126-TRC-07-003

SAFETY COMPLIANCE TESTING FOR FMVSS 126 (Indicant)
Electronic Stability Control Systems

General Motors
2007 Chevrolet Avalanche
NHTSA No. C70118

TRANSPORTATION RESEARCH CENTER INC.
10820 State Route 347
East Liberty, Ohio 43319

December 10, 2007

FINAL REPORT
Prepared Under Contract No.: DTNH22-07-P-00332

U. S. DEPARTMENT OF TRANSPORTATION
National Highway Traffic Safety Administration
Enforcement
Office of Vehicle Safety Compliance
1200 New Jersey Avenue, SE
West Building, 4th Floor (NVS-221)
Washington, DC 20590

A test was conducted on a 2007 Chevrolet Avalanche, NHTSA No. C70118, in accordance with the specifications of the Office of Vehicle Safety Compliance Test Procedure No. TP-126-00 for the determination of FMVSS 126 compliance. Test failures identified were as follows: None.

Compliance Testing
Safety Engineering
FMVSS 126

Copies of this report are available from:
NHTSA Technical Information Services (TIS) (NPO 411)
1200 New Jersey Avenue, SE
Washington, D.C. 20590
Email: tis@nhtsa.dot.gov
FAX: (202) 493-2833

This test is classified as an "Indicant" test because manufacturers are not required to certify vehicles to FMVSS 126 until on or after September 1, 2008.

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1.0 PURPOSE OF COMPLIANCE TEST

The purpose of this test is to determine if the test vehicle, an MY 2007 Chevrolet Avalanche meets the minimum equipment and performance requirements stated in Federal Motor Vehicle Safety Standard (FMVSS) 126, "Electronic Stability Control Systems."

This test is considered an "Indicant" Test because manufacturers are not required to certify vehicles to FMVSS 126 until on or after September 1, 2008.

This standard establishes performance and equipment requirements for Electronic Stability Control (ESC) Systems installed in passenger cars, multipurpose passenger vehicles, trucks and buses with a gross vehicle weight rating of 4,536 kilograms or less.

2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS

Testing of the MY 2007 Chevrolet Avalanche was conducted at Transportation Research Center Inc. (TRC Inc.) in accordance with NHTSA TP-126-00, dated April 6, 2007.

The vehicle was inspected to ensure it was equipped with an ESC system that:
- Augments vehicle directional stability by applying and adjusting the brake torques individually at each wheel to induce a correcting yaw moment to a vehicle;
- Is computer controlled with the computer using a closed-loop algorithm to limit vehicle oversteer and to limit vehicle understeer;
- Has a means to determine the vehicle’s yaw rate and to estimate its side slip or side slip derivative with respect to time;
- Has a means to monitor driver steering inputs;
- Has an algorithm to determine the need, and a means to modify engine torque, as necessary, to assist the driver in maintaining control of the vehicle, and
- Is operational over the full speed range of the vehicle (except at vehicle speeds less than 15km/h (9.3mph) or when being driven in reverse).

The vehicle was subjected to a 0.7Hz sine with dwell steering maneuver to ensure that it would meet the stability and responsiveness requirements of the standard as follows:
- At 1.0 second after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 35 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between first and second peaks during the same test run).
- At 1.75 seconds after completion of a required sine with dwell steering input, the yaw rate of the vehicle must not exceed 20 percent of the first peak value of yaw rate recorded after the steering wheel angle changes sign (between
first and second peaks during the same test run).
- The lateral displacement of the vehicle center of gravity with respect to its initial straight path must be at least 1.83 m (6 feet) (for vehicles with a GVWR of 3,500kg (7,716 lb) or less) when computed 1.07 seconds after the Beginning of Steer (BOS) at the specified steering wheel angles.

System malfunction simulations were executed to verify vehicle could identify and indicate a malfunction.

The vehicle’s ESC System appears to meet the performance and equipment requirements as required by FMVSS 126. The test results are summarized on the following summary sheet.
2.0  TEST PROCEDURE AND DISCUSSION OF RESULTS …continued

DATA SUMMARY SHEET (1 of 2)

VEHICLE MAKE/MODEL/BODY STYLE:  Chevrolet / Avalanche / MPV

VEHICLE NHTSA NO.:  C70118  VIN:  3GNFK12307G113557

VEHICLE TYPE: MPV  DATE OF MANUFACTURE:  05/06

LABORATORY:  Transportation Research Center, Inc.

REQUIREMENTS

ESC Equipment and Operational Characteristics (Data Sheet 2)

The vehicle is equipped with an ESC System that meets the equipment and operational characteristics requirements. (S126, S5.1, S5.6)  

ESC Malfunction Telltale – Location, Labeling and Bulb Check (Data Sheet 3)

Telltale meets the requirements for mounting, symbol or text, color and check of lamp function. (S126, S5.3.1*, S5.3.2*, S5.3.4* and S5.3.5, S5.3.6)  

“ESC Off” and other System Controls and Telltale* (Data Sheet 3)

If provided, ESC OFF telltale meets the requirements for mounting, symbol or abbreviation, color and check of lamp function. (S126, S5.5.1, S5.5.2*, S5.5.3*, S5.5.6*, S5.5.7, and S5.5.8)  

If provided, dedicated off control meets the label requirements (S126, S5.4.2*)  

If provided, off control and other system controls meets the operational requirements (S126, S5.4, S5.4.1, S5.4.3*, S5.5.4, and S5.5.9)  

Vehicle Lateral Stability (Data Sheet 7)

Yaw Rate Ratio at 1 second after COS is less than 35% of peak value.  

(S126, S5.2.1)  

Yaw Rate Ratio at 1.75 seconds after COS is less than 20% of peak value.  

(S126, S5.2.2)
2.0 TEST PROCEDURE AND DISCUSSION OF RESULTS …continued

DATA SUMMARY SHEET (2 of 2)

REQUIREMENTS

Vehicle Responsiveness (Data Sheet 7)
Lateral displacement at 1.07 seconds after BOS is at least 1.83 m (6 feet) for vehicles with a GVWR of 3,500kg (7,716 lbs.) or less, and 1.52 m (5 feet) for vehicles with a GVWR greater than 3,500 kg (7,716 lbs.). (S126 S5.2.3)

ESC Malfunction Warning (Data Sheet 8)
Warning is provided to driver after malfunction occurrence. (S126. S5.3.3*)
Malfunction telltale stayed illuminated as long as malfunction existed and must extinguished after malfunction was corrected. (S126, S5.3.3*, S5.3.7)

*Requirements effective on and after September 1, 2011.

REMARKS:
ESC System malfunction and off telltales and controls do not have to meet the requirements of FMVSS No. 126 until on or after September 1, 2011.
3.0 TEST DATA

DATA SHEET 1
TEST VEHICLE INSPECTION AND TEST PREPARATION

VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet / Avalanche / MPV

NHTSA No.: C70118 TEST DATE: 8-20-07

VIN: 3GNFK12307G113557 MANUFACTURE DATE: 05/06

GVWR: 3266 KG FRONT GAWR: 1724 KG REAR GAWR: 1860 KG

SEATING POSITIONS: FRONT 3 MID N/A REAR 3

ODOMETER READING AT START OF TEST: 72 (45) Kilometers (Miles)

DESIGNATED TIRE SIZE(S) FROM VEHICLE LABELING:
Front Axle P265 / 70R 17 S Rear Axle P265 / 70R 17 S

INSTALLED TIRE SIZE(S) ON VEHICLE:

<table>
<thead>
<tr>
<th>From Tire Sidewall</th>
<th>Front Axle</th>
<th>Rear Axle</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufacturer and Model</td>
<td>Goodyear Wrangler HP</td>
<td>Goodyear Wrangler HP</td>
</tr>
<tr>
<td>Tire Size Designation</td>
<td>P265 / 70R 17 S113</td>
<td>P265 / 70R17 S113</td>
</tr>
</tbody>
</table>

Are installed tire sizes same as labeled tire sizes? X Yes No
If no, contact COTR for further guidance.

DRIVETRAIN CONFIGURATION:
X Front Wheel Drive (FWD)  Rear Wheel Drive (RWD)
X Four Wheel Drive (4WD)  All Wheel Drive (AWD)

VEHICLE STABILITY SYSTEMS (Check applicable technologies):
X ESC  X Traction Control  X Roll Stability Control
X Active Suspension  X Electronic Throttle Control  X Active Steering
X ABS

List other systems; ______________________________________________________

REMARKS:

RECORDED BY: Jason Church DATE: 8-20-07
APPROVED BY: Jeff Sankey DATE: 10-22-07
3.0 TEST DATA….continued

DATA SHEET 2 (Sheet 1 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet / Avalanche / MPV
NHTSA No.: C70118 TEST DATE: 8-20-07

ESC SYSTEM IDENTIFICATION:
Manufacturer/Model Bosch ESC System 8.0

ESC SYSTEM HARDWARE (Check applicable hardware):
- Electronic Control Unit
- Hydraulic Control Unit
- Wheel Speed Sensors
- Steering Angle Sensor
- Yaw Rate Sensor
- Lateral Acceleration Sensor

List other components; 

ESC SYSTEM OPERATIONAL CHARACTERISTICS:

System is capable of generating brake torques at each wheel
- X Yes (PASS)
- No (FAIL)
List and describe component(s): Electronic Brake Control Module

System is capable of determining yaw rate
- X Yes (PASS)
- No (FAIL)
List and describe component(s): Yaw Rate Sensor

System is capable of monitoring driver steering input
- X Yes (PASS)
- No (FAIL)
List and describe component(s): Steering Wheel Angle Sensor

System is capable of estimating side slip or side slip derivation
- X Yes (PASS)
- No (FAIL)
List and describe component(s): Steering Wheel Angle Sensor, Yaw Rate Sensor, Lateral Acceleration Sensor
3.0 TEST DATA….continued

DATA SHEET 2 (Sheet 2 of 2)
ESC SYSTEM HARDWARE AND OPERATIONAL CHARACTERISTICS

ESC SYSTEM OPERATIONAL CHARACTERISTICS (continued):

System is capable of modifying engine torque during ESC activation.  

Yes (PASS)  
No (FAIL)

Method used to modify engine torque: ___ ESC actuates Engine Control System ___

System is capable of activation at speeds of 15 km/h (9.3 mph)  

Yes (PASS)  
No (FAIL)

Speed system becomes active.  ___ 2.8 km/h ___

System is capable of activation during the following driving phases (acceleration, deceleration, coasting, and during activation of ABS or traction control).

Yes (PASS)  
No (FAIL)

Driving phases system is capable of activation.  ___ All phases listed above ___

Vehicle manufacturer submitted documentation explaining how the ___ Yes (PASS)  
ESC system mitigates understeer?  
No (FAIL)

DATA INDICATES COMPLIANCE  
PASS/FAIL  ___ PASS ___

REMARKS:

RECORDED BY:  ___ Jason Church ___  DATE:  ___ 8-20-07 ___
APPROVED BY:  ___ Jeff Sankey ___  DATE:  ___ 10-22-07 ___
DATA SHEET 3 (Sheet 1 of 5)
ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS – Location, Labeling and Bulb Check

VEHICLE MAKE/MODEL/BODY STYLE:  Chevrolet / Avalanche / MPV

NHTSA No.: C70118 TEST DATE:  8-23-07

ESC Malfunction Telltale
Malfunction Telltale Location __________ Instrument Panel Cluster ________________________

Telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

X Yes  ____ No (fail)  If no, explain: ____________________________________________

Telltale is part of a common space?  ____ Yes  X No

Malfunction Telltale symbol or abbreviation required by FMVSS No. 101.

Or  ESC

X Vehicle uses this symbol

X Vehicle uses this abbreviation

X Malfunction telltale symbol used is shown below

Note any words or additional symbols used.

“ESC OFF” Telltale (if provided)

“ESC OFF” Telltale Location __________ Instrument Panel Cluster ________________________

“ESC OFF” telltale is mounted inside the occupant compartment in front of and in clear view of the driver?

X Yes  ____ No (fail)  If no, explain: ____________________________________________

Telltale is part of a common space?  ____ Yes  X No
3.0 TEST DATA….continued

DATA SHEET 3 (Sheet 2 of 5)
ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS

“ESC OFF” Telltale symbol or abbreviation required by FMVSS No. 101.

Or
ESC OFF

______ Vehicle uses this symbol
______ Vehicle uses this abbreviation
_____ X ESC Off telltale symbol used is shown below

Note any words or additional symbols used.

Malfunction Telltale Lamp Function:
Identify position of ignition locking system when malfunction telltale illuminates.

☐ OFF/LOCK    ☐ Between OFF/LOCK and ON/RUN

_____ X ON/RUN    ☐ Between ON/RUN and Start

Is telltale yellow in color?  ____ X Yes      ____ No (fail)

Time telltale remains illuminated  ____ 4 seconds

Note: If telltale is part of common space, it is not required to illuminate during this check of lamp function.

Starter Interlock:
Does vehicle have any starter, transmission or other interlocks that affect operation of the Mal-function telltale lamp check functions?  ____ X Yes  ____ No

If yes, describe the interlock feature:

__________________________________________________________________________________________
3.0 TEST DATA....continued

DATA SHEET 3 (Sheet 3 of 5)
ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS

“ESC OFF” Telltale Lamp Function:
Identify position of ignition locking system when “ESC OFF” telltale illuminates.

- OFF/LOCK   - Between OFF/LOCK and ON/RUN
- ON/RUN     - Between ON/RUN and Start

Is telltale yellow in color?  X Yes   No (fail)
Time telltale remains illuminated 4 seconds

Note: If telltale is part of common space, it is not required to illuminate during the check of lamp function.

Starter Interlock:
Does vehicle have any starter, transmission or other interlocks that affect operation of the “ESC OFF” telltale lamp check functions?  X Yes   No

If yes, describe the interlock feature:

---------------------------------------------

ESC OFF Control Operational Check:
Is the vehicle equipped with a control whose sole purpose is to deactivate the ESC System?  X Yes   No

“ESC OFF” Control identification symbol or abbreviation required by FMVSS No. 101.

- Or ESC OFF  - Vehicle uses this symbol
-          - Vehicle uses this abbreviation
- X     - Off control is identified with symbol shown below

Note any words or additional symbols used.
3.0 TEST DATA….continued

DATA SHEET 3 (Sheet 4 of 5)
ESC MALFUNCTION AND OFF TELLTALES AND CONTROLS

Does the “ESC Off” telltale illuminate upon activation of the ESC off control?  
X Yes  ____ No (fail)
If no, describe off control function:

________________________________________________________________________________

Does the “ESC Off” telltale extinguish when the ignition is cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position?  
X Yes  ____ No (fail)
If no, describe the off control function:

________________________________________________________________________________

Other System Controls that have an ancillary effect on ESC Operation:
List other controls (i.e. low speed off-road axle/transfer case):
  4 Wheel Drive Low (transmission control)

________________________________________________________________________________

Does the “ESC OFF” telltale illuminate upon activation of each control system listed above?  
X Yes  ____ No
If no, describe off control function:

________________________________________________________________________________

For electrical controls, does the “ESC OFF” telltale extinguish and remain extinguished when the ignition is cycled from “On” (“Run”) to “Lock” or “Off” and then back again to the “On” (“Run”) position?  
_____ Yes  _____ No
If no, describe the off control function:

________________________________________________________________________________
For mechanical controls, does the “ESC OFF” telltale extinguish after de-activation of mechanical control?

X Yes  No

If no, describe the off control function:

DATA INDICATES COMPLIANCE:  PASS/FAIL ___PASS___

REMARKS:

The Avalanche uses the same dashboard telltale to identify a system malfunction and a deactivated ESC system. The telltale symbols and controls labeling do not have to meet the requirements of FMVSS No. 126 until on or after September 1, 2011.
VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet / Avalanche / MPV

NHTSA No.: C70118 TEST DATE: 8-28-07

Test Track Requirements: Test Surface Slope (0-1 %) 1 %
Peak Friction Coefficient (at least 0.9) 0.95

Full Fluid Levels: Fuel X Coolant X Other Fluids Washer (specify)

Tire Pressures: Required: Front Axle 210.0 KPA Rear Axle 210.0 KPA
Actual: LF 210.0 KPA RF 210.0 KPA LR 210.0 KPA RR 210.0 KPA

Vehicle Dimensions: Track Width 174.3 cm Wheelbase 330.8 cm
Roof Height 186.7 cm

Vehicle weight ratings: GAWR Front 1,724 KG GAWR Rear 1,860 KG

Unloaded Vehicle Weight (UVW)
Front Axle 1,351.0 KG Right Front 670.0 KG Left Front 681.0 KG
Rear Axle 1,256.0 KG Right Rear 616.0 KG Left Rear 640.0 KG
Total UVW 2,607.0 KG

Baseline Weight and Outrigger Selection (only for MPVs, Trucks, Buses)
Calculated Baseline Weight (UVW+ 73 kg) 2,680 KG

Outrigger size required (“Standard” or “Heavy”) Standard
Standard - Baseline weight under 2,722 kg (6,000 lbs.)
Heavy - Baseline weight equal to or greater than 2,722 kg (6,000 lbs.)
3.0  TEST DATA…continued

DATA SHEET 4 (Sheet 2 of 3)
VEHICLE AND TEST TRACK DATA

UVW with Outriggers (only for MPVs, Trucks, Buses)

Front Axle 1,382.0 KG  
Right Front 690.0 KG  
Left Front 692.0 KG

Rear Axle 1,275.0 KG  
Right Rear 626.0 KG  
Left Rear 649.0 KG

Total UVW w/ Outriggers 2,657.0 KG

Loaded Vehicle Weight w/ Driver and Instrumentation (No Ballast)

Front Axle 1,470.0 KG  
Right Front 721.5 KG  
Left Front 748.5 KG

Rear Axle 1,344.0 KG  
Right Rear 654.5 KG  
Left Rear 689.5 KG

Total Loaded weight w/ Driver 2,814.0 KG

Ballast Required = [UVW + 168 KG] - Total Loaded Vehicle Weight w/Driver and Instrumentation

= [2,657.0 KG + 168 KG] - 2,814.0 KG

= 11.0 KG

Total Loaded Vehicle Weight

Front Axle 1,473.0 KG  
Right Front 723.0 KG  
Left Front 750.0 KG

Rear Axle 1,353.0 KG  
Right Rear 659.5 KG  
Left Rear 693.5 KG

Total Loaded Vehicle Weight 2,826.0 KG
3.0 TEST DATA….continued

DATA SHEET 4 (Sheet 3 of 3)
VEHICLE AND TEST TRACK DATA

Center of Gravity and Inertial Sensing System Location at Loaded Vehicle Condition

x-distance (longitudinal)  Point of reference is the front axle centerline.  
Positive from front axle toward rear of vehicle.

y-distance (lateral)  Point of reference is the vehicle centerline.  
Positive from the center toward the right.

z-distance (vertical)  Point of reference is the ground plane.  
Positive from the ground up.

Locations:

<table>
<thead>
<tr>
<th></th>
<th>Center of Gravity</th>
<th>Inertial Sensing System</th>
</tr>
</thead>
<tbody>
<tr>
<td>x-distance</td>
<td>158.4 cm</td>
<td>126.6 cm</td>
</tr>
<tr>
<td>y-distance</td>
<td>-1.9 cm</td>
<td>-0.54 cm</td>
</tr>
<tr>
<td>z-distance</td>
<td>70.9 cm</td>
<td>76.9 cm</td>
</tr>
</tbody>
</table>

Distance Between Ultrasonic Sensors:  203.2 cm

TEST TRACK DATA MEETS REQUIREMENTS:  YES/NO  YES  
If no, explain:  

REMARKS:

RECORDED BY:  Jason Church  DATE:  8-27-07  
APPROVED BY:  Jeff Sankey  DATE:  10-22-07
3.0 TEST DATA…continued

DATA SHEET 5 (Sheet 1 of 3)
BRAKE AND TIRE CONDITIONING

VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet / Avalanche / MPV

VEHICLE NHTSA No.: C70118

Measured Cold Tire Pressures:
- LF 210 KPA
- LR 210 KPA
- RF 210 KPA
- RR 210 KPA

Wind Speed 2.7 m/sec
(10 m/sec (22 mph) max for passenger cars; 5 m/s (11 mph) max. for MPVs and Trucks)

Ambient Temperature 7°C (45°F) - 40°C (104°F) 28°C

Brake Conditioning

Time: 1:30 PM Date: 8-28-07

56 km/h (35 mph) Brake Stops
- Number of stops executed (10 required) 10 stops
- Observed deceleration rate range (.5g target) 0.45 - 0.55 g

72 km/h (45 mph) Brake Stops
- Number of stops executed (3 required) 3 stops
- Number of stops ABS activated (3 required) 3 stops
- Observed deceleration rate range 0.85 - 0.95 g

72 km/h (45 mph) Brake Cool Down Period
- Duration of cool down period (5 minutes min.) 5 minutes
3.0 TEST DATA….continued

DATA SHEET 5 (Sheet 2 of 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning Series No. 1  Time: 10:08 am   Date: 8-29-07

Measured Tire Pressures:  LF __ 210 __ KPA    LR __ 210 __ KPA
RF __ 210 __ KPA     RR __ 210 __ KPA

Wind Speed __ 1.3 __ m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F))  __ 24 __ °C

<table>
<thead>
<tr>
<th>30 meter (100 ft) Diameter Circle Maneuver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Runs</td>
</tr>
<tr>
<td>------------</td>
</tr>
<tr>
<td>1-3</td>
</tr>
<tr>
<td>4-6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>1 Hz 3 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Runs</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>2</td>
</tr>
<tr>
<td>3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

Steering wheel angle that corresponds to a peak 0.5–0.6g lateral acceleration: __100___ degrees

<table>
<thead>
<tr>
<th>1 Hz 10 Cycle Sinusoidal Steering Maneuver</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test Runs</td>
</tr>
<tr>
<td>-----------</td>
</tr>
<tr>
<td>1 - 3</td>
</tr>
<tr>
<td>4</td>
</tr>
</tbody>
</table>

** The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.
DATA SHEET 5 (Sheet 3 of 3)
BRAKE AND TIRE CONDITIONING

Tire Conditioning Series No. 2

Time: 11:50 AM Date: 8-29-07

Measured Tire Pressures:
- LF: 210* KPA
- LR: 210* KPA
- RF: 210* KPA
- RR: 210* KPA

Wind Speed: 4.0 m/sec
(10 m/sec (22mph) max for passenger cars; 5 m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)): 29.0 °C

### 30 meter (100 ft) Diameter Circle Maneuver

<table>
<thead>
<tr>
<th>Test Runs</th>
<th>Steering Direction</th>
<th>Target Lateral Acceleration (g)</th>
<th>Observed Lateral Acceleration (g)</th>
<th>Observed Vehicle Speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3</td>
<td>clockwise</td>
<td>0.5-0.6</td>
<td>0.55</td>
<td>43</td>
</tr>
<tr>
<td>4-6</td>
<td>counterclockwise</td>
<td>0.5-0.6</td>
<td>0.55</td>
<td>43</td>
</tr>
</tbody>
</table>

### 1 Hz 3 Cycle Sinusoidal Steering Maneuver to Determine Steering Wheel Angle For 0.5-0.6g Lateral Acceleration

<table>
<thead>
<tr>
<th>Test Runs</th>
<th>Vehicle Speed Km/h (mph)</th>
<th>Steering Wheel Angle (degrees)</th>
<th>Target Peak Lateral Acceleration (g)</th>
<th>Observed Peak Lateral Acceleration (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>56±2 (35±1)</td>
<td>30</td>
<td>0.5-0.6</td>
<td>0.18</td>
</tr>
<tr>
<td>2</td>
<td>56±2 (35±1)</td>
<td>100</td>
<td>0.5-0.6</td>
<td>0.51</td>
</tr>
<tr>
<td>3</td>
<td>56±2 (35±1)</td>
<td>50</td>
<td>0.5-0.6</td>
<td>0.51</td>
</tr>
<tr>
<td>4</td>
<td>56±2 (35±1)</td>
<td>0.5-0.6</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Steering wheel angle that corresponds to a peak 0.5-0.6g lateral acceleration: 100 degrees

### 1 Hz 10 Cycle Sinusoidal Steering Maneuver

<table>
<thead>
<tr>
<th>Test Runs</th>
<th>Vehicle Speed (mph)</th>
<th>Steering Wheel Angle (degrees)</th>
<th>Target Peak Lateral Acceleration (g)</th>
<th>Observed Peak Lateral Acceleration (g)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 - 3</td>
<td>56±2 (35±1)</td>
<td>100 (cycles 1-10)</td>
<td>0.5-0.6</td>
<td>0.51</td>
</tr>
<tr>
<td>4</td>
<td>56±2 (35±1)</td>
<td>100 (cycles 1-9)</td>
<td>0.5-0.6</td>
<td>0.51</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 (cycle 10)*</td>
<td>NA</td>
<td>0.80</td>
</tr>
</tbody>
</table>

** The steering wheel angle used for cycle 10 should be twice the angle used for cycles 1-9.

REMARKS: *The tire pressures listed above were the cold settings, which were recorded prior to Tire Conditioning Series No. 1.

RECORDED BY: Jason Church DATE: 8-29-07
APPROVED BY: Jeff Sankey DATE: 10-22-07
3.0 TEST DATA....continued

DATA SHEET 6 (1 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet / Avalanche / MPV

VEHICLE NHTSA No.: C70118        TEST DATE: 8-29-07

Wind Speed ______ 1.3 _______ m/sec
(10m/sec (22mph) max for passenger cars; 5m/s (11mph) max. for MPVs and Trucks)

Ambient Temperature (7°C (45°F) - 40°C (104°F)) ______ 24.0 ______ °C

Preliminary Left Steer Maneuver:
Lateral Acceleration measured at 30 degrees steering wheel angle \( a_{y,30\text{ degrees}} \)
\[ a_{y,30\text{ degrees}} = 0.22 \ g \]

Assuming a linear relationship the following ratio should be used to calculate the steering
wheel angle at .55g.

\[
\frac{30\text{ degrees}}{a_{y,30\text{ degrees}}} = 0.55 \ g
\]

\[ \delta_{SIS} = 75 \text{ degrees} \]

Steering Wheel Angle at Corrected 0.3 g Lateral Acceleration:

<table>
<thead>
<tr>
<th>Maneuver #</th>
<th>Initial Steer Direction</th>
<th>Time Clock (5 min max between runs)</th>
<th>Steering Wheel Angle to nearest 0.1 degree (degrees)</th>
<th>All Conditions Met?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Left</td>
<td>10:33 am</td>
<td>-41.0</td>
<td>Yes</td>
</tr>
<tr>
<td>2</td>
<td>Left</td>
<td>10:36 am</td>
<td>-41.2</td>
<td>Yes</td>
</tr>
<tr>
<td>3</td>
<td>Left</td>
<td>10:38 am</td>
<td>-41.4</td>
<td>Yes</td>
</tr>
<tr>
<td>4</td>
<td>Right</td>
<td>10:42 am</td>
<td>40.6</td>
<td>Yes</td>
</tr>
<tr>
<td>5</td>
<td>Right</td>
<td>10:44 am</td>
<td>41.2</td>
<td>Yes</td>
</tr>
<tr>
<td>6</td>
<td>Right</td>
<td>10:46 am</td>
<td>40.3</td>
<td>Yes</td>
</tr>
</tbody>
</table>
3.0 TEST DATA….continued

DATA SHEET 6 (2 of 2)
SLOWLY INCREASING STEER (SIS) MANEUVER

Average Overall Steering Wheel Angle:

\[ \delta_{0.3 \text{ g, overall}} = \frac{\left| \delta_{0.3 \text{ g, left (1)}} \right| + \left| \delta_{0.3 \text{ g, left (2)}} \right| + \left| \delta_{0.3 \text{ g, left (3)}} \right| + \delta_{0.3 \text{ g, right (1)}} + \delta_{0.3 \text{ g, right (2)}} + \delta_{0.3 \text{ g, right (3)}}}{6} \]

\[ \delta_{0.3 \text{ g, overall}} = 41.0 \text{ degrees} \]
[to nearest 0.1 degree]

REMARKS:

RECORDED BY: Jason Church  DATE: 8-29-07
APPROVED BY: Jeff Sankey  DATE: 10-22-07
### 3.0 TEST DATA….continued

#### DATA SHEET 7 (1 of 3)

**VEHICLE LATERAL STABILITY AND RESPONSIVENESS**

**VEHICLE MAKE/MODEL/BODY STYLE:** Chevrolet / Avalanche / MPV

**VEHICLE NHTSA No.:** C70118  **TEST DATE:** 8-29-07

<table>
<thead>
<tr>
<th>Tire conditioning completed</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESC System is enabled</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>On track calibration checks have been completed</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>On track static data file for each sensor obtained</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>

**Overall steering wheel angle (δ₀, 3 g, overall)**: 41.0 degrees

#### Lateral Stability Test Series No. 1 – Counterclockwise Initial Steer Direction

<table>
<thead>
<tr>
<th>Maneuver #</th>
<th>Clock Time (1.5 – 5 min between each test run)</th>
<th>Commanded Steering Wheel Angle¹ (degrees)</th>
<th>Yaw Rates (degrees/sec)</th>
<th>YRR at 1.0 sec after COS ≤ 35%</th>
<th>YRR at 1.75 sec after COS ≤ 20%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Scalar</td>
<td>Angle</td>
<td>ψ*Peak</td>
<td>ψ*1.0sec</td>
</tr>
<tr>
<td>1</td>
<td>12:03 pm</td>
<td>1.5° δ₀, 3 g</td>
<td>62</td>
<td>14.35</td>
<td>-0.11</td>
</tr>
<tr>
<td>2</td>
<td>12:07 pm</td>
<td>2.0° δ₀, 3 g</td>
<td>82</td>
<td>19.07</td>
<td>-0.14</td>
</tr>
<tr>
<td>3</td>
<td>12:10 pm</td>
<td>2.5° δ₀, 3 g</td>
<td>103</td>
<td>24.67</td>
<td>-0.09</td>
</tr>
<tr>
<td>4</td>
<td>12:14 pm</td>
<td>3.0° δ₀, 3 g</td>
<td>123</td>
<td>30.02</td>
<td>0.56</td>
</tr>
<tr>
<td>5</td>
<td>12:16 pm</td>
<td>3.5° δ₀, 3 g</td>
<td>144</td>
<td>35.65</td>
<td>0.76</td>
</tr>
<tr>
<td>6</td>
<td>12:19 pm</td>
<td>4.0° δ₀, 3 g</td>
<td>164</td>
<td>39.37</td>
<td>0.87</td>
</tr>
<tr>
<td>7</td>
<td>12:22 pm</td>
<td>4.5° δ₀, 3 g</td>
<td>185</td>
<td>42.14</td>
<td>-3.04</td>
</tr>
<tr>
<td>8</td>
<td>12:26 pm</td>
<td>5.0° δ₀, 3 g</td>
<td>205</td>
<td>44.53</td>
<td>-3.68</td>
</tr>
<tr>
<td>9</td>
<td>12:30 pm</td>
<td>5.5° δ₀, 3 g</td>
<td>226</td>
<td>46.70</td>
<td>-5.01</td>
</tr>
<tr>
<td>10</td>
<td>12:33 pm</td>
<td>6.0° δ₀, 3 g</td>
<td>246</td>
<td>48.22</td>
<td>-6.62</td>
</tr>
<tr>
<td>11</td>
<td>12:37 pm</td>
<td>6.5° δ₀, 3 g</td>
<td>267</td>
<td>49.66</td>
<td>-5.10</td>
</tr>
<tr>
<td>12</td>
<td>12:40 pm</td>
<td>6.6° δ₀, 3 g</td>
<td>270</td>
<td>49.21</td>
<td>-0.07</td>
</tr>
</tbody>
</table>

1. Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5°δ₀, 3 g, overall or 270 degrees is utilized, whichever is greater provided the calculated magnitude of 6.5°δ₀, 3 g, overall is less than or equal to 300 degrees. If 6.5°δ₀, 3 g, overall is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5°δ₀, 3 g, overall without exceeding the 270 degree steering wheel angle.
### 3.0 TEST DATA….continued

**DATA SHEET 7 (2 of 3)**  
**VEHICLE LATERAL STABILITY AND RESPONSIVENESS**

#### Lateral Stability Test Series No. 2 – Clockwise Initial Steer Direction

<table>
<thead>
<tr>
<th>Maneuver #</th>
<th>Clock Time</th>
<th>Commanded Steering Wheel Angle¹ (degrees)</th>
<th>Yaw Rates at 1.0 sec after COS [≤ 35%]</th>
<th>Yaw Rates at 1.75 sec after COS [≤ 20%]</th>
<th>% Pass/Fail</th>
<th>% Pass/Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Scalar Angle</td>
<td>$\dot{\psi}$ Peak</td>
<td>$\dot{\psi}$ 1.0sec</td>
<td>$\dot{\psi}$ 1.75sec</td>
</tr>
<tr>
<td>1</td>
<td>12:44 pm</td>
<td>1.5° $\delta_{0.3g}$</td>
<td>62</td>
<td>-14.38</td>
<td>0.11</td>
<td>-0.07</td>
</tr>
<tr>
<td>2</td>
<td>12:47 pm</td>
<td>2.0° $\delta_{0.3g}$</td>
<td>82</td>
<td>-19.80</td>
<td>0.06</td>
<td>0.13</td>
</tr>
<tr>
<td>3</td>
<td>12:50 pm</td>
<td>2.5° $\delta_{0.3g}$</td>
<td>103</td>
<td>-25.34</td>
<td>0.23</td>
<td>0.21</td>
</tr>
<tr>
<td>4</td>
<td>12:53 pm</td>
<td>3.0° $\delta_{0.3g}$</td>
<td>123</td>
<td>-31.06</td>
<td>-0.01</td>
<td>0.11</td>
</tr>
<tr>
<td>5</td>
<td>12:56 am</td>
<td>3.5° $\delta_{0.3g}$</td>
<td>144</td>
<td>-36.86</td>
<td>-1.04</td>
<td>-0.01</td>
</tr>
<tr>
<td>6</td>
<td>12:59 am</td>
<td>4.0° $\delta_{0.3g}$</td>
<td>164</td>
<td>-39.29</td>
<td>-1.16</td>
<td>0.07</td>
</tr>
<tr>
<td>7</td>
<td>1:01 pm</td>
<td>4.5° $\delta_{0.3g}$</td>
<td>185</td>
<td>-42.71</td>
<td>-0.38</td>
<td>-0.26</td>
</tr>
<tr>
<td>8</td>
<td>1:04 pm</td>
<td>5.0° $\delta_{0.3g}$</td>
<td>205</td>
<td>-44.59</td>
<td>-1.17</td>
<td>0.09</td>
</tr>
<tr>
<td>9</td>
<td>1:07 pm</td>
<td>5.5° $\delta_{0.3g}$</td>
<td>226</td>
<td>-47.69</td>
<td>2.81</td>
<td>0.03</td>
</tr>
<tr>
<td>10</td>
<td>1:10 pm</td>
<td>6.0° $\delta_{0.3g}$</td>
<td>246</td>
<td>-49.93</td>
<td>3.67</td>
<td>0.41</td>
</tr>
<tr>
<td>11</td>
<td>1:13 pm</td>
<td>6.5° $\delta_{0.3g}$</td>
<td>267</td>
<td>-51.75</td>
<td>2.82</td>
<td>0.43</td>
</tr>
<tr>
<td>12</td>
<td>1:16 pm</td>
<td>6.6° $\delta_{0.3g}$</td>
<td>270</td>
<td>-51.17</td>
<td>4.12</td>
<td>0.50</td>
</tr>
</tbody>
</table>

1. Maneuver execution should continue until a steering wheel angle magnitude factor of 6.5° $\delta_{0.3g}$ overall or 270 degrees is utilized, whichever is greater provided the calculated 6.5° $\delta_{0.3g}$ overall is less than or equal to 300 degrees. If 6.5° $\delta_{0.3g}$ overall is less than 270 degrees maneuver execution should continue by increasing the steering wheel angle magnitude by multiples of 0.5° $\delta_{0.3g}$ overall without exceeding the 270 degree steering wheel angle.

During execution of the sine with dwell maneuvers were any of the following events observed?

- Rim-to-pavement contact: Yes [X] No
- Tire debeading: Yes [X] No
- Loss of pavement contact of vehicle tires: Yes [X] No
- Did the test driver experience any vehicle loss of control or spinout?: Yes [X] No

If “Yes” explain the event and consult with the COTR.

---

**22**
## 3.0 TEST DATA....continued

### DATA SHEET 7 (3 of 3)

**VEHICLE LATERAL STABILITY AND RESPONSIVENESS**

### Responsiveness – Lateral Displacement

<table>
<thead>
<tr>
<th>Maneuver #</th>
<th>Initial Steer Direction</th>
<th>Commanded Steering Wheel Angle (5.0° ( \delta_{0.3 g} ) or greater)</th>
<th>Calculated Lateral Displacement(^1)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Scalar Angle (degrees)</td>
<td>Distance (m)</td>
</tr>
<tr>
<td>8</td>
<td>Counter Clockwise</td>
<td>5.0° ( \delta_{0.3 g} )</td>
<td>205</td>
</tr>
<tr>
<td>9</td>
<td>Counter Clockwise</td>
<td>5.5° ( \delta_{0.3 g} )</td>
<td>226</td>
</tr>
<tr>
<td>10</td>
<td>Counter Clockwise</td>
<td>6.0° ( \delta_{0.3 g} )</td>
<td>246</td>
</tr>
<tr>
<td>11</td>
<td>Counter Clockwise</td>
<td>6.5° ( \delta_{0.3 g} )</td>
<td>267</td>
</tr>
<tr>
<td>12</td>
<td>Counter Clockwise</td>
<td>6.6° ( \delta_{0.3 g} )</td>
<td>270</td>
</tr>
<tr>
<td>8</td>
<td>Clockwise</td>
<td>5.0° ( \delta_{0.3 g} )</td>
<td>205</td>
</tr>
<tr>
<td>9</td>
<td>Clockwise</td>
<td>5.5° ( \delta_{0.3 g} )</td>
<td>226</td>
</tr>
<tr>
<td>10</td>
<td>Clockwise</td>
<td>6.0° ( \delta_{0.3 g} )</td>
<td>246</td>
</tr>
<tr>
<td>11</td>
<td>Clockwise</td>
<td>6.5° ( \delta_{0.3 g} )</td>
<td>267</td>
</tr>
<tr>
<td>12</td>
<td>Clockwise</td>
<td>6.6° ( \delta_{0.3 g} )</td>
<td>270</td>
</tr>
</tbody>
</table>

1. Lateral displacement should be \( \geq 1.83 \text{ m (6 ft)} \) for vehicles with a GVWR of 3,500 kg (7,716 lb) or less; and \( \geq 1.52 \text{ m (5 ft)} \) for vehicles with a GVWR greater than 3,500 kg (7,716 lb).

**DATA INDICATES COMPLIANCE:**

PASS/Fail: **PASS**

**REMARKS:**

**RECORDED BY:** Jason Church  
**DATE:** 8-29-07

**APPROVED BY:** Jeff Sankey  
**DATE:** 10-22-07
DATA SHEET 8
MALFUNCTION WARNING TEST

VEHICLE MAKE/MODEL/BODY STYLE: Chevrolet / Avalanche / MPV

VEHICLE NHTSA No.: C70118 TEST DATE: 8-30-07

CHECK MALFUNCTION TELTTLAЕ BULB CHECK FUNCTION:
Before simulating an ESC system malfunction activate the vehicle ignition locking system and verify telltale illuminates for the bulb check and then extinguishes.

X Yes No

METHOD OF MALFUNCTION SIMULATION:
Describe method of malfunction simulation:
1) Disconnect Yaw Rate and Lateral Acceleration Sensor
2) Disconnect Electronic Brake Control Module
3) Disconnect LF ABS Sensor

MALFUNCTION TELTTLAЕ ILLUMINATION:
Telltale illuminates and remains illuminated after ignition locking system is activated and if necessary the vehicle is driven at least 2 minutes

X Yes No

Time for telltale to illuminate after ignition system is activated and vehicle speed of 48± 8 km/h (30± 5mph) is reached.

SEE REMARKS Seconds (must be within 2 minutes) X Pass Fail

Cycle ignition locking system and start the vehicle’s engine. Verify that the malfunction telltale illuminates and stays illuminated.

X Yes No

After the ESC system is restored to normal operation verify that the telltale does not remain illuminated.

X Yes No

DATA INDICATES COMPLIANCE:
PASS/FAIL PASS

REMARKS:
Malfunction telltale illuminated immediately upon cycling ignition locking system without driving vehicle.

RECORDED BY: Jason Church DATE: 8-30-07
APPROVED BY: Jeff Sankey DATE: 10-22-07
## 4.0 TEST EQUIPMENT LIST AND CALIBRATION INFORMATION

<table>
<thead>
<tr>
<th>Type</th>
<th>Output</th>
<th>Range</th>
<th>Resolution</th>
<th>Accuracy</th>
<th>Specifics</th>
<th>Serial Number</th>
<th>Calibration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tire Pressure Gage</td>
<td>Vehicle Tire Pressure</td>
<td>0-100psi</td>
<td>1 psi</td>
<td>±2.0% of applied pressure</td>
<td>Marsh Model: Series J 0-100psi</td>
<td>AG-102</td>
<td></td>
</tr>
<tr>
<td>Platform Scales</td>
<td>Vehicle Total, Wheel, and Axle Load</td>
<td>0-2500 lb per each of four pads</td>
<td>0.5 lb</td>
<td>±1.0% of applied load</td>
<td>Mettler Toledo Model: JXGA1000</td>
<td>5225831-5JC</td>
<td></td>
</tr>
<tr>
<td>Automated Steering Machine with Steering Angle Encoder</td>
<td>Handwheel Angle</td>
<td>±800 deg</td>
<td>0.25 deg</td>
<td>±0.25 deg</td>
<td>Heitz Automotive Testing Model: Sprint 3</td>
<td>60303</td>
<td></td>
</tr>
<tr>
<td>Multi-Axis Inertial Sensing System</td>
<td>Longitudinal, Lateral, and Vertical Acceleration Roll, Yaw, and Pitch Rate</td>
<td>Accelerometers: ±2 g Angular Rate Sensors: ±100 deg /s</td>
<td>Accelerometers: ±10 ug Angular Rate Sensors: ±0.004 deg/s</td>
<td>Accelerometers: ±0.05% of full range Angular Rate Sensors: ±0.05% of full range</td>
<td>BEI Technologies Model: MotionPAK MP-1</td>
<td>0767</td>
<td></td>
</tr>
<tr>
<td>Radar Speed Sensor and Dashboard Display</td>
<td>Vehicle Speed</td>
<td>0-125 mph</td>
<td>0.009 mph</td>
<td>±0.25% of full scale</td>
<td>A-DAT Corp. Radar Model: DRS-6 Display Model: RD-2</td>
<td>1400603</td>
<td></td>
</tr>
<tr>
<td>Ultrasonic Distance Measuring System</td>
<td>Left and Right Side Vehicle Height</td>
<td>5-24 inches</td>
<td>0.01 inches</td>
<td>±0.25% of maximum distance</td>
<td>Massa Products Corporation Model: M-5000/220</td>
<td>104619 &amp; 104613</td>
<td></td>
</tr>
<tr>
<td>Data Acquisition System [Amplify, Anti-Alias, and Digitize]</td>
<td>Record Time; Velocity; Distance; Lateral, Longitudinal, and Vertical Accelerations; Roll, Yaw, and Pitch Rates; Steering Wheel Angle.</td>
<td>Sufficient to meet or exceed individual sensors</td>
<td>200 Hz</td>
<td>Sufficient to meet or exceed individual sensors</td>
<td>Dewtron Sidehand DAS Model: DA-121-16 Digitizer Model: Dewe-Orion-1616-100 Amplifier/AntiAliasing: MDAQ-FILT-10-S</td>
<td>12060/1105</td>
<td></td>
</tr>
<tr>
<td>Load Cell</td>
<td>Vehicle Brake Pedal Force</td>
<td>0-300 lb</td>
<td>1 lb</td>
<td>±0.05% of full scale</td>
<td>DATRON Model: DTM-LPA</td>
<td>4970-1103</td>
<td></td>
</tr>
<tr>
<td>Coordinate Measurement Machine</td>
<td>Inertial Sensing System Location</td>
<td>0-10 feet</td>
<td>0.001 inch</td>
<td>±0.003% of full scale</td>
<td>FARO International Model: Faro Arm N10</td>
<td>N10-02-03-01310</td>
<td></td>
</tr>
<tr>
<td>Outriggers</td>
<td>No output. Safety Item.</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
<td>NHTSA Titanium Outriggers Model: Docket 2007-27662-11</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>
5.0 PHOTOGRAPHS

5.1 ¾ FRONTAL VIEW FROM LEFT SIDE OF VEHICLE
5.2 VEHICLE CERTIFICATION LABEL
5.3 VEHICLE PLACARD
5.4 WINDOW STICKER (MONRONEY LABEL)
5.5 ESC MALFUNCTION AND ESC OFF TELTALA
5.6 ESC OFF CONTROL
5.7 OTHER CONTROL HAVING ANCILLARY EFFECT ON ESC
5.8 TEST VEHICLE WITH OUTRIGGERS
5.9 TEST INSTRUMENTATION - STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM
5.10 TEST INSTRUMENTATION - STEERING CONTROLLER BATTERY BOX AND BALLAST
5.11 TEST INSTRUMENTATION - VEHICLE SPEED SENSOR
5.12 TEST INSTRUMENTATION - BODY ROLL SENSOR
5.13 TEST INSTRUMENTATION - BODY ROLL SENSOR
**VEHICLE CERTIFICATION LABEL**

**FMVSS 126**

NHTSA No.: C70118

SEPTEMBER 2007

---

<table>
<thead>
<tr>
<th>KRBN</th>
<th>TIRE SIZE</th>
<th>SPEED RTG</th>
<th>RIM</th>
<th>COLD TIRE PRESSURE</th>
</tr>
</thead>
<tbody>
<tr>
<td>FRT</td>
<td>P265/70R17</td>
<td>S</td>
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<td>240KPA (35 PSI)</td>
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SEE OWNER’S MANUAL FOR MORE INFORMATION.
### TIRE AND LOADING INFORMATION

#### SEATING CAPACITY
- TOTAL: 6
- FRONT: 3
- REAR: 3

The combined weight of occupants and cargo should never exceed 645 kg or 1422 lbs.

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<tr>
<th>TIRE</th>
<th>ORIGINAL SIZE</th>
<th>COLD TIRE PRESSURE</th>
<th>SEE OWNER'S MANUAL FOR ADDITIONAL INFORMATION</th>
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2007 CHEVROLET AVALANCHE
FMVSS 126
NHTSA No.: C70118
SEPTEMBER 2007

5.3 VEHICLE PLACARD
### Standard Equipment
- Air Bags, Dual Frontal
- Passenger Sensing System
- OnStar Service, Includes 1 Year Safety & Sound Plan
- Anti-Lock Brake System, 4-Wheel Disc
- Stabilitrak, Stability Control
- Impact Detector System
- Rear Door Child Security Locks
- Power Door Locks, Programmable
- Pwr Wind, 2-Way, Driver Express on All Doors
- Remote Keyless Entry
- Tire Pressure Monitor
- Daytime Running Lamps
- Silver Aluminum Wheels
- Engine 5.3 L Vortec V8 W/ Active Fuel Management & Flex-Fuel, Cat-Ability
- Transmission, 4 Speed Auto
- Traction Control
- Rear Axle"-3.73 Ratio
- Ext Silver Birch Metallic
- Int Titanium

### Options & Pricing
- Standard Vehicle Price
  - Manufacturer's Suggested Retail Price: $35,295.00

- Apex LT Equipment Group
  - AM/FM Stereo w/CD Player: 90.00
  - 6-CD CD Changer (Replaces STDOFB), Power Antenna: 295.00

- Total Options
  - $595.00

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---

**Gasoline**

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2007 CHEVROLET AVALANCHE
FMVSS 126
NHTSA No.: C70118
SEPTEMBER 2007
5.5 ESC MALFUNCTION AND ESC OFF TELTATE
5.7 OTHER CONTROL HAVING ANCILLARY EFFECT ON ESC
5.8 TEST VEHICLE WITH OUTRIGGERS

2007 CHEVROLET AVALANCHE
FMVSS 126
NHTSA No.: C70118
SEPTEMBER 2007
2007 CHEVROLET
AVALANCHE
FMVSS 126
NHTSA No.: C70118
SEPTEMBER 2007

5.9 TEST INSTRUMENTATION – STEERING WHEEL CONTROLLER AND DATA ACQUISITION SYSTEM
2007 CHEVROLET AVALANCHE
FMVSS 126
NHTSA No.: C70118
SEPTEMBER 2007

5.10 TEST INSTRUMENTATION – STEERING CONTROLLER BATTERY BOX AND BALLAST
5.11 TEST INSTRUMENTATION – VEHICLE SPEED SENSOR

2007 CHEVROLET AVALANCHE
FMVSS 126
NHTSA No.: C70118
SEPTEMBER 2007
5.12 TEST INSTRUMENTATION – BODY ROLL SENSOR
2007 CHEVROLET AVALANCHE FMVSS 126 NHTSA No.: C70118 SEPTEMBER 2007
6.0 DATA PLOTS

Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

Figure 2. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests

Figure 3. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests
6.0 DATA PLOTS

Figure 1. Steering Angle and Yaw Rate Time History, Counter-Clockwise Initial Steer Tests

- Steering Angle (deg)
- Yaw Rate (deg/sec)
- Time (s)
Figure 2. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Counter-Clockwise Initial Steer Tests
Figure 3. Steering Angle and Yaw Rate Time History, Clockwise Initial Steer Tests

Steering Angle (deg) vs. Time (s)

Yaw Rate (deg/sec) vs. Time (s)
6.0 DATA PLOTS…continued

Figure 4. Steering Angle, Lateral Acceleration, and Lateral Displacement Time History, Clockwise Initial Steer Tests
7.0 OTHER DOCUMENTATION

7.1 OWNER'S MANUAL PAGES
7.2 VEHICLE ARRIVAL CONDITION REPORT
7.3 VEHICLE COMPLETION CONDITION REPORT
7.4 SINE WITH DWELL TEST RESULTS
7.5 SLOWLY INCREASING STEER TEST RESULTS
7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES
System Warning

Light

With the anti-lock brake system, this light will come on when you start your engine and may stay on for several seconds.

That's normal. If the light does not come on then, have it fixed so it will be ready to warn you if there is a problem.

If the light stays on, or comes on when you are driving, your vehicle needs service. You will also hear a chime sound when the light is on steady. If the regular brake system warning light is not on, you still have brakes, but you do not have anti-lock brakes. If the regular brake system warning light is also on you do not have anti-lock brakes and there is a problem with your regular brakes. In addition to both lights, you will also hear a chime sound on the first occurrence of a problem and each time the vehicle is shut off and then restarted. See Brake System Warning Light on page 246.

The anti-lock brake system warning light should come on briefly when you turn the ignition key to RUN. If the light does not come on then, have it fixed so it will be ready to warn you if there is a problem.

StabiliTrak® Indicator Light

This warning light should come on briefly when the engine is started.

If the warning light does not come on then, have it fixed so it will be ready to warn you if there is a problem. If it stays on, or comes on when you are driving, there may be a problem with your StabiliTrak® system and your vehicle may need service. When this warning light is on, the system is off and will not limit wheel spin. Adjust your driving accordingly.
This light will also flash when the StabiliTrak® system is active.

If the StabiliTrak® system warning light comes on and stays on for an extended period of time when the system is turned on, your vehicle needs service. See StabiliTrak® System on page 363 for more information.

**Engine Coolant Temperature Gage**

This gage shows the engine coolant temperature.

![Temperature Gage Diagram](image)

United States

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<thead>
<tr>
<th>Temperature</th>
<th>Celsius</th>
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</thead>
<tbody>
<tr>
<td>210°F (100°C)</td>
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<tr>
<td>160°F (75°C)</td>
<td>75°C</td>
</tr>
<tr>
<td>260°F (125°C)</td>
<td>125°C</td>
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</table>

Canada

<table>
<thead>
<tr>
<th>Temperature</th>
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</thead>
<tbody>
<tr>
<td>210°F (100°C)</td>
<td>100°C</td>
</tr>
<tr>
<td>260°F (125°C)</td>
<td>125°C</td>
</tr>
</tbody>
</table>

It also provides an indicator of how hard your vehicle is working. During a majority of the operation, the gage will read 210°F (100°C) or less. If you are pulling a load or going up hills, it is normal for the temperature to fluctuate and approach the 250°F (122°C) mark. If the gage reaches the 260°F (125°C) mark, it indicates that the cooling system is working beyond its capacity.

See Engine Overheating on page 468.
Remember: ABS does not change the time you need to get your foot up to the brake pedal or always decrease stopping distance. If you get too close to the vehicle in front of you, you will not have time to apply your brakes if that vehicle suddenly slows or stops. Always leave enough room up ahead to stop, even though you have ABS.

Using ABS
Do not pump the brakes. Just hold the brake pedal down firmly and let anti-lock work for you. You may feel the brakes vibrate, or you may notice some noise, but this is normal.

Braking in Emergencies
With ABS, you can steer and brake at the same time. In many emergencies, steering can help you more than even the very best braking.

Locking Rear Axle
If your vehicle has this feature, it can give you additional traction on snow, mud, ice, sand or gravel. It works like a standard axle most of the time, but when one of the rear wheels has no traction and the other does, this feature will allow the wheel with traction to move the vehicle.

StabiliTrak® System
Your vehicle may be equipped with the StabiliTrak® system which combines antilock brake, traction and stability control systems and helps the driver maintain directional control of the vehicle in most driving conditions.

When you first start your vehicle and begin to drive away, the system performs several diagnostic checks to ensure there are no problems. You may hear or feel the system working. This is normal and does not mean there is a problem with your vehicle. The system should initialize before the vehicle reaches 20 mph (32 km/h). In some cases, it may take approximately two miles of driving before the system initializes.
If the system fails to turn on or activate, the StabiliTrak® light along with one of the following messages will be displayed on the Driver Information Center (DIC): TRACTION CONTROL OFF, SERVICE TRACTION CONTROL, STABILITRAK OFF, SERVICE STABILITRAK. If these DIC messages appear, make sure the StabiliTrak® system has not been turned off using the StabiliTrak® on/off button. Then turn the steering wheel clockwise from the nine o’clock position to the three o’clock position. If this clears the message(s), your vehicle does not need servicing. If this does not clear the message(s), then turn the vehicle off, wait 15 seconds, and then turn it back on again to reset the system. If any of these messages still appear on the Driver Information Center (DIC), your vehicle should be taken in for service. For more information on the DIC messages, see Driver Information Center (DIC) on page 258.

The StabiliTrak® light will flash on the instrument panel cluster when the system is both on and activated.

You may also feel or hear the system working; this is normal.

The traction control disable button is located on the instrument panel below the climate controls.

The traction control part of StabiliTrak® can be turned off by pressing and releasing the StabiliTrak® button if both systems (traction control and StabiliTrak®) were previously on. To disable both traction control and StabiliTrak®, press and hold the button for five seconds.
Traction control and StabiliTrak® can be turned on by pressing and releasing the StabiliTrak® button if not automatically shut off for any other reason.

When the TCS or StabiliTrak® system is turned off, the StabiliTrak® light and the appropriate TCS off or StabiliTrak® off message will be displayed on the DIC to warn the driver. Your vehicle will still have brake-traction control when traction control is off, but will not be able to use the engine speed management system. See “Traction Control Operation” next for more information.

When the traction control system has been turned off, you may still hear system noises as a result of the brake-traction control coming on.

It is recommended to leave the system on for normal driving conditions, but it may be necessary to turn the system off if your vehicle is stuck in sand, mud, ice or snow, and you want to “rock” your vehicle to attempt to free it. It may also be necessary to turn off the system when driving in extreme off-road conditions where high wheel spin is required. See If Your Vehicle is Stuck in Sand, Mud, Ice, or Snow on page 406.

When the transfer case is in 4LO, the stability system is automatically disabled, the StabiliTrak® light will come on and the STABILITRAK OFF message will appear on the DIC. Both traction control and StabiliTrak® are automatically disabled in this condition.
Traction Control Operation

The traction control system is part of the StabiliTrak® system. Traction control limits wheel spin by reducing engine power to the wheels (engine speed management) and by applying brakes to each individual wheel (brake-traction control) as necessary.

The traction control system is enabled automatically when you start your vehicle. It will activate and the StabiliTrak® light will flash if it senses that any of the wheels are spinning or beginning to lose traction while driving. If you turn off traction control, only the brake-traction control portion of traction control will work. The engine speed management will be disabled. In this mode, engine power is not reduced automatically and the driven wheels can spin more freely. This can cause the brake-traction control to activate constantly.

Notice: If you allow the wheel(s) of one axle to spin excessively while the StabiliTrak®, ABS and brake warning lights and the SERVICE STABILITRACK message are displayed, you could damage the transfer case. The repairs would not be covered by your warranty.

Reduce engine power and do not spin the wheel(s) excessively while these lights and this message are displayed.

The traction control system may activate on dry or rough roads or under conditions such as heavy acceleration while turning or abrupt upshifts/downshifts of the transmission. When this happens, you may notice a reduction in acceleration, or may hear a noise or vibration. This is normal.

If your vehicle is in cruise control when the system activates, the StabiliTrak® light will flash and the cruise control will automatically disengage. When road conditions allow you to use cruise again, you may re-engage the cruise control. See Cruise Control on page 210.

StabiliTrak® may also turn off automatically if it determines that a problem exists with the system. If the problem does not clear itself after restarting the vehicle, you should see your dealer for service.
You can choose among five driving settings:

Indicator lights in the switches show you which setting you are in. The indicator lights will come on briefly when you turn on the ignition and the last chosen setting will stay on. If the lights do not come on, you should take your vehicle in for service. An indicator light will flash while shifting. Fast flashing means the conditions were not met to make the desired shift, typically the vehicle was going too fast, the automatic transmission was not in neutral, or the clutch pedal was not fully pressed. Slow flashing means the shift is in progress. It will stay on when the shift is completed. If for some reason the transfer cannot make a requested shift, it will return to the last chosen setting.

2 ↑ (Two-Wheel Drive High): This setting is used for driving in most street and highway situations. Your front axle is not engaged in two-wheel drive. This setting also provides the best fuel economy.

AUTO (Automatic Four-Wheel Drive): This setting is ideal for use when road surface traction conditions are variable. When driving your vehicle in AUTO, the front axle is engaged, but the vehicle’s power is primarily sent to the rear wheels. When the vehicle’s software determines a need for more traction, the system will transfer more power to the front wheels. Driving in this mode results in slightly lower fuel economy than Two-Wheel Drive High.

4 ↑ (Four-Wheel Drive High): Use the four-wheel high position when you need extra traction, such as on snowy or icy roads or in most off-road situations. This setting also engages your front axle to help drive your vehicle. This is the best setting to use when plowing snow.

4 ↓ (Four-Wheel Drive Low): This setting also engages your front axle and delivers extra torque. You may never need this setting. It sends maximum power to all four wheels. You might choose Four-Wheel Drive Low if you are driving off-road in deep sand, deep mud, deep snow, and while climbing or descending steep hills. StabiliTrak® will not engage in this mode. See StabiliTrak® System on page 363 for more information.
7.2 VEHICLE ARRIVAL CONDITION REPORT

CONTRACT NO. DTNH22-07-P-00332 DATE: 8-20-07

FROM: Event Vehicles (Leasing Company)

TO: TRC

PURPOSE: ( X ) Initial ( ) Received ( ) Present

Receipt via Transfer vehicle condition

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2007 Chevrolet Avalanche MPV

MANUFACTURE DATE: 05/06 NHTSA NO.: C70118

BODY COLOR: pewter VIN: 3GNFK12307G113557

ODOMETER READING: 45 miles GVWR: 3266 KG

PURCHASE PRICE: $ (leased) DEALER’S NAME: (leased)

X ALL OPTIONS LISTED ON “WINDOW STICKER” ARE PRESENT ON THE TEST VEHICLE

X TIRES AND WHEEL RIMS ARE NEW AND THE SAME AS LISTED

X THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS

X THE VEHICLE HAS BEEN PROPERLY PREPARED AND IS IN RUNNING CONDITION

X THE GLOVE BOX CONTAINS AN OWNER’S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS

X PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

X PLACE VEHICLE IN STORAGE AREA

X INSPECT THE VEHICLE’S INTERIOR AND EXTERIOR, INCLUDING ALL WINDOWS, SEATS, DOORS, ETC., TO CONFIRM THAT EACH SYSTEM IS COMPLETE AND FUNCTIONAL PER THE MANUFACTURER’S SPECIFICATIONS. ANY DAMAGE, MISADJUSTMENT, OR OTHER UNUSUAL CONDITION THAT COULD INFLUENCE THE TEST PROGRAM OR TEST RESULTS SHALL BE RECORDED. REPORT ANY ABNORMAL CONDITION TO THE NHTSA COTR BEFORE BEGINNING ANY TEST

RECORDED BY: Jason Church DATE: 8-20-07

APPROVED BY: Jeff Sankey DATE: 10-15-07
7.3 VEHICLE COMPLETION CONDITION REPORT

CONTRACT NO. DTNH22-07-P-00332 DATE: 9-27-07

MODEL YEAR/MAKE/MODEL/BODY STYLE: 2007 Chevrolet Avalanche MPV

MANUFACTURE DATE: 05/06 NHTSA NO.: C70118

BODY COLOR: pewter VIN: 3GNFK12307G113557

ODOMETER READING: 164 miles GVWR: 3266 KG

LIST OF FMVSS TESTS PERFORMED BY THIS LAB: 126

- THERE ARE NO DENTS OR OTHER INTERIOR OR EXTERIOR FLAWS
- THE VEHICLE HAS BEEN PROPERLY MAINTAINED AND IS IN RUNNING CONDITION
- THE GLOVE BOX CONTAINS AN OWNER'S MANUAL, WARRANTY DOCUMENT, CONSUMER INFORMATION, AND EXTRA SET OF KEYS
- PROPER FUEL FILLER CAP IS SUPPLIED ON THE TEST VEHICLE

REMARKS:

Equipment that is no longer on the test vehicle as noted on Vehicle Arrival Condition Report:
None.

Explanation for equipment removal:
N/A

Test Vehicle Condition:
Like new.

RECORDED BY: Jason Church DATE: 9-27-07
APPROVED BY: Jeff Sankey DATE: 10-15-07
## 7.4 SINE WITH DWELL TEST RESULTS

**2007 Chevrolet Avalanche**

**NHTSA No.: C70118**

Date Created: 29-Aug-07

<table>
<thead>
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<th>File</th>
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Note: The table above contains test results for SWA @ 5deg Ct, SWA @ 5deg Mes, and various other measured values along with their respective units and values.
### 7.4 SINE WITH DWELL TEST RESULTS

#### 2007 Chevrolet Avalanche

**NHTSA No.: C70118**

**Date Created:** 29-Aug-07

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## 7.5 SLOWLY INCREASING STEER TEST RESULTS

**2007 Chevrolet Avalanche**

**NHTSA No.: C70118**

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### Averages
- Averages for steering angles:
  - 1.5: 62
  - 2: 82
  - 2.5: 103
  - 3: 123
  - 3.5: 144
  - 4: 164
  - 4.5: 185
  - 5: 205
  - 5.5: 226
  - 6: 246
  - 6.5: 267
  - 6.6: 270
7.6 INERTIAL SENSING SYSTEM LOCATION COORDINATES

2007 Chevrolet Avalanche
NHTSA No.: C70118

Device : N10-02-03-01310
device version : 1.55
device certification date : 12/04/06
today is : 08/28/07
units : Millimeters

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Track Width                                   1743  

| Roof Height (relative to ground)               | 1867.1944 |
|                                                |           |

Motion Pak - x-distance                        | 1265.5676 |
Motion Pak - y-distance                        | -5.4254   |
Motion Pak - z-distance                        | 768.9293  |