

**Howell, Rosa (NHTSA)**

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**From:** Lash, Chris (NHTSA)  
**Sent:** Monday, November 16, 2009 1:24 PM  
**To:** Howell, Rosa (NHTSA)  
**Subject:** FW: PE09-031

Can you put a copy of this email and the attached files in both the Public and Private repositories please.

Chris

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**From:** Quandt, Jeff (NHTSA)  
**Sent:** Monday, November 09, 2009 8:56 AM  
**To:** Lash, Chris (NHTSA)  
**Subject:** FW: PE09-031

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**From:** Nevi, Raymond (R.A.) [mailto:rnevi@ford.com]  
**Sent:** Friday, November 06, 2009 12:47 PM  
**To:** Lash, Chris (NHTSA); Quandt, Jeff (NHTSA)  
**Subject:** Re: PE09-031

Chris/Jeff,

This is Ford's response to your questions from an email sent by the agency on October 23, 2009. The questions are restated, for clarity, immediately prior to our responses. Additionally, a request for confidential treatment is being submitted to the Office of Chief Counsel.

Request 1

Ford stated in its August 19, 2009, response that the ball joint design used in the subject vehicles is unique and not used in any other Ford products. Based on ODIs review of other Ford products it would appear that the "New" Mustang and the Escape front control arm/ball/knuckle design are very similar to the joint under investigation. Does Ford have any complaints or warranty claims for those vehicles related to Category A, B1, or B2 - joint failure while driving?

Answer

While the two ball joint designs identified by the agency may appear similar to that used in the subject Edge vehicles, it would be atypical for the designs to be identical, or even nearly identical, because there may be different loads, different torques, and different geometries that drive a vehicle-specific design. The ball joint design used in the 2007 and 2008 model year Ford Edge vehicles is unique, when compared to all other Ford products, because it employs a combination of both an interference fit and a crimp feature for attaching the ball stud to the lower control arm, neither of which are used on the Ford Escape or Ford Mustang. The Ford Edge also uses a fully threaded pinch bolt and a different torque for securing the nut, as compared to the Ford Escape and Ford Mustang, which do not use a fully threaded bolt and require different torque for securing the nut. Ford's response to Requests 2 and 3 provide additional information about the design and selection of fasteners.

Ford searched its warranty database and owner report (complaint) database for reports that allege a separation of the front lower control arm ball joint assembly on 2007 and 2008 model year Ford Escape and Ford Mustang vehicles. Ford reviewed and categorized the reports in

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accordance with the categories defined in the response dated August 19, 2009; A - Separation of Lower Ball Joint Assembly While Driving, B1 - Separation of Lower Ball Joint Assembly Ambiguous Driving, and B2 - Ambiguous Separation of Lower Ball Joint Assembly. Three "B1" warranty claims were located on 2007 and 2008 model year Ford Escape vehicles. One owner report that is duplicative of one of the warranty claims was also identified. Two of the three Escape vehicles identified in these reports had a prior repair requiring disassembly of the front lower ball joint assembly. One "A" warranty claim and one "B2" warranty claim were located on 2007 and 2008 model year Ford Mustang vehicles. Copies of the reports are provided in the attachments to this email.

#### Request 2

The pinch bolt assembly torque requirement for the subject vehicle is 38 lb-ft. ODI notes that the Mustang's substantially similar joint and pinch bolt has a torque specification of 76 lb-ft. How were the torque specifications determined for the subject vehicles and why would the specifications for the similar joints be so different?

#### Answer

Factors that influence a joint's torque curve and resultant torque specification include dimension of the structure that is flexing (in the Edge, the knuckle slotted block), material properties of the knuckle, bolt diameter, length of the threaded portion of the bolt in the joint, and friction between the pinch nut, pinch bolt, and knuckle.

Ford determines the proper torque specification for a front lower control arm joint by conducting both laboratory component testing and real world full vehicle durability testing to evaluate these combinations of factors. A torque angle test on the components is conducted in the laboratory to establish the torque required to close the joint (snug torque), the linear section of bolt stretch, the yield point, and the ultimate fracture point for the joint. The test is repeated multiple times to establish ranges for the snug torque, yield point, and ultimate fracture point for the joint. A torque for the joint is selected based on component testing and is confirmed with full vehicle durability testing. The full vehicle durability testing validates the torque specification by measuring both the installation torque and the post-test residual torque.

The torque specifications for the 2007 model year Ford Edge and 2007 model year Ford Mustang differ because the torque angle tests for each joint yielded different values for the snug torque, yield point, and ultimate fracture point, requiring different torque specifications.

#### Request 3

The pinch bolt used on the subject vehicles (BOLT M10X60 HF TE SPL 10) has a fully threaded shank. Can Ford describe how that type of fastener was chosen for use in this critical suspension joint and how it is similar to the Mustang and Escape joint assembly?

#### Answer

The selection and design of a bolt for a particular application, such as the front lower control arm ball joint, begins based on the initial design assumptions for the suspension architecture. Ford's response to Request 2 identifies factors that influence component and torque selections for a particular joint. The length of the threaded portion of the bolt is one of the many factors that may be unique to a given application. There are three basic principles that govern the designed thread length on a bolt: 1) sufficient threading to ensure the nut does not bottom out during rundown given all of the tolerances, 2) sufficient threading to allow proper bolt stretch, and 3) threading ceases before the bolt head, preventing two stress concentrations from occurring in this area.

After a bolt is selected, it is evaluated against Ford's Joint Specification for functionality. The bolt is also evaluated for assembly and service. These evaluations include torque angle testing, assembly trials, and full vehicle durability testing. The design of the pinch bolt, including the threaded shank, was developed based on the design requirements and confirmed with full vehicle durability testing.

The same fastener evaluation and selection process was followed for the pinch bolt designs on the Ford Escape and Ford Mustang vehicles.

Request 4

Please provide an engineering diagram(s) or fabrication drawing(s) of the entire Ball Joint / Pinch Bolt / Steering Knuckle assembly that clearly shows the relative positions and dimensions of the joint. A photograph of one of the sample ball joints provided by Ford to ODI is attached for reference.

Answer

The requested drawings are being submitted confidentially under separate cover to the Office of Chief Counsel.

Please feel free to call me if you have any additional questions.

<<2009-11-06 Mustang Reports.pdf>> <<2009-11-06 Escape Reports.pdf>>



R. A. Nevi  
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Automotive Safety Office

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-----Original Message-----

From: Chris.Lash@dot.gov [<mailto:Chris.Lash@dot.gov>]  
Sent: Friday, October 23, 2009 9:01 AM  
To: Nevi, Raymond (R.A.)  
Subject:

Hello Mr. Nevi, attached are the additional questions ODI discussed with Amanda Prescott. Please contact Jeff or myself if you need assistance.

Chris Lash  
Safety Defects Engineer  
National Highway Traffic Safety Adm.  
Office of Defect Investigations

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# Warranty Claims

Claims for Inquiry: PE09-031

Inquiry: PE09-031

CLAIM\_KEY: 1957402 RPR\_DT: 10/27/2008 MILGE: 5183 TXN\_CD: 1  
MDL\_YR: 2008 AWS\_VL\_CD: ZA VIN\_CD: 1ZVHT80N585 [REDACTED]  
PART\_NUM\_CAUS\_PREF: 7R3Z PRODN\_DT: 3/12/2008  
PART\_NUM\_CAUS\_BASE: 3078 WRTY\_START\_DT: 4/26/2008  
PART\_NUM\_CAUS\_SUFF: A TRANS\_CD: C/TL  
DEALER: "SAMES MOTOR COMPANY, INC." ENG\_CD: C/NE  
CUST\_CONC\_CD: N50 COND\_CD: 1 DLR\_CD: 4498 ST\_PROV\_CD: TX CNTRY\_SOLD: USA

CUST\_TXT: (N50) INSPECT RIGHT FRONT WHEEL. CUST. STATES WHEEL CAME LOOSE WHILE DRIVING

TECH\_TXT1: "5186 LOWER BALL JOINT 01 WR INSP AND DUPL CUST CONCERN RF TIRE CAME LOOSE WHILE DRIVING., INSPECT VEHICLE FOR SIGNS OF C COLLITION NO. DAMAGED FOUND LOWERBALL JOINT SEPA RATION CAUSING PREMATUR RF H"

TECH\_TXT2: "UB DAMAGE,SPINDLE BENT,STRUT DAMAGE,SWAY BAR LINK COLLAPSED,UPPER STRUT MOUNT DAMAGED. R R RF LOWER CONTROL ARM SPIDLE,WHEEL HUB,SWAY BAR LINK,STRUT AND STRUT MOUNT,REPOSITION"

# Warranty Claims

Claims for Inquiry: PE09-031

Inquiry: PE09-031

CLAIM\_KEY: 3021015 RPR\_DT: 6/12/2008 MILGE: 1 TXN\_CD: 2  
MDL\_YR: 2007 AWS\_VL\_CD: ZA VIN\_CD: 1ZVHT82H175  
PART\_NUM\_CAUS\_PREF: 7R3Z PRODN\_DT: 1/30/2007  
PART\_NUM\_CAUS\_BASE: 3079 WRTY\_START\_DT: 8/17/2007  
PART\_NUM\_CAUS\_SUFF: A TRANS\_CD: C/SK  
DEALER: YORK FORD INC ENG\_CD: C/HZ  
CUST\_CONC\_CD: H21 COND\_CD: 33 DLR\_CD: 8888 ST\_PROV\_CD: MA CENTRY\_SOLD: USA

CUST\_TXT: L L BALL JOINT PULLED OUT

TECH\_TXT1: \*0 INSTALL LF LOWER COTROL, ARM INSTALL LF SWAY BAR LINK\*

TECH\_TXT2:

# Warranty Claims

Claims for Inquiry: PE09-031

Inquiry: **PE09-031**

CLAIM\_KEY: 3206559      RPR\_DT: 8/14/2008      MILGE: 29985      TXN\_CD: E84  
MDL\_YR: 2007      AWS\_VL\_CD: M1      VIN\_CD: 1FMYU02ZX7KA [REDACTED]  
PART\_NUM\_CAUS\_PREF: 6L8Z      PRODN\_DT: 5/12/2006  
PART\_NUM\_CAUS\_BASE: 3078      WRTY\_START\_DT: 7/15/2006  
PART\_NUM\_CAUS\_SUFF: AA      TRANS\_CD: T/DJ  
DEALER: KINSEL FORD LINCOLN MERCURY      ENG\_CD: T/GZ  
CUST\_CONC\_CD: C50      COND\_CD: 42      DLR\_CD: 4413      ST\_PROV\_CD: TX      CNTRY\_SOLD: USA

CUST\_TXT: CUST STATES RIGHT FRONT HALFSHAFT CAME LOOSE

TECH\_TXT1: "RIGHT FRONT LOWER BALL JOINT CAME OUT OF KNUCKLE, DAMAGED LOWER BALL JOINT AND CONTROL ARM. REPLACED LOWER CONTROL ARM WITH BALL JOINT AND HALFSHAFT. NEC TO CORRECT TOE."

TECH\_TXT2:

# Warranty Claims

Claims for Inquiry: PE09-031

Inquiry: PE09-031

CLAIM\_KEY: 4603635 RPR\_DT: 4/30/2009 MILGE: 54969 TXN\_CD: 0701D  
MDL\_YR: 2007 AWS\_VL\_CD: M6 VIN\_CD: 1FMCU59H87K [REDACTED]  
PART\_NUM\_CAUS\_PREF: 6L8Z PRODN\_DT: 6/6/2006  
PART\_NUM\_CAUS\_BASE: 3078 WRTY\_START\_DT: 9/1/2006  
PART\_NUM\_CAUS\_SUFF: AA TRANS\_CD: T/AI  
DEALER: RON DUPRATT FORD ENG\_CD: T/AN  
CUST\_CONC\_CD: D50 COND\_CD: 63 DLR\_CD: 7955 ST\_PROV\_CD: CA CNTRY\_SOLD: USA

CUST\_TXT: PLEASE CHECK AND ADVISE PASSENGER FRONT WHEEL IS OFF THE A ARM

TECH\_TXT1: 54969 FOUND BALL JOINT FELL OUT OF SPINDAL CAUSING WHELL TO SHIFT REPLACED FR CV AXEL GOT PULLED OUT OF TULIP ALSO END LINK GOT BENT LOWER BALL JOINT GOT DAMAGED AND FR STRUT GOT BENT REPLACED DA

TECH\_TXT2: MAGED COMPONETS ROAD TEST VEHICAL GOOD AT THIS POINT

# Warranty Claims

Claims for Inquiry: PE09-031

Inquiry: PE09-031

CLAIM\_KEY: 154290 RPR\_DT: 9/12/2007 MILGE: 1001 TXN\_CD: 1  
MDL\_YR: 2008 AWS\_VL\_CD: M6 VIN\_CD: 1FMCU59H88K [REDACTED]  
PART\_NUM\_CAUS\_PREF: 6L8Z PRODN\_DT: 8/8/2007  
PART\_NUM\_CAUS\_BASE: 3078 WRTY\_START\_DT: 8/20/2007  
PART\_NUM\_CAUS\_SUFF: AA TRANS\_CD: T/AI  
DEALER: CAPITOL FORD SALES INC ENG\_CD: T/AN  
CUST\_CONC\_CD: C50 COND\_CD: 1 DLR\_CD: 6179 ST\_PROV\_CD: WI CENTRY\_SOLD: USA

CUST\_TXT: CUSTOMER STATES RF WHEEL ASSEMBLE CAME OFF.

TECH\_TXT1: "RIGHT FRONT BALLJOINT SEPERATED FREPLACED DAMAGED RIGHT FRONT STRUT, UPPER BEARING AND PLATE, SWAY"

TECH\_TXT2:

## MORS III Reports for Inquiry PE09-031

Inquiry: PE09-031 Source: MORS III  
Region: CHICAGO Issue: LEGAL Zone: A01 Case: 445862607  
VIN 1FMCU59H88[REDACTED] Engine: H Veh Type: T Opened: 9/17/2007  
Closed: 9/26/2007

Last Name [REDACTED] Title First Name: [REDACTED] Status: CLOSED  
Address [REDACTED] City: COTTAGE GROVE State WI ZIP: 53527  
Phone: [REDACTED]

Model Year: 2008 Model: ESCAPE HYBRID HEV 4X Mileage: 1001 Build\_Date:  
Dealer Name: CAPITOL FORD SALES Sales Code: F41102 P and A: 06179  
Reason Code: 0772 LEGAL - ACCIDENT  
Symptoms: 303155 STRG/HANDLING FUNCTION LOSS OF STRG

Origin: CALGF OGC - CLAIMS - FD INBOUND 9/17/2007 12:23:06 PM  
Action: LP222 OPEN LEGAL CONTACT - PRODUCT LIABILITY - ACCIDENT 04458626070772 30315507  
\*\*\*\*\*PRODUCT LIABILITY\*\*\*\*\*DA  
TE:09-13-07; DEALER CONTACT:MIKE HOERSTRUABBL CUSTOMER ALLEG  
ES RIGHT FRONT LOWER BALL JOINT WAS NOT COMPLETELY INSTALLED  
PAST THE PINCH BOLT RETAINER.CUSTOMER REQUESTS CONTACT FROM  
FORD REPRESENTATIVE.

Origin: CALGL OGC - CLAIMS PHONE 9/18/2007 12:35:34 PM  
Action: LP314 MAKE OUTBOUND CALL TO DEALER 04458626070772 30315507  
OBC TO DEALER -- SPOKE WITH MIKE, SM -- HE HAS DETERMINED TH  
E VEHICLE HAD A PROBLEM -- WILL EMAIL PHOTOS AND AN ESTIMATE  
FOR REPAIRS.

Origin: CALGL OGC - CLAIMS OTHER 9/20/2007 12:10:17 PM  
Action: CA0018 MANAGEMENT APPROVAL OF OFFER 04458626070772 30315507  
VEHICLE REPAIRS AUTHORIZED.

Inquiry: PE09-031

Source: MORS III

Region: CHICAGO [REDACTED]

Zone: A01

Case: 445862607

VIN 1FMCU59H88 [REDACTED]

Engine: H

Veh Type: T

Opened: 9/17/2007

Closed: 9/26/2007

Origin: CALGL OGC - CLAIMS

INBOUND 9/20/2007 8:38:20 AM

Action: LP1904 UPDATE CONTACT STATUS

04458626070772 30315507

RECEIVED EMAIL FROM MIKE, SM -- NO PICS ATTACHED -- ESTIMATE FOR REPAIRS AROUND \$2,000 --- LPA REPLIED ASKING FOR PHOTOS . AWAITING RECONTACT.

PAPERWORK SENT TO DEALER. AWAITING RECONTACT

Origin: CALGL OGC - CLAIMS

PHONE 9/20/2007 10:42:47 AM

Action: LP439 INFORMATIONAL CALL/FAX

04458626070772 30315507

IBC FROM SM -- VERIFIED IF PHOTOS HAVE BEEN RECEIVED -- YES, PHOTOS, ESTIMATE FOR REPAIRS AND FINDINGS RECEIVED BY EMAIL -- CASE SENT TO TL FOR REVIEW AND DECISION.

Origin: CALGL OGC - CLAIMS

PHONE 9/26/2007 9:59:30 AM

Action: LP7004 CLOSING COMMENTS - VEHICLE REPAIRED - DISCRETIONARY

04458626070772 30315507

VEHICLE REPAIRED -- LPA CALLED MIKE AND GAVE HIM P53 CODE:J0 1VZ FOR \$635 - BODY DAMAGE REPAIRS.