UD TRUCKS

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10V-006
(11 pages) Supplemental

May 24, 2010

Via email

Ms. Kelly Schuler
National Highway Traffic Safety Administration
ODI/Recall Management Division - NVS-215
1200 New Jersey Avenue S.E.
Washington, DC 20590

Re: Nissan Diesel America, Inc.

Dear Ms. Schuler:

Enclosed are two (2) Nissan Diesel America, Inc. Supplemental Defect Noncompliance Information Reports pursuant to 49 C.F.R. Part 573.6 for the following recalls.

Safety Recall 10V-005 Brake Actuation and Release Timing
Safety Recall 10V-006 Air Reserve Capacity

(c)(2)	Revised VIN List
(c)(3)	Revised number involved
(c)(7)	Supplemental information provided
(c)(8)(ii)	Revised dealer and owner notification dates

For MY 2008 – 2010 vehicles:
Revised Dealer Notification on or about August 9, 2010Revised Customer Notification on or about August 21, 2010
For MY 1999 – 2007 vehicles:
Dealer Notification has not been determined
Customer Notification has not been determined

This will amend and supplement information previously submitted on December 28, 2009 and April 6, 2010.

It was necessary to revise the dealer and owner notification dates due to parts availability for the MY 2008 – 2010 vehicles.

For MY 1999 – 2007, dealer and owner notification dates will be provided at a later date after finalizing repair procedures and parts availability specifically for those models.

Sincerely,

Les Wells
Senior Manager-Service Operations
Nissan Diesel America, Inc.
972-756-5523

UD Trucks North America
P.O. Box 152034
Irving, Texas 75015-2034

SECTION 573.6 2nd SUPPLEMENTAL INFORMATION REPORT (10V-005)

Pursuant to 49 C.F.R. 573.6, UD Trucks North America, Inc. ("UD Trucks")(formerly Nissan Diesel America, Inc.) submits the following information to supplement and amend the information submitted to NHTSA on December 28, 2009 and April 6, 2010, respectively.

(c)(2)

Specific 1999 through 2010 MY UD3300 model vehicles within the vehicle identification range listed below do not meet the 49 CFR 571.121 Sections 5.3.3 and 5.3.4 standards for Brake Actuation and Release Timing.

Year	Number Involved	Starting Sequence	thru	Ending Sequence
1999	76	JNAPC33L9XGK50001		JNAPC33L5XGH50076
2000	136	JNAPC33L8YGH55001		JNAPC33L1YAR55136
2001	2	JNAPC33L61AM60002		JNAPC33LX1AR60003
2002	24	JNAPC33L12AE65001		JNAPC33L22AE65024
2003	31	JNAPC33L83AR70001		JNAPC33L13AK70031
2004	123	JNAPC33L94AR75001		JNAPC33LX4AM75123
2005	48	JNAPC80L15AR50001		JNAPC80L15AR50001
2006	187	JNAPC80L26AR55001		JNAPC80L76AM55187
	3	JNAPC80L26AR55189		JNAPC80L06AR55191
2007	10	JNAPC80L37AR60001		JNAPC80L47AR60010
	37	JNAPC80L87AR60012		JNAPC80L27AK60048
	40	JNAPC80L37AM60050		JNAPC80LX7AR60089
	1	JNAPC80L87AR60091		JNAPC80L87AR60091
	17	JNAPC80L37AR60094		JNAPC80L87AR60110
	38	JNAPC80L17AR60112		JNAPC80L67AH60149
	7	JNAPC80L67AK60151		JNAPC80L17AR60157
2008	114	JNAPC81L98AR70001		JNAPC81L08AR70114
	1	JNAPC81L78AR70126		JNAPC81L78AR70126
	1	JNAPC81L38AE70189		JNAPC81L38AE70189
	7	JNAPC81L48AE70203		JNAPC81L58AE70209
2009	1	JNAPC81LX9AR75001		JNAPC81LX9AR75001
	10	JNAPC81L99AH75004		JNAPC81L79AF75013
	2	JNAPC81L09AF75015		JNAPC81L29AF75016
	2	JNAPC81L59AC75020		JNAPC81L59AC75020
	7	JNAPC81LX9AF75023		JNAPC81L19AC75029
	1	JNAPC81LX9AC75031		JNAPC81LX9AC75031
	1	JNAPC81L79AF75044		JNAPC81L79AF75044
	1	JNAPC81L19AF75055		JNAPC81L19AF75055
	1	JNAPC81L79AF75061		JNAPC81L79AF75061
	1	JNAPC81L09AF75063		JNAPC81L09AF75063
	4	JNAPC81L29AC75069		JNAPC81L29AC75072
	1	JNAPC81L19AF75086		JNAPC81L19AF75086
	1	JNAPC81L79AF75089		JNAPC81L79AF75089
	2	JNAPC81L79AF75092		JNAPC81L99AF75093
	2	JNAPC81L89AF75098		JNAPC81L49AK75099
	1	JNAPC81L79AC75102		JNAPC81L79AC75102
	2	JNAPC81LX9AC75109		JNAPC81L69AC75110
	1	JNAPC81L79AC75116		JNAPC81L79AC75116
	18	JNAPC81L09AR75122		JNAPC81L69AR75139
	2	JNAPC81L19AR75145		JNAPC81L39AR75146
	1	JNAPC81L89AC75156		JNAPC81L89AC75156

	3	**JNAPC81L19AR75162**	**JNAPC81LX9AE75164**
	1	**JNAPC81L59AF75169**	**JNAPC81L59AF75169**
	1	**JNAPC81L49AE75189**	**JNAPC81L49AE75189**
	6	**JNAPC81L19AH75210**	**JNAPC81L09AH75215**
2010	**14**	**JNAPC81L0AAH80001**	**JNAPC81L5AAR80014**
	11	**JNAPC81L7AAM80016**	**JNAPC81L2AAF80026**
	1	**JNAPC81L3AAR80030**	**JNAPC81L3AAR80030**
	1	**JNAPC81LXAAR80039**	**JNAPC81LXAAR80039**
	1	**JNAPC81LXAAR80042**	**JNAPC81LXAAR80042**

The vehicles within the listed VIN breakpoints were produced from start of production for the 1999 model year through the 2010 model year ending with production on October 2, 2009. All other model year UD3300 vehicles are not involved in this recall.

(c)(3)

1004

(c)(7) The tested condition of air brake performance does not meet FMVSS 121 requirements for apply and release timing because the testing method utilized during self-certification has since been found to result in inconsistent or inaccurate test results. This noncompliance came to the attention of the manufacturer, Nissan Diesel Motor Company, Ltd. (now UD Trucks Corp.), as a result of a November 5, 2009 letter report by a plaintiff's expert, Richard Radlinski, produced to Nissan Diesel America, Inc. ("NDA") in litigation on November 6, 2009. Mr. Radlinski's report contained two summary opinions: (1) that the unmodified UD3300 chassis that NDA furnished to Pioneer Drive, LLC for dualization did not meet the brake application and release timing requirements of FMVSS 121; and (2) the air reservoirs did not contain sufficient volume to meet the minimum reservoir volume requirements of FMVSS 121. (A copy of Mr. Radlinski's letter report is attached.)

(c)(8)(ii)

For MY 2008 – 2010 vehicles, UD Trucks now estimates that it will be able to provide the dealer notification letter on or about August 9, 2010 and that such notification will be completed within 10 days. Owner notification will be provided on or about August 16, 2010 and such notification will be completed within 10 days.

For MY 1999 – 2007 vehicles, Dealer and customer notification has not been determined at this time and UD Trucks will provide a supplemental Information Report at a later date. This delay is due to finalizing a repair procedure and parts procurement specifically for the MY 1999 – 2007 vehicles.

(Note: As indicated in UD Trucks's April 6, 2010 report, the different notification dates above are the result of different parts and procedures required for the MY 2008 – 2010 vehicles versus the MY 1999 – 2007 vehicles. The reason for the revised dealer and owner notification dates above is anticipated parts availability.)

For those UD3300 vehicles that will require both the 10V-005 and 10V-006 remedies, UD Trucks will notify dealers and owners that the repairs for the 10V-005 recall will be performed at the same time as the repairs for the air tank reservoir noncompliance that is the subject of recall campaign 10V-006. (See 2nd Supplemental 573.6 Report for 10V-006 submitted today to NHTSA.)

The number of vehicles subject to the 10V-006 recall is larger than the number for 10V-005 because some vehicles had the brake timing adjusted in the 09V-487 recall or were modified by Fontaine Manufacturing with dual steering for the road sweeper applications and certified when modifications were completed.

SECTION 573.6 2nd SUPPLEMENTAL INFORMATION REPORT (10V-006)

Pursuant to 49 C.F.R. 573.6, UD Trucks North America, Inc. ("UD Trucks")(formerly Nissan Diesel America, Inc.) submits the following information to supplement and amend information submitted to NHTSA on December 28, 2009 and April 6, 2010, respectively.

(c)(2)

Specific 1999 through 2010 MY UD3300 model vehicles within the vehicle identification range listed below do not meet the 49 CFR 571.121 Section 5.1.2.1 Air Tank Reserve Capacity.

Year	Number Involved	Starting Sequence	thru	Ending Sequence
1999	76	JNAPC33L9XGK50001		JNAPC33L5XGH50076
2000	136	JNAPC33L8YGH55001		JNAPC33L1YAR55136
2001	2	JNAPC33L61AM60002		JNAPC33LX1AR60003
2002	24	JNAPC33L12AE65001		JNAPC33L22AE65024
2003	31	JNAPC33L83AR70001		JNAPC33L13AK70031
2004	123	JNAPC33L94AR75001		JNAPC33LX4AM75123
2005	48	JNAPC80L15AR50001		JNAPC80L55AR50048
2006	191	JNAPC80L26AR55001		JNAPC80L06AR55191
2007	110	JNAPC80L37AR60001		JNAPC80L87AR60110
	46	JNAPC80L17AR60112		JNAPC80L17AR60157
2008	114	JNAPC81L98AR70001		JNAPC81L08AR70114
	85	JNAPC81L98AE70116		JNAPC81L98AE70200
	7	JNAPC81L48AE70203		JNAPC81L58AE70209
	3	JNAPC81L38AE70211		JNAPC81L78AE70213
2009	2	JNAPC81LX9AR75001		JNAPC81LX9AD75002
	3	JNAPC81L99AH75004		JNAPC81L99AR75006
	27	JNAPC81L59AF75012		JNAPC81L29AC75038
	36	JNAPC81L59AF75043		JNAPC81L29AF75078
	12	JNAPC81L69AF75083		JNAPC81L09AF75094
	5	JNAPC81L49AF75096		JNAPC81L39AC75100
	1	JNAPC81L79AC75102		JNAPC81L79AC75102
	4	JNAPC81L09AC75104		JNAPC81L69AC75107
	2	JNAPC81LX9AC75109		JNAPC81L69AC75110
	5	JNAPC81LX9AC75112		JNAPC81L79AC75116
	2	JNAPC81L09AC75118		JNAPC81L29AC75119
	20	JNAPC81L09AR75122		JNAPC81L59AF75141
	3	JNAPC81L09AF75144		JNAPC81L39AR75146
	1	JNAPC81L89AC75156		JNAPC81L89AC75156
	2	JNAPC81L09AF75158		JNAPC81L09AF75158
	4	JNAPC81L09AF75161		JNAPC81LX9AE75164
	1	JNAPC81L59AF75169		JNAPC81L59AF75169
	1	JNAPC81L49AF75180		JNAPC81L49AF75180
	1	JNAPC81LX9AF75183		JNAPC81LX9AF75183
	1	JNAPC81L39AF75185		JNAPC81L39AF75185
	1	JNAPC81L49AE75189		JNAPC81L49AE75189
	6	JNAPC81L19AH75210		JNAPC81L09AH75215
2010	14	JNAPC81L0AAH80001		JNAPC81L5AAR80014
	11	JNAPC81L7AAM80016		JNAPC81L2AAF80026
	1	JNAPC81L3AAR80030		JNAPC81L3AAR80030
	1	JNAPC81LXAAR80039		JNAPC81LXAAR80039
	1	JNAPC81LXAAR80042		JNAPC81LXAAR80042

The vehicles within the listed VIN breakpoints were produced from start of production for the 1999 model year through the 2010 model year ending with production on October 2, 2009. All other model year UD3300 vehicles are not involved in this recall.

(c)(3)

1164

(c)(7) Air reservoir tank volume does not meet the FMVSS 121 regulation because the air tank volume was not increased for 1999 and later models to accommodate larger air brake chambers used with the 1999 and later models. The resulting noncompliance came to the attention of the manufacturer, Nissan Diesel Motor Company, Ltd. (now UD Trucks Corp.), as a result of a November 5, 2009 letter report by a plaintiff's expert, Richard Radlinski, produced to Nissan Diesel America, Inc. ("NDA") in litigation on November 6, 2009. Mr. Radlinski's report contained two summary opinions: (1) that the unmodified UD3300 chassis that NDA furnished to Pioneer Drive, LLC for dualization did not meet the brake application and release timing requirements of FMVSS 121; and (2) the air reservoirs did not contain sufficient volume to meet the minimum reservoir volume requirements of FMVSS 121. (A copy of Mr. Radlinski's letter report is attached.)

(c)(8)(ii)

For MY 2008 – 2010 vehicles, UD Trucks now estimates that it will be able to provide the dealer notification letter on or about August 9, 2010 and that such notification will be completed within 10 days. Owner notification will be provided on or about August 16, 2010 and such notification will be completed within 10 days.

For MY 1999 – 2007 vehicles, Dealer and customer notification has not been determined at this time and UD Trucks will provide a supplemental Information Report at a later date. This delay is due to finalizing a repair procedure and parts procurement specifically for the MY 1999 – 2007 vehicles.

(Note: As indicated in UD Trucks's April 6, 2010 report, the different notification dates above are the result of different parts and procedures required for the MY 2008 – 2010 vehicles versus the MY 1999 – 2007 vehicles. The reason for the revised dealer and owner notification dates above is anticipated parts availability.)

For those UD3300 vehicles that will require both the 10V-006 and 10V-005 remedies, UD Trucks will notify dealers and owners that the repairs for the 10V-006 recall will be performed at the same time as the repairs for the brake actuation and release noncompliance that is the subject of recall campaign 10V-005. (See 2nd Supplemental 573.6 Report for 10V-005 submitted today to NHTSA.)

The number of vehicles subject to the 10V-006 recall is larger than the number for 10V-005 because some vehicles had the brake timing adjusted in the 09V-487 recall or were modified by Fontaine Manufacturing with dual steering for the road sweeper applications and certified when modifications were completed.

Richard Radlinski Consulting

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Letter Report

November 5, 2009

Steven G. Liday
Miller Nash LLP
3400 US Bancorp Tower
111 S.W. Fifth Avenue
Portland OR 97204-3699

SUBJECT: **Expert Report in the matter of Pioneer Drive LLC v. Nissan Diesel America, Inc. and Nissan Motor Co. LTD.**

Dear Steven:

At your request I have evaluated the design of the brake system on the Nissan Diesel UD 3300 4x2 truck in order to assess it's compliance with the requirements of Federal Motor Vehicle Safety Standard (FMVSS) No. 121, *Air Brake Systems*. My evaluation focused primarily on the pneumatic requirements of the standard. The report that follows describes the results of my evaluation.

MY QUALIFICATIONS

I believe that I am well qualified to perform this evaluation. I have over 40 years of experience in testing and evaluating braking systems and working with the regulations that apply to these systems. For 25 years I worked at the National Highway Traffic Safety Administration (NHTSA, the agency responsible for FMVSS No.121) where I was involved in the development of various braking regulations, including FMVSS No.121. After leaving NHTSA I started my own company, Radlinski& Associates, Inc. (RAI), which provided independent brake testing services to vehicle manufacturers, brake suppliers, the US Army, the Truck Manufacturers Association (TMA) and others. The majority of this testing was geared towards evaluating vehicles to determine their compliance with FMVSS No.121. RAI also developed and sold brake testing equipment including a PC-based pneumatic analyzer that is used by truck manufacturers such as Volvo, Mack and International as well as brake manufacturers including Bendix, Haldex and Meritor Wabco to check compliance with the pneumatic requirements of FMVSS No.121. I sold RAI to Link Engineering Co. in 2003* and have worked since 2005 as an independent consultant. My resume along with a list of publications is provided in Attachment A. A list of cases where I testified as an expert is provided in Attachment B.

* RAI is now known as Link-Radlinski, Inc. I have no ownership in this company nor am I an employee.

MATERIAL REVIEWED

A list of the documents reviewed while preparing this report is included in Attachment C. The list includes the FMVSS No. 121 regulatory text, documents from Nissan Diesel relative to the design and their testing of UD 3300 trucks and test results from several different independent organizations that also tested UD 3300 trucks.

SUMMARY OF OPINIONS

1. The UD3300 4x2 trucks as furnished to Pioneer Drive did not meet the brake application and release (pneumatic) timing requirements of FMVSS No. 121 contained in S5.3.3 and S5.3.4. The brakes were too slow to apply and too slow to release.

2. The air reservoirs (air tanks) on the UD 3300 4x2 trucks furnished to Pioneer Drive did not contain sufficient volume to meet the minimum reservoir volume requirements of FMVSS No.121. The lack of sufficient air reservoir volume contributes to slow brake apply times discussed in Opinion 1.

BASIS FOR OPINIONS

Opinion 1. (Failure to meet timing requirements)

Timing test results for unmodified UD 3300 trucks of the configuration supplied to Pioneer Drive were available from Nissan Diesel Motor Co. LTD. (NDJ) as well as three independent testing organizations.

NDJ utilizes their Certification Test Report No. W-K 521 (Reference 3*) as the basis for compliance with the timing requirements of FMVSS No.121 for UD3300 PKC model trucks for model years 2003-2008. Mr. Kuga of NDJ, in his letter to Mr. Sesame of NDA (Reference 14) includes data drawn from Report No. W-K 521 to indicate this compliance. In addition, in a letter to NHTSA from Lawrence Shultz of NDA (Reference 13), the Test Report No. W-K 521 is included as a basis for compliance with FMVSS No. 121 for a 2008 UD 3300 PKC truck.

I believe that it is inappropriate to use Test Report No. W-K 521 as the basis for compliance for the UD3300 PKC truck for the following reasons:

- The test described in the W-K 521 report is for a vehicle with a wheelbase of 156 inches. This is the shortest wheelbase available for the UD 3300 PKC. (The NHTSA truck had a wheelbase of 238 in.)

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* Reference numbers refer to documents listed in Attachment C

The shorter the vehicle, the shorter the air lines in the brake system and the faster the apply and release occurs, as air has a shorter distance to travel. Because of this fact, it is standard industry practice in the US is to test the longest wheelbase vehicle available in a particular model line in order to certify compliance of the entire model line with the timing requirements of FMVSS No. 121.

- Using the timing test results from one test conducted in 2002 on a vehicle with a 2003 brake system to certify all UD 3300 PKC trucks with model years from 2003 through 2008 would not be appropriate if the components or plumbing of the brake system brake system on the vehicles has changed over the years. Based on the documents that I reviewed, either due to the quality of the reproductions or the lack of sufficient information identifying the documents with specific model years, I was unable to determine what changes, if any had been made. Further information is needed to make this determination.

- The apparatus used by NDJ to test pneumatic timing is flawed. NDJ uses a switch on the brake pedal to sense first pedal movement. It is a well known fact that pedal switches do not sense first movement of the pedal accurately, particularly when the pedal is released. The inertia of the switch mechanism causes a delay in the closure of the switch. In short, the pedal moves before the apparatus detects movement and this results in measured release times that are shorter than actual release times. It is common practice in the US to sense pedal movement with an accelerometer or other device which does not have the delays inherent with a pedal switch.

- The brake adjustment used by NDJ for testing was artificially "tight". NDJ used a brake shoe to drum clearance of 0.3mm (0.012in.). This adjustment level would have resulted in the wheels not rolling freely due to brake drag. A clearance of 0.020 to 0.030in. is more typical. Furthermore FMVSS no. 121 does not allow brake adjustment prior to the timing test. This is stated clearly in S5.3 of the standard. Testing with "tight' brakes results in apply and release times that are artificially short as less air needs to flow to and from the brake actuators to apply and release the brakes.

It should also be pointed out that NDJ Test Report No. W-K 521 indicates that timing was either exactly at, or very close to the limits allowed by FMVSS No.121 despite all of the favorable test conditions (short wheelbase, slow-to-react pedal movement sensor and "tight" brake adjustments). Furthermore, when test results are this close to the limits there is no room for vehicle-to-vehicle variability caused by normal production variance in components and assembly operations. NHTSA requires that all vehicles produced must meet their requirements when tested in accordance with the standard and it is up to the vehicle manufacturer to allow for this production variability when self certifying their vehicles.

Data available from three independent testing organizations indicates that the UD 3300 PKC model trucks as furnished to Pioneer Drive did not meet the timing requirements of FMVSS No.121. Nevada Automotive Test Center tested a 2005 UD 3300 that had been modified to four-wheel drive by Pioneer Drive. In the process of trying to determine why the vehicle did not meet FMVSS No.121 timing requirements, they obtained an unmodified UD 3300 chassis and tested it. The results given in their report (Reference 12) indicate that the apply and release times of this unmodified chassis exceeded the maximums permitted by FMVSS 121 by a significant margin (actual data is given on the page with Bates stamp NDA 01341).

Link-Radlinski, Inc. tested three UD 3300 chassis (References 9 and 10). One of these chassis had the Pioneer Drive twin-steer modification. The second had a minor modification (relocated air tank) and the third vehicle was unmodified. All three of these vehicles had brake apply and release times that exceeded the maximum limits specified in FMVSS No.121 by significant margins.

The third independent organization that tested UD 3300 PKC chassis for timing was Fontaine Modification Co. (Reference 15). Fontaine also found that the unmodified UD 3300 chassis failed to meet the FMVSS 121 timing requirements by a significant margin.

Table 1 is a summary of the results for the three unmodified UD 3300 PKC chassis that were tested by the three different organizations. It can be seen that all three of the vehicles tested failed to meet the timing requirements by significant margins.

Table 1 – Timing Test Results for Three Unmodified Chassis Tested by Three Different Organizations and Maximum Times Allowed by FMVSS No. 121

Test Organization	Brake Position	Apply Time, sec		Release Time, sec	
		Measured	121 Max. Allowed	Measured	121 Max. Allowed
NATC	LF	**0.51***	0.45	**0.70**	0.55
	RF	**0.51**		**0.70**	
	LR	**0.46**		**0.74**	
	RR	**0.47**		**0.71**	
Link-Radlinski	LF	**0.57**		**0.74**	
	RF	**0.57**		**0.74**	
	LR	**0.66**		**0.76**	
	RR	**0.66**		**0.88**	
Fontaine Modification	LF	**0.57**		**0.74**	
	RF	**0.56**		**0.72**	
	LR	0.31		**0.56**	
	RR	0.31		**0.60**	

*Values in bold exceed the FMVSS No.121 timing limits

A review of the air brake plumbing details for the UD 3300 PKC model truck that were provided by NDA /NDJ in the various responses to the Plaintiff's Second Discovery Requests (References 4, 5, 6, 7 and 8) indicates that the slow apply and release timing is likely due the following factors:

- There are an unusual number of fittings, particularly 90 degree fittings incorporated into the plumbing. These fittings provide restrictions that slow the air flow.

- The supply and delivery lines for the front brakes that are connected to the brake valve are very small diameter (8.6 mm ID) given the fact that the front axle utilizes type 24 brake chambers and does not incorporate a relay valve. All of the air for the front brakes must pass through these small diameter lines and the type 24 brake chambers (actuators) require a great deal of air flow during brake apply and release. US vehicles typically use larger air lines in such an application or they incorporate a relay valve.

These observations are consistent with the modifications made by Fontaine Modification in order to bring the UD 3300 PKC into compliance with FMVSS No. 121. These modifications (which include the addition of a relay valve for the front axle) are described by Dayle Wetherall, NDA in his e-mail to Mr. Sesame, NDA (Reference 16) where he also states: .... "I recommend that we ask NDJ to review their air brake installations on all UD 3300s to see if there are ways to improve the performance and reduce cost. Some of the items removed by Fontaine appear to be the result of "excess fitting" installations. For example, in some areas, NDJ would "use back to back" 90-degree fittings instead of using a little more hose length and a straight fitting. The NDJ design created unnecessary air restrictions in the system".

Opinion 2 – Inadequate Air Reservoir Volume

I performed calculations to determine if the air reservoirs on the UD 3300 PKC trucks were in compliance with FMVSS 121 in terms of their total volume. FMVSS No. 121 in S5.1.2.1 requires that the total combined volume of the air reservoirs must be at least 12 times the combined volume of all service brake chambers. It further specifies that the volume of the service brake chambers is determined by referring to Table V in the standard or by measuring the actual volume of the chamber at "maximum travel of the brake piston or pushrod". It is clear that the intent of the standard is to use the maximum or full-rated stroke of the brake chamber in this calculation. The values in Table V of FMVSS No.121 are volumes for typical chambers at maximum or full-rated stroke. Use of maximum or full-rated stroke of a brake chamber to determine chamber volume is industry practice and chamber manufacturers publish the volumes for their various chambers in their catalogs based on this maximum travel. The volumes for the bakes chambers used on the UD 3300 PKC truck are as follows:

Table 2 – Volumes of Brake Chambers Used on the UD 3300 PKC Truck

Chamber	Volume, cu. in. (each chamber)	
	Based on Table V in FMVSS 121	Based on MGM Catalog*
Front - Type 24 (2.5 in. rated stroke)	67	69.6
Rear - Type 3030 (2.5 in. rated stroke)	89	88.3

*The UD 3300 PKC is equipped with MGM TR3030 rear brake chambers and the volume for this chamber is specified in the MGM catalog (Reference 17). While the front brake chambers are not made by MGM, the volume for their type 24 chamber with a 2.5 inch rated stroke would be very close.

Using the values in Table 2, minimum required reservoir volumes are calculated as follows:

Using FMVSS 121 Table V: (67 + 89) x 2 x12 = 3744 cu. in. = 61.4 liters

Using MGM Catalog: (69.6 + 88.3) x 2 x 12 = 3789.6 cu. in. = 62.1 liters

The total combined air reservoir volume on the UD 3300 PKC is 59.8 liters (Reference 6) which is less than the volume required by FMVSS No.121 using either method to determine brake chamber volume.

In their Second Supplemental Response to the Plaintiff's Second Discovery Request, NDJ indicated that they determined chamber volume based on the stroke when the brakes were adjusted for a 0.3 mm shoe to drum clearance and then fully applied. They stated that this essentially resulted in a stroke of 30 mm (1.18 inches). This is less than one half the maximum or full-rated stroke of the front and rear brake chambers. It is not the correct method for determining chamber volume and should not be used for reservoir volume calculations in determining compliance with S5.1.2.1 of FMVSS No.121.

The opinions expressed in this report are based on the information available to me at this time. I reserve the right to modify or supplement these opinions based on new information as it becomes available to me.

My fee for reviewing documents, conducting research, preparing reports and providing testimony is $375 per hour.

Respectfully Submitted,

Richard W. Radlinski

Richard W. Radlinski
Braking Systems Consultant