



Heat Shield Variation Acceptance

1 Scope

1.1 Material Description. The objective of this standard is to define acceptance limits for several types of variation in heat shield manufacturing. The types of manufacturing variation covered include perimeter hem variation in multi-layer heat shields, wire mesh isolator form variation, shield body form variation and insulation layer form variation.

1.2 Symbols. Not applicable.

1.3 Applicability. This standard covers supplier manufacturing variation in engine under hood heat shields used for exhaust manifolds, turbochargers, after treatment components (catalytic converter, exhaust gas recirculation (EGR) hardware/plumbing, etc.,) starters and sensors. The standard is primarily applicable to multi-layer shields, but a subset of the content is also applicable to single layer shield designs.

1.4 Remarks. The intent of the standard is to provide a uniform set of acceptance criteria for part print reference. This standard is intended to supplement the part print content. Detailed print exceptions take precedent in the case of conflicts with this standard.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

GMW3059

3 Requirements

3.1 Part Condition. These visual standards are applicable to the final heat shield assembly as delivered to the customer. Acceptance limits for manufacturing variation in this standard are divided into four categories. Any deviations from these requirements require GM Engineering approval prior to implementation. Deviations to be documented on the released part print.

3.1.1 Perimeter Hem Form Variation. Overlap between the outer and inner layers of perimeter hems shall be as uniform as possible, but some degree of manufacturing variation (hem dimensions, folds, wrinkles, etc.,) is unavoidable with multi-layer shield designs.

- An acceptable hem shall be defined as one where the edge of the inner layer is completely covered by the outer layer fold over. In designs where both layers are folded over to form the hem, the outer layer shall completely cover the folded perimeter of the inner layer (reference Figure A1 through Figure A3.) The inner cut edge may extend past the outer cut edge in dual layer, fold over designs (reference Figure A4). The maximum extent of the layer edge mismatch may be defined on the GM part print. In addition, the hem shall be fully closed.
- An acceptable hem shall not have folds, wrinkles or burrs that result in exposed sharp edges that may affect safe handling (reference left side image in Figure A3).
- Splits or tears of the folded over layer(s) that extend to the edge of the shield perimeter are unacceptable (reference Figure A5 and Figure A6). Splits or tears that are detrimental to performance or appearance are unacceptable regardless of size.

- Perimeter hems under fastener interfacing surfaces are not acceptable without prior GM Engineering approval. **Note:** Overlap between fastener under head zones and perimeter hems may be driven by the GM design and tolerance stack conditions.

3.1.2 Wire Mesh Isolator Form Variation. Multiple types of wire mesh isolators are utilized for heat shields. The following requirements apply specifically to two piece isolator designs, wire mesh + fastener eyelets, unless otherwise specified as "All isolator types".

- Strands of wire protruding greater than 5 mm are not acceptable (reference Figure A7).
- Strands of wire that may extend onto the eyelet top surface side where the wire may become trapped under the bolt head during assembly are not acceptable.
- Strands of wire mesh less than 5 mm and eyelet overlap less than 25% of the circumference are acceptable on the eyelet bottom surface side (reference Figure A8).
- Creases in the wire mesh are acceptable (reference Figure A9).
- Asymmetric mesh from handling and/or manufacturing damage is not acceptable (reference Figure A10).
- Wire mesh overlap of perimeter hems is not acceptable without prior GM Engineering approval (reference Figure A11). **Note:** Mesh to hem overlap may be driven by the GM design and tolerance stack conditions - all isolator types.

3.1.3 Shield Body Form Variation. The following are acceptance limits for manufacturing variation in the shield inner and outer metal body layers. GM Engineering shall detail any application specific cosmetic appearance requirements, such as "wrinkle free" zones, in the technical requirement documentation provided at the time of sourcing and shall perform ongoing reviews of cosmetic requirements during part development.

- Surface distortion, wrinkles and folds shall be permissible in both the inner and outer layers, but should be kept to a minimum and requires approval of initial production samples at Production Part Approval Process (PPAP) from GM Global Propulsion Systems (GPS) (reference Figure A12 and Figure A13).
- Certain surfaces may be identified on the print as "wrinkle free" due to under hood cosmetic appearance requirements.
- Splits or tears in the heat shield body are unacceptable, except along the hem fold over as defined in 3.1.1.
- Wrinkles and folds under fastener interfacing surfaces are not acceptable without prior GM Engineering approval. **Note:** Wrinkles and folds at fastener interface surfaces may be driven by GM design.

3.1.4 Insulation Layer Form Variation. Voids or splits in the insulation layer of multi-layer shields shall not exceed a 4 mm gap. Gap defined as the separation between insulation edges or maximum width of a split. Inspection for the insulation layer is a destructive test and shall be performed during development and as required per the supplier Process Control Plan.

3.2 Inspection Process. Inspection is to be performed with the naked eye as natural vision or corrected vision to 20/20. No magnification is to be used, except as required to confirm variation type and/or size. Inspection lighting shall be provided as required to discriminate the anomalies detailed within this standard.

3.3 All materials supplied to this standard must comply with GMW3059, **Restricted and Reportable Substances**, including the requirement to submit a full material composition disclosure to GM via the International Material Data System (IMDS) or via a completed GMW3059 report form.

4 Manufacturing Process

Not applicable

5 Rules and Regulations

5.1 Legal Regulations. All materials must satisfy applicable laws, rules, regulations and recommendations valid in the country of usage.

5.2 Language. In the event of conflict between the English and domestic language, the English language shall take precedence.

5.3 Inspection and Rejection. Samples of components or materials released to a GM material specification shall be tested for conformity with the requirements of this material specification and approved by the responsible Engineering department prior to commencement of delivery of bulk supplies.

A new approval must be received for any changes, e.g., properties, manufacturing process, location of manufacture, etc. If not otherwise agreed, all testing and documentation normally required for initial release must be completed.

It is the responsibility of the supplier to inform the customer in a timely manner, without solicitation, and to include documentation of all modifications of materials and/or processes and to apply for a new release.

5.4 Material Safety Data Sheets/Safety Data Sheets (MSDS/SDS). For new product submissions, or when a change in chemical composition of an existing product has occurred, a complete copy of the Material Safety Data Sheet/Safety Data Sheet must be submitted in compliance with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS) requirements or other country-specific MSDS/SDS requirements.

6 Approved Sources

Materials supplied to this specification must be approved by General Motors.

The appropriate GM Materials Engineering department(s) must confirm material as meeting the requirements of this specification. Any test data sheets of material submitted to General Motors for such confirmation (e.g., during Production Part Approval Process (PPAP)) under this material specification must list all properties and must apply corresponding test methods of this material specification.

7 Notes

7.1 Glossary.

Eyelet Bottom Surface: Small diameter side of the fastener eyelet that typically interfaces with the component to which the shield is mounted.

Eyelet Top Surface: Large diameter side of the fastener eyelet that typically interfaces with the under head of the mounting fastener.

Fastener Eyelet: Fastener load limiter subcomponent of a mounting isolator.

Folds: Intentional or unintentional areas of the shield where the layers fold over on themselves due to metal deformation during shield forming.

Perimeter Hem: Edge of folded over metal to retain insulation and provide for safe handling around the perimeter of the shield form. Also applies to the perimeter of internal holes/openings, except for bolt holes and other print defined exceptions.

Splits/Tears: Points of separation (cracks) due to excess stretching of the material during shield forming.

Wire Mesh: Subcomponent of a mounting isolator providing partial decoupling of shield from mounting point.

Wire Mesh Crease: Crease in the final wire mesh resulting from the mesh folding over itself during compression.

Wrinkles: Distorted/uneven areas of the shield resulting from bunching of excess material during shield forming.

7.2 Acronyms, Abbreviations, and Symbols.

EGR	Exhaust Gas Recirculation
GHS	Globally Harmonized System of Classification and Labeling of Chemicals
GPS	Global Propulsion Systems
GSSLT	Global Subsystem Leadership Team
IMDS	International Material Data System
MSDS	Material Safety Data Sheet
PPAP	Production Part Approval Process
SDS	Safety Data Sheet

8 Coding System

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

HEAT SHIELD MUST MEET VARIATION ACCEPTANCE STANDARD GMW17827