2/6/08

**James P. Vondale, Director**
Automotive Safety Office
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**Fairlane Plaza South**
330 Town Center Drive
Dearborn, MI 48126-2738 USA

February 4, 2008

Ms. Kathleen C. DeMeter, Director
Office of Defects Investigation Safety Assurance
National Highway Traffic Safety Administration
1200 New Jersey Avenue, SE/W45-302
Washington, DC 20590



Dear Ms. DeMeter:

Subject: PE07-057:NVS-214bby

The Ford Motor Company (Ford) response to the agency's November 26, 2007, letter concerning reports of alleged steering or suspension system oscillations in 2005 through 2007 model year Ford F-250 and F-350 Super Duty 4x4 vehicles is attached.

Ford has conducted extensive investigation into this subject and found that the vast majority of customer complaints provided in this response relate to torsional ring-down (small oscillations in the steering wheel that self-dampen), while some relate to shimmy (self-excited oscillation of the steerable wheels with accompanying wheel tramp). In the rare event that shimmy occurs, it is likely caused by severely under-inflated tires, and may be influenced by modifications to the front suspension, including inappropriate aftermarket tires or lift kits. These conditions are not an indication of a defect in the product produced by Ford. In order to address both torsional ring-down and shimmy, Ford has appropriately issued a Technical Service Bulletin to help technicians better diagnose and repair either condition.

Even if shimmy occurs, the vehicle can be steered and braked. Ford's evaluations have not found it to present a risk of loss of vehicle control. The lack of accidents and injuries as a result of either shimmy or the more typical momentary torsional ring-down condition supports Ford's assessment that neither condition poses an unreasonable risk to vehicle safety.

If you have any questions concerning this response, please feel free to contact me.

Sincerely,

James P. Vondale

Attachment

ATTACHMENT
February 4, 2008

FORD MOTOR COMPANY (FORD) RESPONSE TO PE 07-057

Ford's response to this Preliminary Evaluation information request was prepared pursuant to a diligent search for the information requested. While we have employed our best efforts to provide responsive information, the breadth of the agency's request and the requirement that information be provided on an expedited basis make this a difficult task. We nevertheless have made substantial effort to provide thorough and accurate information, and we would be pleased to meet with agency personnel to discuss any aspect of this Preliminary Evaluation.

The scope of Ford's investigation conducted to locate responsive information focused on Ford employees most likely to be knowledgeable about the subject matter of this inquiry and on review of Ford files in which responsive information ordinarily would be expected to be found and to which Ford ordinarily would refer. Ford notes that although electronic information was included within the scope of its search, Ford has not attempted to retrieve from computer storage electronic files that were overwritten or deleted. As the agency is aware, such files generally are unavailable to the computer user even if they still exist and are retrievable through expert means. To the extent that the agency's definition of Ford includes suppliers, contractors and affiliated enterprises for which Ford does not exercise day-to-day operational control, we note that information belonging to such entities ordinarily is not in Ford's possession, custody or control.

Ford has construed this request as pertaining to vehicles manufactured for sale in the United States, its protectorates and territories.

Ford notes that some of the information being produced pursuant to this inquiry may contain personal information such as customer names, addresses, telephone numbers, and complete Vehicle Identification Numbers (VINs). Ford is producing such personal information in an unredacted form to facilitate the agency's investigation with the understanding that the agency will not make such personal information available to the public under FOIA Exemption 6, 5 U.S.C. 552(b)(6).

Answers to your specific questions are set forth below. As requested, after each numeric designation, we have set forth verbatim the request for information, followed by our response. Unless otherwise stated, Ford has undertaken to provide responsive documents dated up to and including November 26, 2007, the date of your inquiry. Ford has searched within the following offices for responsive documents: Ford Customer Service Division, Marketing and Sales Operations, Quality, Research, Global Core Engineering, Office of the General Counsel, Automotive Safety Office, and North American Truck Product Development.

Request 1

State, by model and model year, the number of subject and peer vehicles Ford has manufactured for sale or lease in the United States. Separately, for each subject vehicle manufactured to date state the following:

a. Vehicle Identification Number;
b. Model;
c. Model Year;
d. Date of manufacture;

e. Date warranty coverage commenced;
f. The State in the United States where the vehicle was originally sold or leased (or delivered for sale or lease).

Provide the table in Microsoft Access 2000, or a compatible format, entitled "PRODUCTION DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table designed for this submission.

Answer

Ford records indicate that the approximate total number of model year 2005 through 2007 F-250 and F-350 Super Duty 4x4 vehicles sold in the United States (the 50 states and the District of Columbia) and its protectorates and territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and Virgin Islands) is 520,909.

The number of subject vehicles sold in the United States by model and model year is shown below.

| Model | 2005 MY | 2006 MY | 2007 MY |
|---|---|---|---|
| F-250 4x4 | 117975 | 139536 | 42796 |
| F-350 4x4 | 84655 | 103783 | 32164 |

Ford records indicate that the approximate total number of model year 2005 through 2007 F-250 and F-350 Super Duty 4x2 vehicles sold in the United States (the 50 states and the District of Columbia) and its protectorates and territories (American Samoa, Guam, Northern Mariana Islands, Puerto Rico, and Virgin Islands) is 169,484.

The number of peer vehicles sold in the United States by model and model year is shown below.

| Model | 2005 MY | 2006 MY | 2007 MY |
|---|---|---|---|
| F-250 4x2 | 35119 | 44777 | 16306 |
| F-350 4x2 | 26318 | 34618 | 12346 |

The requested data for each subject vehicle and peer vehicle is provided electronically in Appendix A (filename: 2008-02-04 Appendix A) on the enclosed CD.

Request 2

State the number of each of the following, received by Ford, or of which Ford is otherwise aware, which relate to the alleged defect in the subject and peer vehicles.

a. Consumer complaints, including those from fleet operators;
b. Field reports, including dealer field reports;
c. Reports involving a crash, injury, or fatality, based on claims against the manufacturer involving a death or injury, notices received by the manufacturer alleging or proving that a death or injury was caused by a possible defect in a subject vehicle, property damage claims, consumer complaints, or field reports;

d. Third-party arbitration proceedings where Ford is or was a party to the arbitration; and,
e. Lawsuits, both pending and closed, in which Ford is or was a defendant or codefendant.

For subparts "a" through "e," state the total number of each item (e.g., consumer complaints, field reports, etc.) separately for each model and model year. Multiple incidents involving the same vehicle are to be counted separately. Multiple reports of the same incident are also to be counted separately (i.e., a consumer complaint and a field report involving the same incident in which a crash occurred are to be counted as a crash report, a field report and a consumer complaint).

In addition, for items "c" through "e," provide a summary description of the alleged problem and causal and contributing factors and Fords assessment of the problem, with a summary of the significant underlying facts and evidence. For items "d" and "e", identify the parties to the action, as well as the caption, court, docket number, and date on which the complaint or other document initiating the action was filed.

Answer

For purposes of identifying reports of incidents that may be related to the alleged defect and any related documents, Ford has gathered "owner reports" and "field reports" maintained by Ford Customer Service Division (FCSD), and claim and lawsuit information maintained by Ford's Office of the General Counsel (OGC).

Descriptions of the FCSD owner and field report systems and the criteria used to search each of these are provided electronically in Appendix B (filename: 2008-02-04 Appendix B) on the enclosed CD.

The following categorizations were used in the review of reports located in each of these searches:

| Category | Allegation |
|---|---|
| A | Intermittent oscillation in steering or suspension following front or rear wheel impacts in the road surface |
| B | Intermittent oscillation in steering or suspension, unknown if induced by front or rear wheel impact in the road surface |

We are providing electronic copies of reports categorized as "B" as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these reports is insufficient to support a determination that they pertain to the alleged defect.

Owner Reports: Records identified in a search of the Master Owner Relations Systems (MORS) database, as described in Appendix B, were reviewed for relevance and categorized in accordance with the categories described above. The number and copies of relevant owner reports identified in this search that may relate to the agency's investigation are provided in the MORS III portion of the electronic database contained in Appendix C1 for subject vehicles and Appendix C2 for peer vehicles (filenames: 2008-02-04 Appendix C1 and 2008-02-04 Appendix C2) on the enclosed CD. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive (i.e., not ambiguous) duplicate owner reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one report associated with their VINs. These reports have been counted separately.

Legal Contacts: Ford is providing, in Appendix B, a description of Legal Contacts and the activity that is responsible for this information, Litigation Prevention. To the extent that responsive (i.e., not ambiguous) owner reports indicate that they are Legal Contacts, Ford has gathered the related files from the Litigation Prevention section. Non-privileged documents for files that were located that are related to the responsive owner reports are provided electronically in Appendix D (filename: 2008-02-04 Appendix D).

Field Reports: Records identified in a search of the Common Quality Indicator System (CQIS) database, as described in Appendix B, were reviewed for relevance and categorized in accordance with the categories described above. The number and copies of relevant field reports identified in this search that may relate to the agency's investigation are provided in the CQIS portion of the electronic database contained in Appendix C1 for the subject vehicles and Appendix C2 for the peer vehicles on the enclosed CD. The categorization of each report is identified in the "Category" field.

When we were able to identify that responsive duplicate field reports for an alleged incident were received, each of these duplicate reports was marked accordingly, and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one report associated with their VINs. These reports have been counted separately. In addition, field reports that are duplicative of owner reports are provided in Appendix C1 for the subject vehicles and C2 for the peer vehicles but are not included in the field report count.

VOQ Data: This information request had an attachment that included 78 Vehicle Owner's Questionnaires (VOQs). Ford made inquiries of its MORS database for customer contacts, and its CQIS database for field reports regarding the vehicles identified on the VOQs. Ford notes that there was one VOQ for an F-150 vehicle that is not included in the scope of this request and two VOQs pertaining to peer vehicles. A fourth VOQ could not be confirmed due to an invalid VIN. Additionally, 14 VOQs did not have accompanying VIN information; VINs were subsequently identified by Ford for seven of these VOQs based on review of Ford's customer database information. One VOQ VIN was provided by the agency upon Ford's request because it pertains to an alleged injury. Any reports located on a vehicle identified in the VOQs related to the alleged defect are included in the MORS and CQIS portions of the electronic database provided in Appendix C1 for the subject vehicles and Appendix C2 for the peer vehicles and have been identified by a "Y" in the "VOQ Dup" field.

Crash/Injury Incident Claims: For purposes of identifying allegations of accidents or injuries that may have resulted from the alleged defect, Ford has reviewed responsive owner and field reports, and lawsuits and claims. Copies of documents relating to alleged accidents or injuries are provided electronically as Appendix E (filename: 2008-02-04 Appendix E) on the enclosed CD. Copies of reports corresponding to these alleged incidents are provided in the MORS, CQIS, and Analytical Warranty System (AWS) portions of the electronic database provided in Appendix C1 for the subject vehicles and Appendix C2 for the peer vehicles.

Claims, Lawsuits, and Arbitrations: For purposes of identifying incidents that may relate to the alleged defect, Ford has gathered claim and lawsuit information maintained by Ford's OGC. Ford's OGC is responsible for handling product liability lawsuits, claims, and consumer breach of warranty lawsuits and arbitrations against the Company.

Lawsuits and claims gathered in this manner were reviewed for relevance and categorized in accordance with the categories described above. Ford has also located other lawsuits, claims or consumer breach of warranty lawsuits, each of which is ambiguous as to whether it meets the alleged defect criteria. We have included these lawsuits and claims as "non-specific allegations" for your review because of the broad scope of the request. Based on our engineering judgment, the information in these lawsuits and claims is insufficient to support a determination that they pertain to the alleged defect.

We are providing the requested detailed information, where available, on the responsive and ambiguous lawsuits and claims in our Log of Lawsuits and Claims, provided in Appendix C1 in the Legal Claim/Lawsuits tab on the enclosed CD. The number of relevant lawsuits and claims identified is also provided in this log. To the extent available, electronic copies of complaints, first notices, or MORS reports relating to matters shown on the log are provided on the enclosed CD. With regard to these lawsuits and claims, Ford has not undertaken to contact outside law firms to obtain additional documentation. Ford was not able to locate any lawsuits or claims against the peer vehicles.

Request 3

Separately for each item (complaint, report, claim, notice, or matter) within the scope of your response to Request No. 2, state the following information:

a. Ford's file number or other identifier used;
b. The category of the item, as identified in Request No. 2 (i.e., consumer complaint, field report, etc.);
c. Vehicle owner or fleet name (and fleet contact person), address, and telephone number;
d. Vehicle's VIN;
e. Vehicle's make, model and model year;
f. Vehicle's mileage at time of incident;
g. Incident date;
h. Incident state;
i. Report or claim date;
j. Whether a crash is alleged;
k. Whether property damage is alleged;
l. Number of alleged injuries, if any;
m. Number of alleged fatalities, if any;
n. Alleged cause of the failure;
o. Complaint summary;
p. Consumer comments; and,
q. Fords assessment of the allegation;

Provide this information in Microsoft Access 2000, or a compatible format, entitled "REQUEST NUMBER TWO DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table designed for this submission.

Answer

Ford is providing owner and field reports in the electronic database contained in Appendix C1 for the subject vehicles and Appendix C2 for the peer vehicles on the enclosed CD in response to Request 2. To the extent information sought in Request 3 is available for owner and field reports, it is provided in the database. To the extent information sought in Request 3 is available for lawsuits and claims, it is provided in the Log of Lawsuits and Claims in Appendix C1. Ford was not able to locate any lawsuits or claims against the peer vehicles.

Request 4

Produce electronic copies of all documents related to each item within the scope of Request No. 2. Organize the documents separately by category (i.e., consumer complaints, field reports, etc.) and describe the method Ford used for organizing the documents.

Answer

Ford is providing owner and field reports in the electronic database contained in Appendix C1 for the subject vehicles and Appendix C2 for the peer vehicles on the enclosed CD in response to Request 2. Copies of complaints, first notices, or MORS reports relating to matters shown on the Log of Lawsuits and Claims (Appendix C1) are provided in Appendix F. To the extent information sought in Request 4 is available, it is provided in the referenced appendices. Ford was not able to locate any lawsuits or claims against the peer vehicles.

Request 5

State, by model and model year, a total count for all of the following categories of claims, collectively, that have been paid by Ford to date, which relate to the alleged defect, in the subject and peer vehicles: warranty claims; extended warranty claims; claims for good will services that were provided; field, zone, or similar adjustments and reimbursements; and warranty claims or repairs made in accordance with a procedure specified in a technical service bulletin. Separately, for each such claim, state the following information:

a. Fords claim number;
b. Vehicle owner or fleet name (and fleet contact person) and telephone number;
c. VIN;
d. Vehicle's make, model, and model year;
e. Repair date;
f. Vehicle mileage at time of repair;
g. Repairing dealer's or facility's name, telephone number, city and state or ZIP code;
h. Labor operation number;
i. Problem code;
j. Causal part (if identified);
k. Replacement part number(s) and description(s);
l. Repair procedure performed;
m. Technical Service Bulletin performed;
n. Concern stated by customer; and
o. Comments, by dealer/technician relating to claim and/or repair;

Provide this information in Microsoft Access 2000, or a compatible format, entitled "WARRANTY DATA." See Enclosure 1, Data Collection Disc, for a pre-formatted table designed for this submission.

Answer

Records identified in a search of the AWS database, as described in Appendix B, were reviewed for relevance and categorized in accordance with the categories described in the response to Request 2. The number and copies of relevant warranty claims identified in this search that may relate to the agency's investigation are provided in the AWS portion of the electronic database contained in Appendix C1 for subject vehicles and Appendix C2 for peer vehicles (filenames: 2008-02-04 Appendix C1 and 2008-02-04 Appendix C2) on the enclosed CD. The categorization of each report is identified in the "Category" field.

When we were able to identify that duplicate claims for an alleged incident were received, each of these duplicate claims was marked accordingly and the group counted as one report. In other cases, certain vehicles may have experienced more than one incident and have more than one claim associated with their VINs. These claims have been counted separately. Warranty claims that are duplicative of owner and field reports are provided in Appendix C1 for subject vehicles and Appendix C2 for the peer vehicles but are not included in the report count above.

Requests for "goodwill, field or zone adjustments" received by Ford to date that relate to the alleged defect that were not honored, if any, would be included in the MORS reports identified above in response to Request 2. Such claims that were honored are included in the warranty data provided.

Request 6

Describe in detail the search criteria used by Ford to identify the claims identified in response to Request No. 5, including the labor operations, problem codes, part numbers and any other pertinent parameters used. Provide a list of all labor operations, labor operation descriptions, problem codes, and problem code descriptions applicable to the alleged defect in the subject vehicles. State, by make and model year, the terms of the new vehicle warranty coverage offered by Ford on the subject vehicles (i.e., the number of months and mileage for which coverage is provided and the vehicle systems that are covered). Describe any extended warranty coverage option(s) related to the alleged defect that Ford offered for the subject vehicles and state by option, model, and model year, the number of vehicles that are covered under each such extended warranty.

Answer

Detailed descriptions of the search criteria, including all pertinent parameters, used to identify the claims provided in response to Request 5 are described in Appendix B.

For 2005 through 2007 model year F-250 and F-350 Super Duty 4x4 vehicles, the New Vehicle Limited Warranty, Bumper-to-Bumper Coverage begins at the warranty start date and lasts for three years or 36,000 miles, whichever occurs first. Optional Extended Service Plans (ESPs) were available to cover various vehicle systems, time in service and mileage increments. The details of the various plans are provided electronically in Appendix G (filename: 2008-02-04

Appendix G) on the enclosed CD. As of the date of the information request, 114,905 new vehicle ESP policies had been purchased on 2005 through 2007 model year F-250 and F-350 Super Duty 4x4 vehicles.

Request 7

> Produce electronic copies of all service, warranty, and other documents that relate to, or may relate to, the alleged defect in the subject vehicles, that Ford has issued to any dealers, regional or zone offices, field offices, fleet purchasers, or other entities. This includes, but is not limited to, bulletins, advisories, informational documents, training documents, or other documents or communications, with the exception of standard shop manuals. Also include the latest draft copy of any communication that Ford is planning to issue within the next 120 days.

Answer

For purposes of identifying communications to dealers, zone offices, or field offices pertaining, at least in part, to this subject, Ford has reviewed the following FCSD databases and files: The On-Line Automotive Service Information System (OASIS) containing Technical Service Bulletins (TSBs) and Special Service Messages (SSMs); Internal Service Messages (ISMs) contained in CQIS; and Field Review Committee (FRC) files. We assume this request does not seek information related to electronic communications between Ford and its dealers regarding the order, delivery, or payment for replacement parts, so we have not included these kinds of information in our answer.

A description of Ford's OASIS messages, ISMs, and the Field Review Committee files and the search criteria used are provided in Appendix B.

OASIS Messages: Ford has identified no SSMs and one active and four archived TSBs that may relate to steering wheel oscillations and is providing a copy of each of them in Appendix H1 (filename: 2008-02-04 Appendix H1).

Internal Service Messages: Ford has identified eight ISMs that may relate to steering wheel oscillations and is providing a copy of each of them in Appendix H2 (filename: 2008-02-04 Appendix H2).

Field Review Committee: Ford has identified no field service action communications that may relate to the alleged defect in the subject vehicles.

Request 8

> Describe all assessments, analyses, tests, test results, studies, surveys, simulations, investigations, inquiries and/or evaluations (collectively, "actions") that relate to, or may relate to, the alleged defect or any of the subject vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, Ford. For each such action, provide the following information:
>
> a. Action title or identifier;
> b. The actual or planned start date;
> c. The actual or expected end date;
> d. Brief summary of the subject and objective of the action;

e. Engineering group(s)/supplier(s) responsible for designing and for conducting the action; and,
f. A brief summary of the findings and/or conclusions resulting from the action.

For each action identified, provide electronic copies of all documents related to the action, regardless of whether the documents are in interim, draft, or final form. Organize the documents chronologically by action.

Answer

Ford is construing this request broadly and is providing not only studies, surveys, and investigations related to the alleged defect, but also notes, correspondence, and other communications that were located pursuant to a diligent search for the requested information. Ford is providing the responsive non-confidential Ford documentation in Appendix I (filename: 2008-02-04 Appendix I).

To the extent that the information requested is available, it is included in the documents provided. If the agency should have questions concerning any of the documents, please advise.

Ford is submitting additional responsive documentation as Appendix J (filename: 2008-02-04 Appendix J) with a request for confidentiality under separate cover to the agency's Office of the Chief Counsel pursuant to 49 CFR, Part 512.

In the interest of ensuring a timely and meaningful submission, Ford is not producing non-responsive materials or items containing little substantive information. Examples of the types of materials not being produced are meeting notices, raw data lists (such as part numbers or VINs) without any analytical content, duplicate copies, non-responsive elements of responsive materials, and draft electronic files for which later versions of the materials are being submitted. Through this method, Ford is seeking to provide the agency with substantive responsive materials in our possession in the timing set forth for our response. We believe our response meets this goal. Should the agency request additional materials, Ford will cooperate with the request.

Ford identified a number of computer model files used in the design and development of the subject vehicle's chassis. Ford does not believe these computer model files contain substantive or meaningful information pertaining to the agency's request, and has not provided them with this response. These models were generated using ADAMS software. ADAMS is a commercially available computer software program used by companies in various industries to forecast how machines or parts of machines will perform. At Ford the program is used to build vehicle computer models which in turn solve equations of motion and predict vehicle performance. ADAMS computer models consist of various vehicle sub-assemblies or templates including the front suspension, rear suspension, vehicle body, and tires as well as fitted tire data generated from tire evaluations. In addition, there are numerous "inputs" that form the basis of the various template files.

The ADAMS models in various configurations can be interpreted by ADAMS programs such as ADAMS/Pre and ADAMS/Solver which are commercially available from MSC Software ("MSC") (formerly known as Mechanical Dynamics). Ford licenses the ADAMS software it uses for its ADAMS models from MSC, which includes subroutines and features proprietary to Ford. Thus, as a matter of copyright law, Ford cannot simply "make a copy of" or "produce" the ADAMS software. Further, the agency should understand that running older ADAMS models using

newer versions of the ADAMS software may not provide results identical to those using the version of the software with which the model was originally created. Ford will, upon request, authorize MSC to work directly with the agency in regard to the installation of software and the purchase of the necessary license. At the agency's request, Ford will produce these ADAMS models.

As part of Ford's process to continually improve and accelerate its development processes for future vehicles, an effort was undertaken in December of 2006 to simulate vehicle behavior including front suspension and steering wheel oscillation using computer modeling techniques. A number of vehicles, including a 2005 model year Super Duty vehicle, have been used to develop and refine the model for use on 2010 model year vehicles and beyond. The modeling techniques have yet to be validated and are continuing to be developed. Therefore we do not believe this computer model or the documents relating to its development contain substantive or meaningful information pertaining to the agency's request, and have not provided them with this response. Should the agency desire information pertaining to this model and its development, Ford would be pleased to discuss the model and its related documentation with the agency.

Request 9

> State whether Ford has ever conducted, or is aware of, any returned part analyses in subject vehicles related to the alleged defect. If so, describe, and provide electronic copies of all documents and photographs relating to, any and all returned part analyses of subject components. Include in your description the total number of such parts returned, the number analyzed, a description of how they were analyzed, a listing of all such components that were inspected, tested, evaluated, or assessed by stating the vehicle's VIN, recall repair date, mileage at the recall repair date, date of build, anomalies detected, and reason for specific component analysis. Include any and all material showing the frequencies of failed components as a function of service life or mileage.

Answer

Ford has identified no returned part analysis that may relate to the alleged defect in the subject vehicles.

Request 10

> Provide copies of all documents transmitted internally within Ford that relate to the alleged defect in the subject vehicles. Organize the document copies in chronological order.

Answer

To the extent available, Ford is providing all of the documents in response to Request 10 within the response to Request 8. Ford is providing the responsive non-confidential Ford documentation in Appendix I (filename: 2008-02-04 Appendix I). Ford is submitting additional responsive documentation as Appendix J (filename: 2008-02-04 Appendix J) with a request for confidentiality under separate cover to the agency's Office of the Chief Counsel pursuant to 49 CFR, Part 512.

Request 11

Provide copies of all failure mode and effects analyses related to the alleged defect in the subject vehicles.

Answer

Ford is providing a failure mode and effects analysis (FMEA) for the lower steering system and an FMEA for the suspension system electronically as Appendix K (filename: 2008-02-04 Appendix K) on the enclosed CD.

Request 12

Furnish Fords assessment of the alleged defect in the subject vehicles, including:

g. An assessment of the failure mechanism including all causal or contributory factors;
h. An assessment of the design factors of the subject vehicles that may contribute to or influence the existence of the alleged defect;
i. An assessment of the manufacturing factors that may contribute to or influence the existence of the alleged defect;
j. An assessment of the vehicle assembly factors that may contribute to or influence the existence of the alleged defect;
k. An assessment of the vehicle use factors of the subject component that may contribute to or influence the existence of the alleged defect;
l. Being as specific as possible in your answers, please provide engineering explanations for how various factors affect the suspension and steering systems resulting in the alleged defect;.
m. Any warning symptoms;
n. The root cause of the failures;
o. Its potential effect on occupant safety; and
p. The potential for future occurrences of the alleged defect in the subject vehicles;

Answer

A review of the reports and claims that may relate to the "alleged defect" reveals that there are two distinct types of suspension or steering wheel oscillations that may result from wheel impacts, such as with potholes, sewer tops, manhole covers, expansion joints, drop-offs, and roadway delamination areas. One type of oscillation is referred to by Ford as torsional ring-down, or wheel fight. Though often noticeable to the driver, it quickly dampens out with no driver reaction. The majority of the reports and claims provided in this response appear to relate to this type of momentary steering wheel oscillation. The other type of suspension oscillation, referred to as shimmy, is essentially defined by SAE as a self-excited oscillation of a pair of steerable wheels about their steering axes accompanied by appreciable wheel tramp. Wheel tramp is essentially defined as a form of movement in which two wheels move in opposite phase. The steering wheel oscillation is larger in amplitude than torsional ring-down and may require driver reaction to alleviate the condition. Throughout such an event, the vehicle can be steered and braked and the vehicle remains controllable. Driver reaction may include slowing the vehicle by releasing the accelerator or through braking, or simply steering the vehicle. Ford has thoroughly investigated customer reports of shimmy and has found the condition to occur much less frequently than torsional ring-down. Ford's investigations have also found that shimmy only occurs with significantly under-inflated front tires.

A description and illustrations of the subject vehicle's steering and suspension systems are provided below to assist with the more detailed explanation of torsional ring-down and shimmy that follows. The front suspension of the subject vehicles consists of a solid front axle. This design ties the two front corners of the vehicle together such that forces generated on one wheel are transferred to the other wheel causing a reaction force. Energy within the front suspension is also transferred to the vehicle's frame through a track bar and to the steering wheel through the steering gear.

The 2005 through 2007 F-250 and F-350 4x2 peer vehicles in this inquiry do not have a solid front axle and use an independent front suspension that does not provide a direct transfer of energy between the wheels.

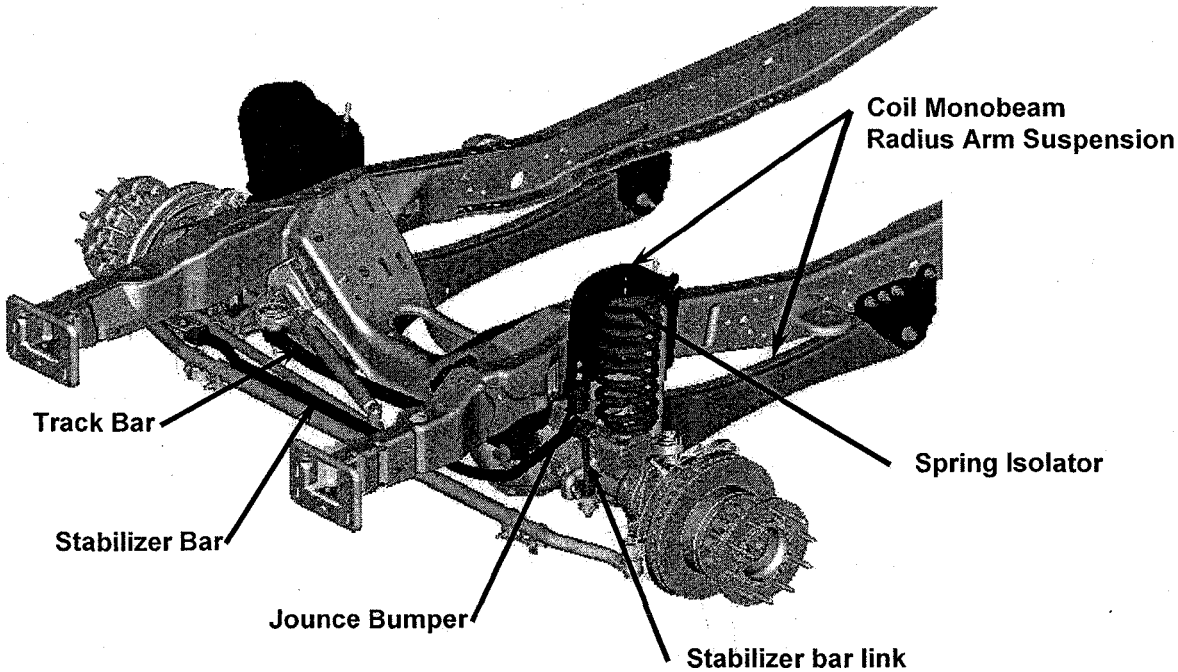


**Figure 1: 2005 – 2007 F-250 and F-350 4x4 Front Suspension System**

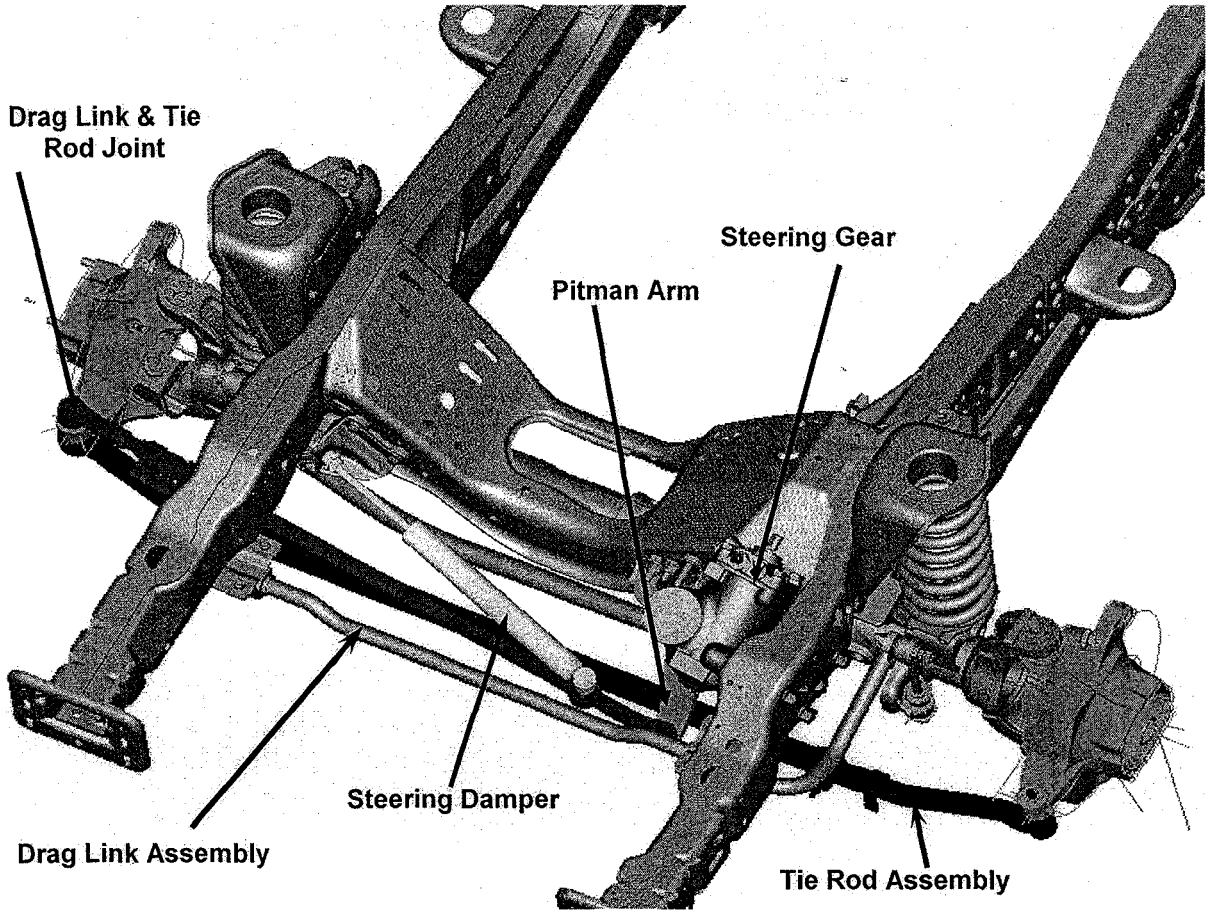


**Figure 2: Partial View of 2005 – 2007 F-250 and F-350 4x4 Steering System**

Torsional Ring-down

It is possible for vehicle vibrations to be transferred to the steering system, through the gear, and, if the magnitude is large enough, they may be noticeable to the driver at the steering wheel as a slight wheel rotation. A steering damper is used to dampen out vibrations caused by displacement of the steering system. Larger front wheel movements may result in momentary oscillation of the steering wheel, as much as +/- 10 degrees. Within approximately five cycles and one to two seconds, the oscillation is no longer perceived by the driver. The typical cause of this type of steering wheel oscillation is front wheel impacts, though they could also result from rear wheel impacts. As previously noted, torsional ring-down quickly dampens out, and no driver reaction is required to mitigate the oscillation. Throughout the event vehicle control, including steering and braking, are unaffected.

Extensive Ford development testing has shown that the major contributors to torsional ring-down include frame stiffness, steering damper condition, cab mount stiffness and steering wheel mass. Torsional ring-down has not been shown to be sensitive to vehicle speed or tire inflation pressure.

Ford has reviewed a random sampling of warranty claims provided in this response and estimates that this type of oscillation constitutes approximately 85% of the warranty claims provided in this response.

Shimmy

Shimmy is a condition associated with solid front axle suspensions and is present in any solid front axle design, including those used by other manufacturers. During vehicle development, Ford routinely tunes vehicle suspensions to eliminate shimmy during expected vehicle operating conditions. As stated previously, with a solid front axle, it is possible for an impact in one wheel to induce a reaction force in the other wheel. Following a large impact, such as with a deep pothole or large bump, the two front tire and wheel assemblies may transmit energy back and forth through the axle and tie rod. During shimmy, the axle lateral motion is typically out of phase from the tie rod lateral motion creating a steer angle at the wheels. This motion is transferred to the steering system and can be felt by the driver through steering wheel oscillations, which are typically on the order of +/- 10 degrees, but may be as much as +/- 30 degrees, and at a frequency of approximately 10 Hz. Under these conditions, the front wheels of the vehicles are rapidly moving in all three directions. During the event, the vehicle can be steered and braked. Reducing vehicle speed by simply releasing the accelerator or braking eliminates the vibration.

Ford Engineering has conducted extensive testing to evaluate the causes and effects of shimmy on the subject vehicles, and has visited numerous fleet customers that have contacted Ford regarding the condition. Related analyses have found that shimmy results from significant under-inflation of the front tires.

For example, during a visit to one fleet that had reportedly experienced shimmy on a subject vehicle, Ford found that the tire inflation pressure on the vehicles had been reduced to only 40 psi, which is 35 psi under Ford's specified tire inflation pressure of 75 psi. The fleet reportedly maintained their tires at this pressure in order to provide improved off-road traction. While Ford understands that some vehicle owners may reduce tire pressure for off-road use, Ford explicitly advises operators in the 4x4 Truck/SUV supplement accompanying each vehicle to "Avoid reducing tire pressure. Operating your vehicle with below the recommended tire pressure can increase the risk of loss of vehicle control, vehicle rollover, personal injury, and death. If you choose to reduce the tire pressure for off-road operation, make sure you re-inflate the tires as soon as possible." Beyond the warning, customers who are reducing inflation pressures to improve off-road handling clearly understand that substantially changing the inflation pressure changes the handling characteristics of the vehicle.

Other factors that Ford has observed in the vehicles with reported shimmy sensitivity are a weak or disconnected steering damper, improper caster settings, imbalanced wheels, improper vehicle loading, and significantly worn or under-torqued steering and suspension components. While these factors will not individually induce shimmy, when combined with significantly under-inflated tires, the likelihood of shimmy increases. However, significantly under-inflated tires can by themselves induce shimmy. Additionally, the installation of lift kits, and/or tires which do not meet original equipment specification increase the likelihood of it occurring.

Field Communications

Ford is aware that customers may be dissatisfied by either torsional ring-down or a shimmy condition and has issued a TSB to assist service technicians in diagnosis and repair of steering wheel oscillations. The TSB states that the tire pressure should be set to the level specified by

Ford, the steering damper should be replaced, the steering and suspension components should be property fastened and torqued, and the caster should be set. Whether the actual condition being addressed is torsional ring-down or shimmy, proper completion of this TSB should address either concern. Ford has also made quality improvements to the steering damper to improve its damping characteristics and its durability.

In addition to providing improved service information for diagnosis and repair of steering wheel oscillation, Ford has well-communicated to the operators the need to maintain proper tire pressures in various places, including the vehicle Owners Guide, corporate websites, and service publications. Ford includes sections in the Owner Guide on "Driving" and "Tires, Wheels and Loading," as well as in separate guides called "4x4 Truck/SUV Supplement" and "Driving Your SUV or Truck," with detailed information regarding the consequence of not properly maintaining a vehicle, including tire, tire replacement and tire pressure maintenance.

Proper tire pressures, as specified on the FMVSS 110 Tire/Load label, are essential to maintaining the proper tire spring rate, which directly affects tire performance, steering, braking, and vehicle handling. Ford designed and tested these vehicles to operate safely, capably and predictably across the wide variety of the usage conditions to which these vehicles are typically exposed. Alteration of vehicle parameters outside those specified by Ford, such as significantly reduced tire pressures or installation of lift kits, can affect vehicle handling performance in ways that Ford could not feasibly or reasonably be expected to consider in its base design. In the Owner Guide, Ford "strongly recommends that you do not make modifications such as adding or removing parts (such as lift kits or stabilizer bars) or by using replacement parts not equivalent to the original factory equipment" because these types of changes can negatively affect vehicle steering, braking, and handling capabilities, as well as durability. Customers who intentionally under-inflate their tires in order to change the ride characteristics of the vehicle, change tire traction characteristics for off-road usage, and/or modify their vehicles in some other manner not recommended by Ford introduce the potential for unexpected vehicle behavior, such as a shimmy condition.

Customer Report Reviews

After reviewing the VOQs provided with this inquiry, it appears that the concern expressed to the agency by customers primarily relates to the shimmy condition. Ford has found similar warranty claims relating to shimmy that indicate customers are not maintaining proper inflation pressures or are intentionally lowering the tire pressures. When the tires are properly inflated, the shimmy condition is mitigated. Several representative excerpts follow.

> VIN 1FTSW21586E[redacted] "Customer states: when hitting [asphalt] on the turnpike the vehicle shook violently almost to the point he lost control of vehicle . . . Verified vibration in steering when hitting uneven pavement and divots in the road, as per TSB 05 22 01 checked and adjusted tire psi from 40 to 75, checked steering dampner (sic) and that was ok, checked steering and suspension fastener and they are ok, adjusted steering gear box mesh and preload"
>
> VIN 1FTSW21Y85E[redacted] "Cust states veh having vibration issues – states that veh shakes violently on the highway (if veh hits any bumps on the highway) . . .veh tire pressure was low & had tire filled . . . cust . . . states veh improved dramatically after tire were inflated to correct pressure . . ."

VIN 1FTSX21575E[redacted] "Tech states that this vehicle has a shimmy over bumps that was in previously. Tech states that they upped the tire pressures and checked mesh load and also replaced the dampener. The concern is back but the tire pressures are back down."

VIN 1FTSC21565E[redacted] "S/M states that the vehicle has a vibration after hitting bumps. S/M states that he preformed the TSB and replaced the steering shock. S/M states that the tire press is 46lbs and the torque was check with a (sic) impact . . . The customer is still complaining of steering wheel oscillation when hitting bumps. By following TSB 06-15-01 they cured the majority of the oscillation, but customer still complaining of a little when hitting bumps. Customer has lowered tire pressure to help improve ride handling."

VIN 1FTSX21506E[redacted] (ODI reference number 10192570): ". . . while driving at speeds in excess of 60 mph the truck shakes violently . . . when encountering any rough place in the roadway. . . . The shaking will not stop until you have slown (sic) down dramatically or come to a stop . . ." In a customer contact with Ford filed by the customer on the same day that the VOQ was recorded, "customer states veh above 70 mph after hitting bump states vehicle feel very loose . . . has to slow down to regain control . . . cust has put 33+12.50R17 Mickey Thompson aggressive tread . . . max tire pressure is 60 psi on new tires . . . this vehicle has tires not rated the same [as] originally produced. They are on wheels to narrow for this width tire, they will not hold the road as they were intended to because at the correct pressure they will bow out in the middle . . ."

Included within the VOQs and Ford reports provided with this response are three allegations of minor accidents and two allegations of injury. Available information regarding each claim does not allow Ford to assess if it was in fact a shimmy condition, and what contributing factors may have existed. The claims of loss of control are inconsistent with how Ford understands the vehicle to behave under shimmy conditions. Additionally, there is one VOQ where the customer alleges three injuries based on the completed form but no contact was made with Ford regarding any injury or accident associated with that complaint. The customer comments in the majority of reports do not indicate any loss of vehicle control. Customers typically contact Ford regarding service misdiagnosis of the condition or improper completion of the recommended service procedure.

Ford has also included MORS report (VIN 1FTSX21547E[redacted] related to a roll-over accident, although it is ambiguous as to whether or not the allegation meets the alleged defect. This vehicle was outfitted with aftermarket tires of the wrong size and wrong load range, specifically LT265/70R17 8PR, which is equivalent to a "D" load range. The vehicle was originally equipped with LT265/70R17E. These aftermarket tires are rated for 65 psi maximum inflation pressure. A vehicle inspection following the accident found the front tire inflation pressure to be in the range of 30-42 psi, significantly below the tire inflation pressure specified by Ford for tires installed on these vehicles.

Conclusion

Ford has conducted extensive investigation into this subject and found that the vast majority of customer complaints provided in this response relate not to shimmy, but rather to torsional ring-down. Torsional ring-down is a momentary condition that requires no driver response to eliminate. In the rare event that shimmy occurs, it is likely caused by severely under-inflated tires, and may be influenced by modifications to the front suspension including inappropriate aftermarket tires or lift kits. These conditions are not an indication of a defect in the product

produced by Ford. Even if shimmy occurs, Ford's evaluations have not found shimmy to present a risk of loss of vehicle control. Consequently, Ford believes the condition does not present an unreasonable risk to vehicle safety. The lack of accidents and injuries as a result of either shimmy or the more typical momentary torsional ring-down condition supports our assessment that neither condition poses an unreasonable safety risk. In order to address both phenomena, Ford has appropriately issued a TSB to help technicians better diagnose and repair either condition.