application of these SAE specifications be limited to hose, tubing, and fittings used on trucks, truck-trailer combinations, and buses with either a GVWR greater than 10,000 lbs. or which are designed to transport 16 or more people, including the driver. In addition, the petitioners requested that the current versions of the SAE specifications be adopted instead of the older versions cited in the FMCSRs.

NHTSA granted the joint petition for rulemaking, and published a notice of proposed rulemaking on May 15, 2003 (68 FR 26384, DOT Docket No. 03–14483). The agency agreed with the petitioners that there was a safety need to transfer the brake hose, tubing, and fitting requirements currently contained in sections 393.45 and 393.46 of the FMCSRs to FMVSS No. 106, before the FMCSA removes those requirements. NHTSA tentatively concluded that to ensure the continued safety of commercial motor vehicle braking systems, the substantive specifications of the SAE Recommended Practices should be incorporated into FMVSS No. 106, with a few exceptions as noted. This would involve, among other changes, establishing a new category in the standard for plastic air brake tubing, end fittings, and tubing assemblies.

NHTSA's decision to grant the joint petition was also based on the fact that FMVSS No. 106 had not been substantially updated in many years. Revisions over the past 20 years primarily addressed labeling issues, inclusion of metric-sized brake hoses, updating test fluids to match advances in industry, and minor regulatory revisions to individual test conditions such as the whip test and the adhesion test. We noted that most of the substantive requirements in Standard 106, other than the labeling requirements, were originally based on SAE standards and American Society for Testing and Materials (ASTM) standards referenced therein. While the SAE and ASTM standards have been modified over time to keep pace with technological developments in the industry, the substantive requirements of FMVSS No. 106 have remained relatively unchanged. NHTSA's proposed changes to Standard No. 106 intended to take into account the substantial technological developments that have occurred. Incorporating many of the SAE standards' performance requirements is consistent with Office of Management and Budget (OMB) Circular A–119, which directs federal agencies to use and/or develop voluntary consensus industry standards, in accordance with Pub. L. 104–113, the ''National Technology Transfer and Advancement Act of 1995.''

II. Final Rule of December 20, 2004

On December 20, 2004 (69 FR 76298, DOT Docket No. NHTSA–2003–14483), NHTSA published a final rule amending the brake hose standard. The agency's

rule differed in the following respects from that petitioned for by the petitioners—

First, instead of simply incorporating complete SAE standards by reference as the FMCSRs currently do, NHTSA incorporated only the specific requirements/specifications of the SAE standards that are either more rigorous than those in Standard No. 106 or are not present at all in FMVSS No. 106.

Second, the agency did not limit the application of those SAE requirements/specifications to brake hose, tubing, and fittings used on commercial motor vehicles, but made them applicable to all motor vehicles. NHTSA determined that all brake hose, tubing, and fittings can and should meet the requirements/specifications, regardless of their end use.

Third, although NHTSA agreed with the petitioners that changes to FMVSS No. 106 should be based on the most recent versions of the SAE standards, instead of the older versions cited in the FMCSRs, the agency noted that a number of SAE's standards have been updated since the joint petition was filed (in 1998). Accordingly, NHTSA relied on what it believed to be the most recent versions of the SAE standards.

Fourth, the agency did not incorporate SAE standards relating to copper tubing, galvanized steel pipe, or end fittings used with metallic or non-metallic tubing, materials that are occasionally used in chassis plumbing. Since these products are not considered to be brake hoses, NHTSA determined them not to be appropriate to include in FMVSS No. 106, a brake hose standard.

Fifth, NHTSA did not incorporate the material and construction specifications for Type A and Type B tubing contained in SAE J844, *Nonmetallic Air Brake System Tubing,* and SAE J1394, *Metric Nonmetallic Air Brake System Tubing* because the agency tentatively concluded that incorporating those material specifications would be design-restrictive.

Sixth, NHTSA did not incorporate the manufacturer identification requirements in SAE J1401, *Hydraulic Brake Hose Assemblies for Use with Nonpetroleum-Base Hydraulic Fluids,* because it concluded that the manufacturer identification requirements already present in FMVSS No. 106 are sufficient.

III. Petitions

In early 2005, NHTSA received petitions for reconsideration of the December 20, 2004 final rule from Cooper Standard Automotive (Fluid Division), Degussa Corporation, George Apgar Consulting, MPC, Inc., and Parker Hannifin Corporation (with separate submissions from its Brass Division and from its Hose Products Division). In July 2005, Arkema, Inc., submitted a document styled as a petition for reconsideration. NHTSA is treating the document as a petition for rulemaking instead since its regulations (49 CFR 553.35(a)) provide that a document styled as a petition for reconsideration of a final rule and received by the agency more than 45 days after the issuance of that final rule will be treated as a petition for rulemaking. The petitions addressed a wide range of FMVSS No. 106 subjects.

In this document, we deny several of the petitions and explain why. We also correct typographical errors in, and inadvertent omissions from, the December 20, 2004 final rule. In a companion NPRM published in today's edition of the **Federal Register**, we respond to additional issues raised in the petitions, and propose a number of amendments to the brake hose rule in response to the petitions.

IV. Issues Raised by Petitioners and NHTSA's Responses

A. Hydraulic Brake Hoses

1. Expansion and Burst Strength (Volumetric Expansion) Test—Before the final rule was issued, expansion tests were conducted at 1,000 and 1,500 psi. In the final rule, NHTSA added a 2,900 psi expansion test in order to align FMVSS No. 106 with the latest revision of SAE J1401, Road Vehicle-Hydraulic Brake Hose Assemblies for Use with Nonpetroleum-Base Hydraulic Fluids, and incorporated the revised hydraulic expansion requirements in Table I—Maximum Expansion of Free Length Brake Hose (69 FR 76322). The inside diameter of the hoses listed in the first column of Table I are: ⅛ inch, or 3mm or less; 3⁄16 inch or 4–5 mm and ¼ inch or 6 mm or more.

In a request for an interpretation, Eaton Corporation asked for clarification of the set of measurements to use from Table I if the inside diameter of a hydraulic brake hose is greater than ⅛ inch but less than 3⁄16 inch. In a letter dated January 26, 2005, NHTSA explained that the expansion requirements for the 3⁄16 inch brake hose apply to a brake hose that is larger than ⅛ inch but smaller than 3⁄16 inch: ''In other words, the set covers brake hose with inside diameter greater than '⅛ inch or 3mm' and less than '¼ inch or 6 mm.' Thus, the inside diameter of your hydraulic brake hose falls into the category described in Table 1 as '3⁄16 inch or 4 to 5 mm.' ''

In this final rule, NHTSA will make explicit the principle explained in the January 26, 2005 final rule by amending the identifying row titles in the first column of Table 1. The inside diameters will now be identified as: ''⅛ inch, or 3 mm, or less''; ''> [greater than] ⅛ inch or 3 mm, to 3⁄16 inch, or 5 mm''; and ''> 3⁄16 inch or 5 mm.'' Thus, after the changes, it will be evident that hydraulic brake hoses with inside diameters greater than ⅛ inch but less than 3⁄16 inch fall into the category described in Table I as ''> 1/8 inch or 3 mm, to 3⁄16 inch, or 5 mm.''

B. Plastic Air Brake Tubing

1. General—In response to plastic air brake tubing requirements in the final rule, we received requests from four companies. Each of them (Degussa, Parker Brass Division, Apgar, and Arkema) stated that because the agency did not include a requirement that plastic air brake tubing be constructed of nylon (polyamide), there are risks that alternate materials will not provide adequate long-term service in air brake systems. In addition, Arkema petitioned for inclusion of other tests; a battery acid resistance test requirement for copolyester tubing; a high temperature burst strength test; an increase in the length of time for the high temperature conditioning test from 72 hours to 1,000 hours; a quantitative adhesion test (also petitioned for by Degussa); and an increase in the length of time for the long-term high temperature conditioning and moisture absorption test from 100 hours to 720 hours. As explained below, NHTSA has decided it will not make any of these additions to test procedures applicable to plastic air brake tubing.

2. Specifying Plastic v. Nylon—In the December 2004 final rule, the agency adopted the generic term ''plastic'' for air brake tubing, rather than specify that air brake tubing must be constructed from ''nylon.'' As discussed in the final rule, the agency did not intend restrictions in FMVSS No. 106 for material that may be used to manufacture air brake tubing (69 FR 76306). The agency stated that it was adopting 22 performance test requirements (one of these is a dimensional specification of the tubing) to ensure the safety of plastic air brake tubing.

Apgar stated that removing material requirements from standards and regulations is an excellent goal to promote innovation, but makes standards development more difficult because the known properties of specific materials cannot be taken for granted when the material is not

specified. Apgar stated that in the absence of specifying polyamide as the material for air brake tubing, more requirements than those in the agency's final rule are needed. Apgar stated that there is an ongoing activity by an SAE subcommittee to develop a standard designated as SAE J2547 to describe requirements for alternate construction air brake tubing, but that this standard is still a working document.

Degussa stated that the 22 requirements for plastic air brake tubing adopted in the agency's final rule will not guarantee that the tubing material will provide safe service for air brake systems. It stated that none of the requirements in FMVSS No. 106 or in SAE J844 reflects long-term field use, and that many of the requirements are specific to nylon materials and do not cover potential deficiencies of new materials without a proven track record. Degussa cited SAE J2260, Nonmetallic Fuel System Tubing, with One or More Layers, that requires a 5,000-hour fuel exposure at 60 degrees Celsius and heat aging for 1,000 hours at 90 degrees Celsius before tests are conducted. It further stated that nylons used in air brake tubing have a successful track record of many years, but that for new materials, neither the requirements of SAE J844 nor the requirements in the FMVSS No. 106 final rule are sufficient. Degussa proposed that a statement be added that materials used for air brake tubing must demonstrate a track record over several years, or meet long term test requirements agreed upon between material supplier, tubing manufacturer, and end user.

Parker stated its belief that compared to the then-existing rule, the agency's December 20, 2004 final rule compromises vehicle safety, and that the new requirements are less practicable than the previous requirements in FMVSS No. 106, because the agency did not specify nylon for air brake tubing. Parker believes that the burden of compliance will shift from the brake tubing component manufacturers to the assemblers of air brake tubing assemblies, and that the DOT markings on tubing and end fittings will no longer assure that these components are compatible.

Parker stated that numerous entities, including service shops, may have to acquire testing capability for the assemblies made with alternate tubing materials and the agency did not consider costs of such testing capability. Parker stated that the chance of tubing assemblies being put into service that do not meet the requirements of the FMVSS No. 106 final rule is significant. Parker stated that it knows of non-polyamide materials for tubing that can meet the requirements of the final rule for tubing, but when made into assemblies they do not meet the requirements of the final rule. Parker provided no examples of its assertions. A brake hose assembly that does not meet the December 20, 2004 final rule (when it takes effect) would be in noncompliance. A noncompliant assembly would not be permitted on a motor vehicle.

Arkema stated that the strong safety record of polyamides is well established, but it is impossible to foresee what testing will be required upon introduction of countless unknown materials and constructions. It stated that similar challenges were met by the International Standards Organization (ISO) TC22 SC2 Working Group that developed ISO 7628, a standard for plastic air brake tubing that allows some flexibility of composition of the material used in the construction of the tubing. Arkema also mentioned the efforts to develop SAE J2547 but acknowledged that this SAE standard is still a working document. Arkema asked that a list of all approved materials and constructions for the manufacture of nonmetallic air brake tubing be established, and that manufacturers of such alternate materials or constructions apply for approval from either the agency or from the SAE. Arkema asked that the optional early compliance provision in the final rule (that manufacturers may meet the new FMVSS No. 106 requirements starting on February 18, 2005) be rescinded until its requested changes to the final rule are made.

Arkema also stated that tubing made from materials that are more elastomeric (rubbery) than polyamide will probably require fittings designed especially for that tubing. Arkema asked for adoption of several new requirements for plastic air brake tubing including an adhesion test for tubing with multi-layer construction; a chemical resistance test for each layer of multi-layer tubing; a high-temperature burst test (similar to that specified in Deutsches Institüt für Normung e.V. (DIN) 73378); [1] increasing the time of conditioning for the heat aging requirement at S12.11 of FMVSS No. 106 from 72 hours to 1,000 hours; checking the effects of moisture conditioning and hydrolysis on the mechanical performance of alternative materials; and requiring that all currently available SAE J246 and J2494 fittings function correctly with any DOT 106-marked air brake tubing.

We have reviewed the requests and note that in many instances they are similar to the comments submitted by the same commenters in response to the NRPM. The issue of specifying the generic term ''plastic'' versus specifying ''nylon'' was discussed in the final rule (69 FR 76306). The agency determined that it would not be appropriate for FMVSS No. 106 to be design-restrictive regarding the material or construction methods for air brake tubing, but the standard should be performance based to the extent practicable. Arkema's suggestion that a list of approved materials and constructions for plastic air brake tubing be established and that manufacturers of alternate materials or constructions apply for approval from either the agency or the SAE, does not meet 49 U.S.C. Section 30115 *Certification of Compliance* that specifies self-certification by each manufacturer of motor vehicles and motor vehicle equipment.

Specifying nylon as the sole construction material for plastic air brake tubing would not permit alternate materials that can provide safe and satisfactory performance when used in air brake systems. Arkema's comments tacitly recognize this in Arkema's statement that use of new materials and constructions will allow innovation, and will perhaps lead to improved performance and economy. Therefore, the agency will consider only the issue of establishing appropriate minimum performance requirements to ensure the safety of plastic air brake tubing.

Parker and Arkema suggested that because the agency did not specify nylon as the sole material for plastic air brake tubing in the final rule, it was their belief that air brake tubing and end fittings may no longer work together. Parker stated that nylon provides a certain level of hardness and compressive strength that enables end fittings to retain the tubing. These companies also stated that there are non-nylon tubing materials that can meet the new FMVSS No. 106 requirements for the tubing, but will not retain the end fittings. The agency believes that if this were the case, such tubing would be non-compliant with the end fitting retention and performance requirements of air brake tubing assemblies in FMVSS No. 106 (S11.3.17 through S11.3.24) when the December 20, 2004 final rule takes effect. At such

[1] NHTSA notes that DIN 73378 (February 1996) at Section 1 *Scope* states in the English translation: ''This standard specifies requirements for and methods of testing polyamide tubing intended for the transport of fuel in motor vehicles * * *'' Searching on the DIN Web site, we were unable to find a DIN standard for polyamide air brake hose, other than DIN 74323 that covers coiled tubing only. No DIN standard was found for straight air brake tubing used on motor vehicles.

time, the tubing and/or the assembly would be subject to the agency's remedial actions for such non-compliance. Although the agency is not able to analyze hypothetical non-compliance situations, it does not agree that the burden of compliance has changed from the prior requirements under FMVSS No. 106 solely because nylon is not specified as the only material that can be used for air brake tubing.

In the future, if different types of air brake tubing are developed that require unique end fittings, additional rulemaking may be required to differentiate (by labeling or other means) the various types of tubing and end fittings. This is the approach currently taken in FMVSS No. 106 for rubber air brake hoses that are designated as Types A, AI, and AII (and now a Type AIII petitioned for addition by Gates Corporation), that each have unique dimensions and corresponding end fittings.

3. Resistance to Battery Acid—Apgar's petition for reconsideration requested that the agency include the battery acid resistance test from ISO 7628–2 in FMVSS No. 106. ISO 7628–2 includes a battery acid resistance test requirement for copolyester brake tubing. (See Section 7.11 of ISO 7628–2.) The ISO test requires that three samples of tubing be bent around a test cylinder with a radius of five times the outside diameter of the tubing, and then be immersed in a sulfuric acid solution at room temperature for 70 hours. After this conditioning, the tubing must have no dimensional change greater than two percent, no change in weight greater than two percent, nor any evidence of cracking.

In considering whether to propose adopting the ISO 7628–2 requirement into FMVSS No. 106 to ensure the safety of all types of plastic air brake tubing, the agency conducted additional review of SAE J844 and found that under Section 1—Scope, the standard states that the tubing it applies to is not to be used in an area subject to attack by battery acid. In practice, the agency believes that the battery installations on heavy vehicles are such that air brake tubing is not routed in the vicinity of the batteries, so that exposure to battery acid is avoided. There may be other situations (such as transportation of new or used lead-acid batteries) in which air brake tubing could be exposed to battery acid, but the agency believes that adequate environmental and hazardous materials transportation requirements make such exposure unlikely to occur. In addition, we note that the issue of the need for battery acid resistance for plastic air brake tubing was not raised by companies other than Apgar in response to the May 15, 2003 NPRM on air brake hoses or tubing. For these reasons, the part of Apgar's petition asking that FMVSS No. 106 include a battery acid resistance test for plastic air brake tubing incorporated from ISO 7628–2 is denied.

Arkema's petition requested the addition of several other requirements or substantial modifications (all relating to plastic air brake tubing) to the current FMVSS No. 106 requirements published in the agency's December 2004 final rule. These are described in further detail below.

4. High Temperature Burst Strength Test—Arkema asked that a high temperature burst test be added for plastic air brake tubing. Arkema's recommended text would specify filling a 12-inch brake hose assembly with ASTM IRM 903 oil and conditioning the assembly in air at 100 degrees Celsius (212 degrees Fahrenheit) for one hour, and then increasing the oil pressure inside the assembly at a rate of 3,000 psi per minute until burst occurs. The ratio of high temperature burst pressure to room temperature burst pressure is then calculated, and the required performance would be that the ratio must exceed 37 percent. In other words, the burst strength of the tubing at an elevated temperature must be greater than 37 percent of the burst strength at room temperature.

Arkema references DIN 73378, Polyamide Tubing for Use in Motor Vehicles as the reference standard for calculating this ratio. Arkema also provided a table of proposed burst strengths of each size of tubing at room temperature and at 100 degrees Celsius. The data in that table indicate high temperature to low temperature ratio equal to 40 percent.

Degussa recommended that a high temperature burst test from ISO 7628 be added to FMVSS No. 106 for plastic air brake tubing. The ISO test consists of conditioning the tubing in air at 100 degrees Celsius (212 degrees Fahrenheit) for 1 hour, and performing a burst strength test (pressure increased to failure within 15 to 60 seconds) with the tubing at the elevated temperature. The required performance is to withstand 2.50 MPa (363 psi) pressure if the tubing is designated as 1 MPa (145 psi) tubing, or to withstand 3.13 MPa (454 psi) pressure if the tubing is designated as 1.25 MPa (181 psi) tubing.

The agency evaluated the requirements from ISO 7628 to determine the ratio of high temperature burst strength to room temperature burst strength. For example, the required burst strength for a 1 MPa designated tube is 4.00 MPa at room temperature and 2.50 MPa at 100 degrees Celsius, which yields a ratio of 2.50/4.00 = 0.625 or 63 percent. This is a much higher ratio than that in the test proposed by Arkema, although it appears that the ISO 7628 room temperature burst strength requirements (e.g., 4 MPa (580 psi) for 1 MPa type tubing) are not particularly stringent in comparison to FMVSS No. 106 requirements (e.g., 5.5 MPa (800 psi) to 9.7 MPa (1400 psi) depending on tubing size), and even more so considering that trucks in the United States are operating at slightly lower air system pressures than European trucks.

Arkema provided a graph of burst pressures for 5/16 inch polyamide tubing over a temperature range of 50 to 275 degrees Fahrenheit that shows a considerable decrease in burst strength at higher temperatures. The graph shows the burst strength at 200 degrees Fahrenheit is approximately 450 psi or 45 percent of the 1,000 psi burst strength at 75 degrees Fahrenheit.

After reviewing Arkema's and Degussa's submissions, we have decided that there is no safety need that would be met by adding an additional high-temperature test to FMVSS No. 106. Based on requirements in SAE J844, the agency adopted a series of high-temperature conditioning tests in FMVSS No. 106 at S11.3.2, S11.3.8, S11.3.9, and S11.3.10 that use a conditioning temperature of 230 degrees Fahrenheit. Arkema stated that plastic air brake tubing may be subjected to intermittent temperatures under a vehicle hood as high as 248 degrees Fahrenheit. Arkema did not propose any tests be conducted at 248 degrees Fahrenheit.

We believe that vehicle manufacturers are not using plastic air brake tubing in high temperature applications because we have not seen temperature-related thermoplastic air brake tubing failures on vehicles. In a common application of air brake tubing used in the engine compartment of heavy trucks, the air brake tubing is routed to the treadle valve located on the driver's side of the engine compartment while the high-temperature engine exhaust components are typically on the passenger's side of the engine compartment.

In a high-temperature application such as an air compressor discharge line, a wire-reinforced elastomeric hose is used rather than plastic tubing. It is for these reasons that we believe we have not seen instances of plastic tubing failing from high-temperature exposure in vehicle applications. We are aware that the 2007 emission-compliant heavy

duty engines could result in higher underhood temperatures.

We also believe that the SAE Airbrake Tubing and Fittings Subcommittee, working with vehicle manufacturers who are installing the plastic air brake tubing on their vehicles, would be able to identify any need for changes in high-temperature resistance requirements for plastic air brake tubing.

5. High Temperature Conditioning, Low Temperature Impact Resistance—Arkema asked that the high-temperature conditioning (temperature soak at 230 degrees Fahrenheit) component in S11.3.10 *High temperature conditioning, low temperature impact resistance* of FMVSS No. 106, be increased from 72 hours to 1,000 hours. Arkema's justification for this request relates to their comment on intermittent high underhood temperatures that can reach 248 degrees Fahrenheit (measured at the brake tubing) for six minutes or longer upon stopping the truck in high ambient temperature conditions. Arkema stated that based on a service life of 5 years, with such a hot soak occurring four times every twenty-four hours of truck operation, an equivalent of 30 days of continuous exposure to high temperatures would result.

The agency does not dispute that brake tubing may see intermittent high temperatures in underhood applications, particularly under high ambient temperature conditions, but does not conclude that the substantial test burden that would result by increasing the S11.3.10 high temperature soak from 72 hours to 1,000 hours has been shown to be necessary to meet a safety issue. The agency does not conclude that Arkema has provided sufficient technical justification for such an increase in test burden in the absence of an apparent or known safety problem. For these reason, the increase of the high temperature conditioning component in S11.3.10 of FMVSS No. 106 from 72 hours to 1,000 hours is denied.

6. Adhesion Test—Degussa recommended including a quantitative adhesion test as described in S7.13 of SAE J2260, Nonmetallic Fuel System Tubing with One or More Layers, November 20042. This includes a peel test in which a sample of tubing is cut and then separated at the layer interface so that a peel test can be conducted on the strength of the interface bond. Degussa recommended that a minimum layer adhesion of 1 N/mm (5.6 pounds per inch) be achieved using this method.

Arkema recommended a similar test requirement. However, Arkema's suggested procedure would first subject the tubing to one of ten required pre-conditionings, including high temperature conditioning, boiling water conditioning, moisture conditioning, and ultraviolet light conditioning. Arkema's recommended test procedure describes how the layers of the tubing are initially separated using a scalpel, then additionally separated using pliers and clamped in a tensile testing machine for the peel test to be conducted. Arkema recommended a peel strength of 1.0 N/mm for an average value with no instantaneous peel strength less than 0.5 N/mm.

We discussed this issue in detail in both the May 2003 NPRM (68 FR 26400) and the December 2004 final rule (69 FR 76311). In the NPRM, the agency proposed an adhesion test after the tubing was subjected to high temperature conditioning. In the final rule, the agency decided not to include an adhesion test because the industry comments on this issue were divergent as to the peel strength that should be required, and because the test appeared to be problematic from compliance and enforcement standpoints.

In their petitions, neither Arkema nor Degussa have satisfactorily resolved the issues raised in the final rule regarding the adhesion tests. An adhesion test for fuel hose may be suitable for testing plastic tubing manufactured for fuel hoses where truly different layers of materials exist in the tubing for chemical resistance, mechanical strength and other factors. The layers in current plastic air brake tubing are, to the agency's knowledge, uniform in material and fully bonded such that they cannot be readily separated for a peel test. Arkema's proposed method of initiating separation of the layers by using a scalpel evidences the permanence of the bond in plastic air brake hoses. An adhesion test in this situation can ultimately end up testing the tensile strength of the brake tubing material rather than the strength of its bonds, in particular where a particular layer is very thin.

Furthermore, we believe that Arkema's recommendation for conducting ten pre-conditioning tests, each of which would be followed by an adhesion test, would be a substantial compliance test burden on the brake tubing manufacturers, especially since the agency is not aware of any safety problem that has occurred due to poor adhesion characteristics being exhibited by plastic air brake tubing. For these reasons, we see no safety justification to propose to add Arkema's recommended battery of adhesion tests. This portion of Arkema's petition is denied. For technical reasons that have been described regarding conducting adhesion tests on plastic tubing with high interlayer bonding properties, both Arkema's and Degussa's requests to add an adhesion test to FMVSS No. 106 for plastic air brake tubing are also denied.

7. Long-Term High Temperature Conditioning and Moisture Absorption—Arkema cited regional high humidity environments in the United States as a reason that the tubing conditioning in a humid environmental chamber in S12.6, *Moisture absorption and burst strength,* paragraph (c) should be increased from 100 hours to 720 hours. Adopting Arkema's recommendation would substantially increase the compliance test burden without a demonstrated safety need. Arkema's recommendation may be based upon the specific performance of Arkema's brake tubing product as discussed below in further detail.

In its petition, Arkema included a graph of the elongation properties of polyamide (nylon) tubing that shows a substantial decrease in this elongation at approximately 40 days (960 hours) of exposure (a comparison material is mentioned but does not appear in the graph). The agency questions if this also translates into a corresponding decrease in burst strength, and whether plastic air brake tubing in service on motor vehicles experiences this level of degradation. Also, the agency does not know if the degradation of elongation would be mainly a function of exposure to ambient moisture in the atmosphere (as stated by Arkema) or to exposure to moisture contained within the air brake system. The data do not indicate whether the elongation degradation at 960 hours is accompanied by an increase in moisture weight gain or if such weight gain exceeds two percent.

The data provided by Arkema raises many questions. We also note that Arkema's proposed 720 hour conditioning is the time just prior to when the nylon tubing properties begin to substantially degrade, so it would appear the 720 hour value was selected to match the performance curve of this particular material. We further note that Arkema's test data shows a conditioning temperature of 212 degrees Fahrenheit, which is substantially higher than the 75 degree Fahrenheit conditioning temperature that is currently specified in FMVSS No. 106 and in SAE J844.

In reviewing Arkema's petition, the agency has once again reviewed its decision to not include the moisture weight gain portion from the SAE J844 requirements in the final rule. This requirement states that after the tubing is conditioned in the environmental chamber at 100 percent relative

humidity at room temperature for 100 hours, the weight of the tubing sample shall not increase by more than two percent. Such weight gain would be caused by the tubing sample absorbing moisture. In its petition, Arkema stated that some thermoplastics are very sensitive to moisture associated with temperature, leading to degradation of the material (hydrolysis). It stated that the material will get brittle and lose mechanical strength over time.

In the final rule, the agency stated that it did not have a basis for believing that a weight gain of more than two percent would constitute a safety problem. The agency instead included a burst strength test at the end of the test sequence as a check of the mechanical strength of the tubing after conditioning it in the humid environment.

We once again reviewed the comments submitted in response to the May 2003 NPRM and note that Saint-Gobain Performance Plastics objected to the weight gain limit as being designed around nylon and that using weight gain as a performance metric is not appropriate. DuPont did not object to having a weight gain limit but noted that several other tests proposed (and subsequently adopted in the final rule) would be satisfactory in evaluating the resistance of the tubing to degradation from moisture absorption.

Based upon all of the information we have at this time, the agency has again decided not to propose the adoption of a weight gain limit. Therefore, the part of Arkema's petition asking for an increase from 100 to 720 hours in tubing conditioning in a humid environmental chamber in paragraph (c) of S 12.6 moisture absorption and burst strength is denied.

Before undertaking further rulemaking on plastic air brake tubing moisture absorption and burst strength, we would ask for complete test data from Arkema or other manufacturers so that we may review the difference in weight gain for different materials of plastic air brake tubing subjected to both 100-hour and longer conditioning times. We need this information to determine how much moisture various types of tubing materials absorb, and if there is a correlation to a degradation of tubing mechanical properties such as burst strength.

V. Listing and Description of Corrections

In addition, the agency has noted typographical errors or omissions in the final rule of December 20, 2004. In this final rule document, we are making the following corrections:

1. S6.1.3 Calculation of expansion at 1,000 psi, 1,500 psi, and 2,900 psi for hydraulic brake hose. Paragraph (b) of this section incorrectly states that the pressure increase rate is 1,500 psi per minute. The correct rate of 15,000 psi per minute is being restored in this corrections notice.

2. Table III—Air brake hose dimensions. The minimum inside diameter for ¼ inch inside diameter, Type A air brake hose, is shown as 0.277 inches in Table III of the final rule. This is in error and the correct dimension is 0.227 inches, consistent with SAE J1402 (January 2005) Table 1.

3. S7.3 Test requirements for air brake hose. In the final rule, the second sentence of 7.3 states that in addition to the constriction requirements in S7.3.1, air brake hose is subject to the requirements in S7.3.2 through S7.3.14. This is incorrect because it should cite the requirements in S7.3.2 through S7.3.13.

4. S7.3.5 Ozone resistance for air brake hose. The test temperature is specified as 104 degrees Fahrenheit (49 degrees Celsius). The correct metric conversion for 104 degrees Fahrenheit is 40 degrees Celsius.

5. S8.7 Flex strength and air pressure test for air brake hose. This requirement includes a flex test apparatus figure with several specified dimensions. The table accompanying Figure 5 describes the dimensions of the test apparatus for various sizes of air brake hose. The ninth column specifies the ''C'' dimension of Position ''2'' of the test apparatus for a 7/16, ½, or 5/8 inside diameter hose and is shown as 5.00 inches (102 mm). The correct metric conversion for 5.00 inches is 127 mm. This correction is being made to the table accompanying Figure 5.

6. S8.12 End fitting corrosion resistance for air brake hose end fittings. This section states how to conduct the corrosion test in S6.9, using an air brake hose. However, in the final rule S6.9 was changed to incorporate a new dynamic ozone resistance test, and the corrosion test was moved to S6.11. The correct reference to the corrosion resistance test in S6.11 is made to S8.12 in this notice. This revision was inadvertently not included in the NPRM or final rule.

7. S9.1.2 End fittings for vacuum brake hose. The first sentence of this section states ''[e]xcept for an end fitting that is attached by heat striking or by interference fit * * *'' However, the agency notes that the word ''striking'' should be ''shrinking,'' consistent with similar text in S9.1.3. Heat shrinking is a process that may be used to assemble end fittings onto vacuum brake hose. This typographical error is corrected in this notice.

8. S9.2.1 Constriction test for vacuum brake hose and S10.10 corrosion resistance for vacuum brake hose. The citation at the end of S9.2.1 references the constriction test procedure as S10.10. In the December 2004 final rule, S10.10 is the constriction test, however, this conflicts with the existing S10.10 in FMVSS No. 106 that is the end fitting corrosion resistance test. Therefore, the constriction test in the December 2004 final rule is redesignated as S10.11, and the reference in S9.2.1 is changed to S10.11 as well.

We also revise S10.10, corrosion resistance test, to correct a revision that was omitted from the final rule. The reference in S10.10 to ''conduct the test specified in S6.9'' is changed to ''conduct the test specified in S6.11'' to reflect changes that were made in S6 in the December 2004 final rule.

9. S9.2.3 Low temperature resistance for vacuum brake hose. Paragraph (b) of this section references the hydrostatic pressure test as S10.6. This is incorrect, because the hydrostatic pressure test procedure is in S10.1(e). The correction is made in this notice.

10. S10.7 Swell and adhesion test for vacuum brake hose. Paragraph (c) of this section states that after soaking a vacuum brake hose in reference fuel, the constriction test in S10.10 is to be conducted. However, the reference for the constriction test is changed to S10.11 as described in item 8 above. This change is made in S10.7 as well.

11. S10.9 Deformation test for vacuum brake hose. S10.9 states that Table VI specifies the test specimen dimensions to be used for conducting the deformation test. However, the header of the second column in Table VI states ''Specimen dimensions (see fig. 4)'' is incorrect because Figure 4 was changed to Figure 7 in the December 2004 final rule. This revision to the header in Table VI is made in this final rule.

12. *S11.3 Test requirements for plastic air brake tubing.* The final rule states that in addition to the constriction requirements in S11.3.1, plastic air brake tubing is subject to the requirements in S11.3.2 through S11.3.22. This is incorrect. The correct citation is to the requirements of S11.3.2 through S11.3.24.

13. S12.6 Moisture absorption and burst strength for plastic air brake tubing. Paragraph (e) of this section has an equation to calculate the percentage moisture absorption, but a division symbol is missing from the text in the final rule. Paragraph (g) of this section

is missing the letter ''S'' in reference to S12.5. The corrections to both paragraphs (e) and (g) are made in this final rule.

14. S12.10 High temperature resistance test for plastic air brake tubing. The temperature specification for conditioning the tubing is 230 degrees Fahrenheit. The metric equivalent temperature of 110 degrees Celsius, missing from the text, is included in this final rule.

15. S12.15 High temperature conditioning and collapse resistance test for plastic air brake tubing. Paragraph (b)(4) of this section states to condition the holding device and brake hose in an air oven at 230 degrees Fahrenheit (110 degrees Celsius) for 24 hours. However, as stated in the test requirements in S11.3.14, the correct temperature specification is 200 degrees Fahrenheit (93 degrees Celsius).

Paragraph (c) of this of S12.15 includes an equation to calculate the percentage collapse of the outside diameter of the tubing. A division symbol missing from the text in the December 20, 2004 final rule is included in this final rule.

16. S12.17 Oil resistance test for plastic air brake tubing. Paragraph (b) of this section references ASTM 903 oil. The correct reference is ASTM IRM 903 oil.

17. S12.23 Thermal conditioning and end fitting retention test for plastic air brake tubing. Paragraph (a) of this section incorrectly references ASTM IBM 903 oil. The correct reference is ASTM IRM 903 oil.

VII. Effective Date

Because the changes in this final rule are minor ones on the order of correcting typographical errors and other inadvertent omissions in FMVSS No. 106, this final rule will take effect on December 21, 2007. This final rule corrects the final rule of December 20, 2004 (69 FR 76298), which will take effect on December 20, 2007 (See 71 FR 74823, December 13, 2006). Optional early compliance is permitted as of the date this document is published in the **Federal Register**.

VIII. Rulemaking Analyses and Notices

This rule makes technical corrections and has no impact on the regulatory burden of manufacturers. The agency discussed the relevant requirements of Executive Order 12866, the Department of Transportation's regulatory policies and procedures, the Regulatory Flexibility Act, the National Environmental Policy Act, Executive Order 13132 (Federalism), the Unfunded Mandates Act, Civil Justice Reform, the National Technology Transfer and Advancement Act, and the Paperwork Reduction Act in the December 2004 final rule cited above. Those discussions are not affected by these technical amendments.

Privacy Act

Please note that anyone is able to search the electronic form of all documents received into any of our dockets by the name of the individual submitting the document (or signing the document, 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).

List of Subjects in 49 CFR Part 571

Imports, Incorporation by Reference, Motor vehicle safety, Motor vehicles, Rubber and rubber products, and Tires.

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

PART 571—FEDERAL MOTOR VEHICLE SAFETY STANDARDS

■ 1. The authority for part 571 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 571.106 is amended by:
■ a. Revising Table I;
■ b. Revising paragraph (b) of S6.1.3;
■ c. Revising Table III;
■ d. Revising in S7.3, the second sentence;
■ e. Revising S7.3.5;
■ f. Revising the Table Accompanying Figure 5, following S8.7.1;
■ g. Revising S8.12;
■ h. Revising in S9.1.2, the introductory text;
■ i. Revising S9.2.1;
■ j. Revising in S9.2.3, paragraph (b);
■ k. Revising in S10.7, paragraph (c);
■ l. Revising Table VI following S10.9.2(a);
■ m. Redesignating S10.10 as S10.11;
■ n. Adding new S10.10;
■ o. Revising in S11.3, the second sentence;
■ p. Revising in S12.6, paragraphs (e) and (g);
■ q. Revising in S12.10, the first sentence;
■ r. Revising in S12.15, paragraph (b)(4) and paragraph (c);
■ s. Revising in S12.17, in paragraph (b), the first sentence, and
■ t. Revising in S12.23, paragraph (a).

The additions and revisions read as follows:

§ 571.106 Standard No. 106; Brake hoses.

* * * * *

TABLE I.—MAXIMUM EXPANSION OF FREE LENGTH BRAKE HOSE, CC/FT

Hydraulic brake hose, inside diameter	Test pressure					
	1,000 psi		1,500 psi		2,900 psi	
	Regular expansion hose	Low expansion hose	Low expansion hose	Regular expansion hose	Regular expansion hose	Low expansion hose
1/8 inch, or 3mm, or less	0.66	0.33	0.79	0.42	1.21	0.61
> 1/8 inch or 3mm, to 3/16 inch or 5 mm	0.86	0.55	1.02	0.72	1.67	0.91
> 3/16 inch or 5 mm	1.04	0.82	1.30	1.17	*	*

* * * * *

S6.1.3 *Calculation of expansion at 1,000 psi, 1,500 psi, and 2,900 psi.*

* * * * *

(b) Close the valve to the burette, apply pressure at the rate of 15,000 psi per minute, and seal 1,000 psi in the hose (1,500 psi in the second series, and 2,900 psi in the third series).

* * * * *

TABLE III.—AIR BRAKE HOSE DIMENSIONS—INSIDE DIAMETER (ID) AND OUTSIDE DIAMETER (OD) DIMENSIONS IN INCHES (MILLIMETERS)

	Type A—Hose Size—Nominal Inside Diameter					
	1/4	5/16	3/8	7/16	1/2 SP (1)	5/8
Min. I.D.	0.227 (5.8)	0.289 (7.3)	0.352 (8.9)	0.407 (10.3)	0.469 (11.9)	0.594 (15.1)
Max. I.D.	0.273 (6.9)	0.335 (8.5)	0.398 (10.1)	0.469 (11.9)	0.531 (13.5)	0.656 (16.7)
Min. O.D.	0.594 (15.1)	0.656 (16.7)	0.719 (18.3)	0.781 (19.8)	0.844 (21.4)	1.031 (26.2)
Max. O.D.	0.656 (16.7)	0.719 (18.3)	0.781 (19.8)	0.843 (21.4)	0.906 (23.0)	1.094 (27.8)
	Type AI (2)—Hose Size—Nominal Inside Diameter					
	3/16	1/4	5/16	13/32	1/2	5/8
Min. I.D.	0.188 (4.8)	0.250 (6.4)	0.312 (7.9)	0.406 (10.3)	0.500 (12.7)	0.625 (15.9)
Max. I.D.	0.214 (5.4)	0.281 (7.1)	0.343 (8.7)	0.437 (11.1)	0.539 (13.7)	0.667 (16.9)
Min. O.D.	0.472 (12.0)	0.535 (13.6)	0.598 (15.1)	0.714 (18.1)	0.808 (20.5)	0.933 (23.7)
Max. O.D.	0.510 (13.0)	0.573 (14.6)	0.636 (16.2)	0.760 (19.3)	0.854 (21.7)	0.979 (24.9)
	Type AII (2)—Hose Size—Nominal Inside Diameter					
	3/16	1/4	5/16	13/32	1/2	5/8
Min. I.D.	0.188 (4.8)	0.250 (6.4)	0.312 (7.9)	0.406 (10.3)	0.500 (12.7)	0.625 (15.9)
Max. I.D.	0.214 (5.4)	0.281 (7.1)	0.343 (8.7)	0.437 (11.1)	0.539 (13.7)	0.667 (16.9)
Min. O.D.	0.500 (12.7)	0.562 (14.3)	0.656 (16.7)	0.742 (18.8)	0.898 (22.8)	1.054 (26.8)
Max. O.D.	0.539 (13.7)	0.602 (15.3)	0.695 (17.7)	0.789 (20.1)	0.945 (24.0)	1.101 (27.9)

(1) Notes: Type A, sizes 3/8, 7/16, and 1/2 Special can be assembled with reusable end fittings. All sizes can be assembled using permanently-attached (crimped) end fittings.
(2) Types AI and AII, all sizes, can be assembled with reusable or permanently-attached (crimped) end fittings.

* * * * *

S7.3 *Test requirements.* * * * However, a particular hose assembly or appropriate part thereof need not meet further requirements after having met the constriction requirement (S7.3.1) and then having been subjected to any one of the requirements specified in S7.3.2 through S7.3.13.

* * * * *

S7.3.5 *Ozone resistance.* An air brake hose assembly shall not show cracks visible under 7-power magnification after exposure to ozone for 70 hours at 104 degrees Fahrenheit (40 degrees Celsius) when bent around a test cylinder of the radius specified in Table IV for the size of hose tested (S8.4).

* * * * *

TABLE ACCOMPANYING FIGURE 5.—DIMENSIONS IN INCHES (MILLIMETERS)

Free hose length	Nominal hose inside diameter	Dimensions							
		Position "1"				Position "2"			
		A	B	C	R(1)	A	B	C	R(1)
10.00 (254)	3/16, 1/4	3.00 (76)	2.75 (70)	3.75 (95)	1.40 (34)	3.00 (76)	2.75 (70)	3.75 (95)	1.20 (30)
11.00 (279)	5/16, 3/8, 13/32	3.00 (76)	3.50 (89)	4.50 (114)	1.70 (43)	3.00 (76)	3.50 (89)	4.50 (114)	1.30 (33)
14.00 (355)	7/16, 1/2, 5/8	3.00 (76)	4.00 (102)	5.00 (127)	2.20 (56)	3.00 (76)	4.00 (102)	5.00 (127)	1.80 (46)

Note (1): This is an approximate average radius.

* * * * *

S8.12 *End fitting corrosion resistance test.* Conduct the test specified in S6.11 using an air brake hose assembly.

* * * * *

S9.1.2 *End fittings.* Except for an end fitting that is attached by heat shrinking or by interference fit with

plastic vacuum hose or that is attached by deformation of the fitting about a hose by crimping or swaging, at least one component of each vacuum brake hose fitting shall be etched, embossed, or stamped in block capital letters and numerals at least one-sixteenth of an inch high with the following information:

* * * * *

S9.2.1 *Constriction.* Except for that part of an end fitting which does not contain hose, every inside diameter of any section of a vacuum brake hose assembly shall not be less than 75 percent of the nominal inside diameter of the hose if for heavy duty, or 70 percent of the nominal inside diameter of the hose if for light duty (S10.11).

* * * * *

S9.2.3 Low temperature resistance.

* * *

* * * * *

(b) Not leak when subjected to a hydrostatic pressure test (S10.1(e)).

* * * * *

S10.7 *Swell and adhesion test.*

* * * * *

(c) Remove fuel and conduct the constriction test in S10.11.

* * * * *

TABLE VI.—DIMENSIONS OF TEST SPECIMEN AND FEELER GAGE FOR DEFORMATION TEST

Hose inside diameter*		Specimen dimensions (see Fig. 7)		Feeler gage dimensions	
in.	mm	Depth (inch)	Length (inch)	Width (inch)	Thickness (inch)
7/32	5	3/64	1	1/8	3/64
1/4	6	1/16	1	1/8	1/16
9/32	.....	1/16	1	1/8	1/16
11/32	8	5/64	1	3/16	5/64
3/8	10	3/32	1	3/16	3/32
7/16	.....	5/64	1	1/4	5/64
15/32	.....	5/64	1	1/4	5/64
1/2	12	1/8	1	1/4	1/8
5/8	16	5/32	1	1/4	5/32
3/4	.....	3/16	1	1/4	3/16
1	.....	1/4	1	1/4	1/4

*These sizes are listed to provide test values for brake hoses manufactured in these sizes. They do not represent conversions.

* * * * *

S10.10 *End fitting corrosion resistance test.* Conduct the test specified in S6.11 using a vacuum brake hose assembly.

* * * * *

S11.3 *Test requirements.* * * * However, a particular tubing assembly or appropriate part thereof need not meet further requirements after having met the constriction requirement (S11.3.1) and then having been subjected to any one of the requirements specified in S11.3.2 through S11.3.24.

* * *

* * * * *

S12.6 *Moisture absorption and burst strength.*

* * * * *

(e) Calculate percentage of moisture absorption as follows:

([Conditioned Weight—Initial Weight] ÷ [Initial Weight]) × 100

* * * * *

(g) Conduct the burst strength test in S12.5 except use 80 percent of the burst strength pressure for the size of tubing being tested as specified in Table VIII.

* * * * *

S12.10 *High temperature resistance test.* Condition the tubing in an air oven at 230 degrees Fahrenheit (110 degrees Celsius) for 72 hours. * * *

* * * * *

S12.15 *High temperature conditioning and collapse resistance test.*

* * * * *

(b) *Preparation.*

* * * * *

(4) Condition the holding device and tubing in an air oven at 200 degrees Fahrenheit (93 degrees Celsius) for 24 hours. Remove the holding device and tubing and allow to cool at room temperature for thirty minutes.

* * * * *

(c) *Calculation.* Calculate the percentage collapse of the outside diameter of the tubing as follows: ([Initial Outside Diameter—Final Outside Diameter] ÷ [Initial Outside Diameter]) × 100

* * * * *

S12.17 *Oil resistance test.*

(b) Immerse the tubing in ASTM IRM 903 oil at 212 degrees Fahrenheit (100 degrees Celsius) for 70 hours. * * *

* * * * *

S12.23 *Thermal conditioning and end fitting retention test.* (a) *Apparatus.* A source of hydraulic pressure that includes a pressure gauge or monitoring system, uses ASTM IRM 903 oil, and is constructed so that an air brake tubing assembly mounted to it can be conditioned in an environmental test chamber.

* * * * *

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Nicole R. Nason,

Administrator.

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