GM	WORLDWIDE ENGINEERING STANDARDS	General Specification	GMW3600

Generic Supplier Analysis/Development/Validation Process Tasks and Deliverables

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. This document defines the Supplier requirements to GM relative to Analysis, Development and Validation (ADV) tasks and deliverables.

1.2 Applicability. This standard applies to all commodities (e.g., components, subsystems, systems, features, etc.) supplied to GM for any vehicle program; if the Supplier is design responsible and execution responsible for ADV tasks and deliverables or if the Supplier is not design responsible, but they are execution responsible for ADV tasks and deliverables.

1.3 Remarks. This standard is otherwise known as Statement of Requirements (SOR) Appendix G1.

1.3.1 Use of Engineering Title, Validation Engineer. In this document, the Validation Engineer is used to refer to the GM Engineer that is responsible to verify that the commodity provided by the Supplier to GM is validated and meets the technical requirements as specified in the commodity specific SOR.

2 References

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

2.1 External Standards/Specifications.

SAE J1739	SAE J2886

2.2 GM Standards/Specifications.

GMW3059	GMW8758	GMW15758	GMW16044
GMW3172	GMW14133 (ID)	GMW15760	GMW17162
GMW8287	GMW14375	GMW15920	GMW17626

(ID) = Standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

2.3 Additional References.

- Accelerates Life Testing Analysis (ALTA) software, available at www.reliasoft.com/alta/features1.htm.
- Analysis Modeling Guidelines.
- Automotive Industry Action Group (AIAG). Current versions of documents can be obtained by calling +01 (248) 358-3003. If documents cannot be obtained via the referenced telephone number, contact the Buyer's Buyer or the Buyer's Lead Engineer.
- CG4649 Proof of Validation Letter.
- CG4663 Supplier Design Failure Mode and Effects Analysis (DFMEA) Risk Analysis and Review.
- CG4816 Commodity Validation Sign-off Form.
- Component Environmental Test Plan.
- Component Timing Charts.
- Contract.

© Copyright 2017 General Motors Company All Rights Reserved

Documents
Document Sharing Hub

Copyright General Motors Company
Provided by IHS Markit under license with General Motors Company
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: GMW-R GMW3600 2017

- Engineering Library/Global/Technical Standards and References/Standards in www.gmsupplypower.com.
- GM Compliance Summary Document.
- GM Software Portfolio available at gmsupplypower.com or gmsupplypower.covisint.com.
- Issue Status Report.
- Main SOR.
- Open Item List.
- Potential Failure Mode and Effects Analysis (FMEA) Reference Manual.
- Problem Resolution Tracking System (PRTS).
- Production Part Approval Process (PPAP).
- Program Master Timing Chart.
- SOR Appendix G1.
- SOR Appendix G2.
- SOR Appendix G3.
- Virtual Vehicle (VV) Chart.

3 Analysis/Development/Validation (ADV) Planning Requirements for Suppliers

3.1 The commodity-specific SOR Appendix G2 specifies the ADV documentation requirements for a particular commodity and program.

- Validation Cross Reference Index (VCRI).
- Design Failure Mode and Effects Analysis (DFMEA).
- Program Specific Analysis/Development/Validation Plan and Report (ADVP&R).
- Component Environmental Test Plan (only required for components/subsystems with electrical/electronic content).

3.1.1 The subparagraphs of Section 3 describe the requirements associated with each of the ADV planning documents named in the list in 3.1.

3.2 Validation Cross Reference Index (VCRI). The VCRI is a commodity specific baseline template that outlines validation tasks relative to regulatory, performance, reliability, and durability evaluations for a given set of GM technical specifications. It is a matrix that maps the performance requirements from the technical specification to their respective evaluation procedure. The VCRI is the standard starting point for a GM Validation Engineer to create the initial Program Specific ADVP&R that is provided as SOR Appendix G3. The VCRI resides as a portion or section of the Program Specific ADVP&R document.

Note: SOR Appendix G3 may have multiple ADVP&Rs attached depending upon the content requirements or program bandwidth.

3.2.1 General Process Requirements for a VCRI. Unless specified otherwise in the commodity specific SOR Appendix G2, the supplier shall meet the following requirements.

3.2.1.1 If the VCRI section within the Program Specific ADVP&R has a partial or incomplete map, the Supplier is required to populate the unfinished areas per the document instructions and submit an updated initial Program Specific ADVP&R with VCRI content complete in their SOR Quote Response Package (QRP).

3.2.1.2 The supplier may propose an alternative procedure or modification to an existing GM procedure for review and approval. All procedure changes or other VCRI update requests shall include supporting detail with change rationale and the initial Program Specific ADVP&R with the VCRI proposed changes complete. The documentation shall be submitted for approval to the GM Validation Engineer on or before the Final VCRI date specified in the commodity specific SOR Appendix G2. Table 3.1, or no later than 6 weeks after sourcing. If the request is denied, the supplier is not authorized to proceed with the proposed revisions and the Supplier shall revert the VCRI section and resubmit the corrected document for approval.

© Copyright 2017 General Motors Company All Rights Reserved

Documents
Document Sharing Hub
Copyright General Motors Company
Provided by IHS Markit under license with General Motors Company
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: GMW-R GMW3600 2017

3.3 Design Failure Mode and Effects Analysis (DFMEA) and Design Review Based on Failure Modes (DRBFM). The following requirements are applicable if the Supplier is required by the commodity specific SOR to provide a DFMEA or DRBFM.

3.3.1 General Process Requirements for DFMEA.

3.3.1.1 The supplier shall make available for review by the GM engineer(s) specified in Table 3.1 of the commodity specific SOR Appendix G2, the analysis portion of the DFMEA including representative block diagram, DFMEA meeting attendance rosters, risk rating scales used, and any items specified by the commodity specific SOR. Any vehicle level effects of failure and severity ratings that are applicable shall be provided by the GM engineer(s) through Supplier DFMEA Risk Analysis and Review (CG4663). All component level failure modes related to these vehicle level effects and severity ratings shall be mutually agreed by GM and the Supplier. The Supplier shall include cascaded vehicle level effects of failure and severity ratings for relevant line items in both the Supplier Design and Process FMEA analyses. Where design/process responsibility is outsourced to Tiered Suppliers, vehicle level effects of failure and severity ratings for relevant line items must be further cascaded to those Suppliers.

3.3.1.2 The Supplier's DFMEA, including identification of all failure modes, effects, failure causes, design controls, and initial Severity, Occurrence and Detection rankings, shall be completed by the Program Specific DFMEA (Initial Analysis Complete) date specified in Table 3.1 of the commodity specific SOR Appendix G2, or no later than the Final ADVP&R approval date. Risk should be evaluated using the GM risk level matrices and ranking values. All Risk Priority Level (RPL) S or 1, as agreed between GM and the Supplier, must be addressed with recommended actions implemented by the DFMEA RPL Closure date specified in Table 3.1 of the commodity specific SOR Appendix G2, or no later than Validation Test Complete (VTC). Any risk that cannot be mitigated to RPL 2 or lower shall be escalated for review with GM Validation Engineer. The Supplier DFMEA, with closure of all action items, shall be completed and stored by the Supplier under document control prior to PPAP approval, including failure modes and action items cascaded to tiered Suppliers for resolution.

3.3.2 Format and Content Requirements for DFMEA.

3.3.2.1 The Supplier shall prepare the DFMEA (analysis portion) in accordance with the format and content of the Automotive Industry Action Group (AIAG), the Potential FMEA Reference Manual and SAE J1739.

3.3.3 General Process Requirements for DRBFM.

3.3.3.1 The Supplier shall provide a DRBFM analysis for all design changes made after production math data release. The DRBFM analysis shall be completed prior to implementation of the specified design change and is a requirement of the GM engineering change process. This requirement applies to both Supplier and GM requested design changes.

3.3.3.2 The Supplier shall request participation in the applicable GM Product Development Team (PDT) to review the DRBFM analysis portion with the GM team in order to identify and document any additional concerns related to the specified design change. A copy of the DRBFM results/report shall be provided to the GM Design Release Engineer to attach to the associated Engineering Work Order.

3.3.3.3 Upon approval of the specified change, the Supplier shall update the DFMEA with the results of the DRBFM analysis. All previously specified requirements for maintenance, approval and retention of the final DFMEA shall remain in force.

3.3.4 Format and Content Requirements for DRBFM. The Supplier shall conduct a DRBFM in accordance with the SAE J2886: Design Review Based on Failure Modes.

3.4 Supplier Analysis/Development/Validation (ADV) Plan. Unless otherwise specified in commodity specific SOR Appendix G2 or in writing by GM, the Supplier shall meet the following requirements associated with the Program Specific ADVP&R.

3.4.1 General Process Requirements for the Program Specific ADVP&R.

3.4.1.1 The initial Program Specific ADVP&R is provided the GM Validation Engineer in the commodity specific SOR Appendix G3.

3.4.1.2 The Supplier shall update the plan as required to meet the commodity specific completion dates and milestones provided, based upon availability of facilities, vehicle properties and any other constraints that may impact successful execution of the identified performance requirement by the completion date.

© Copyright 2017 General Motors Company All Rights Reserved

Documents
Document Sharing Hub

Copyright General Motors Company
Provided by IHS Markit under license with General Motors Company
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: GMW-R GMW3600 2017

3.4.1.3 The Supplier shall comprehend the failure modes identified from the DFMEA (analysis portion) within the Program Specific ADVP&R prior to ADVP&R submission to GM.

3.4.1.4 The Supplier shall submit the Program Specific ADVP&R to the GM Validation Engineer for review and approval 2 weeks prior to the Final ADVP&R approval date specified in the commodity specific SOR Appendix G2, Table 3.1 or no later than 2 weeks prior to Design Validation (DV) test start. DV cannot begin until the ADVP&R has been approved by GM.

3.4.1.5 For engineering changes (e.g., Engineering Work Order (EWO)) the Supplier shall provide the ADVP&R impacts based upon the DRBFM to the GM Validation Engineer for approval within 3 calendar days of notification for those evaluations where the Supplier is execution responsible. The approved plan is attached to the EWO to document the agreement between GM and the Supplier for the validation required to support the EWO changes.

3.4.1.6 The Supplier shall have a process for managing, approving, and documenting changes to the ADV plan.

3.4.1.7 GM Validation Engineer approval of the Program Specific ADVP&R is mandatory for the final plan and any subsequent revisions based engineering changes. The GM Validation Engineer's approval shall be demonstrated by a signature, printed name and approval date on a hardcopy of the ADV plan. The most current approved version of the plan shall be retained by the Supplier until Commodity Validation Sign-off is complete.

3.4.2 Content and Format Requirements for Program Specific ADVP&R.

3.4.2.1 The Supplier shall review GMW15758 for definitions of the vocabulary used within the Program Specific ADVP&R.

3.4.2.2 The Supplier shall utilize GMW15760; sample selection procedure to select parts for Production Validation (PV) and for any Post-Validation Audit (PVA).

3.4.2.3 The plan includes the development and validation tasks that shall be conducted by the Supplier, GM, and any other organizations (e.g., contract laboratories) to achieve and demonstrate conformance of the commodity to its specified performance requirements from the technical specification and the associated reference documents.

3.4.2.4 The plan includes the evaluations planned, the validation type, evaluation methods (i.e., test, analysis, demonstration, inspection, surrogate and engineering judgement), sample size, timing, etc.

3.5 Component Environmental Test Plan. For components with electrical/electronic content, unless otherwise specified in commodity specific SOR Appendix G2 or in writing by GM, the Supplier shall meet the following requirements associated with the Component Environmental Test Plan.

3.5.1 General Process Requirements for Component Environmental Test Plan.

3.5.1.1 Initial Component Test Plan. The Supplier shall provide an initial Component Environmental Test Plan to GM as part of the Supplier's Quote Response Package. A Component Environmental Test Plan is also required for GM directed buys.

3.5.1.2 Final Component Environmental Test Plan. The Supplier shall submit a draft of the final Component Environmental Test Plan to the GM environmental/durability expert 4 weeks prior to the date specified in Table 3.1 of the commodity specific SOR Appendix G2.

3.5.1.2.1 Any test plan negotiations between GM and the Supplier must be completed, and approval of the final Component Environmental Test Plan by the date specified in Table 3.1 of the commodity specific SOR Appendix G2. If a date is not specified, the approval shall occur 10 weeks after source selection.

3.5.1.2.2 GM approval of the final Component Environmental Test Plan is mandatory. The GM environmental/durability expert's approval shall be provided to the Supplier. This approval shall be in the form of an e-mail containing an approval number.

3.5.1.2.3 The approved copy of the final Component Environmental Test Plan shall be retained by the Supplier until commodity validation sign-off is complete.

3.5.1.2.4 Once the Component Environmental Test Plan is approved, the required testing must be included in the Program Specific ADVP&R.

3.5.1.3 The Supplier shall have a process for managing, and documenting changes to the Component Environmental Test Plan.

3.5.1.4 For engineering changes (e.g., EWO) or other changes requiring validation, the Component Environmental Test Plan shall be revised or a new Component Environmental Test Plan submitted for approval.

© Copyright 2017 General Motors Company All Rights Reserved

Documents
Document Sharing Hub

Copyright General Motors Company
Provided by IHS Markit under license with General Motors Company
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: GMW-R GMW3600 2017

3.5.1.5 The Supplier shall obtain the GM environmental/durability expert's approval for any changes to the final Component Environmental Test Plan. Only the most current approved version of the final Component Environmental Test Plan shall be executed, however, all versions shall be retained by the Supplier until commodity validation sign-off is complete.

3.5.2 Content and Format Requirements for Component Environmental Test Plan. The content and format requirements for the Component Environmental Test Plan are specified in GMW3172.

3.5.2.1 Initial Component Environmental Test Plan. The initial Component Environmental Test Plan shall be completed through Section 2.

3.5.2.1.1 The initial Component Environmental Test Plan shall be based on the GMW3172 code letters as stated in the in the commodity specific SOR. If the GMW3172 code letters are not identified, the Supplier shall obtain them from the GM environmental/durability expert.

3.5.2.2 Final Component Environmental Test Plan.

3.5.2.2.1 The final Component Environmental Test Plan shall comprehend all failure modes identified in the GMW3172; Hardware Design Review.

3.5.2.2.2 The final Component Environmental Test Plan shall consider program timing, availability of facilities, or any other details that were negotiated between GM and the Supplier.

3.6 Process Requirements for Reliability Planning. Unless otherwise specified in the commodity specific SOR or in writing by GM, the Supplier shall comply with the following requirements.

3.6.1 General Requirements.

3.6.1.1 Validation methods shall be based on levels of customer usage and operating environmental stresses as defined in the commodity specific SOR. The test conditions shall properly exercise all failure mechanisms that may occur in actual product usage.

3.6.1.2 If analytical validation is used in place of physical validation, it shall be approved in advance by the GM Validation Engineer and must be comprehend in the Program Specific ADVP&R.

3.6.1.3 If requested by the GM Validation Engineer or GM Design Release Engineer (DRE)/Lead Engineer, the Supplier shall conduct design reviews, concentrating on factors affecting the product's reliability. Reviews may be used to clarify product requirements, review and evaluate the design, and address any current issues, including any test results, corrective actions, and analysis. A final review following design or product validation may be used to verify that all reliability-related issues have been resolved to GM's satisfaction. All reviews should include pertinent information on the product's design and processing, with particular attention being paid to potential safety-related or walk-home failure effects.

3.6.2 Preferred Methods of Reliability Demonstration.

3.6.2.1 The preferred method of reliability demonstration is a Test-to-Failure plan, using normal or accelerated conditions, comprehending all historical and potential new failure modes and mechanisms. However, depending on the test phase, a Success Test plan may be approved per Table 1, Methods of Reliability Demonstration.

© Copyright 2017 General Motors Company All Rights Reserved

Documents
Document Sharing Hub

Copyright General Motors Company
Provided by IHS Markit under license with General Motors Company
No reproduction or networking permitted without license from IHS
Licensee=/, User=,
Not for Resale,
Full document details: GMW-R GMW3600 2017