

# VOLVO

Volvo Trucks North America, Inc.

February 20, 2004

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NVS-214  
2004 FEB 23 P 02:57  
OFFICE OF INVESTIGATION

Mr. Tom Bowman  
Office of Defects Investigation  
U.S. Department of Transportation  
National Highway Traffic Safety Administration  
400 Seventh Street, S.W.  
Washington, DC 20590

Re: **Volvo VN Front Axle U-bolt Investigation**  
Your File: NVS-214 / EA02-021

Dear Mr. Bowman:

Volvo Trucks North America ("VTNA") has received comments from third parties concerning comments contained within the Closing Resume for the above referenced Engineering Analysis. Specifically, the focus is on certain language found on page 13 under "Detectability". The language is being interpreted that a retorque is required at 15,000 mile or three month intervals. We believe VTNA's retorque recommendations may have been misinterpreted.

In VTNA's April 12, 2002 response to PE01-042, which is believed to have been handled by Mr. Scott York, VTNA outlined in Response 6 the recommended maintenance and inspection procedures. A copy of the entirety of that response is attached.

On page 5, it is stated that subsequent to the initial installation and re-torque at the assembly plant, the u-bolts should be retorqued at 15,000 miles and then at the "B" and "C" inspections thereafter (normally six months and twelve months). VTNA has not recommended the u-bolts be retorqued every 15,000 miles. As noted in the Closing Resume, all manufacturers have some level of retorquing recommendation.

VTNA requests, if possible, that the public record be clarified as to VTNA's u-bolt maintenance and inspection practices.

Yours truly,



Heino W. Scharf  
Director, Product Assurance

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April 12, 2002

**VIA EXPRESS MAIL**

Mr. Richard P. Boyd  
Chief, Vehicle Control Division  
Office of Defects Investigation  
U.S. Department of Transportation  
National Highway Traffic Safety Administration  
400 Seventh Street, S.W.  
Washington, DC 20590

Re: **Front Axle U-bolt Investigation**  
Your File: NSA-122sby  
PE01-042

Dear Mr. Boyd:

This is in response to your letter of December 17, 2001 and recent verbal amendments to that letter requesting information for front axle u-bolts on certain VN models for the years 1998 through 2000. Volvo Trucks North America, Inc. ("VTNA") will be responding for all VN models for model years 1998 through 2000. Specifically, this will include the Day Cab, 420, 610, 660 and 770 models. Please note that in certain exhibits, the term "STD" is used to designate the Day Cab model.

VTNA has learned that inquiries have been directed to other truck manufacturers ("OEM") requesting information similar to that which has been requested of VTNA. However, it is noted the information has been requested for specific axle weight rating ranges. The request directed to VTNA has not been so limited. Additionally, the current and specific requests to VTNA have been model specific. The requests to other OEMs do not appear to focus on specific models, but only model years.

Accordingly, and as discussed, VTNA will be supplying information broken down by model year, model and front axle weight rating to ensure that comparisons with the information supplied by other OEMs are as accurate as possible.

**Information Requested**

*1. State the total number of subject vehicles that Volvo has sold in the United States by model and model year.*

**Response**

Attached as Exhibit 'A' is a spreadsheet indicating the number of vehicles sold, broken down by model, nominal front axle weight rating and model year.

There are six different front axle u-bolt designs that are used in all front axle ratings for all models for all years. Specifically, the part numbers are:

8079196	8081552
8081550	8081553
8081551	8081554

Exhibit 'B' is a copy of drawing 8081654 providing the dimensional characteristics of each of the u-bolt part numbers.

Attached as Exhibit 'C' is a spreadsheet providing part number usage for each of the above part numbers by model, model year and front axle weight rating. Please note the values provided for each part number are the number of vehicles that used that part number for the given model, FAWR and model year.

In some instances the same FAWR may have used different u-bolt part numbers. For example, see the 420 model, 12.0K FAWR for the year 1999. There are three entries which meet this criteria. However, one combination used 8081552, another used 8081551 and the third used both 8081551 and 8079196. In most cases, there are four u-bolts, all of the same part number, used on front axles. However, in some cases there are two u-bolts of one part and two u-bolts of another.

*2. State the number and provide copies of all the following, from all sources, of which Volvo is aware and which relate, or could relate to the alleged defect in the subject vehicles:*

- a. owner/fleet complaints;*
- b. field reports;*
- c. crash/incident claims;*
- d. subrogation claims;*
- e. lawsuits; and*

*f. third-party arbitration proceedings (where Volvo is a party to the arbitration).*

*Please list and collate your response for each category ("a" through "f") by date of claim. Please provide for each item in this question the incident date, mileage of vehicle at time of incident (if known), approximate age of vehicle or model year, disposition of matter, and, where a fleet vehicle is involved, the name of the fleet, and the name and telephone number of a contact person at that fleet. For items "a" through "d," please provide all related information and*

reports whether or not Volvo has verified each one. For items "e" and "f," summaries are acceptable. Please identify in the summary the caption, court, docket number, and filing date of each lawsuit if a copy of the Complaint initiating the lawsuit is not provided.

**Response**

- a. Attached as Exhibit 'D' are copies of customer contact reports in which reference is made to front axle u-bolts. The customer contact report numbers are as follows:

17199	37873	41696	42808
19010	38448	42103	43022
22334	41114	42293	43310
32055	41333	42523	
36145	41419	42586	

Attached as Exhibit 'E' are copies of warranty claims made referring to "u-bolts". Efforts were made to isolate warranty claims for front axle u-bolts only as warranty claims relating to rear axle u-bolts have been previously submitted in regard to EA01-011. The filtering criteria used for the claims text field is as follows:

*Not Like "front drive" And Not Like "forward driv" And Not Like "ft. driv" And Not Like "lean" And Not Like "rear axle" And Not Like "rear drive" And Not Like "drive axle" And Not Like "rear sus" And Not Like "ft end" And Not Like "front end" And Not Like "3 axle" And Not Like "exhaust" And Not Like "rearsus" And Not Like "window rat" And Not Like "rear end" And Not Like "rear sprin" And Not Like "cab flt" And Not Like "a/c com" And Not Like "tandem" And Not Like "rear u-bolt" And Not Like "tru bolt" And Not Like "exh pipe" And Not Like "2 axle" And Not Like "right rear" And Not Like "left front driv" And Not Like "diff" And Not Like "5th wheel" And Not Like "noise in rear" And Not Like "drv shaft" And Not Like "z spring" And Not Like "rearend" And Not Like "z-spring"*

In addition, to attempt to exclude rear axle u-bolt part numbers, additional filtering criteria were used as follows:

*Not Like "978431" And Not Like "8077508" And Not Like "8397608" And Not Like "8078877" And Not Like "3186731" And Not Like "3186732" And Not Like "8084012" And Not Like "8084013" And Not Like "8089338"*

In spite of the filtering efforts, a review of the spreadsheet will show that certain claims not relating to the front axle u-bolts are reported.

Attached as Exhibit 'F', is a spreadsheet containing claims paid relative to Service Program "725". These claims were not included in Exhibit 'E'.

- b. See a. above.
- c. No "legal" claims or lawsuits have been directed to or served upon VTNA concerning the alleged defect.
- d. See c. above.
- e. See c. above.
- f. See c. above.

3. *If Volvo has issued any service or technical bulletins, advisories, or other communications to dealers, zone offices, or field offices pertaining to the alleged defect in the subject vehicles, provide a copy of each such document. If no such documents have been issued, so state.*

**Response**

Attached as Exhibits 'G', 'H', 'I' and 'K' are copies of service publications relating to the retorquing of u-bolts (both front and rear axle). They are Service Programs 725-001 dated 04.97, Service Program 725-001 dated 05.97, Field Service Bulletin 725-002 dated 01.00 and Field Service Bulletin 725-002 dated 02.00 respectively.

4. *Identify and provide copies of each of the following, pertaining to the alleged defect, including any interim, draft, final, etc. documents:*

- a. testing;
- b. studies;
- c. surveys; and
- d. investigations

**Response**

There have been no test, studies, surveys or investigations relating specifically to front axle u-bolts loosening torque, stretching, fracturing or otherwise not performing as designed.

5. *Identify and describe all significant modifications or changes made by or on behalf of Volvo in the manufacture, design, or material composition of the subject U-bolts from 1998 to date that relate, or could relate to the alleged defect. The following information must be included for each such modification or change:*

- a. *the date or approximate date on which the modification or change was incorporated into production;*
- b. *a description of the modification or change;*

- c. the reason for the modification or change; and*
- d. whether the modified or changed components can be interchanged with earlier production components.*

**Response**

No significant design changes have been made in regard to the front axle u-bolts. The only change that has been to add the requirement verifying the phosphate and oil corrosion-inhibiting coating is 'dry to the touch'.

- 6. Furnish Volvo's assessment of the alleged defect in the subject vehicles, including:*
  - a. all causal or contributory factors;*
  - b. the failure mode;*
  - c. the risk to motor vehicle safety that it poses; and*
  - d. whether there are any circumstances that would provide vehicle operators or others with warning of its existence.*

**Response**

VTNA believes failing U-bolts are due to the long-term effects of improper maintenance and improper inspection. The ultimate failure of a U-bolt is actually a fatigue failure that has arisen as the result of a looseness condition that has gone uncorrected.

At initial assembly there is a normal relaxation of the clamp load in any joint made with a threaded fastener. When the bolt is initially torqued, it stretches slightly resulting in the desired clamp load. However, the surfaces of the mating components may have minute irregularities or coverings (e.g., paint) that will experience plastic deformation. The small "bumps" found on a casting or forging surface may deform. The paint may "flow". These factors can result in a bolt losing some of its "stretch" and accompanying clamp load. This condition is typically known as "embedment relaxation". Before the truck leaves the assembly plant, the bolts are retorqued to the required levels.

As a check, the U-bolts are required to be retorqued at the Pre-Delivery Inspection ("PDI"). This is normally done by the selling dealer. As further assurance, we recommend the U-bolts be retorqued at 15,000 miles.

We also recommend that U-bolts be checked every six months at the "B" inspection and again at the "C" inspection. We also recommend the U-bolts be inspected at each pre-trip inspection. A developing looseness condition will become obvious at some point in time before failure occurs.

We believe that in the case of a U-bolt failure, these recommendations have been ignored or the retorquing has not been properly done as described in the service manuals.

This condition does not occur without warning. Parts which are moving in relationship to one another will rub off the paint and leave shiny surfaces. Some of these surfaces may oxidize leaving a rust pattern or streaks of rust. In addition, a looseness condition in front axle u-bolts will provide other indicators. Tire wear may become irregular. The driver may experience a weaving or darting as the vehicle is driven. Popping noises may be heard in the front axle due to the shifting of components. Obviously, these complaints cannot be ignored and must be checked and evaluated.

If periodic inspections and retorquing at recommended intervals are performed, there is no threat of motor vehicle safety due to front axle u-bolt failures.

*7. Furnish a copy of all documents not specifically requested herein, which Volvo believes are relevant to, or which were used in formulating its assessment of, the alleged defect.*

#### **Response**

Attached as Exhibits 'P' and 'Q' are copies of The Maintenance Council ("TMC") Recommended Practices RP642 and RP514 respectively. In Exhibit 'P', see specifically Appendix 12, section 3.f. In Exhibit 'Q', see specifically checklist for Steer Axle Components on page RP514-4.

It should be noted the TMC is comprised of representatives from all aspects of the heavy truck industry including component suppliers, truck manufacturers, owners, operators, maintenance facilities and others. The information contained within the Recommended Practices is a consensus of that group's findings concerning best practices in regard to maintenance of heavy trucks and the diagnosis of problems.

*8. Furnish a design comparison of the subject U-bolts to the rear axle U-bolts on the same subject vehicles. The comparison should include:*

- a. The diameter and threading of the U-bolts.*
- b. The overall size and material of the U-bolts.*
- c. The size, type, and material of the nuts used on the various U-bolts.*
- d. The initial build torque requirements and requirements/recommendations for any maintenance torque procedures.*

#### **Response**

a. Front axle u-bolts use as 'squared U' design (see Exhibit 'B') while rear u-bolts are of a semi-circular design. They are available in different lengths dependent upon the size of the axle beam and spring pack.

Front u-bolts are 20 millimeters in diameter and utilize a coarse series thread. Rear axle u-bolts are available in both 20 millimeter and 22 millimeter diameters. Both coarse-series and fine-series threads are used. Rear axle u-bolts also come in various lengths.

b. Grade 10.9 material is used for u-bolts.

c. A hex nut (part number 961996) and a hardened washer (part number 1075368) are used on u-bolt legs on the forward side of the front axle. The same hex nuts and a plate washer (part number 8084707) are used on the u-bolt legs on rearward side of the front axle. Attached are drawing numbers 1052551 (3 pages), 1058139 (2 pages) and 8084707 for the hex nut, hardened washer and plate washer respectively.

Wheel nuts (combined hex nut and washer) are used on rear axle u-bolts.

d. The torque requirement for the front axle u-bolts at the time of initial assembly is 310 lb-ft. plus or minus 37 lb-ft. Retorquing is done at the factory approximately 10 hours after initial installation. Retorquing is required at 15,000 miles and at yearly inspections thereafter.

*9. Furnish copies of any and all instructions furnished to purchasers of trucks and/or to dealers covering recommended schedules for torque maintenance of the subject U-bolts.*

#### Response

See Exhibits 'G', 'H', 'J' and 'K'.

In addition, attached as Exhibit 'L' is a copy of the Pre-delivery Service Instructions supplied to dealers advising of the proper manner in which to retorque u-bolts.

Attached as Exhibit 'M' is a copy of an excerpt from the Operators Manual which accompanies each vehicle advising the owner or operator to retorque the u-bolts at 15,000 miles and at the yearly inspections thereafter.

Proper retorquing procedures at yearly inspections can be found in the Service Manual. See Exhibit 'N'.

**PE01-042 - Page 4**

**Please note there are no Exhibits T or 'O'. If you have any questions, please feel free to contact me at the address and/or phone number indicated.**

**Yours truly,**

**Helmo W. Schaeff  
Director, Product Assurance**