



Air Induction Subsystem Over Pressurization

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. The purpose of this standard is to subject the Air Induction Subsystem (AIS) to an over pressurization event.

1.2 Applicability. See the Air Induction Subsystem Technical Specification (SSTS) for applicable engine types.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW16411 GMW17381

2.3 Additional References.

- AIS Analysis/Development/Validation Plan and Report (ADVP&R)
- Air Induction SSTS

3 Resources

3.1 Facilities.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.1.3 A room is required which is capable of providing protection to the surroundings and operators from possible flying debris. Protection from noise emanating from the detonation of combustible mixtures inside of intake manifolds should also be provided. In addition, adequate ventilation is required to remove any combustible mixtures of fuel and air from the ambient surroundings.

3.1.4 Chamber must be large enough to house the entire air induction system and attaching components.

3.2 Equipment. Two (2) pressure sensors and equipment to measure the pressure and plot the results. Refer to GMW16411 for additional equipment.

3.3 Test Vehicle/Test Piece.

3.3.1 Test Material Required.

3.3.1.1 Air Induction Subsystem.

3.3.1.2 A pressure vessel or an intake manifold assembly with the production intent pressure relief valve (if applicable).

3.3.1.3 Throttle body assembly.

3.3.1.4 Ancillary hole block-offs, plugs, or tubes (if applicable).

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3.3.1.5 Positive Crankcase Ventilation (PCV) hose to AIS (if applicable).

3.3.1.6 Secondary air hose to AIS (if applicable).

3.3.2 Test Quantity. Test the necessary sample size as identified in the AIS Analysis/Development/Validation Plan and Report (ADVP&R).

3.4 Test Time.

Calendar time: 5 days

Test time: 8 h to 24 h

Coordination time: 48 h to 72 h

3.5 Test Required Information. Inspection: Determine that the AIS and intake manifold is suitable for testing by inspection of the overall initial condition and leak integrity of the assembly. Look for any damage such as cracks or breakages which will negate the usefulness of the test.

3.6 Personnel/Skills. A technician trained to perform the instructions in Section 4 is required.

4 Procedure

4.1 Preparation.

4.1.1 The sample test components shall be prepared per GMW17381 Preparation (4.1) and leak tested per GMW17381 Instructions (4.3.3).

4.1.2 Install any ancillary attachments to the AIS such as Exhaust Gas Recirculation (EGR), PCV, Secondary Air Injection (SAI), vacuum, or purge ports. This shall be production intent tubes or hoses, and plugged at their free end.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

Note: Deviations shall be approved by the GM Design Release Engineer (DRE) and GM Validation Engineer prior to start of test.

4.3 Instructions.

4.3.1 Use a manifold for an "impulse generator" and follow GMW16411 for setup and impulse generation.

4.3.2 Install pressure sensor into intake manifold/pressure vessel near throttle body.

4.3.3 Determine charge necessary to generate Test Pressure (TPR) at the intake manifold side of the throttle with the throttle plate closed. These conditions will be used to define test state with the throttle open to represent possible worst case initial throttle conditions. Intake manifold/pressure vessel must be capable of containing a combustion mixture that when ignited will reach the TPR pressure for 10 ms.

Note: Where TPR = Test Pressure in kPa, reference the Air Induction SSTs, for the over pressurization TPR.

4.3.4 Add a burst membrane between the throttle body inlet and the AIS, combustible mixture only in the manifold.

4.3.5 Add an AIS with all production intent interfaces, PCV, SAI, etc. Interface connection at AIS clean air duct PCV port includes intent joint design of duct and attaching hose. Production intent hoses shall be plugged at the open end. Mount AIS in in-vehicle position (with respect to the manifold).

4.3.6 Install pressure sensor into air induction system clean air side, either in clean air duct or clean air side of air box.

4.3.7 Throttle Angle. Test with throttle angle in worst case position for startup (as determined by lead GM engine calibrator) or default/non-powered position.

4.3.8 Initial Pressure. Purge and charge manifold to 6.89 kPa gauge.

4.3.9 Ignite the mixture within the pressure vessel, record the data (Data Sheet A1 in Appendix A), inspect for damage. Remove air induction system from the test fixture for inspection; do not disassemble the air induction system components.

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4.3.10 Repeat 4.3.5 through 4.3.9 for all test samples.

Note: Reference the Air Induction SSTS for testing compliance.

4.4 Posttest Leakage Check and Inspection.

4.4.1 All sample test components shall be leakage checked after testing per GMW17381 Instructions (4.3.3).

4.4.2 Post leak testing, inspect components as defined in the Air Induction SSTS.

5 Data

5.1 Calculations. Not applicable.

5.2 Interpretation of Results. Test results should be compared to the Air Induction SSTS.

5.3 Test Documentation. An Engineering Report should be written following completion of this procedure. Include the information:

5.3.1 Completed Data Sheet A1 in Appendix A.

5.3.2 Completed posttest inspection notes, Data Sheet B1 in Appendix B.

5.3.3 A picture and schematic of layout and location of pressure sensors. See Figure C1 example in Appendix C.

5.3.4 Graph of pressure wave for each sensor on each test. See Figure C2 example in Appendix C.

5.3.5 Photographs of the test samples before testing as installed in the test fixture.

5.3.6 Photographs of the test samples after testing.

6 Safety

This Engineering Standard may involve safety requirements for hazardous materials, the method of operations and equipment. This standard does not propose to address all the safety issues associated with its use. It is the responsibility of the user of this standard to ensure compliance with all appropriate safety and health practices. This would include any specific training that may be required. The safety and health standards include site specific rules and procedures, company rules and procedures, and Government Standards. Contact shall be made with the appropriate site Safety and Health personnel for further direction and guidance in these matters.

7 Notes

7.1 Glossary.

Air Induction Subsystem Over Pressurization: Refers to the intake manifold combustion event propagation into the AIS. The failure may be catastrophic, such as a structural failure of the AIS causing a clean air side leak or a thermal event starting with the filter media.

7.2 Acronyms, Abbreviations, and Symbols.

AIS	Air Induction Subsystem
Asm	Assembly
DRE	Design Release Engineer
EGR	Exhaust Gas Recirculation
GSSLT	Global Subsystem Leadership Team
MASF	Mass Air Flow Sensor
PCV	Positive Crankcase Ventilation
S/N	Serial Number
SAI	Secondary Air Injection
SSTS	Subsystem Technical Specification
TPR	Test Pressure

8 Coding System

This standard shall be referenced in other documents, drawings, etc., as follows:

Test to GMW15458

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