UNITED STATES DEPARTMENT OF TRANSPORTATION
NATIONAL HIGHWAY TRAFFIC SAFETY ADMINISTRATION

In re:

22E-061
Brake Hose Assemblies

April 21, 2023

PROTERIAL CABLE AMERICA, INC.'S SECOND SUPPLEMENTAL PETITION FOR DETERMINATION OF INCONSEQUENTIAL NONCOMPLIANCE

Pursuant to the National Traffic and Motor Vehicle Safety Act ("Safety Act"), 49 U.S.C. §§ 30118(d) and 30120(h), and 49 C.F.R. Part 556, Proterial Cable America, Inc. ("PCA") submits this Second Supplemental Petition for Determination of Inconsequential Noncompliance ("Second Supplemental Petition"). Together with PCA's August 19, 2022 Petition for Determination of Inconsequential Noncompliance (the "Original Petition") and PCA's November 10, 2022 Supplemental Petition for Determination of Inconsequential Noncompliance (the "First Supplemental Petition"), which PCA incorporates by reference herein, this Second Supplemental Petition seeks an exemption from the notice and remedy requirements of 49 U.S.C. §§ 30118 and 30120 on the ground that the noncompliance of certain motorcycle brake hose assemblies with Federal Motor Vehicle Safety Standard 106 ("FMVSS 106" or "106") is inconsequential to motor vehicle safety.

This petition summarizes extensive safety testing demonstrating that the noncompliances identified in two types of brake hose assemblies ("Assembly" or "Assemblies"), one type made with an inner Polytetrafluoroethylene ("PTFE") tube, 8-wire stainless steel braided cable layer, and an outer PVC layer ("PVC Assembly" or "PVC Assemblies"), and one type made with an inner PTFE tube, 6-wire stainless steel braided cable layer, and an outer Nylon layer ("Nylon Assembly" or "Nylon Assemblies"), are inconsequential to motor vehicle safety because they do

not present an incremental risk to motorcycle riders. Specifically, in addition to the conclusions in Exponent Inc.'s ("Exponent") technical reports submitted in support of the Original Petition and the First Supplemental Petition, Exponent has demonstrated through safety testing that (i) constriction and high-temperature impulse ("HTI") noncompliances in certain Nylon and PVC Assemblies, (ii) tensile strength ("Tensile") and burst strength ("Burst") noncompliances in certain PVC Assemblies, and (iii) any overlapping noncompliances in Nylon and PVC Assemblies are inconsequential to motor vehicle safety, as all of the noncompliant Assemblies—even Assemblies with all combinations of noncompliances identified—are robust to very severe conditions that exceed motorcycle lifetime demands with no adverse impact on brake performance

Exponent engaged in a series of detailed technical activities to comprehensively evaluate the safety profile of the Assemblies. To start, Exponent developed a comprehensive understanding of the underlying noncompliances at issue. Exponent also evaluated the relevant FMVSS 106 standards in detail, including evaluating how those standards compare to the actual forces and stresses motorcycles experience in the field. Based on this analysis, Exponent designed a rigorous set of testing programs to determine whether or not the noncompliances posed any incremental safety risk.

Over the course of Exponent's testing in support of the Prior PCA Petitions and this Second Supplemental Petition, Exponent subjected nearly 1,000 Assemblies to a variety of tests designed to evaluate any potential safety consequences of the FMVSS 106 noncompliances identified in Nylon and PVC Assemblies. These tests included (i) pressure and time sensitivity testing, (ii) accelerated durability pressure cycle testing (at varying temperatures); (iii) accelerated durability suspension stroke testing; (iv) field inspections of assemblies for evidence of fatigue; (v) master cylinder leakage testing; and (vi) dynamic response time testing. Based on this rigorous evaluation

and Exponent's ultimate conclusion that none of the noncompliance conditions identified in Nylon and PCA assemblies present an incremental risk to motorcycle riders, PCA seeks relief from the notice and remedy requirements of 49 U.S.C. §§ 30118 and 30120.

Background

I. Factual Background

PCA's[1] Original Petition and First Supplemental Petition addressed certain brake hose assemblies produced between February 28, 2007 and October 13, 2022 for exclusive use in Harley motorcycles. The PCA Petitions address PVC and Nylon Assemblies.

Certain of these Assemblies produced during this timeframe were identified in PCA's Part 573 report filed July 27, 2022 (the "Initial 573 Report") and PCA's amended Part 573 report filed October 18, 2022 (the "October 573 Report") (collectively, "Prior 573 Reports") as noncompliant with certain requirements of FMVSS 106. Specifically, the Prior 573 Reports identified that (1) certain Nylon Assemblies produced between November 16, 2015 and July 1, 2022 did not comply with brake fluid compatibility ("BFC"), HTI, whip resistance ("Whip"), and water absorption whip resistance ("Water Whip") requirements, and (2) certain PVC Assemblies produced between February 28, 2007 and October 13, 2022 did not comply with Whip and Water Whip requirements.

As indicated in the Prior 573 Reports, Exponent subsequently engaged in a review of additional historical FMVSS 106 testing records. Specifically, Exponent reviewed engineering testing conducted on a periodic basis (the "Engineering Tests") and Tensile, BFC, and Burst testing conducted on a regular basis as part of production control processes (the "Production Tests"). Exponent also analyzed constriction performance of Nylon and PVC Assemblies, including by

[1] PCA is a corporation organized under the laws of New York, with headquarters located at 2 Manhattanville Road, Suite 301, Purchase, NY 10577. PCA's Automotive Division is based in New Albany, Indiana.

conducting constriction testing on a sample of 7,692 Assemblies produced between December 29, 2020 and July 16, 2022, which resulted in constriction testing of more than 34,000 end fittings (crimps).

Based on Exponent's review of historical test results and additional constriction testing, PCA further amended its Part 573 filings on March 30, 2023 to include (1) certain PVC Assemblies produced between February 28, 2007 and June 18, 2009, and specified time periods after (totaling 330 days between August 2009 and June 2021), identified as noncompliant with FMVSS 106's Tensile requirements, (2) certain PVC Assemblies produced in specified time periods between October 12, 2013 and October 7, 2014 identified as noncompliant with FMVSS 106's Burst requirements, (3) certain PVC Assemblies produced between August 30, 2007 and October 1, 2007 identified as noncompliant with FMVSS 106's HTI requirement, and (4) certain PVC and Nylon Assemblies produced on certain dates between March 8, 2021 and July 15, 2022 identified as noncompliant with FMVSS 106's constriction requirement. *See* March 30, 2023 Amended 573 Report (the "March 573 Report"), Attachments A2 and B2.

The Second Supplemental Petition addresses the noncompliances identified in the March 573 Report. The March 573 Report, for the most part, identifies additional types of FMVSS 106 noncompliances associated with previously reported Assemblies. It also reports an additional 202,168 Assemblies as noncompliant, in addition to the 5,972,187 Assemblies previously reported, for a total of 6,174,355.

As described in the Prior PCA Petitions, Exponent conducted and supervised extensive safety testing, which demonstrated that the PVC, Nylon, and revised design[2] Nylon Assemblies

[2] As explained in the Original Petition, in June and July 2022, PCA produced Nylon Assemblies featuring a revised socket design.

are safe and any noncompliance is inconsequential to motor vehicle safety. Exponent conducted and supervised additional testing for the noncompliances identified in the March 573 Report, as well as all combinations of noncompliances present in the Assemblies at issue.

This safety testing demonstrates that the PCA's Nylon and PVC Assemblies are safe, and any noncompliance with the seven FMVSS 106 tests at issue (BFC, HTI, Whip, Water Whip, Tensile, Burst, and constriction) is inconsequential to motor vehicle safety. Specifically, Exponent's safety testing shows that the Nylon and PVC Assemblies identified as noncompliant in the March 573 Report are robust and withstand severe conditions that exceed motorcycle lifetime demands with no impact on brake performance. In addition, Exponent's testing addressing combinations of noncompliances shows that even Assemblies with all combinations of noncompliances identified are similarly robust when subjected to severe conditions that exceed motorcycle lifetime demands with no adverse impact on brake performance. Details regarding Exponent's supplemental safety testing are included in Exponent's Technical Report in Support of Proterial Cable America, Inc.'s Second Supplemental Petition for Inconsequential Noncompliance (the "Second Supplemental Technical Report"), attached hereto as the Second Supplemental Appendix and incorporated by reference.

II. Regulatory History Of FMVSS 106

As explained in PCA's Original Petition, FMVSS 106 as originally promulgated did not apply to motorcycles, but rather "to hydraulic brake hoses for use in passenger cars and multipurpose passenger vehicles." 32 Fed. Reg. 2,408, 2,411 S2 (Feb. 3, 1967); *see also id.* at 2,409 S3 (separately defining "motorcycle"). In 1973, NHTSA amended FMVSS 106 to apply to "all motor vehicles and hydraulic, air, and vacuum brake hose end fittings for use in those vehicles," including motorcycles. 38 Fed. Reg. 31,302, 31,302 pt. 571 (Nov. 13, 1973). NHTSA

did not explain its rationale for broadening the scope of FMVSS 106 to apply to two-wheeled as well as four-wheeled vehicles.

The standard was most recently substantively updated in 2004. 69 Fed. Reg. 76,298, 76,299 (Dec. 20, 2004). In that rulemaking, one commenter suggested that "hydraulic brake hoses used on recreational boat trailers, motorcycles, all-terrain vehicles (ATVs), snowmobiles, and off-road tractors/trailers and farm implements do not require the same level of severe service performance requirements" as other brake hose applications. *Id.* at 76,301. NHTSA declined to differentiate between these categories of hoses "because NHTSA does not wish to create separate categories of hydraulic brake hose (*e.g.*, 'commercial' and 'non-commercial.') To avoid brake system failures caused by brake hose ruptures, we believe there is a safety need for all motor vehicle brake hose to meet rigorous performance requirements." *Id.* However, neither the 2004 rulemaking docket—nor, so far as we can ascertain from the public record, any other rulemaking material—contains technical analysis of FMVSS 106 as applied to motorcycles, or a safety-based rationale or data indicating that all brake hoses should be subject to identical requirements, regardless of their application.

Also as explained in the Original Petition, FMVSS 106 requires any hydraulic brake hose to be "capable of meeting" thirteen separate performance requirements. However, any individual hose "need not meet further requirements after having been subjected to and having met the constriction requirement (S5.3.1) and any one of the" twelve additional performance "requirements specified in" the regulations. 49 C.F.R. § 571.106 S5.3. The purpose of FMVSS 106 testing is to demonstrate that hoses will not be at risk of a "brake system failure from pressure or vacuum loss due to hose or hose assembly rupture." *Id.* at S2. A "rupture" is defined as "any failure that results in separation of a brake hose from its end fitting or in leakage." *Id.* at S4. The

standard does not define the amount of fluid loss or other characteristics of "leakage." While NHTSA has stated that "[b]oth a small leak and a hose burst constitute 'leakage' under this definition," 39 Fed. Reg. 7,425, 7,425 (Feb. 26, 1974), additional NHTSA guidance has indicated that "[t]he determining factor" in whether or not there has been a rupture is "the pressure maintained by the system." *See* NHTSA, Chief Counsel (May 27, 1987).[3]

As explained in the Original Petition, NHTSA has made clear that manufacturers are not required to conduct these thirteen tests, but rather must meet the underlying performance requirements: "[m]anufacturers are not required to test their products in the manner specified in the relevant safety standard, or even to test the product at all, as their basis for certifying that the product complies with all relevant standards. A manufacturer may choose any valid means of evaluating its products to determine whether the vehicle or equipment will comply with the safety standards when tested by the agency according to the procedures specified in the standard and to provide a basis for its certification of compliance." NHTSA Chief Counsel Letter (Aug. 12, 2003);[4] 38 Fed. Reg. 31,302, 31,303 (Nov. 13, 1973) (noting with respect to FMVSS 106 that "the safety standards should in all cases be considered as performance levels that each vehicle or item of equipment must meet, and not as instructions for manufacturer testing"); 74 Fed. Reg. 58,562, 58,565 (Nov. 13, 2009) ("[A]s we have explained on a number of occasions, manufacturers are not required to test their products in the manner specified in the relevant safety standard, or even to test the product at all, as their basis for certifying that the product complies with all applicable standards. A manufacturer may choose any valid means of evaluating its products to determine whether the vehicle or equipment will comply with the safety standards when tested by the agency

[3] *Available at* https://www.nhtsa.gov/interpretations/nht87-199.

[4] *Available at* https://www.nhtsa.gov/interpretations/gf005279.

according to the procedures specified in the standard and to provide a basis for its certification of compliance.").

Seven FMVSS 106 tests are at issue here. For the Nylon Assemblies, at issue is the constriction test (§ 571.106, S5.3.1), in addition to the HTI, BFC, Whip, and Water Whip tests addressed in the Prior PCA Petitions.

For the PVC Assemblies, at issue are (1) the Tensile test (§ 571.106, S5.3.4); (2) the Burst test (§ 571.106, S5.3.7 and S6.2); and (3) the constriction test (§ 571.106, S5.3.1), in addition to the HTI, BFC, Whip, and Water Whip tests addressed in the Prior PCA Petitions.

The publicly available regulatory history of FMVSS 106 largely does not include information regarding NHTSA's rationale for setting performance standards at certain levels for the tests at issue in this petition or their application to motorcycles. For example, with respect to the tensile strength requirement, FMVSS 106 states: "[a] hydraulic brake hose assembly shall withstand a pull of 325 pounds without separation of the hose from its end fittings during a slow pull test, and shall withstand a pull of 370 pounds without separation of the hose from its end fittings during a fast pull test." 49 C.F.R. § 571.106, S5.3.4. The FMVSS 106 rulemaking record reflects that these requirements originated from standards promulgated by the Society of Automotive Engineers ("SAE"), but does not elaborate on the underlying basis for requiring brake hose assemblies to withstand tensile loads of the magnitude required by FMVSS 106. The regulatory history is similarly silent, for example, on the reasons for selecting 64% as the maximum level of constriction permitted in hydraulic brake hose assemblies. *Id.* § 571.106, S5.3.1. Moreover, as noted above, NHTSA has not provided a specific rationale for applying these same performance criteria to motorcycles.

In 2004, NHTSA revised FMVSS 106 to raise the burst strength requirement of brake hoses with a diameter of 1/8 inch or less from 5,000 psi to 7,000 psi. 69 Fed. Reg. 76,298, 76,301 (Dec. 20, 2004) (codified at 49 C.F.R. § 571.106, S5.3.2). In the Notice of Proposed Rulemaking, NHTSA noted that the 7,000 psi requirement was adopted from SAE standard J1401, and that it was adopting the requirement because third party testing showed hydraulic brake hoses are capable of consistently sustaining pressures of at least 7,000 psi without rupturing. 68 Fed. Reg. 26,384, 26,387 (May 15, 2003). That brake hose assemblies may be capable of meeting the 7,000 psi requirement does not mean burst strengths below 7,000 psi are unsafe.

In evaluating this petition, NHTSA must carefully consider whether the noncompliance actually poses a risk to motor vehicle safety, and that risk must be assessed based on scientific testing and other data. *See*, *e.g.*, *Nissan North America, Inc.*, 85 Fed. Reg. 39,678, 39,679 (July 1, 2020) (finding noncompliance inconsequential where there was an imperceptible difference between the noncompliant headlights with photometric intensity below standard, and compliant headlights).[5]

Legal Standard

Under the Safety Act, manufacturers who file a defect or noncompliance report are generally required to comply with the notice and remedy requirements of 49 U.S.C. §§ 30118 and 30120. However, manufacturers are exempted from these requirements when the "Secretary [of Transportation] decides a defect or noncompliance is inconsequential to motor vehicle safety." 49 U.S.C. §§ 30118(d), 30120(h). NHTSA has promulgated procedural regulations for parties

[5] To be clear, PCA is not challenging or calling into question the FMVSS 106 standard. Rather, PCA is focused on the application of the standard to the noncompliant Assemblies at issue and the need for a nuanced understanding of how the standard relates to motorcycles when considering the potential consequences of a noncompliance to motor vehicle safety.

seeking a determination of inconsequential noncompliance, 49 C.F.R. Part 556, but neither the statute nor the regulations define when a noncompliance is "inconsequential." Instead, "the agency determines whether particular noncompliance is inconsequential to motor vehicle safety based upon the specific facts before it in a particular petition." *Toyota N. America, Inc.*, 87 Fed. Reg. 4,705, 4,707 (Jan. 28, 2022).

Under longstanding agency practice, when evaluating a petition, NHTSA focuses on "the consequence to an occupant who is exposed to the consequence of that noncompliance." *FCA US LLC*, 87 Fed. Reg. 22,620, 22,621 (Apr. 15, 2022). The ultimate question is "whether an occupant who is affected by the noncompliance is likely to be exposed to a significantly greater risk than an occupant in a compliant vehicle." *Volkswagen Group of America, Inc.*, 76 Fed. Reg. 30,239, 30,240 (May 24, 2011); *General Motors Corp.*, 69 Fed. Reg. 19,897, 19,900 (Apr. 14, 2004) (same); *see also Osram Sylvania Products Incorporated*, 78 Fed Reg. 46,000, 46,000 (July 30, 2013) (finding "an occupant using the noncompliant subject light source would not be exposed to a significantly greater risk than an occupant using a similar compliant light source. Therefore the noncompliance is inconsequential to motor vehicle safety."); *Mercedes-Benz USA, LLC*, 87 Fed. Reg. 76,230, 76,233 n.4 (Dec. 13, 2022) (citing this language from *Osram*); *Dorel Juvenile Group*, 75 Fed. Reg. 507, 510 (January 5, 2010) ("The relevant issue is whether an occupant who is affected by the noncompliance is likely to be exposed to a significantly greater risk than an occupant using a compliant vehicle or equipment."); *Cosco, Inc.*, 64 Fed. Reg. 29,408, 29,409 (June 1, 1999) (denying a petition because it "failed to provide any information which would support a determination that these noncompliances do not create a significant safety risk").

Under applicable regulations, "[a]ny interested person may appeal the grant or denial of a petition by submitting written data, views, or arguments to the Administrator." 49 C.F.R. § 556.7.

Final determinations are subject to judicial review under the Administrative Procedure Act and will be set aside if found to be "arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law." 5 U.S.C. § 706(2)(A).

Discussion

Consistent with the Prior PCA Petitions, PCA seeks a determination of inconsequentiality on the ground that the FMVSS noncompliances identified in PCA's March 573 Report (Tensile, Burst, HTI, and constriction) do not affect the functionality of PCA's Nylon and PVC Assemblies in any manner that would result in an incremental risk to a motorcycle rider. The following sections summarize key aspects of the safety testing and analyses outlined in Exponent's Second Supplemental Technical Report. Specifically, Section I addresses constriction noncompliances identified in PVC and Nylon Assemblies; Section II addresses noncompliances other than constriction identified in Nylon Assemblies; Section III addresses noncompliances other than constriction identified in PVC Assemblies; and Section IV addresses overlapping noncompliances in both Nylon and PVC Assemblies.

I. Any Constriction Noncompliances Of Nylon And PVC Assemblies Is Inconsequential To Motor Vehicle Safety.

At PCA's request, Exponent conducted or supervised safety testing designed to evaluate the potential safety effects of constriction noncompliances identified in PCA's March 573 Report. Based on the results of these safety tests, Exponent concluded that the constriction noncompliance condition identified in certain Nylon and PVC Assemblies, including when considered in connection with any identified overlapping noncompliances present in the Assemblies, "does not adversely affect motorcycle brake system performance, does not deteriorate with use, and presents no incremental risk to motor vehicle safety." Second Supplemental Appendix at 72. Key findings from Exponent's safety testing are summarized below.

A. Exponent's Supplemental Safety Testing Demonstrates That Any Constriction Noncompliance Is Inconsequential To Motor Vehicle Safety.

1. Constriction Testing Of Assemblies Demonstrates That Any Constriction Noncompliance Is Inconsequential To Motor Vehicle Safety.

To assess the potential safety effects of the constriction noncompliance condition in certain Nylon and PVC Assemblies identified in PCA's March 573 Report, Exponent developed a comprehensive test program to evaluate brake performance over (and indeed, beyond) the service life of Assemblies with constriction above FMVSS 106 requirements (the "Constricted Assemblies"), as well as assemblies that meet FMVSS 106 requirements (the "Non-Constricted Assemblies"). As discussed below, Exponent's testing program demonstrates that (1) constriction in the assemblies at issue does not change over the service life of a motorcycle, and (2) constriction levels observed in the noncompliant Assemblies—and even constrictions levels significantly greater than those observed—do not adversely affect brake system performance over (and indeed beyond) the lifetime of a motorcycle. *Id.* at 43, 72.[6]

To implement its test program, Exponent first conducted computed tomography ("CT") scanning on 53 Nylon Assemblies (39 Constricted Assemblies and 14 Non-Constricted Assemblies) to determine each Assembly's constriction level, minimum inner diameter, and open cross-sectional area. From this population, Exponent sampled 25 Assemblies representative of the range of inner diameters observed in the 54 CT scanned Assemblies. These 25 Assemblies consisted of (i) 20 Constricted Assemblies with constriction levels between 59.2% and 63.9% of

[6] While Exponent's constriction safety test program involved a series of tests performed on Nylon Assemblies, the results apply equally to PVC Assemblies identified as noncompliant with FMVSS 106 constriction requirements. *Id.* at 5, 8. As Exponent explains in its Second Supplemental Technical Report, the constriction noncompliance observed in Nylon and PVC Assemblies is located in the nipple, and the same nipple design is used in both types of Assemblies. *Id*. at 20-22, 43. Because the Nylon and PVC Assemblies share the same nipple design, the brake hoses and end fittings on both assembly types would experience similar forces and stresses during motorcycle operation. *Id*.

the brake hose nominal inner diameter ("NID") and (ii) five Non-Constricted Assemblies with constriction levels between 64.1% and 67% of NID. Exponent then subjected the 25 samples to the following sequence of 11 tests designed to evaluate changes to constriction over (and beyond) the lifetime of a motorcycle and the potential effects of certain levels of constriction on brake system performance. *Id.* at 22–24.

1. Exponent performed constriction testing on each crimp of each of the 25 Assemblies in accordance with FMVSS 106 S6.12.1 and S6.12.3. *Id.* at 24.

2. Exponent CT scanned each of the 25 Assemblies to determine the level of constriction before conditioning by measuring the nipple inner diameter and open cross-sectional area of each sample. *Id.*

3. Exponent subjected each of the 25 Assemblies to a test designed to evaluate the dynamic response time ("DRT") of each sample prior to conditioning (the "Brake Performance Test"). DRT refers to the response time lag between pressure at the master cylinder and equivalent pressure at the caliper. A higher DRT indicates slower brake system response to actuation of the brake controls. To conduct the Brake Performance Test, Exponent installed the Assemblies on a motorcycle equipped with sensors to measure brake lever positions and brake system pressure and subjected them to a series of brake applications performed by three experienced motorcycle riders. For each of the Assemblies, the three riders performed 20 brake applications (for a total of 60 applications per Assembly) representing a range of braking events from ordinary to emergency stops.[7] This third test allowed Exponent to assess DRTs for Assemblies prior to any conditioning.

[7] The four types of brake applications utilized were: (1) 100% actuation with a slow rate of application; (2) 25% to 75% actuation with a medium rate of application; (3) 50% actuation with a slow rate of application; and (4) 100% actuation with a fast rate of application. *Id*. at 31-32.

Exponent observed that there was no statistically significant difference between DRTs in the Constricted Assemblies and Non-Constricted Assemblies. *Id.* at 28–41.

4. Exponent conditioned the 25 Assemblies according to the FMVSS 106 S5.3.9 BFC test and observed that each of the 25 Assemblies passed the BFC conditioning without any leakage or damage. *Id.* at 26.

5. Exponent performed a second round of CT scans on each of the 25 Assemblies to identify any change in constriction resulting from the Brake Performance Test or BFC conditioning. Exponent observed that slight increases and decreases in measured constriction were within the measuring error[8] of the scans and concluded that there was no quantifiable change in constriction. *Id.* at 41–43.

6. Exponent subjected the 25 Assemblies to accelerated durability suspension stroke testing, as described in Exponent's Initial Technical Report, which replicates forces that are considerably more severe than those expected over the lifetime of a motorcycle.[9] Original Petition, Appendix at 53–58. As part of this test, each of the Assemblies was pressurized with water to 3.5 MPa and exposed to 300,000 cycles of suspension stroke durability (from full jounce to full rebound at 2.5 Hz). Exponent did not observe leakage from, or damage to, any of the Assemblies as part of the accelerated durability suspension stroke test. *Id.* at 25–26.

7. Exponent conducted a second round of the Brake Performance Test to evaluate the potential effects of BFC conditioning and the accelerated durability suspension stroke testing on DRTs for the 25 Assemblies. Again, Exponent found that there was no statistically significant

[8] Exponent observed that the diameter measurement error of the CT scans was approximately 1 voxel, or 38 microns. *Id.* at 41, note 84.

[9] As noted in PCA's Original Petition, based on internal Harley testing, the test Exponent utilized "subject[ed] brake hose assemblies to significantly more severe conditions than anticipated in Harley motorcycle use by even the most active riders." Original Petition at 19.

difference between DRTs in the Constricted Assemblies and Non-Constricted Assemblies. In addition, Exponent did not observe a measurable difference in DRTs attributable to BFC conditioning or accelerated durability suspension stroke testing. *Id.* at 28–41.

8. Element Materials Technology ("Element") subjected the 25 Assemblies to accelerated pressure durability testing, as described in Exponent's Supplemental Technical Report, which replicates pressure conditions that are considerably more severe than those expected over the lifetime of a motorcycle. Supplemental Petition, Supplemental Appendix at 22–26. This stage of testing consisted of subjecting the Assemblies filled with brake fluid to 300,000 room temperature pressure cycles from 0 to 500 psi at 0.56 Hz. Based on data from Harley, Exponent determined that a pressure range of 0 to 500 psi represents non-emergency brake stops. *Id.* at 25–26. Element reported that all of the 25 Assemblies completed accelerated pressure durability testing without exhibiting any "leaks, moisture, droplets, drips, or spray." *Id.* at 25–27.

9. Exponent conducted a third round of CT scanning to assess any changes to constriction resulting from accelerated durability suspension stroke testing, the Brake Performance Test, or accelerated pressure durability testing. Again, Exponent observed that slight changes in measured constriction were within the measuring error of the scans and concluded that there was no quantifiable change in constriction. *Id.* at 41–43.

10. Exponent subjected the 25 Assemblies to a third round of the Brake Performance Test to evaluate DRTs following accelerated pressure durability testing. As with the first and second rounds of the Brake Performance Test, Exponent found there was no statistically significant difference between DRTs in the Constricted Assemblies and Non-Constricted Assemblies. Moreover, Exponent did not identify any measurable difference between the DRTs of unconditioned Assemblies and Assemblies subjected to durability testing. *Id.* at 28–41.

11. Exponent conducted pressure sensitivity and Burst testing to assess the end of life condition and structural integrity of the 25 Assemblies. This testing consisted of subjecting Assemblies to a series of two minute pressure holds at 500 psi increments from 500 to 5,000 psi. If leakage was observed, the pressure hold was increased by five minutes from the point of observed leakage. Exponent observed that none of the Assemblies leaked during the pressure hold periods up to, and including, 2,500 psi. Eleven Assemblies completed all of the pressure hold periods without leakage. For the remaining Assemblies, Exponent observed the following: (i) 6 Assemblies leaked during the 5,000 psi hold (with no leak volume captured); (ii) 4 Assemblies leaked during the 4,000 psi hold (with leak volumes from 0.08 to 0.29 milliliters over five minutes); (iii) 2 Assemblies leaked at the 3,500 psi hold (with leak volumes from 0.01 to 1.03 milliliters over five minutes); and (iv) 2 Assemblies leaked at the 3,000 psi hold (with leak volumes from 0.01 to 0.16 milliliters over five minutes). None of the Assemblies experienced a drop in pressure, and each of the Assemblies exceeded the FMVSS 106 S6.2 Burst requirement, with an average burst strength of 12,360 psi. *Id.* at 27–28.

Based on the extensive testing described above, Exponent concluded that constriction at levels observed in the Nylon and PVC Assemblies PCA identified as noncompliant does not adversely affect brake system performance. Specifically, Exponent demonstrated that (i) DRTs for Assemblies with the highest levels of constriction fall within the experimental variations observed across the Constricted Assemblies and Non-Constricted Assemblies; (ii) DRTs do not change over the lifetime of a motorcycle based on durability testing; (iii) the initial constriction levels of Assemblies observed in testing do not affect end-of-life DRTs; and (iv) the PCA Assemblies are not expected to experience any change in constriction over the lifetime of a motorcycle. *Id.* at 72.

2. Additional Constriction Considerations Further Support The Assemblies' Safety.

Exponent observed constriction as low as 38.8% of the hose NID in certain PVC Assemblies tested from PCA inventory. These constriction levels were limited to a single PVC part number (000S220Y4). Other PVC part numbers largely exceeded 55% of hose NID, with a single Assembly measuring approximately 51% of hose NID. Nylon Assemblies tested exceeded 59% of NID, except for one Assembly which measured approximately 57% of hose NID. *Id.* at 44–45.

As a result, Exponent also evaluated the potential effects of Constriction below 59.2% of hose NID, which were outliers in Exponent's testing. Specifically, Exponent evaluated the effect, if any, of constriction levels as low as 38.8% of the hose inner diameter observed in certain PVC Assemblies. To conduct its evaluation, Exponent created an adaptor with an inner diameter of 1.24 millimeters (equal to 38.8% of the hose inner diameter). Because the orifice within the adapter was both longer and had a lower cross-sectional area than the Constriction in the PVC Assemblies at issue, tests performed using the adapter represent a very conservative evaluation of the effect of constriction on brake system performance. *Id.*

Exponent measured DRTs during tests performed without the adapter, as well as with the adaptor installed at three locations—the caliper, the master cylinder, and both the caliper and master cylinder at the same time. While Exponent observed marginal increases in DRTs when using the adaptor, it concluded that the increases did not affect brake system performance. *Id.* at 46–47.

In addition to the extensive testing described above, based on information from a brake system supplier, Exponent explained that other portions of the brake system introduce considerably higher levels of constriction than levels observed in even the most constricted noncompliant Nylon

and PVC Assemblies. Based on information from a brake system supplier, the diameter of the orifice in the supplier's ABS modulator is 0.4 millimeters and the open area is approximately 0.126 mm^2. By comparison, the minimum open area observed in the noncompliant PCA Assemblies is approximately 2.3 mm^2 (roughly 18 times larger). The flow of fluid within the brake system will be primarily controlled by the orifice with the smallest open area in the system. Therefore, with respect to the noncompliant Assemblies, the rate of the flow of fluid will be controlled by the ABS orifice, and not any constricted end fitting. Accordingly, any constriction noncompliance in that end fitting is inconsequential to safety. *Id.* at 45–47.

3. Agency Decisions Support A Finding Of Inconsequentiality For The Nylon Assemblies.

NHTSA recently denied a petition for inconsequentiality involving constricted brake hose assemblies for use in four-wheeled vehicles. *FCA US LLC*, 87 Fed. Reg. 61,432 (Oct. 11, 2022). In that case, FCA had conducted certain testing in an effort to demonstrate that the constriction at issue was inconsequential to motor vehicle safety. However, the FCA testing does not appear to have included any accelerated aging component.[10] NHTSA's principal basis for denying the petition was that "any potential safety consequence resulting from FCA US's noncompliance may not present itself initially, but can emerge over the service life of the product." *Id.* at 61,434. That concern is not present here: Exponent's safety testing subjected the Assemblies to conditions far beyond what they would experience over a lifetime, and demonstrated that they nevertheless would continue to perform the same as non-constricted Assemblies.

NHTSA also observed that the FCA constriction at issue, which was 53% of the nominal inside diameter, "represents a significant decrease from FMVSS No. 106's 64% minimum safety

[10] No such aging is described in the petition; however, the complete exhibits with the test results do not appear in the docket on regulations.gov.

requirement." *Id.* at 61,434. Here, however, the inner diameter of a vast majority of hoses subject to constriction testing by Exponent were far less constricted than the hoses in FCA. All but one of the Nylon Assemblies tested by Exponent had inner diameters of approximately 58.8% of the nominal inner diameter or higher, and the remaining Nylon Assembly had an inner diameter of approximately 56.9%. These constriction levels are far closer to FMVSS 106's 64% minimum safety requirement than the constriction found in FCA brake hose assemblies. Similarly, for PVC Assemblies tested by Exponent, all but two part numbers tested had inner diameters of approximately 58.8% of the nominal inner diameter or higher, which is also less constricted than the hoses at issue in FCA. Two outlier part numbers generally had inner diameters between 50.6% and 58.1% of the hose nominal inner diameter, with one Assembly having an inner diameter of approximately 38.8% of the nominal inner diameter. These part numbers are outliers and Exponent's technical analysis demonstrates that the safety of PCA's Assemblies is not adversely affected even with constriction at levels of 38.8% of NID. *See* Second Supplemental Appendix at 44–47.

Additionally, NHTSA commented that "over-crimping a brake hose, which FCA stated caused the noncompliance, is a common cause of brake hose failure in motor vehicles, and it can lead to cyclical fatigue that causes a shorter lifespan than a correctly crimped brake hose." *FCA US LLC*, 87 Fed. Reg. at 61,434. Exponent has stated that the constricted condition does not affect the performance and structural integrity of the Assemblies, and that it did not observe damage to the Teflon inner tube and stainless-steel braid due to the excess pressure induced by the crimping process. As described above, Exponent's testing shows that constriction does not impact the performance of the Assembly, and that constriction does not change over the motorcycle lifetime. Second Supplemental Appendix at 72.

In sum, the concerns that led NHTSA to deny the FCA petition are not present here, and the safety testing conducted by Exponent demonstrates that at no point in the Assemblies' life would constriction pose any safety risk. *Id*.

Likewise, we understand that NHTSA may have denied a 2001 petition by Federal Mogul relating to constricted brake hoses.[11] Like the FCA petition, Federal Mogul's petition described certain testing, but that testing does not appear to have included any accelerated aging component. Moreover, the constriction present there appears to have been as low as 51.2%, again greater than the constriction for virtually all the Assemblies at issue here.

II. Any Noncompliance Of Nylon Assemblies Is Inconsequential To Motor Vehicle Safety.

Exponent also conducted or supervised safety testing designed to further evaluate the potential safety effects of HTI noncompliances in certain Nylon Assemblies identified in PCA's March 573 Report. Based on the results of these safety tests, Exponent further concluded that the HTI noncompliance identified in Nylon Assemblies with respect to HTI requirements "does not reflect the real-world application pressures and hold periods of real-world motorcycle use, does not adversely affect motorcycle brake system performance, and presents no incremental risk to motor vehicle safety." *Id.* at 72.

A. Exponent's Supplemental Safety Testing Further Demonstrates That Any High Temperature Impulse Noncompliance Is Inconsequential To Motor Vehicle Safety.

In its October 573 Report, PCA identified Nylon Assemblies as noncompliant with FMVSS 106's HTI requirements. Specifically, the HTI failures identified in Nylon Assemblies occurred during the 4,000 psi two-minute hold portion of the HTI test. Exponent conducted safety testing

[11] The petition decision does not appear to be publicly available online, but the petition itself is available here: https://www.regulations.gov/document/NHTSA-2001-9956-0001

and concluded that the HTI noncompliances in Nylon Assemblies are inconsequential to motor vehicle safety. Original Petition, Appendix at 69–71; Supplemental Petition, Supplemental Appendix at 53–54.

To supplement its prior testing, Exponent conducted additional safety testing on Nylon Assemblies. As part of this additional testing, Exponent subjected 15 Nylon Assemblies to the 4,000 psi two-minute hold component of HTI testing and measured any leak quantities observed. Exponent selected the Nylon Assembly with the highest observed leak quantity (amounting to 4.4 milliliters), installed it on the front wheel brake system of a Harley motorcycle, and subjected it to a brake system test consisting of repeated pressure cycling by full application of the brake lever for more than 100,000 brake applications. Brake system pressure over the 100,000 brake applications ranged from approximately 650 to 1,080 psi. Exponent did not observe any leaks from, or wetness on, the hose or end fittings, nor did it observe any quantifiable loss of brake fluid from the master cylinder's fluid reservoir. Second Supplemental Appendix at 49.

Based on this additional testing, as well as testing described in Exponent's and Harley's prior technical reports,[12] Exponent determined that fluid loss observed during HTI testing of Nylon Assemblies is not replicated when Assemblies are exposed to brake pressures and hold periods experienced in actual motorcycle operation. Exponent concluded that these findings further support its conclusion that the HTI noncompliance condition in Nylon Assemblies is inconsequential to motor vehicle safety. *Id* at 50–51.

[12] Original Petition, Appendix at 69–71; Supplemental Petition, Supplemental Appendix at 52–54; Technical Report in Support of Harley-Davidson Motor Company's Petition for Determination of Inconsequential Noncompliance at 1; Supplemental Technical Report in Support of Harley-Davidson Motor Company's Petition for Determination of Inconsequential Noncompliance at 3.

III. Any Noncompliance Of PVC Assemblies Is Inconsequential To Motor Vehicle Safety.

Exponent also conducted or supervised safety testing on PVC Assemblies designed to evaluate the potential safety effects of noncompliances other than constriction in certain PVC Assemblies identified in PCA's March 573 Report. Based on the results of these safety tests, Exponent concluded that noncompliances identified in PVC Assemblies with respect to Tensile, Burst, HTI, and constriction requirements, as well as any overlapping noncompliances present in PVC Assemblies, "do not present an incremental risk to motor vehicle safety over the useful lifetime of the motorcycles." Second Supplemental Appendix at 72–74. Key findings from each category of Exponent's safety testing are summarized below.

A. Exponent's Supplemental Safety Testing Demonstrates That Any Noncompliance Is Inconsequential To Motor Vehicle Safety.

1. *Tensile Testing Demonstrates That Any Tensile Noncompliance Is Inconsequential To Motor Vehicle Safety.*

Exponent conducted safety testing designed to assess (1) the tensile forces experienced by PVC Assemblies during actual motorcycle operation and (2) the potential for PVC Assemblies to experience a reduction in tensile strength over the service life of a motorcycle. *Id.* at 72. As discussed below, based on the results of this testing, Exponent concluded that the Tensile test noncompliance condition identified in certain PVC Assemblies is inconsequential to motorcycle safety. *Id*.

To evaluate the tensile forces experienced during motorcycle operation, Exponent subjected a pressurized PVC Assembly to 3,000 cycles of maximum suspension stroke travel (from full jounce to full rebound). Using a load cell attached to one end of the PVC Assembly, Exponent measured tensile forces experienced during the 3,000 cycles and observed a maximum applied

tensile force of approximately 14.3 pounds.[13] *Id.* at 54. Exponent contrasted these findings with the tensile forces that resulted in noncompliant PVC Assemblies identified in PCA's March 573 Report—which ranged from 113 to 324.9 pounds for slow Tensile, 330.9 to 351.8 pounds for fast Tensile, and 369.2 pounds for fast water Tensile—and concluded that despite failing to meet FMVSS 106 requirements, the noncompliant PVC Assemblies provide tensile strengths that far exceed tensile forces experienced during motorcycle operation. *Id.* at 52.

Exponent also conducted testing to evaluate whether the tensile strength of PVC Assemblies changes over the service life of a motorcycle. Exponent performed slow Tensile testing on 86 PVC Assemblies with similar manufacturing dates to the PVC Assemblies identified as noncompliant with FMVSS 106 Tensile requirements in PCA's March 573 Report. Each of the 86 Assemblies had previously been subjected to (1) suspension stroke durability testing[14] (with and without pre-conditioning by water absorption) and (2) subsequent leak and burst strength testing resulting in structural failure. *Id.* at 55.

Exponent observed that 48 of the Assemblies failed at pre-existing burst locations (*i.e.*, locations where structural failure had occurred during prior burst testing) and 38 of the Assemblies failed at locations away from the pre-existing burst damage. Exponent excluded from its analysis the Assemblies that failed at a pre-existing burst location on the basis that those Assemblies are not comparable to FMVSS 106 requirements, which require testing of a new brake hose and are not designed to assess the tensile strength of Assemblies with pre-existing structural damage from

[13] Exponent measured tensile forces at three maximum extension levels—(1) the "as designed" maximum extension level for the Harley motorcycle used, (2) extension exceeding the "as designed" maximum level by 1.67 millimeters, and (3) extension exceeding the "as designed" maximum level by 7.57 millimeters. Exponent observed tensile forces ranging from approximately 3.7 pounds (at the "as designed" maximum level) to approximately 14.3 pounds (at 7.57 millimeters beyond the "as designed" maximum level).

[14] *See* Original Petition, Appendix at 53–58 (describing the suspension stroke durability test).

burst testing. *Id.* at 56; *cf. Coupled Products, Inc.*, 70 Fed. Reg. 10,162, 10,163 (2005) ("The purpose of the tensile strength test is to test only the crimped area in a brake hose."). With respect to the 38 Assemblies that failed away from a pre-existing burst location, Exponent observed tensile strengths of 361 to 583 pounds, with the exception of one Assembly that failed at 324.6 pounds, or just under the FMVSS 106 requirement. Exponent did not observe any effects of water absorption on the tensile strengths of the Assemblies tested. *Id.* at 57. Based on its evaluation, Exponent determined that the tensile strength of PVC Assemblies does not decrease over the service life of a motorcycle.

Exponent also compared tensile strengths observed in the 38 post-durability PVC Assemblies discussed above to tensile strengths reported in historical PCA production testing of new PCA Assemblies that passed the Tensile test requirement. Exponent observed that the tensile strengths of post-durability PVC Assemblies are comparable to the tensile strengths observed in new PVC Assemblies. Specifically, the post-durability PVC Assemblies demonstrated an average tensile strength of 450 pounds (with a range from 324 to 583 pounds) and the new PVC Assemblies demonstrated an average tensile strength of 421 pounds (with a range from 325 to 632 pounds). *Id.* at 58.

Ultimately, Exponent concluded that the noncompliance condition present in certain PVC Assemblies is inconsequential to motorcycle safety because the PVC Assemblies provide considerably greater tensile strength than the forces present in motorcycle use and the PVC Assemblies are expected to retain their tensile strength over the service life of a motorcycle. *Id.* at 58–59.

2. *Burst Testing Demonstrates That Any Burst Test Noncompliance Is Inconsequential To Motor Vehicle Safety.*

Based on safety testing performed in connection with the Prior PCA Petitions, and data from Harley regarding actual operation brake pressure and duration, Exponent concluded that the Burst test noncompliances identified in PCA's March 573 Report are inconsequential to motor vehicle safety. *Id.* at 62. Specifically, Exponent assessed (1) whether the PVC Assemblies PCA identified as noncompliant failed at pressure levels present in actual motorcycle operation and (2) whether the burst strengths of PVC Assemblies are expected to decrease over the service life of a motorcycle. *Id.* at 61.

Testing conducted by Harley demonstrates that "most breaking pressure levels are maintained or held for relatively short periods of time," and there is a "clear trend that the braking pressures which are held for longer periods of time are at the lower pressure levels." Technical Report in Support of Harley-Davidson Motor Company's Petition for Determination of Inconsequential Noncompliance at 4.[15] The maximum breaking pressure Harley observed during this testing was 2,200 psi, which was maintained for less than 0.25 seconds. *Id.* By contrast, each of the three Burst test failures identified in PCA's March 2023 Report occurred under considerably more severe conditions than the maximum actual operation breaking pressure observed by Harley. One failure occurred during the 4,000 psi, 2-minute hold portion of the test, and the other two failures occurred at 5,666 psi and 6,703 psi respectively. Second Supplemental Appendix at 60. Moreover, based on the results of accelerated durability safety testing performed in connection

[15] Harley's testing showed that a majority (57%) of breaking events registered pressures of less than 1,000 psi for a duration of less than one second, and that a large majority (78%) registered pressures of less than 1,000 psi for a duration of less than 5 seconds. *Id.*

with its Supplemental Technical Report, Exponent determined that the PVC Assemblies maintain their burst strength over the service life of a motorcycle. *Id.* at 61.

Based on its findings that (1) the structural integrity of the noncompliant PVC Assemblies is not compromised at pressure levels experienced in motorcycle operation and (2) the burst strength of the PVC Assemblies is not expected to reduce over lifetime usage, Exponent concluded that the burst test noncompliances PCA identified are inconsequential to motorcycle safety. *Id*. at 62.

3. *HTI Testing Demonstrates That Any HTI Noncompliance Is Inconsequential To Motor Vehicle Safety.*

In its March 573 Report, PCA identified a limited number of PVC Assemblies as noncompliant with FMVSS 106 HTI test requirements based on three test failures in 2007. The three PVC Assemblies in the 2007 tests at issue failed to pass the 4,000 psi, 2-minute hold portion of the HTI test, though each exceeded HTI burst strength requirements registering burst strengths of 7,653 psi, 8,108 psi, and 9,017 psi respectively. Based on the data from Harley discussed in Section III.A.2 above, Exponent determined that, despite failing to meet HTI test requirements, the performance of each of the three PVC Assemblies far exceeded the brake pressure and duration levels experienced during motorcycle operation. Second Supplemental Appendix at 63.

B. Agency Decisions Support A Finding Of Inconsequentiality For The Past Production PVC Assemblies.

In circumstances similar to those presented in this case, NHTSA has granted inconsequentiality petitions based on safety testing demonstrating that a brake hose failure would not occur. *See, e.g., Ford Motor Co.*, 45 Fed. Reg. 29,160, 29,161 (May 1, 1980) (corrosion test noncompliance was inconsequential because the hose did not burst until pressure reached a level much higher than that required by the standard: "No safety problem would exist unless the end fitting were corroded to the point where they could not sustain the 5000 psi pressure required by

Standard No. 106; Ford's own tests showed a bursting strength approaching 11,500 PSI."); *Philatron Int'l*, 57 Fed. Reg. 26,687, 26,687-88 (June 15, 1992) (oil immersion testing noncompliances in air brake hose assemblies were inconsequential on the basis that the tubing burst only at 1,200 and 1,050 psi, above the relevant requirement). In *Philatron*, NHTSA granted the petition, in part, because the test conditions would not occur in actual motorcycle operation. *Id.* at 26,688 ("NHTSA agrees with Philatron's assertion that excessive oil build-up will not occur and that there will be no saturation of the hoses with hot oil.").[16] Similarly, Exponent's safety testing here shows that the forces used in the Tensile test are orders of magnitude higher than forces experienced in real world motorcycle operation. Second Supplemental Technical Report at 53–54.

NHTSA more recently granted another petition on appeal involving failed Tensile testing, on the basis that the hoses (1) passed pressure cycle testing designed to simulate heavy real-world use, and (2) demonstrated a burst strength of over 10,000 psi. *Coupled Products, Inc.,* 70 Fed. Reg. 32,397, 32,397 (June 2, 2005). The Assemblies here remained intact and did not experience pressure loss when subjected to similarly rigorous testing and burst near or above 10,000 psi. *See* Supplemental Petition, Supplemental Appendix at 21, 25–26, 29–31.

In another context, NHTSA granted a petition for inconsequentiality in a case involving headlights not meeting the required photometric intensity, where it was shown through data that the human eye could not tell the difference between a compliant headlight and the noncompliant

[16] *See also Navistar International and Mack Trucks, Inc.*, 56 Fed. Reg. 51,440 (Oct. 11, 1991) (granting petition for inconsequentiality when air brake hoses were used in a pressure rather than vacuum situation, and adhesion strength noncompliance did not affect safety in a pressure situation); *Toyota Motor North America, Inc.*, 87 Fed. Reg. 3,382, 3,384 (Jan. 21, 2022) (granting petition for inconsequentiality when loop fasteners noncompliant with burn rate requirements "constitute a small percentage of the fabric area and are located where they are not likely to encounter an ignition source.").

headlight at issue. *Nissan North America, Inc.*, 85 Fed. Reg. 39,678, 39,679 (July 1, 2020). Similarly here, the data shows that even though certain Assemblies do not meet Tensile requirements, those requirements are much higher than what the Assemblies here are exposed to under even extreme usage conditions. As in *Nissan*, a motorcycle rider will not experience any difference between an Assembly compliant with Tensile requirements, and the non-compliant Assemblies at issue here.

Additionally, Harley's field data analysis did not identify any documented crashes or injuries attributable to the potential FMVSS No. 106 noncompliances identified by PCA. Harley-Davidson Supplemental Petition for Determination of Inconsequential Noncompliance, at 4. NHTSA has previously considered such lack of incidents to support a grant of a petition for inconsequential noncompliance. *See Kolcraft Enterprises, Inc.,* 63 Fed. Reg. 24,585, 24586 (May 4, 1998) ("Although empirical results are not determinative, the absence of any reports of fires originating in these child restraints supports the agency's decision that the noncompliance does not have a consequential effect on safety."); *Philatron,* 57 Fed. Reg. at 26688 ("There have been no reports that these hoses were damaged or failed due to heat in the work environment. NHTSA representatives telephone the vendors of Philatron hoses that filed comments in support of the petition, and others as well, and verified representations that the hoses had proven satisfactory in use."); *cf.* 94 Fed. Reg. 27,261 (Nov. 3, 1994) (in the context of a terminating a rulemaking, NHTSA stated "A single complaint in a database as encompassing as the Hotline complaint file does not indicate the possible existence of a significant safety problem. . . . NHTSA believes that if there were a safety problem with brake fluid and component compatibility, evidence of the problem would have appeared in the ten years since ATAC's petition was received by NHTSA.").

IV. Exponent's Supplemental Safety Testing Demonstrates That Any Combination Of Noncompliances Is Inconsequential To Motor Vehicle Safety.

Exponent's safety testing also addressed combinations of noncompliances present in certain Nylon and PVC Assemblies. As described in Section 8 of the Second Supplemental Appendix, certain Assemblies contain more than one noncompliance. Specifically, certain Nylon Assemblies have noncompliances with Whip and Water Whip, HTI, BFC requirements, as well as constriction requirements. Certain PVC Assemblies have both (1) noncompliances with Whip and Water Whip, and constriction requirements, and (2) various combinations of noncompliances with Whip and Water Whip, Burst, Tensile, and HTI requirements.

Exponent's constriction safety testing addressed overlapping noncompliances of constriction with Whip and Water Whip, HTI, and/or BFC in Nylon and PVC Assemblies. Second Supplemental Appendix at 22–41, 70. Exponent subjected constricted Nylon Assemblies (which were also included within the scope of PCA's Whip, Water Whip, HTI, and BFC noncompliance determination) to safety testing that combined BFC conditioning, accelerated durability suspension stroke testing, and accelerated pressure durability testing. These hoses still exceeded FMVSS 106's burst requirement and did not exhibit leakage, rupture, or failure at 2,500 psi 2-minute hold periods. *Id.* at 27. Additionally, prior testing described in the Supplemental Appendix demonstrated that water absorption does not affect the performance of the PVC Assemblies when subjected to suspension stroke durability testing. Supplemental Appendix at 17. Together, these tests demonstrate that overlapping noncompliances of constriction, Whip, Water Whip, HTI, and BFC is inconsequential to motor vehicle safety. Second Supplemental Appendix at 70–71.

Exponent addressed overlapping noncompliances of Whip and Water Whip, HTI, and BFC in Nylon Assemblies through safety testing that combined (1) HTI followed by stroke durability, leak, and burst, *see* Original Petition, Appendix at 40, (2) HTI followed by pressure durability,

leak and burst testing, *see* Supplemental Petition, Supplemental Appendix at 22, and (3) water absorption followed by stroke durability, leak, and burst testing, *see* Supplemental Appendix at 30–32. These tests were conducted on Nylon Assemblies either of similar manufacture or design to the Nylon Assemblies identified as noncompliant with Whip, Water Whip, HTI, and BFC, or on Nylon Assemblies produced during noncompliant time periods; therefore, the Nylon Assemblies used for this safety testing were representative of Assemblies identified to have multiple noncompliances. The Nylon Assemblies subject to the safety test maintained structural integrity and passed burst strength requirements. Second Supplemental Appendix at 69–70. The results from these tests show that the combination of Whip, Water Whip, HTI, and BFC noncompliances are inconsequential to motor vehicle safety. Additional safety testing of HTI, water absorption, stroke durability, leak, burst and tensile strength is also currently being conducted.

For PVC Assemblies, overlapping noncompliances of Whip and Water Whip, Tensile and water tensile strength ("Water Tensile"), and Burst requirements were addressed by safety testing that combined (1) stroke durability, leak and Burst, and Tensile and (2) water absorption, stroke durability, leak and Burst, and Tensile. *See* Second Supplemental Appendix at 67. These tests were conducted on PVC Assemblies of similar manufacture or design to the PVC Assemblies identified noncompliant with Whip, Water Whip, Tensile and Burst requirements, or on PVC Assemblies produced during noncompliant time periods. Specifically, the PVC Assemblies safety tested included PVC Assemblies from 2008, within a period of noncompliance for Whip, Water Whip, Tensile, and Water Tensile, and from 2013, near a period of noncompliance for Whip, Water Whip, and Burst. *See* Supplemental Petition, Supplemental Appendix at 41. These PVC Assemblies showed burst and tensile strengths exceeding FMVSS 106 requirements, even at end-

of-life.[17] The Assemblies showed tensile strengths exceeding tensile forces expected during motorcycle operation and maintained end-of-life burst and tensile strength even after pre-conditioning by water exposure. Second Supplemental Appendix at 67–68. The results of these tests, demonstrating no safety issue over the life of the motorcycle, are further supported by the survey of PVC Assemblies in the field showing that the Assemblies do not experience fatigue damage or leakage when subject to motorcycle use conditions, *see* Supplemental Petition, Supplemental Appendix at 34, and Exponent's evaluation of tensile forces encountered during motorcycle operation, *see* Second Supplemental Appendix at 53.

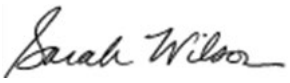
Overlapping noncompliances of Whip and Water Whip, Tensile and Water Tensile strength, and HTI in PVC Assemblies are being addressed by the ongoing testing, consisting of HTI followed by water absorption, stroke durability, leak, Burst and Tensile strength. Second Supplemental Appendix at 67. Additionally, prior safety testing demonstrating that the PVC Assembly design is not sensitive to the temperature exposure in HTI and BFC testing, as well as a survey of PVC Assemblies in a field showing no fatigue damage, *see* Supplemental Petition, Supplemental Appendix at 34, demonstrate that these overlapping compliances are inconsequential to motor vehicle safety.

Conclusion

For the foregoing reasons, the FMVSS 106 noncompliances of certain Nylon or PVC Assemblies subject to Recall 22E-061 is inconsequential to motor vehicle safety. PCA therefore respectfully requests that NHTSA grant its Original Petition, First Supplemental Petition, and Second Supplemental Petition.

[17] One sample failed at 324.6 lbf, 0.4 lbf below the requirement of 325 lbf. Second Supplemental Appendix at 10–11.

Respectfully submitted,



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