



Derek

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Vehicle Control Division
Office of Defects Investigation
National Highway Traffic Safety Administration
1200 New Jersey Ave., S. E., Room W48-307
Washington, D.C. 20590

N090132

NVS-213dlr
PE09-025

Dear Mr. Quandt:

This letter is General Motors (GM) response to your preliminary evaluation (PE), dated June 4, 2009, regarding allegations of power steering fluid leakage in model year (MY) 2005 and 2006 Pontiac Grand Prix and MY 2006 Chevrolet Impala and Monte Carlo vehicles manufactured by General Motors Corporation, and to request certain information.

Your questions and our corresponding replies are as follows:

1. **State, by model, model year and engine, the number of subject vehicles GM has manufactured for sale or lease in the United States. Separately, for each subject vehicle manufactured to date by GM, state the following:**
 - a. **Vehicle identification number (VIN);**
 - b. **Make;**
 - c. **Model;**
 - d. **Model Year;**
 - e. **Engine Type;**
 - f. **Date of manufacture;**
 - g. **Date warranty coverage commenced;**
 - h. **The State in the United States where the vehicle was originally sold or leased (or delivered for sale or lease);**
 - i. **If customer satisfaction program 06072 has performed on the vehicle; and**
 - j. **The date the customer satisfaction program was performed if applicable.**

Provide the table in Microsoft Access 2003, or a compatible format, entitled "PE09-025PRODUCTION DATA." See Enclosure, A Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

General Motors is providing the number of subject vehicles produced for sale or lease in the United States by make, model, model year and engine type in Table 1 below:

Product Investigations

| MAKE/MODEL | 2005 MY | 2006 MY | TOTAL |
|--------------------------|---------|---------|---------|
| Pontiac Grand Prix V6 | 106,205 | 110,297 | 216,502 |
| Pontiac Grand Prix V8 | 1,791 | 6,167 | 7,958 |
| Chevrolet Impala V6 | N/A | 256,063 | 256,063 |
| Chevrolet Impala V8 | N/A | 18,462 | 18,462 |
| Chevrolet Monte Carlo V6 | N/A | 29,798 | 29,798 |
| Chevrolet Monte Carlo V8 | N/A | 8,340 | 8,340 |
| TOTAL | 107,996 | 429,127 | 537,123 |

TABLE 1 GM SUBJECT VEHICLE PRODUCTION

The GM production information requested in 1a-1j is provided on the Att_1_GM disk in the folder labeled "Q_01" refer to the Microsoft Access 2000 file labeled, "Q_01_PRODUCTION DATA". GM is providing the state where the vehicle was shipped in response to request 1h. For some of the subject vehicles, which have incomplete warranty files, the GM warranty system does not contain a warranty start date or state where the vehicle was shipped and, therefore, these fields are blank in the Microsoft Access 2000 file.

2. **State the number of each of the following, received by GM, or of which GM is otherwise aware, which relate to, or may relate to, the alleged defect in the subject 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. **Reports involving a fire, 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;**
 - e. **Property damage claims; and**
 - f. **Third-party arbitration proceedings where GM is or was a party to the arbitration; and**
 - g. **Lawsuits, both pending and closed, in which GM 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. 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 "g," provide a summary description of the alleged problem and causal and contributing factors and GM's assessment of the problem, with a summary of the significant underlying facts and evidence. For items "f" and "g," 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.

Table 2-1 below summarizes records that may relate to either (1) power steering fluid leakage from power steering cooling (return) hose/clamps (V6 engines) or the power steering cooling (return) pipe/hose assemblies (V8 engines); or (2) engine compartment fires that are or may be related to power steering fluid leakage in the subject vehicles. GM has organized the records by the GM file number within each attachment. Refer to access database "Q_03_REQUEST NUMBER TWO DATA" for categories prescribed by the NHTSA.

| TYPE OF REPORT | GM REPORTS | SUBCATEGORIES | | | | |
|--|------------|--------------------------------|-----------------------------|-------------------|---------------------------------|-------------------|
| | | CORRESPONDING TO NHTSA REPORTS | NUMBER WITH PROPERTY DAMAGE | NUMBER WITH CRASH | NUMBER WITH INJURIES/FATALITIES | NUMBER WITH FIRES |
| Owner Reports | 363 | 8 | 3 | 1 | 0 | 6 |
| Field Reports | 241 | 0 | 0 | 0 | 0 | 0 |
| Not-In-Suit Claims | 2 | 1 | 0 | 0 | 0 | 2 |
| Subrogation Claims | 0 | 0 | 0 | 0 | 0 | 0 |
| Third Party Arbitration Proceedings | 0 | 0 | 0 | 0 | 0 | 0 |
| Product Liability Lawsuits | 0 | 0 | 0 | 0 | 0 | 0 |
| Total Reports (Including Duplicates) | 606 | 9 | 3 | 1 | 0 | 8 |
| Total Vehicles with Reports (Unique VIN) | 596 | 8 | 3 | 1 | 0 | 6 |

TABLE 2-1: GM SUBJECT VEHICLE - MAY RELATE TO ALLEGED DEFECT - REPORT CLASSIFICATION

The sources of the requested information and the last date the searches were conducted are tabulated in Table 2-1 below.

| SOURCE SYSTEM | LAST DATE GATHERED |
|---|--------------------|
| Customer Assistance Center | 6/10/2009 |
| Technical Assistance Center | 6/19/2009 |
| Field Information Network Database (FIND) | 6/12/2009 |
| Field Product Report Database (FPRD) | 6/12/2009 |
| Company Vehicle Evaluation Program (CVEP) | 6/09/2009 |
| Captured Test Fleet (CTF) | 6/09/2009 |
| Early Quality Feedback (EQF) | 6/09/2009 |
| Legal / Employee Self Insured Services (ESIS) / Product Liability Claims / Lawsuits | 6/09/2009 |

TABLE 2-2: DATA SOURCES

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:
- GM's file number or other identifier used;
 - The category of the item, as identified in Request No. 2 (i.e., consumer complaint, field report, etc.);
 - Vehicle owner or fleet name (and fleet contact person),
 - Vehicle owner's address,
 - Vehicle owner's telephone number;
 - Vehicle's VIN;
 - Vehicle's make, model and model year;
 - Vehicle's mileage at time of incident;
 - Incident date;
 - Report or claim date;
 - Whether a crash is alleged;
 - Whether a fire is alleged;
 - Whether property damage is alleged;
 - Number of alleged injuries, if any; and
 - Number of alleged fatalities, if any.

Provide this information in Microsoft Access 2003, or a compatible format, entitled "PE09-025REQUEST NUMBER TWO DATA." See Enclosure, A Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

The requested GM information is provided on the Att_1_GM disk in the folder labeled "Q_03"; refer to the Microsoft Access 2000 file labeled, "Q_03_REQUEST

NUMBER TWO DATA". Some incident reports may not contain sufficient reliable information to accurately answer all parts of question 3.

4. **Produce 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 GM used for organizing the documents.**

Copies of the records summarized in Table 2-1 are on the Att_1_GM disk embedded in the folder labeled "Q_03"; refer to the Microsoft Access 2000 file labeled, "Q_03_REQUEST NUMBER TWO DATA". GM has organized the records by the GM file number within each attachment.

5. **State, by model, model year and engine, a total count for all of the following categories of claims, collectively, that have been paid by GM to date that relate to, or may relate to, the alleged defect in the subject 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 or customer satisfaction campaign.**

Separately, for each such claim, state the following information:

- a. **GM's claim number;**
- b. **Vehicle owner or fleet name (and fleet contact person)**
- c. **Vehicle owner's address**
- d. **Vehicle owner's telephone number;**
- e. **VIN;**
- f. **Repair date;**
- g. **Vehicle mileage at time of repair;**
- h. **Repairing dealer's or facility's name,**
- i. **Repairing dealer's or facility's telephone number,**
- j. **Repairing dealer's address;**
- k. **Labor operation number;**
- l. **Problem code;**
- m. **Replacement part number(s) and description(s);**
- n. **Concern stated by customer; and**
- o. **Comment, if any, by dealer/technician relating to claim and/or repair.**
- p. **If the claim is for completion of customer satisfaction program 06072**

Provide this information in Microsoft Access 2003, or a compatible format, entitled "PE09-025WARRANTY DATA." See Enclosure, A Data Collection Disc, for a pre-formatted table that provides further details regarding this submission.

Table 5-1 summarizes the GM regular warranty claims and Table 5-2 summarizes the MIC and UWC service contract claims for the subject vehicles that were collected by searching the labor codes that may be related to the alleged defect.

| MAKE/MODEL | 2005 | 2006 | TOTAL |
|--------------------------|------|--------|--------|
| Pontiac Grand Prix V6 | 0 | 7 | 7 |
| Pontiac Grand Prix V8 | 30 | 842 | 872 |
| Chevrolet Impala V6 | N/A | 35,738 | 35,738 |
| Chevrolet Impala V8 | N/A | 2,170 | 2,170 |
| Chevrolet Monte Carlo V6 | N/A | 5,626 | 5,626 |
| Chevrolet Monte Carlo V8 | N/A | 1,183 | 1,183 |
| TOTAL | 30 | 45,566 | 45,596 |

TABLE 5-1 GM REGULAR WARRANTY CLAIMS

| MAKE/MODEL | 2005 | 2006 | TOTAL |
|--------------------------|------|-------|-------|
| Pontiac Grand Prix V6 | 13 | 16 | 29 |
| Pontiac Grand Prix V8 | 16 | 104 | 120 |
| Chevrolet Impala V6 | N/A | 1,479 | 1,479 |
| Chevrolet Impala V8 | N/A | 265 | 265 |
| Chevrolet Monte Carlo V6 | N/A | 182 | 182 |
| Chevrolet Monte Carlo V8 | N/A | 85 | 85 |
| TOTAL | 29 | 2,131 | 2,160 |

TABLE 5-2 MIC AND UWC SERVICE CONTRACT CLAIMS FOR THE SUBJECT VEHICLES

The sources of the requested information and the last date the searches were conducted are tabulated in Table 5-3 below.

| SOURCE SYSTEM | LAST DATE GATHERED |
|--|--------------------|
| GART - Regular Warranty | 7/8/2009 |
| Motors Insurance Corporation (MIC) - Service Contract Claims | 7/8/2009 |
| Universal Warranty Corporation (UWC) - Service Contract Claims | 6/16/2009 |

TABLE 5-3: DATA SOURCES

For this response, GM searched the GM Global Analysis and Reporting Tool (GART-regular warranty), the Motors Insurance Corporation (MIC- service contract claims), and the Universal Warranty Corporation (UWC- service contract claims) databases to collect the subject warranty data.

GM's warranty database does not contain the vehicle owner's name or telephone number. Some of the replacement part numbers; part descriptions and customer concern code descriptions are not included in the GM warranty database. GM is providing a field labeled "Verbatim Text". The verbatim text is an optional field in the GM warranty system for the dealer to enter any additional comments that may be applicable to the warranty claim. The verbatim text field is not required to be completed for every warranty claim.

A summary of the GM warranty claims and MIC/UWC service contract claims for subject vehicles, including the information requested in 5(a-p), is provided on the Att_1_GM disk in the folder labeled "Q_05"; refer to the Microsoft Access 2000 file labeled, "Q_05_WARRANTY DATA".

- 6. Describe in detail the search criteria used by GM 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 GM 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) that GM 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.**

To search for and collect the GM warranty data for this response, the GM GART-regular warranty database and the MIC service contract claims database were searched using the labor codes that may be related to the alleged defect in the subject vehicles, listed in Table 6-1, UWC does not use labor codes.

GM lists the problem cause codes on the ATT_1_GM_disk; in the folder labeled, "Q_6 problem Codes" and the customer complaint on the ATT_1_GM_disk; in the folder labeled, "Q_6 Customer Complaint Codes", within the labor codes, that may relate to either (1) power steering fluid leakage from power steering cooling (return) hose/clamps (V6 engines) or the power steering cooling (return) pipe/hose assemblies (V8 engines); or (2) engine compartment fires that are or may be related to power steering fluid leakage.

GM included claims with a verbatim text that indicated the claim may be related to the alleged defect regardless of the replacement part number listed in the claim, and claims that showed replacement of the subject components part numbers, unless a verbatim indicated that the issue was unrelated to either (1) power steering fluid leakage from power steering cooling return hose/clamps (V6 engines) or the power steering cooling pipe/hose assemblies (V8 engines); or (2) engine compartment fires that are or may be related to power steering fluid leakage.

| LABOR CODE | DESCRIPTION: |
|------------|--|
| E8623 | HOSES, POWER STEERING HYDRAULIC - RETURN - REPLACE |
| E8904 | PIPE, POWER STEERING HYDRAULIC - RETURN - REPLACE |
| E8906 | POWER STEERING FLUID COOLING PIPE REPLACEMENT |
| E9427 | P/S COOLER PIPE/HOSE - REPAIR |
| E9680 | LINE, POWER STEERING GEAR CYLINDER - RIGHT - REPLACE |
| E9681 | LINE, POWER STEERING GEAR CYLINDER - LEFT - REPLACE |
| E9687 | LINE, POWER STEERING GEAR CYLINDER - BOTH - REPLACE |
| Z1241 | PRODUCT LIABILITY/INVESTIGATION REP PR (GOODWILL) |
| Z1242 | PAR - REPAIRS/REIMBURSEMENT (GOODWILL) |
| Z1243 | BUSINESS RESOURCE CENTER INSPECTION |

TABLE 6-1 LABOR CODES USED IN WARRANTY SEARCH

The warranty data provided has limited analytical value in analyzing the field performance of a motor vehicle component. The warranty records do not contain sufficient information to establish the condition of the part at the time of the warranty correction and service personnel may not consistently use the appropriate labor and trouble codes. Warranty numbers represent claims by our dealers for reimbursement for parts and labor costs incurred in performing warranty service for our customers.

The subject vehicles are covered by a bumper-to-bumper new vehicle warranty for three years or 36,000 miles, whichever occurs first. Many different extended warranty options are available through GM dealerships. They are offered at different prices and for varying lengths of time, based on customer's preference, up to 7 years from the date of purchase or up to a total of 100,000 vehicle miles.

The General Motor's warranty system does not contain information on the number of vehicles that have extended warranty coverage. The number of MIC Service contracts on the subject vehicles that have been sold by MIC regardless of status (in-force, expired, cancelled) as of May 22, 2009 is contained in Table 6-2.

| MAKE/MODEL | 2005 | 2006 | TOTAL |
|-----------------------|--------|--------|--------|
| Pontiac Grand Prix | 22,443 | 18,699 | 41,142 |
| Chevrolet Impala | N/A | 49,322 | 49,322 |
| Chevrolet Monte Carlo | N/A | 9,125 | 9,125 |
| TOTAL | 22,443 | 77,146 | 99,589 |

TABLE 6-2: SUBJECT VEHICLE MIC SERVICE COVERAGE CONTRACTS SOLD

- 7. Produce copies of all service, warranty, and other documents that relate to, or may relate to, the alleged defect in the subject vehicles, that GM 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 GM is planning to issue within the next 120 days.**

In October 2006 GM issued Service Bulletin No. 06072 Customer Satisfaction Program – Power Steering Hose Leak. A copy of the bulletin is included in the ATT_1_GM disk; folder labeled “Q_07”.

In November 2006 GM issued Technical Service Bulletin No. 06-02-32-014: Power Steering Fluid Leak (Replace Hose and Clamps or Pipe/Hose Assembly) – November 1, 2006. A copy of the bulletin is included in the ATT_1_GM disk; folder labeled “Q_07”.

In October 2007 GM issued Service Bulletin No. 1867312 - Closing 06072 Customer Satisfaction Program – Power Steering Hose Leak. A copy of the bulletin is included in the ATT_1_GM disk; folder labeled “Q_07”.

General Motors is reviewing Technical Service Bulletin 06-02-32-014 and may issue, in the next 120 days, a service, warranty or other technical document or communications to its dealers, regional offices, zone offices or other entities regarding the subject condition in the subject vehicles.

The preceding information was collected from GM Service Operations and was completed on June 18, 2009.

- 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 in the subject**

vehicles that have been conducted, are being conducted, are planned, or are being planned by, or for, GM. 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 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.

The information listed in Table 8 below is a summary of actions that have been conducted, are being conducted, are planned, or are being planned by or for GM regarding the subject condition on the subject vehicles as of July 28, 2009. Documents and additional supporting information are included in the Attachments as noted in the table.

General Motors requested assistance and documents from suppliers in responding to this question and this response includes those documents and the information received from suppliers.

| |
|--|
| <p>Action 8-1: Design, Development, and Validation of the subject vehicle power steering cooling (return) hose/clamps (V6 engines) or the power steering cooling (return) pipe/hose assemblies (V8 engines). Start Date: November 2002 End Date: May 2006 Engineering Group: GM Engineering, Eaton Corporation – Automotive Attachments: ATT_1_GM_disk; folder labeled "Q_8-1 GM Validation" ATT_2_GM_Conf disk; folder labeled "Q_8-1 GM Validation" ATT_3_Eaton_Conf disk; folder labeled "Q_8-1 Eaton Validation" Description: GM's and Eaton engineering documents. Summary: The subject components passed all validation tests.</p> |
| <p>Action 8-2: GM Investigation 2006 Start Date: January 2006 End Date: May 2007 Engineering Group: GM Engineering, Eaton Corporation – Automotive Attachment: ATT_1_GM_disk; folder labeled "Q_8-2 GM Investigation" ATT_2_GM_Conf disk; folder labeled "Q_8-2 GM Inv" ATT_3_Eaton_Conf disk; folder labeled "Q_8-2 Eaton Inv" Description: GM's internal investigation of the Impala, Monte Carlo and V8 Grand Prix power steering cooler line leaks. Summary: GM's data analysis was completed. Warranty data indicated that the issue occurred in Canada and colder US states for which a customer satisfaction field action was conducted.</p> |

Action 8-3: Engineering changes

Start Date: January 2006

End Date: June 2006

Engineering Group: GM Engineering, Eaton Corporation – Automotive

Attachments: ATT_2_GM_Conf disk; folder labeled "Q_9", in the files labeled "Q_9_CKCRG", "Q_9_CJWSM" and "Q_9_CHMAJ" and ATT_2_GM_Conf disk, in the folder labeled "Q_8-3".

ATT_3_Eaton_Conf disk; folder labeled "Q_8-3 Eaton".

Description: GM's and Eaton Engineering change documentation and validation related to changes to the subject components.

Summary: GM validated and released engineering changes after start of production. The subject component passed all validation tests.

Action 8-4: GM Investigation 2009

Start Date: May 2009

End Date: Continuing

Engineering Group: GM Engineering, Eaton Corporation – Automotive

Attachments: ATT_2_GM_Conf disk; in the folder "Q_8-4_GM Inv 2009".

Description: GM's investigation of the subject vehicle power steering cooling (return) hose/clamps (V6 engines) and the power steering cooling (return) pipe/hose assemblies (V8 engines).

Summary: GM is continuing its investigation of the subject condition.

9. Describe all modifications or changes made by, or on behalf of, GM in the design, material composition, manufacture, quality control, supply, or installation of the subject component, from the start of production to date, which relate to, or may relate to, the alleged defect in the subject vehicles. For each such modification or change, provide the following information:
- The date or approximate date on which the modification or change was incorporated into vehicle production;
 - A detailed description of the modification or change;
 - The reason(s) for the modification or change;
 - The part number(s) (service and engineering) of the original component;
 - The part number(s) (service and engineering) of the modified component;
 - Whether the original unmodified component was withdrawn from production and/or sale, and if so, when;
 - When the modified component was made available as a service component; and
 - Whether the modified component can be interchanged with earlier production components.

Also, provide the above information for any modification or change that GM is aware of which may be incorporated into vehicle production within the next 120 days.

GM is providing a summary of the product engineering information requested in 9(a-h) on the Att_1_GM disk in the folder labeled "Q_9"; refer to the file labeled, "Q_9_Modifications". The Engineering Work Orders (EWO) related to the modifications are on the Att_2_GM_Conf disk in the folder labeled "Q_9", refer to the files labeled, "Q_9_CKCRG", "Q_9_CJWSM" and "Q_9_CHMAJ".

10. Produce each of the following:

- a. **One exemplar sample of each design version of the subject component; and**
- b. **Two field return samples of each of the subject components (hose/clamp – V6 engines or hose/piping assemblies – V8 engines) exhibiting the subject failure mode.**

Enclosure 10a contains one exemplar sample of the latest version of the subject component (hose/clamp for V6 engines) and one exemplar sample of the latest version of the subject component (hose/piping assemblies for V8 engines). The earlier design versions of the subject components are no longer produced and there are none in GM service stock.

GM does not have available field returned samples of the following subject components exhibiting the subject failure mode:

- hose/clamp – V6 engines
- hose/piping assemblies – V8 engines

11. Provide the following information regarding the subject components:

- a. **State the material composition of the subject hoses, including the SAE line that identifies calls out for each rubber material used in the hose;**
- b. **State the design sealing forces or pressures in each subject component joint design (hose/clamp fitting - vehicles equipped with V6 engines and crimp fitting - vehicles equipped with V8 engines) and provide a chart showing how they change with temperature/time;**
- c. **State the minimum hose pressure at which each subject component joint design begins to leak power steering fluid;**
- d. **State the nominal design operating temperature / pressures of the subject component designs;**
- e. **State the nominal fluid capacity of the power steering system in the subject vehicles, the amount of leakage necessary to affect performance (i.e. increased effort), the amount of fluid leakage that could lead to failure of the power steering pump failure and the hot surface ignition temperature of the power steering fluid used in the subject vehicles;**
- f. **All copies of documents related to the subject customer satisfaction program bulletin, including all related meetings, briefing material and presentations; and**
- g. **Explain why GM decided to address the power steering hose leak with a customer satisfaction program rather than a safety recall.**

General Motors requested assistance and documents from suppliers in responding to this question and this response includes those documents and the information received from suppliers.

11a.

The Elastomer compounds in the both the original 1H119 hose (SOP 2005 MY) and the modified 1H116 (June 2006) hose are the same. The reinforcements in the hoses are different.

Hose 1H119:

Inner: Chlorinated Polyethylene

Reinforcement: Polyester Braid

Outer: Chlorinated Polyethylene

Hose 1H116:

Inner: Chlorinated Polyethylene

Reinforcement: Twin Aramid Braid

Outer: Chlorinated Polyethylene

11b.

The design sealing forces or pressures in each subject component joint are not measured by GM or the supplier of the hose. The design of the hose / clamp joint is tested and meets the specifications contained in the ADVP&R on the ATT_2_GM_Conf disk; folder labeled "Q_8-1 GM Validation", provided in response to item No. 8-1.

During the 2006 GM investigation, pressure data was acquired in cold temperatures. The pressure in the area of the rubber hose was measured. On the V6 it was between 1300 and 1400 psi at -40°C and between 800 and 900 psi at -20°C. On the V8 it was between 1100 and 1200 psi at -40°C and between 700 and 800 psi at -20°C. A chart showing the power steering cooler assembly hose section maximum measured pressures vs. cold start temperature is included in the response to item No. 8-2.

11c.

The minimum hose pressure, at which each subject component joint begins to leak power steering fluid, is not measured by GM or the supplier of the hose. The hose/ clamp joint is designed and tested to the GM specifications contained in the ADVP&R on the ATT_2_GM_Conf disk; folder labeled "Q_8-1 GM Validation", in response to item No. 8-1.

11d.

The design working temperature range of the subject components is -40°C (-40°F) to +150°C (302°F). The design operating pressures of the subject component are provided in response to item No. 8.

11e.

The power steering system for subject vehicles with V6 engines is designed to operate at;

| | |
|----------------------|----------|
| Maximum Fluid Volume | 880.4 ml |
| Minimum Fluid Volume | 821.4 ml |

The power steering system for subject vehicles with V8 engines is designed to operate at;

| | |
|----------------------|----------|
| Maximum Fluid Volume | 900.9 ml |
| Minimum Fluid Volume | 841.9 ml |

Operating the system outside of the maximum/minimum fluid volumes may reduce system performance and durability to something less than design intent indicated by noise and/or increased effort. If all of the fluid leaks from the system, power steering assist will be lost and damage to the power steering pump may occur. In the event of a power assist failure, the steering shall default to a manual steering mode and power steering will be lost and the steering shall default to a manual steering mode and the vehicle can be steered in a safe and controlled manner.

The hot surface ignition (HSI) temperatures of the power steering fluid used in the subject vehicles is 608°F (360°C) to 720°F (383°C) as published in NFPA 921 (2008 Edition).

11f.

The requested documentation related to the subject Customer Satisfaction Program Bulletin 06072 is provided on the Att_1_GM disk, in the folder labeled "Q_11f" and on Att_2_GM_Conf disk, in the folders labeled, "Q_11f" and "Q_8-2_GM_Investigation".

11g.

The highest rates of leakage were from cold weather US states and Canada, and many reports of leaks were associated with the initial start of the vehicle after an overnight soak. Cold starts are associated with leaks because power steering fluid becomes more viscous in lower temperatures. When the fluid is more viscous, the pressure in the system increases and the potential of a leak at a clamp (Impala/Monte Carlo V6 only) or through the hose itself (Impala/Monte Carlo V6 and V8 and Grand Prix V8) is higher.

If the leak occurs during a cold start, (1) fluid will generally drop down to the ground since there would be no air flow to redirect fluid upward toward the exhaust system, and (2) the exhaust system would not be hot enough to ignite any fluid that may contact it. GM also concluded that if there was a leak after the engine temperature had increased, there was a low likelihood of a fire due to the vertical orientation of the hose and proximity to exhaust system components. Leaks are more likely to send fluid away from hot exhaust system components.

A "slow" leak (@ V6 clamps or pin hole in hose) may be noticed as a puddle where the vehicle has been parked. After approximately 59 ml of fluid is lost, system performance and durability may be reduced to something less than design intent. If all of the fluid leaks from the system, power steering will be lost and the steering shall default to a manual steering mode and the vehicle can be steered in a safe and controlled manner.

Based on GM field reports, a "fast" leak due to a split hose may be noticed as a pop when the hose bursts. Complete loss of fluid will occur quickly due to pump operation. Power steering effort will increase, damage to the power steering pump may occur and the steering shall default to a manual steering mode.

At the time the customer satisfaction field action was initiated, GM had no reports regarding loss of steering control, fires or injuries related to the power steering cooler line leakage. Additionally GM assessment was that there was a low likelihood of a fire due to the vertical orientation of the hose and proximity to exhaust system components and the condition was likely to occur during a cold start.

- 12. State the number of each of the following that GM has sold that may be used in the subject vehicles by component name, part number (both service and engineering/production), model and model year of the vehicle in which it is used and month/year of sale (including the cut-off date for sales, if applicable):**
- a. Subject component; and**
 - b. Any kits that have been released, or developed, by GM for use in service repairs to the subject component/assembly.**

For each component part number, provide the supplier's name, address, and appropriate point of contact (name, title, and telephone number). Also identify by make, model and model year, any other vehicles of which GM is aware that contain the identical component, whether installed in production or in service, and state the applicable dates of production or service usage.

An electronic summary table of the requested service part information for the subject components is provided on the ATT_1_GM disk; folder labeled "Q_12": refer to the Microsoft Excel file labeled "Q_12_Part Sales".

These sales numbers represent sales to dealers in the US and Canada. This data has limited analytical value in analyzing the field performance of a motor vehicle component because the records do not contain sufficient information to establish the reason for the part sale. It is not possible from this data to determine the number of these parts that have been installed in the subject vehicles or the number remaining in dealer or replacement part supplier inventory.

This table contains service part numbers, part description, part usage information including the GM vehicles that contain the identical component, part sales figures by month and calendar year, and the supplier's name and address, contact name and phone number.

13. Furnish GM's assessment of the alleged defect in the subject vehicle, including:

- a. The causal or contributory factor(s);**
- b. The failure mechanism(s);**
- c. The failure mode(s);**
- d. The risk to motor vehicle safety that it poses;**
- e. What warnings, if any, the operator and the other persons both inside and outside the vehicle would have that the alleged defect was occurring or subject component was malfunctioning;**
- f. The failure rates after 12, 36 and 60 months in service and describe fully the statistical methodology used for this response;**
- g. VOQs 10258309 and 10219882 where fires were alleged;**
- h. GM's assessment of the number of fires that may be related to the alleged defect;**
- i. GM's assessment of the likelihood of a fire due to the alleged defect; and**
- j. The reports included with this inquiry.**

GM's investigation of the subject condition indicates that it is not an issue on the 2005 -06 MY Pontiac Grand Prix vehicles with V6 engines, The subject components installed in the 2005-06 MY Pontiac Grand Prix vehicles with V6 engines are carryover parts designed and manufactured by Delphi Corporation. The responsive warranty data contains only 7 warranty claims and 29 extended service contract claims related to power steering cooler lines on over 215,000 vehicles, and no reports of fires that may be related to the power steering cooler line.

The subject components installed in the 2005-06 Pontiac Grand Prix vehicles with V8 engines and the 2006 MY Chevrolet Impala and Monte Carlo vehicles with both V6 and V8 engines were designed and manufactured by Eaton Corporation – Automotive (Eaton). The subject Customer Satisfaction Program applied only to subject vehicles manufactured with the Eaton design. Consequently, GM did not include the Grand Prix V6 data in calculating the failure rates in response to item 13f.

Response to 13(a) – 13(c), 13(e):

The Eaton design hose can split and/or leak at the clamps (V6 Impala/Monte Carlo only) if pressure pulses in the power steering cooler line exceeds the capacity of the parts. These expansion related cracks of the inner hose rubber may occur at grooves of varying depth resulting from burrs on the hose extrusion tools. These grooves may be sufficient to be stress risers. Although these stress risers are common to all manufacturers, they are generally not an issue unless the hose braid allows the rubber to expand to the point that cracks can initiate.

At cold temperatures during engine start, power steering fluid becomes more viscous which increases the pressure in the system. Consequently, the system pressures are the highest in cold temperatures until heat generated by the operation of the power steering pump warms the fluid. The pressure is reduced after the vehicle has operated for a few minutes.

During the 2006 GM investigation, pressure data was acquired in cold temperatures. The pressure in the area of the rubber hose was measured. On the V6 it was between 1300 and 1400 psi at -40°C and between 800 and 900 psi at -20°C. On the V8 it was between 1100 and 1200 psi at -40°C and between 700 and 800 psi at -20°C.

The minimum design burst pressure of the Eaton hose is provided in response to item No. 8. Over time heat aging of the hose may raise the cold start temperature that could contribute to the initiation of a leak. In certain vehicles the hose braid may allow the inner rubber layer to expand and develop longitudinal splits. A leak at the inner layer of rubber allows fluid between rubber layers and the reinforcement. Fluid weakens the hose and increases the potential that the outer layer of rubber may burst without damaging the reinforcing matrix.

A "slow" leak (@ V6 clamps or pin hole in hose) may be noticed as a puddle where the vehicle has been parked. After approximately 59 ml of fluid is lost, system performance and durability may be reduced to something less than design intent. If all of the fluid leaks from the system, power steering will be lost, and damage to the power steering pump may occur.

A "fast" leak due to a split hose may be noticed as a pop when the hose bursts. Complete loss of fluid will occur quickly due to pump operation. Power steering effort will increase and damage to the power steering pump may occur.

Response to Question 13(f):

GM is providing the requested failure rates after 12, 36 months in service and the projected failure rate after 60 months in service on the ATT_2_GM_Conf disk, in the folder labeled, "Q13f Survival Analysis." Included in this attachment is a description of the statistical methodology used to calculate these rates.

Response to Question 13(g): VOQs 10258309 and 10219882.

GM was not able to review the parts in question, so we cannot comment as to whether or not the power steering cooler line was the true cause of the issue alleged in each VOQ.

The vehicle (2006 Impala V6) referenced in VOQ 10258309 has no warranty claims in the GM warranty system that may be related to the subject condition. There is a GM owner report with the GM Customer Assistance Center (CAC). The information regarding the circumstances of the incident is consistent with that in the VOQ. The

customer indicates the vehicle was taken to a dealer who stated the vehicle needed a new power steering line, ignition coil, spark plug wires, transmission line, and engine wire harness. Based on the GM owner report the vehicle was repaired in February 2009.

The vehicle (2006 Impala V6) referenced in VOQ 10219882 has no warranty claims in the GM warranty system that may be related to the subject condition. There is a GM owner report with the GM CAC. The information regarding the circumstances of the incident in the GM record is consistent with that in the VOQ. The customer indicates the vehicle was taken to an independent shop where he paid \$123 to have the vehicle repaired. The customer also indicated that the only item replaced was the power steering cooling line.

Response to questions 13(h) and 13(i): Risk of Fire:

The highest rates of leakage are from US states that may experience cold weather (temperatures below -23°C) and many reports of leaks are associated with initial start of the vehicle after an overnight soak. Cold starts are associated with leaks because power steering fluid becomes more viscous at low temperatures. If the fluid is more viscous, it will increase the pressure in the system and the potential of a leak at a clamp (Impala/Monte Carlo V6 only) or through the hose itself (Impala/Monte Carlo V6 and V8 and Grand Prix V8).

If the leak occurs during a cold start, the exhaust system would not be hot enough to ignite any fluid that may contact it. If the leak occurs during a cold start, fluid will generally drop down to the ground since there would be no air flow to redirect fluid upward toward the exhaust system.

GM concludes that if there is a leak after the engine temperature has increased, there is a low likelihood of a fire due to the vertical orientation of the hose and proximity to exhaust system components. Leaks are more likely to send fluid away from hot exhaust system components.

In the GM system there were six unique VINs with reports of smoke or fires that may be related to the alleged defect. All six are 2006 MY Impala vehicles with V6 engines. Two of the alleged fires occurred after the vehicle had the field remedy hose installed by a dealer. As indicated in response to item No. 7 GM is reviewing Technical Service Bulletin 06-02-32-014. The breakdown of the other four reports GM reports is as follows:

- 1 Smoke only required replacement of the cooler line and pump (\$236)
- 1 No warranty claim, but the customer alleged a fire and an independent repaired the vehicle for \$123
- 1 Fire alleged with warranty claim for \$1,109
- 1 Fire alleged with warranty claim for \$1,884

All four incidents were discovered while the engine was running, the vehicle was attended and no injuries were reported.

Excluding the smoke only report, there have been three fires resulting in relatively minor damage on vehicles with the original equipment power steering cooler lines. This is a low incident rate of 0.94 incidents per 100,000 vehicles.

Loss of Power Assist:

The system has been designed that in the event of a complete loss of power steering fluid the steering system will default to manual steering mode and the vehicle can be steered in a safe and controlled manner. There is no evidence of lock-up in the steering system. Some customers have incorrectly reported manual steering higher effort as a steering system "lock-up", particularly if the vehicle was stopped or at very low speed.

The power steering system is designed so that the driver can maintain control if the power steering system exhibits a low fluid flow or no fluid flow condition. The response to item No. 11 contains information regarding fluid capacity of the power steering system and the amount of leakage necessary to affect performance. The mechanical linkage between steering wheel and road surface is similar to other steering rack systems used by other motor vehicle manufacturers for many years. The effect of power steering assist is greatest at very low speeds (such as when parking) and lowest at highway speeds. Gradual changes in vehicle direction (low lateral g-levels) would require the least increase in steering wheel force. Therefore, the loss of power steering assist is unlikely to be associated in any way with serious injuries that might occur in a high-speed crash.

GM owner's manuals provide information relating to system function. The owner's manual for subject vehicles has the following statement regarding power steering:

"Power Steering

If you lose power steering assist because the engine stops or the system is not functioning, you can steer but it will take much more effort."

There is one GM Owner report of a crash. There were no injuries reported with that incident. The crash was a minor event that occurred when the vehicle was traveling between 5-10 mph. The customer alleged she lost power steering and was unable to turn into her driveway and subsequently ran into a snow bank.

There is one VOQ (10269392) that alleges a crash with two injuries. GM does not believe the cause of the crash is related to the alleged defect. The VOQ states that the wheel locked and the vehicle rolled. GM identified a matching Product Allegation Resolution (PAR) report that does not include any information regarding an alleged defect in the subject components. Loss of power steering fluid would not result in a locked steering wheel.

Response to Question 13(d):

In summary, GM continues to investigate the alleged defect with the following conclusions to date:

- The risk and rate of fire is very low. All have occurred while the vehicle was attended and there have been no reported injuries.
- Customers may notice power steering leakage underneath the vehicle when parked.
- GM has one customer report of alleged loss of control due to loss of power assist. This accident occurred at low speed and there were no reported injuries.
- The GM Owner and Field reports that contained sufficient information to determine when a leak occurred indicate that approximately one third were at initial vehicle start.

□ □ □

General Motors requested assistance and documents from suppliers in responding to items 8, 9, 10, and 11 and this response includes those documents received from suppliers.

GM claims that certain information, in documents that are part of lawsuit and claims files maintained by the GM Legal Staff, is attorney work product and/or privileged. That information includes notes, memos, reports, photographs, and evaluations by attorneys (and by consultants, claims analysts, investigators and engineers working at the request of attorneys). GM is producing responsive documents from claims files that are neither attorney work product nor privileged, and withholding those that are attorney work product and/or privileged.

This response is based on searches of General Motors Corporation (GM) locations where documents determined to be responsive to your request would ordinarily be found. As a result, the scope of this search did not include, nor could it reasonably include, " all of their divisions, subsidiaries (whether or not incorporated) and affiliated enterprises and all of their headquarters, regional, zone and other offices and their employees, and all agents, contractors, consultants, attorneys and law firms and other persons engaged directly or indirectly (e.g., employee of a consultant) by or under the control of GM (including all business units and persons previously referred to), who are or, in or after January 1, 2002, were involved in any way with any of the following related to the alleged defect in the subject vehicles:

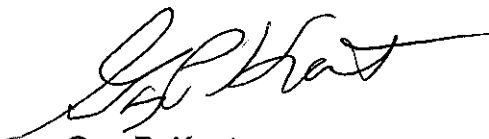
- a. Design, engineering, analysis, modification or production (e.g. quality control);
- b. Testing, assessment or evaluation;
- c. Consideration, or recognition of potential or actual defects, reporting, record-keeping and information management, (e.g., complaints, field reports, warranty information, part sales), analysis, claims, or lawsuits; or

- d. Communication to, from or intended for zone representatives, fleets, dealers, or other field locations, including but not limited to people who have the capacity to obtain information from dealers.”

This response was compiled and prepared by this office upon review of the documents produced by various GM locations, and does not include documents generated or received at those GM locations subsequent to their searches.

Please contact me if you require further information about this response or the nature or scope of our searches.

Sincerely,



Gay P. Kent
Director
Product Investigations

Attachments