# **Introduction/ General**

### Note: Nothing in this standard SHALL supersede applicable laws and regulations. In the event of a conflict between English and a domestic language, the English language SHALL take precedence. GM issued drawings and Math supersede any conflicts created by this specification. ANY conflict in CG documentation SHALL be brought the attention of the GM Commodity SQE and DRE for resolution.

### **Purpose**: It is the responsibility of the supplier to ensure that the manufacturing process is state of the art. The expectation is for GM to receive parts that meet 100% of the specifications as defined by GM. It is the responsibility of the Supplier to ensure that the process **meets or exceeds** all requirements and able to show compliance through the associated Commodity Specific Audit (self-audit and/or through onsite audit by GM personnel) by the time of the APQP Kickoff review and verified according to CRV process.

## **Applicability**: These requirements are in addition to any requirements as outlined in the CG4338 GM 1927 03 SQ SOR “SHALL” in this document is mandatory. “Should” is highly recommended.

## These requirements SHALL be valid for any components or assemblies manufactured at the sub-supplier (Tier 1 or Tier 2… Tier x.). The Tier 1 supplier SHALL be responsible to validate and audit to these requirements at sub-tiers and provide evidence to GM upon request. (CG4355)

## All deviations requested for “SHALL” items are to be documented and submitted using CG3404 M7 Technical Issues List for review and approval by General Motors Supplier Quality prior to sourcing.

### It is understood that advances in technology may require modifications to the following requirements in order to ensure that state of the art processing and testing are being utilized. Alternative solutions that achieve the intended requirement SHALL be documented and approved by the GM SQE.

# **References**

## **External Standards/Specifications-**

* ASTM - American Society for Testing and Materials
* SAE – Society of Automotive Engineers
* JIS – Japanese Industrial Standards

## **External Audits**

* ISO14001 – International Standards Organization 14001
* CQI-27 - Continuous Quality Improvement process 27 – Casting Special Process Systems

## **GM Standards/Specifications**

GM CGs and Process Audits are in GM Supply Power.

* CG4238 GM 1927 03a Leak Test
* GM1724 Label Standards
* GM1738NA GM Packaging & Identification Requirements for Production Parts
* GM 1927 10 Fixture Standards
* GM 1927 28 Early Production Containment
* GM 1927 35 Run at Rate
* GMW16037 Test Method to Quantify Cleanliness of Powertrain Components
* GMW15862 Part Marking Procedure -Revised June 2013 and SP-E-DPM Version G2.0 specification
* GMW16530 Summary for Powertrain Requirements
* CG4355 Sub Tier Supplier
* CG3404 M7 Supplier Technical Issues List
* GM9982257 GPS Assembly Sealing Hardware Release Center (HRC) adhesion test -material specification
* RTV Adhesion Test Procedure – GMW17696
* CG4665 RTV Sealing Surface Applications
* CG5404 Contamination Control

## **GM Specific Audits**

* CG4633 GM 1927 16a Oil Pan Commodity Specific Audit
* CQI-27 Continuous Quality Improvement process 27 – Casting Special Process Systems Assessment

# **Planning**

## **Program Manager**: If this program is a major program (i.e., not a mid-cycle refresh), the supplier SHALL have a dedicated Program Manager to support this specific program full time (not shared) from contract award through PPAP approval and successful completion of GM 1927 35 R@R (i.e., pass status).The supplier SHALL support all builds listed in the Program Timing Cadence with a Program Manager. The supplier SHALL also support, with resources, all launch and production activities at GM manufacturing facilities. Once the program moves to Saleable, program management ownership can change from the corporate facility to the plant (if applicable).

## **Quality Engineer**: If this program is a major program (i.e., not a mid-cycle refresh), the supplier SHALL have a dedicated Quality Engineer to support this specific program full time (not shared) from contract award through PPAP approval and successful completion of GM 1927 35 R@R (i.e., pass status). The supplier SHALL support all builds listed in the Program Timing Cadence with a Quality Engineer. The supplier SHALL also support, with resources, all launch and production activities at GM manufacturing facilities. Once the program moves to Saleable, Quality Engineer ownership can change from the corporate facility to the plant (if applicable).

## **Audits and Action Plans**

### An assessment using GM 1927 16a Oil Pans Commodity Specific Audit SHALL be conducted initially and as needed to confirm continued compliance due according to CRV process.

### All findings classified as “Fail”, or “Needs Immediate Action”, or “Not Satisfactory” should be included in a continuous improvement plan and could, at the discretion of the SQE, impact Full PPAP status.

### Analysis of the failures SHALL be done to identify potential process improvements.

### For any non-compliances, a regular audit SHALL be developed to control areas of risk for each non-compliance.

# **PRODUCT Design & Development-**

## **Manufacturing Equipment Development Activity:** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the manufacturing process / equipment development activity:

## Equipment suppliers SHALL provide a machine FMEA. No additional requirements. Refer and comply to AIAG FMEA VDA Handbook or AIAG PFMEA 4th Edition and CG4338 GM 1927 03 SQ SOR. For Critical Characteristics, test equipment/EP SHALL reject part automatically and place part into a locked scrap bin without operator involvement. (i.e., exits system on the other side of the equipment.).

## All CC/SC on the GM and Supplier drawing SHALL use SPC (when applicable) to control the process.

## Equipment suppliers SHALL guarantee rate as stated in RFQ.

## Effect on Appearance (where applicable) SHALL be considered during Manufacturing Equipment Development:

### For Appearance Items only: An SQE approved duplicate of the Master AAR approved samples or a representative boundary sample SHALL be on-line and accessible by the operator to inspect parts. Any means used as an operator aide SHALL be controlled and assessed at a specified frequency for relevance and condition (deterioration, cleanliness, damage, etc.).

## If applicable, color verification SHALL be performed by a certified color operator as part of the process.

## Training: Training to AAR form for “Max Conditions” SHALL be reviewed as part of training of the operator.

## No Silicones, grease or sealants are allowed in the manufacture of any AUTOMATIC transmission component.

## **Appearance and Color:** The following appearance features and colors are acceptable guidelines for subcomponent parts of the assemblies pending final approval by the GPS DRE.

## Molded nylon SHALL be black in color.

## As-processed/manufactured color for all aluminum components.

## Media blasting is not required for this component.

## Media blasting may be allowed as a method to eliminate sharp edges. Use and acceptance criteria for this process SHALL be approved by the GPS SQE and DRE. The Supplier SHALL complete validation and PPAP to approve the use of a media-blast process.

## As-processed/manufactured color of Zn-Ni plated carbon steel and stainless steel for metallic connectors.

## Non-metallic connectors SHALL be black in color.

## Insulation material SHALL be black in color.

## Heat shield material SHALL be black or silver in color unless otherwise requested or agreed upon by the GPS DRE.

## Shield material to provide protection against abrasion damage SHALL be black in color unless otherwise requested or agreed upon by the GPS DRE.

# **PROCESS Design & Development-**

## **Control Plan:** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the manufacturing process control plan.

## **Cleanliness:** Operators SHALL clean workstation / equipment defined by the PM schedule (minimum-start of each shift and break). Example: Follow 5S principles.

## **Contamination Control**: Contamination Control CG5404 applies, and must be accepted and followed. High severity items SHALL be mitigated by vacuum, air, magnetic means, brush or a combination. This operation SHALL be automated and not operator dependent.

## Supplier SHALL have the ability to 3D scan parts (this may be done through a local contract source with ISO/IEC 17025 accreditation).

## All processes SHALL have displayed work instructions defining actions to be taken when a suspected non-conforming part is identified. Work instructions SHALL include non-conforming/suspect materials handling and segregation.

## System SHALL be locked out to prevent any unauthorized changes to manufacturing process and/or parameters.

## Supplier SHALL have a contingency plan for part segregation for an electric energy disruption in heat treatment operations.

## **Equipment:** Equipment should be equipped with instrumentation or visual indicators that allow operators to monitor key operating parameters.

## All Beta/Gamma parts should be made in the production intent process sequence, with production machining conditions, and with actual production tooling where possible.

### GPS will consider providing waivers to use production style tooling instead of the actual tooling where significant cost and/or timing advantages would result. This is not permitted except where prior written approval has been given by GPS.

### Production gaging is not required for Beta/Gamma manufacturing but is recommended.

### Supplier is responsible for acquiring all tooling required.

### All commercially confirmed GM owned tooling to become property of GM after completion of order.

## For all pre-serial production runs the differences to the serial process SHALL be understood and documented. In case of adverse effect on product integrity containments and additional controls SHALL be implemented.

## **Manufacturing Inspection and Test Equipment:** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the manufacturing inspection / test equipment:

## For any changes to test equipment including software, sample units (e.g., first article) SHALL be reviewed with the GM Product Development Team (DRE, SQE, CVE) to confirm compliance to the validated design record requirements. Approval SHALL be formally documented (e.g., GM3660, SPCR, CN).

## A Process Failure Mode Effects Analysis (PFMEA) SHALL be completed before the Production machining, assembly and test equipment is purchased. Refer and comply to AIAG FMEA VDA Handbook or AIAG PFMEA 4th Edition and CG4338 GM 1927 03 SQ SOR.

## The supplier is responsible for resolving all issues relative to parts that are machined incorrectly, not correctly assembled, fail leak test, and/or are otherwise defective.

## Error proofing is required to ensure correct subcomponent parts are present and installed properly.

## Installation of components that require force (i.e. seals, sensors with O-rings, fittings, plugs, dowel pins) SHALL be installed with a load transducer such that the force can be digitally recorded and tracked to the assembly serial number.

## Automated process controls SHALL be used to ensure acceptable part quality for all manufacturing processes such as, but not limited to, welding, brazing, heat-staking, orbital peening, and gluing processes.

## The assemblies SHALL be shipped directly to the engine assembly plant as complete assemblies consisting of all subcomponent parts.

## Assemblies SHALL be packaged appropriately to ensure no damage occurs during the shipping and handling process.

## All control plans SHALL document the sampling rate of parts (e.g., 2 parts/day, 5 parts/shift).

## Master gauges SHALL be identified and calibrated according to a schedule agreed upon by the GPS SQE and DRE.

## EPC

## All data collected during Production operations SHALL be plotted with reference to the upper and lower control limits.

## A graph of the data SHALL be posted at or near the Production operating station.

## A data summary SHALL be provided to the GPS SQE and DRE every month for review.

## **Dimensional Requirements:**

## Pre-Production parts SHALL be measured to verify drawing dimensional tolerances are met. The measurement results SHALL be documented and provided to the GPS SQE and DRE by the time the parts are delivered to GPS.

## Follow the PPAP (Production Part Approval Process) for both Prototype and Production part approval.

## Supplier SHALL comply with CG 4338 GM 1927 03 SQ SOR APPENDIX E ADDENDUM for Propulsion Systems Process Capability and Control Requirements.

## All data collected for the PC’s, as applicable per drawing specifications, SHALL be plotted against the upper and lower tolerance limits and submitted to the GPS DRE at least once per month for review.

## All Part Quality Characteristics (PQC) SHALL be tracked with a “Run Chart” at a frequency agreed upon by the GPS SQE and DRE. The “Run Charts” SHALL be submitted to the GPS SQE and DRE at least once per month for review.

## No dimensions are required to conform to Key Product Characteristic (KPC).

## No dimensions are required to conform to the PQC, 6σ Program.

## All dimensions that SHALL conform to the PQC, Non-6σ Program SHALL be reviewed and agreed upon by the GM DRE, Supplier, GM SQE, and Tech Specialists and are listed below. Inspection requirements for these dimensions will be agreed upon by the GM DRE, supplier, GM SQE, and GM technical specialist.

## Dimensions that SHALL conform to the Attribute Quality Characteristics (AQC), Non-6σ Program SHALL be agreed upon by the GM DRE, supplier, GM SQE, and GM technical specialist. Inspection requirements for these dimensions will be agreed upon by the GM DRE, supplier, GM SQE, and GM technical specialist such as Leak Test Requirements.

## Dimensions that SHALL conform to DR requirements are listed below:

## Cylinder block mounting surface flatness

## Transmission mounting face profile tolerance

## Perimeter bolt hole position tolerance

## Dowel pin hole diameter and true position

## Step chamfer height

## Part cleanliness requirement

## **Leak Test Requirements:**

## Leak Testing SHALL be planned for and performed per CG4238 GM 1927 03a Leak Test, where applicable.

## 100% of the assemblies SHALL complete the leak test throughout the entire program; during the experimental, prototype, and production design phases.

## All parts SHALL complete and pass the air leak test prior to shipment to GM.

## Castings and machined components may be leak checked prior to assembly at a different leak rates than specified. However, a leak test SHALL be completed for the final assembly in accordance with GPS specifications.

## The leak test SHALL be capable of detecting leaks between mating surfaces.

## The air leak and flow restriction tests SHALL be completed in a room with an air temperature of 25°C ± 10°C.

## The supplier SHALL maintain records for the leak test data plotted with reference to the test specifications and can be tracked by oil pan serial number.

## The air leak test is intended to ensure parts are properly assembled.

## It is not acceptable for parts to develop a leak during the life of the product, which includes engine plant hot or cold test.

## The supplier is responsible for investigating and implementing corrective actions if any parts develop a leak during the life of the product, which includes engine plant hot or cold test.

## Water dunk testing can be used to detect leakage location.

### **Standard Work**: The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the manufacturing process Standard Work.

## Standard Work (Instructions/Job Element Sheet) SHALL consider and include any boundary sample interpretations or agreed upon industry standards. Boundary Samples Established – Min-Max, Go-No Go, Visual, DRE Specific documentation- (Ex. BS10 – Con Rods).

### **Training:** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into a documented training program.

## Supplier proof of training SHALL include individual record keeping which shows sign-offs for all levels of employees, maintained/updated/reviewed prior to commencement of work, to allow all tasks to be performed properly.

## Supplier SHALL train all affected personnel on changes from Continuous Improvement activities, SPPS actions, warranty actions and Lessons Learned.

## Systematic approach of process knowledge through each gauge/process/station/cell SHALL be documented which includes approved sign-off signatures, audits/verification of tasks, and approved by leadership, supervision, team/process leaders, including auditing regularly for task knowledge

## Problem Solving SHALL be a documented and trained procedure subject to all audits of training

## Established audit process SHALL be performed as described in GM 1927 SQ Manual including auditing of standard work **and** training to the standard work, on ALL shifts. This should have a Feedback strategy for Continuous Improvement.

## **Manufacturing Preventative Maintenance:** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the manufacturing equipment preventive maintenance program.

## A power supply backup system should also be in place to prevent unplanned downtime to the manufacturing / test equipment programming.

## The mounting of critical fixtures to production equipment SHALL be secured to a defined torque. The fixtures SHALL be inspected to detect loosening.

## **Manufacturing Traceability:** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the manufacturing process for traceability.

## **EXAMPLE**; If supplier is given part id info, supplier SHALL be able to provide all requested info back to GM within 24 hours – As designated in the GM Engineering Appendix C.

## **Part Marking, Labelling and Identification Requirements:**

## Parts, components, assemblies and modules identified as requiring Traceability through the Key Characteristics Designation System (KCDS) SHALL be encoded in a Data Matrix. These parts SHALL have the Direct Marked Part zone identified on the part drawing / UG math. Consistent marking placement is essential when fixed mount scanners are used at the point of scan.

## The requirements for trace information SHALL include:

## Direct part marking per GMW 15862.

## This pan SHALL use a 2D matrix for error-proofing, in accordance with the GMW 15862 and SP-E-DPM Version G2.0 specification. Additional information is also provided on the assembly part drawing.

## No cast-in GM assembly part numbers are to be used, unless otherwise specified. If the supplier needs to add an identifier, they SHALL have the Supplier Quality Engineer and Design Release Engineer approval in writing.

## During Production, the final assemblies SHALL be marked in a permanent manner with a serial number after successful completion of leak testing in the same station and prior to releasing the assembly from the station.

## The serial number SHALL be traceable to all in-process quality checks such as, but not limited to, the following parameters:

## Leak test results

## Fastener torque values

## Press-in force values

## A laser etching marking system or printed label application SHALL be used for marking parts with the 2D matrix traceability information. Please quote BOTH options for cost comparison.

## The date of manufacture (DOM) SHALL be marked on Production assemblies in an easily viewed location approved by the GPS SQE and DRE.

## The DOM SHALL include the following information in a format, size and location agreed upon by the GPS SQE and DRE:

## Month, day, year

## Shift, Tool / cavity number

## Production line

## The GM part number for the assembly SHALL be marked on Production parts unless otherwise requested and approved by the GPS SQE and DRE. However, the supplier SHALL specify if there is an additional cost for marking each assembly with the GM part number during Production.

## Part identification SHALL be managed as standard practice during Production via labeled shipping (dunnage) containers.

## The GPS SQE and DRE SHALL approve the method of marking parts with a part number.

## All Experimental and Prototype parts SHALL be marked with a GM part number including suffix and release level unless otherwise approved by the GPS SQE and DRE.

## The supplier may propose a method of marking the parts for approval by the GPS SQE and DRE. A few examples of methods used to mark experimental and prototype parts include, but are not limited to:

## Laser Etching

## Dot matrix indent marking system

## Scribing,

## Application of labels

## The following sources detail various methods for marking parts with a part number:

## [www.columbiamt.com](http://www.columbiamt.com)

## [www.technifor.com](http://www.technifor.com)

## Experimental, Prototype, and Production part assemblies should be marked with the supplier’s manufacturing facility identification number if approved by the GPS SQE and DRE.

## Credible features identified by GM SQE, DRE, or Tech Specialists SHALL be required on the component for error proofing or identification. Size, shape, and location SHALL be approved by the GPS SQE and DRE.

## The part assembly SHALL not be marked with a supplier logo unless otherwise approved by the GPS SQE and DRE.

## The GM logo SHALL not be marked on the part unless otherwise requested and approved by the GPS DRE.

## The part assembly SHALL not be marked with country of origin unless otherwise approved by the GPS SQE and DRE.

## Certain countries may have emissions certification requirements that require parts to be marked with a supplier or part identification label.

## Re-certification may be required if markings change during a product life cycle.

## It is recommended to define a part identification label that is not associated with the part number. This strategy avoids unnecessary re-certification requirements.

## **Containerization:**

## The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the Containerization activity:

## The use of returnable containers should be utilized where possible.

## Returnable containers SHALL NOT be used internally for storage, secondary processing transport, scrap, rework, etc.…

## If returnable containers are utilized the supplier SHALL be responsible for removing or covering up any old labels unless GM has contracted a local third party to provide the service.

## Supplier is responsible for maintenance and cleanliness of container per GM1738

## Supplier is responsible for container labeling per GM1724.

## Dunnage (shipping containers) can be a significant factor affecting the cleanliness of parts

## Dunnage containers are not expendable and SHALL be reused.

## GPS is responsible for designing the returnable dunnage.

## The supplier is encouraged to participate in the design process and propose design concepts.

## The GPS Engine Assembly Plant will not accept shipments of parts that are contaminated with debris from the dunnage containers. In this case, the cleanliness issue SHALL be resolved by the supplier. The pictures attached below are examples of parts that were received at an engine assembly plant and returned to the supplier for rework due to debris contamination.

# **Product & Process Validation**

## **Compliance/ Regulatory Documentation:** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best practices into the Compliance Documentation activity:

## If applicable, the manufacturing facility SHALL maintain documentation to show that the Bar code label requirements are being met and approval documented (CG2503)

## **Care Audit and Lot Acceptance Testing (LAT):**

## Material SHALL be quarantined until the LAT has passed all parameters. An electronic “lock” SHALL be in place until the Quality Manager releases the finished goods.

## Testing Process: If an issue occurs during an LAT the supplier SHALL notify the GM plant(s) and Commodity SQE within 24 hours.

# **Production -**

## **Cleanliness Requirements and Guidelines:**

## Supplier Plant Floor SHALL be safe, clean, and organized. Example: using 5S principles.

## Equipment used to Manufacture for GM SHALL be safe, clean and in proper working order per the local PM’s and SOP’s.

## Tools used to Manufacture for GM SHALL be cleaned and maintained per written procedure with pre-defined frequencies/standards.

## All parts (including all subcomponent parts) delivered to GM SHALL be clean and dry with no chips, oil, corrosion products, residual abrasive materials, process fluids, cutting fluids, release agents, soap-scum, detergent residues, and/or any other substance that may adversely affect function, appearance, safe handling, and/or the engine assembly process.

## As part of the Level 1 cleanliness requirement - Debris on finished parts SHALL be regularly monitored and controlled using statistical methods, upper control limits, and procedures approved by GPS Engineering. The procedures approved by GPS SHALL be detailed in the Supplier Process Control Plan.

## As part of the Level 2 cleanliness specification any mass of debris present on any individual assembly SHALL not exceed 15 milligrams (mg) when measured per test method GMW16037. This specification also applies to the final assembly as delivered from the Tier 1 Supplier and is referred to as the Level 3 cleanliness specification.

## The sampling frequency and quantity SHALL be approved by the GPS SQE and DRE and documented in the Supplier Process Control Plan.

## A “Run Chart” SHALL be provided to the GPS SQE and DRE each month.

## If the mass of debris contamination exceeds the upper control limit (UCL), a report in accordance with the 5-Phase Problem Resolution guidelines SHALL be written as detailed per Section 2 of Appendix D. Additionally, the batch of parts SHALL be rejected unless otherwise approved by the GPS SQE.

## Supplier SHALL follow “best practice” guidelines per CG5404 for sediment reduction process controls, a test method to quantify foreign material, and documented. (example: run charts).

## **RTV Applications and Requirements:**

## **Any parts that are using any type of RTV process or application SHALL reference and follow all requirements in GM CG4665 RTV Sealing Surface Applications and GMW17696 Adhesion Test Procedure.**

## **Control of Non-Conforming Material/Rework:**

## Safety related parts that do not successfully pass process parameters (i.e., weld verification, etc.) SHALL be permanently marked or mutilated to prevent being used in assemblies or shipped to Customer.

## At the end of a shift or rework operation, system SHALL reconcile i.e., 130 total were built. 120 were packaged and 10 were scrapped out during the process.

## Reworked parts and assemblies SHALL have traceability documentation at the module level and for the manufacturing process steps successfully completed.

## All rework or repair processes in the supplier manufacturing facility SHALL be incorporated in the production Control Plan and PFMEA, have written work instructions and SHALL be approved by GM. There SHALL be no rework permitted for failure modes with a 7-10 severity ranking unless approved in writing by the GM Supplier Quality Manager or above. Refer and comply to AIAG FMEA VDA Handbook or AIAG PFMEA 4th Edition and CG4338 GM 1927 03 SQ SOR.

**Repairs:**

## If a repair process is approved during the program, all repair and rework processes SHALL be documented and approved by the GPS SQE and DRE. Additionally, repaired or re-worked parts SHALL be permanently marked via a method approved by the GPS SQE and DRE and the part serial number SHALL be documented for future reference.

## All non-conforming parts are to be contained in a controlled area to avoid possible use of the parts.

## Disposition of subcomponents and assemblies SHALL be managed by a supervisor and not line-side workers. Locked boxes or quarantined areas are requested.

## Any part that fails to meet the acceptance criteria SHALL be quarantined and clearly marked to ensure the part is not shipped to an engine assembly plant.

## The supplier is responsible for investigating and resolving all incidents of defective assemblies (i.e., fails leak test, incorrectly machined or assembled incorrectly).

# **Feedback Assessment & Corrective Action -** The supplier manufacturing location SHALL incorporate the following Lessons Learned and Best Practices into the GM 1927 28 EPC activity:

### For new product launches, the EPC exit criteria SHALL include the following:

## There SHALL be no supplier responsible warranty returns at 2 Months in Service (MIS) for 30 production days.

## The suppler SHALL formally request to the GM Product Development Team (DRE, SQE, and CVE) to exit from or to modify the EPC exit criteria.

## All AIAG PFMEA, VDA Handbook, or AIAG PFMEA 4TH Edition within CG4338 GM 1927 03 SQ SOR failure modes identified as high severity or safety critical, SHALL be clearly documented in the control plan and visible throughout the EPC inspection process.

**Performance Requirements:**

**Warranty:**

## The IPTV (Incidents per Thousand Vehicles) warranty is of critical importance. The design objective is to reduce IPTV by 25% in comparison to the previous model year engine program.

## The IPTV target for this assembly is a maximum value of 0.1 in any given one year period.

**Root Cause Analysis:**

## The supplier is responsible for analyzing all failed parts to determine the root cause of each failure regardless if the part warranty meets the IPTV target.

## The supplier SHALL create and maintain a Pareto chart to summarize the history of part failures and defects. The Pareto chart SHALL be created / updated within 20 working days after receipt of a part and/or dealer repair order (verbatim).

**Failure Incident Reports:**

## A part failure incident report SHALL be created for the top 3 failure modes.

## The supplier is required to visit dealers and inspect engines and parts as necessary to determine the root cause of warranty claims.

## A copy of the part failure incident report SHALL be submitted to the GPS DRE and Technical Specialist (TS).

## **GM Plant Support -**

### **Engine/ Transmission/ Vehicle Assembly Plant Support:**

## The supplier SHALL acquire confirmed failures from the assembly plant within 48 hours and a corrective action plan initiated regardless if a SPPS is issued or not.

## For product manufactured outside the GM assembly plant region, the supplier SHALL have the capability to perform a functional containment screen per GM 1927 17 procedures in the region of the impacted assembly plants.

# **Quality Information at Global APQP Technical Review** -

## Gather the above information in a binder or envelope marked “Quality” and submit it with your bid package. If you have any questions relative to the required information, please contact your GM Supplier Quality Engineer for clarification. All information SHALL relate to the manufacturing site that the product will be manufactured and SHALL reference the RFQ number and part numbers. All listed information is required in your Quote Package. Be prepared to answer questions during the Technical Review Meeting.

Acronyms, Abbreviations, Definitions and Symbols

AAR Appearance Approval Report

CC/SC Critical/Significant Characteristic

CCT Continuous Compliance Testing

CG GM General Form/Template identifiers

CN Change Notice

CRV Component Readiness Valve

CVE Component Validation Engineer

DRE Design Release Engineer

EP Error Proofing

EPC Early Production Containment

Gate Product Development Checkpoints

GPS Global Propulsion Systems

GMW GM Worldwide Engineering Standards

LAT Lot Acceptance Testing

NOK Not Ok

PM Preventative Maintenance

R@R Run at Rate

RFQ Request for Quote

SOP Standard Operating Procedure

SOR Statement of Requirements

SPC Statistical Process Control

SPCR Supplier Process Change Request

SPPS Supplier Practical Problem Solving

SQE Supplier Quality Engineer

Acknowledgement

Please sign, date, provide evidence (current and/or empirical) and return this document as a record of your understanding of these requirements

Authorized Supplier Management:

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Supplier Manufacturing Location Duns

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| **Change History** | | | | |
| **Date** | **Version** | **Change Summary** | **Approver** | **Approving Department** |
| 8/31/2016 | Initial Release | New CG SOR for Global Propulsion Appendix F on baseline template | Craig Kirbitz | GPS Global Process |
| 11/30/2016 | Rev. 2 | Added reference to RTV process and application requirements CG4665 and GMW17696. Removed obsolete RTV items. | Craig Kirbitz | GPS Global Process |
| 5/23/17 | 2.1 | Corrected typing errors, replaced GMPT with GPS, and updated the embedded audit form | Craig Kirbitz | GPS Global Process |
| 4/23/2019 | 2.2 | Update name to remove date and GM Conf | Brian Davis | GPS Global Process |
| 3/30/2022 | 3.0 | Updated Header. Replaced PRR with SPPS; Replaced GP12 with EPC; Replaced SRV with CRV, Replaced GP5 with GM 1927 17; Added new PFMEA VDA requirements | Charles Mastroeni | GPS Global Process |
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