Preface

This Reference Manual represents the collaborative efforts of a GM worldwide team engaged to develop a GM Common APQP process. Prior to this, each General Motors Supplier Quality organization facilitated the implementation of the APQP process using divisional and regional specific methodologies.

The global team harmonized and standardized the various divisional and regional APQP processes and developed this GM APQP Manual (GM1927). This manual defines GM’s common global product quality planning requirements that are necessary to develop and implement an APQP process for a product or service. It is intended as a standard to provide the Supplier Quality Engineer, and the supplier, a common format from which to proceed with all steps of APQP.

This document is the first revision to the initial release and has been updated to reflect the most recent requirements set by General Motors for all Global Suppliers. As part of this update, a new section has also been added to support the activities on Modular Assemblies. Many of the Tasks have also been updated to include special activities for Modular parts and systems. Any activities for Modular APQP are shown in italic with a special superscript M to highlight the task.

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Manual Content Explanation

Each section is referenced by a task number and includes the following:

- Task name
- Task Owner(s)
- Task Timing (approximate)
- Task Description
- Deliverables upon completion of the specific task
- Customer(s) for the deliverables
- Necessary Inputs to complete the specific task including source for each input
- Listing of Resources—this includes people of organizations involved in completing the task
- Methodology—brief description of the task and purpose
- SQE Responsibilities—brief description of actions required
- Supplier Responsibilities—brief description of actions required
- References and additional information.

Appendices

The Appendices contain all GM specific APQP forms and documents that are to be used throughout the implementation of the APQP process. Directions for specific application of each form or document are explained in APQP Task Definitions 1 through 17.

Document Procurement

GM Global APQP
All specific GM APQP forms and documents referenced in this GM Global APQP manual (GM1927) are contained in this document and can be copied for use. This manual and all documents can also be obtained through GM’s SupplyPower at www.gmsupplypower.com.

GM General Procedures (GPs)
All GM General Procedures (GPs) referenced can be obtained by contacting Boise Cascade Office Products at 1-800-472-6473 or 1-810-758-7750, Fax 810-758-5731.

AIAG Documents
All AIAG specific documents referenced can be obtained by contacting AIAG at 01-248-358-3003. Documents can also be ordered by accessing the web at www.AIAG.org. In Europe contact Carwin Ltd at 44-1708-861333.

Note to Suppliers:
This manual is intended to be comprehensive and “all-encompassing”; however, certain circumstances will prompt questions. If you have any questions regarding any part of this manual you are encouraged to contact your respective Supplier Quality Engineer.
Customer vs. Supplier Monitored APQP

The following matrix describes the responsibility differences between "Customer-Monitored" and "Supplier-Monitored" APQP. Suppliers are responsible for carrying out all the "R" activities shown in the supplier column of the matrix, whether or not their parts are designated as customer or supplier-monitored APQP. If a part is designated as customer-monitored APQP, a GM representative may monitor and approve the APQP activities.

<table>
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<th>APQP Activity</th>
<th>Customer Monitored APQP</th>
<th>Supplier</th>
<th>GM</th>
<th>Supplier Monitored APQP</th>
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R  Responsible (GM or Supplier)
A  Approve - GM approves deliverables
S  Support completion of deliverables (GM or Supplier)
I  Inform – GM reviews deliverables at discretion of SQE
C  Consult

* May be reviewed by GM as part of PPAP (Depending on submission level)
**Advanced Product Quality Planning (APQP)**

**Top Flow Down**

**STEP I: Pre-sourcing Activity**

A. Buyer conducts Key Stakeholders Meeting
B. Purchasing sends out RFQ
C. Buyer conducts Technical reviews
D. Buyer/SQE/Engineer conduct risk assessment /sourcing
  - Supplier Quality SOR in RFQ
  - Lessons learned added to RFQ
  - Risk Assessment
  - Sourcing Recommendation
  - Preliminary Timing chart, Process flow chart, PFMEA and Control plan
  - Team Feasibility commitment

**STEP II: Plan and Define Program**

A. SQE schedules APQP kick-off meeting
B. SQE hosts APQP kick-off meeting
C. Supplier provides updated draft of Timing chart, Open Issues, Process flow chart, PFMEA, and Control plan, etc.
D. Initial Design and Gage, Tooling and Equipment reviews
  - Initial Timing chart, Open issues list, Process flow chart, PFMEA, and Control plan
  - Schedule dates for required workshops (KCDS)
  - Updated Lessons Learned

**STEP III: Product Design and Development**

A. SQE attends design reviews and conducts scheduled workshops
B. SQE reviews gage, tool & equipment concept
C. SQE reviews prototype draft of process flow chart, PFMEA, and Control Plan
D. GP-11 plan approved by appropriate GM department
E. Program review #2 is conducted
  - Updated Process flow chart, PFMEA, and Control plan
  - Gage, tooling & equipment concept
  - Feasibility Letter #1
  - Updated Timing chart & Open issues list

**STEP IV: Process Design and Development**

A. SQE attends design reviews and promotes lessons learned
B. SQE reviews gage and tool designs
C. SQE guides update of post-prototype Process flow chart, PFMEA, and Control plan
D. SQE reviews error proofing & RPN reduction plans
E. GP-11 parts, modules and systems approved
F. Risk Assessment updated by SQE
G. Program Review #3 is conducted
  - Updated Process flow chart, PFMEA, Control plan, Timing chart and Open issues list
  - Completed gage & tool designs
  - Feasibility letter #2
  - GP-12 plan
  - Updated Risk Assessment

**STEP V: Product and Process Validation**

A. SQE conducts advanced PPAP and tool shop reviews
B. SQE reviews and statuses PPAP package
C. Run@Rate (GP-9) is performed
D. Program review #4 is conducted
  - PPAP and Run@Rate Status
  - Feasibility Letter #3
  - Updated Timing chart and Open Issues list

**STEP VI: Feedback, Assessment and Corrective Action**

A. Supplier performs GP-8 and updates control plan
B. GP-12 is completed
C. Lessons learned captured and DFMEA/PFMEA are updated
D. APQP is concluded
  - Updated control plan
  - DFMEA/PFMEA updated with lessons learned

\[ \text{x} = \text{Indication of corresponding APQP Task Number} \]
Advanced Product Quality Planning (APQP)
Global Process

Task Number: 1
Task Name: Key Stakeholders Meeting
Task Owner: Buyer. SQE participates in meeting.
Task Timing: Pre-Sourcing

Task Description: The purpose of the Key Stakeholders Meeting is to involve all GM stakeholders in the Advanced Purchasing Process on a particular commodity package to develop and understand the sourcing process, content, timing, and strategy to ensure that the RFQ-package contains all information needed to receive comparable quotes. It is intended that these meetings be conducted on all commodities identified for early sourcing by the platform. Key Stakeholders meet to review key program information and timing as referenced in the Advanced Purchasing “Typical Agenda” (GM1927-18)

Deliverables:
- Generic functional requirements for inclusion into the Engineering SOR
- Define Critical and Non-Critical Commodities that the Supplier shall prepare and obtain GM approval for the ADVP&R Cover Sheet (GM 1829).
- Agreement by Stakeholders on process content, timing and strategy of the Sourcing Package
- Guidelines and expectations for Supplier Workshops (Technical Design Issues /timing, team members, questionnaire, etc.)
- Target date for Technical reviews
- Communication Strategy - process to be used to communicate information to Key Stakeholders
- Program Management RASIC (GM1927-22M)

Customer for Deliverables: Purchasing*, Engineering*, Supplier Quality*, Marketing, PC&L and any additional functional groups as appropriate
* Mandatory participation as Key Stakeholders

Necessary Inputs:
- Technical documents (BOM, SOR, SSTS/CTS etc.)
- ADV Process Tasks and Deliverables
- Creativity Team Bidders List (enhanced quality metrics)
- Lessons Learned on previous programs
- Supplier Quality Statement of Requirements (GM1927-3)
- Required Quality Information letter (GM1927-4)
- Program related information

Source of Input:
- Engineer
- Buyer
- SQE
- Key Stakeholders (ref. GM1927-18)

Resources:
- Purchasing, Supplier Quality, Engineering

Methodology:
- The Key Stakeholders meeting date is identified on the Sourcing Program Plan
- Buyer sends invitation to appropriate Key Stakeholders identified for specific component/commodity/system
- The buyer conducts the meeting (typical agenda GM1927-18)
- Key Stakeholders discuss and review program information and timing.
- Each Stakeholder discusses pertinent requirements:
  - Review of Engineering requirements in Technical Documents
  - Supplier Quality Statement of Requirements
  - Warranty and IPTV requirements
- Review potential bidders list to restrict Request for Quotation (RFQ) distribution to suppliers meeting GM criteria, and to identify suppliers that need to be visited for conducting Potential Supplier Assessments (PSA) or Sourcing Team Evaluation Process (STEP) visits.
- Supplier Workshops for technical design issues (if applicable):
  - Questions are developed for the Supplier Workshops and dates are established
  - A core group (sub-group of Stakeholders) is defined that will: Attend Supplier Workshops, summarize results and refine functional requirements based on workshop findings.
Task Number: 1 continued

Task Name: Key Stakeholders Meeting

Methodology: (continued)
- At the end of the meeting there should be agreement by all Stakeholders on the process, content, timing and strategy for the specific package to go as the RFQ to suppliers.
- The buyer will clarify the timing of each step in the AP Sourcing process and what is expected from each Stakeholder in each step. Action items will also be reviewed.

SQE Responsibility:
- Participate in the meeting.
- Clarify the role of the SQE in the sourcing process.
- Review the requirements stated in the SQ SOR with the other Stakeholders.
- Obtain knowledge of what is being sourced (functional aspects of part)
- Obtain knowledge of timing (sourcing and program)
- Confirm “Make or Purchase” (MOP) coding has been done for modules/integrated packages (Should accompany SOR).
- Inquire about any sequencing plans.
- SQE reviews suppliers on Creativity Team Bid List and corresponding performance with enhanced metrics.
- Identify suppliers that will require “Business Case” Action Plans due to performance problems.
- Provide SQ questions to be included in the Pre-Workshop questionnaire.
- Provide overview of lessons learned. (Use Lessons Learned Overview GM1927-10 and Lessons Learned Flow Chart Process Overview GM1927-11)
- Note: If commodity is on the GM Corporate Lessons Learned List, review the commodity specific checklist and what is expected by the supplier. If the commodity is NOT on the Corporate list you should work with the supplier and the engineer to ask questions about previous programs and similar parts.
- Identify modular and system requirements
- Complete Key Stakeholders Meeting Checklist (GM1927-6)
- Start the APQP Open Issues list (GM1927-5) with any items that need to be addressed. Consideration should be given to missing technical information, decisions on modularity, etc.
- Identify Functional / End of Line Test requirements

Additional Information:
Supplier Quality Statement of Requirements (GM1927-3)
Required Quality Information letter (GM1927-4)
Open Issues list (GM1927-5)
Key Stakeholders Meeting Checklist (GM1927-6)
Lessons Learned Process Overview (GM1927-10)
Lessons Learned Flow Chart Process Overview (GM1927-11)
Typical Agenda Stakeholders Meeting (GM1927-18)
Program Management RASIC (GM1927-22M)
Task Number: 2

Task Name: Attend the Technical Review

Task Owner: Buyer

Task Timing: Pre-Sourcing

Task Description: The Technical Review is a meeting attended by the supplier, buyer, engineer, SQE, with representation from other affected organizations. The purpose of the meeting is to review quotations to insure that all requirements in the RFQ-package have been understood and that the supplier has potential to produce parts meeting GM expectations (any item related to the manufacturability of the part, including timing, design, manufacturing capability, packaging, etc.). Update the APQP Open Issues List GM1927-5 with concerns related to the supplier’s ability to meet the quality expectations.

Note: If a technical review is not held, the SQE should review the Quality information submitted as part of the supplier’s quote, prior to performing the Risk Assessment.

Deliverables: • Identification of suppliers that are capable and should continue in the sourcing process
• Initial Risk Assessment GM1927-7 for appropriate suppliers
• APQP Open Items list GM1927-5

Customer for Deliverables: Buyer, SQE, PDT

Necessary Inputs:

- Technical documents
- Supplier’s Quality History
- ADVP&R Cover Sheet (GM 1829)
- Preliminary SFMEA / DFMEA Block Diagram
- Preliminary timing charts
- Information on the manufacturing facility (Location, capacity, etc)
- Preliminary process flow diagrams
- Warranty Risk and Reward Plan (if applicable to the commodity)
- Preliminary Control plans
- Manufacturing site organizational chart
- Tier 2 management
- Capability studies on similar parts
- Major disruptions, PR/Rs and PPM Reduction Plans
- Serial Tooling / Checking Equipment Sheet GM1927-9
- Timing and Feasibility GM1927-8 (recommended)
- Checking fixture plan (Include dual gauge needs for modularity)
- Prototype plan
- Continuous Compliance Testing Plan
- Preliminary PFMEA
- Proof of ISO/TS 16949 / QS-9000 Certification / Implementation plan
- Description of operator-training program
- Plan for communication between technical support and manufacturing plant
- Team Feasibility Commitment (Required by QS-9000)
- Error Proofing/Poka-Yoke Techniques
- Lessons Learned Overview slides GM1927-10 & 11

Source of Input:

- Engineer
- SQE
- Supplier

Additional Inputs for Modular Suppliers:

- Level of integration for subcontractors (Tier 2)
- Validation plan for module and major sub-components
- RASIC Chart for Overall Program Management for Modules
- Sourcing plan / process for subcontractors
- Plan to meet broadcast window requirements
- Detailed BOM for module
- List of Directed Buys
- Supplier prior module experience (provide examples of Lessons Learned)
- Plan to manage sub contractors quality problem resolutions
- Carryover part contact list

Resources: Purchasing, Engineering, Supplier Quality, Supplier
Task Number: 2 continued

Task Name: Attend the Technical review

Methodology:
- The buyer invites potential suppliers to Technical Review Meetings
- Supplier addresses topics related to timing, design capability (if applicable), manufacturability of the part as designed, quality processes, packaging, and transportation.
- Supplier addresses the specific quality topics listed in the RFQ. (Refer to the Required Quality Information letter GM1927-4).
- Supplier provides Team Feasibility Commitment (QS-9000 requirement per 4.2.3.3), Serial Tooling / Checking Equipment Checklist GM1927-9 (if applicable), Timing and feasibility GM1927-8 (if applicable) and signed Supplier Quality SOR sheet (page5) GM1927-3
- SQE reviews expectations relative to Lessons Learned.
- At the conclusion of the Technical Review, the Buyer, SQE and Engineer complete the Risk Assessment GM1927-7

SQE Responsibility:
- Prior to the meeting review specific documents provided in the supplier’s quote and prepare questions.
- Ask questions relative to quality and any issues related to the manufacturability of the component/system.
- Ask questions pertaining to the supplier’s responses to items requested in the quality portion of the RFQ package.
- Provide a five minute overview of the Lessons Learned Process
- Participate in the Risk Assessment GM1927-7
- Complete the Technical Review Checklist GM1927-13
- Ensure the supplier has returned the signed Supplier Quality SOR page 5, this is required prior to signing the Sourcing Recommendation form.
- Finalize plans for needed supplier visits (PSA or STEP for new suppliers)

Supplier Responsibilities:
- Supplier must provide the “Required Quality Information” (GM1927-4) together with their quote.
- At the technical review, the supplier is expected to review the following information:
  1. Preliminary timing charts. Supplier will highlight any concerns relative to tooling / testing that may impact providing a quality process/part on time
  2. Review of the manufacturing facility. Where is it located? How long has it been in operation? What modifications to the facility would be required to support the RFQ volumes?
  3. The time frame of the last review by a General Motors SQE (please specify type of review conducted).
  4. Preliminary process flow diagrams. (Including any special assembly techniques, test methods, and containment procedures used)
  5. Warranty Risk and Reward Plan. (If indicated by the GM buyer as a risk & reward commodity). Plans in place to meet the IPTV targets.
  6. Capability studies on similar parts, along with plans for error proofing, data analysis, and record keeping must be included in plan.
  7. Manpower resource commitment to insure successful completion of program; proper skills and training to perform the necessary tasks.
  8. Provide evidence from previous project to demonstrate experience on the new product.
- The supplier will also receive in the RFQ package, a GM Supplier Quality SOR. This document is a reference and brief explanation of the automotive quality requirements plus GM specific quality requirements. The supplier is expected to be familiar with all processes and procedures listed in this document. The last page of the Supplier Quality SOR must be signed and submitted to the SQE at the Technical review.

Additional Information:
- APQP Open Issues List (GM1927-5)
- WWP Early Warning Risk Assessment (GM1927-7)
- Timing and Feasibility (GM1927-8)
- Lessons Learned Process Overview (GM1927-10)
- Lessons Learned Flow Chart Process Overview (GM1927-11)
- Serial Tooling / Checking Equipment Checklist (GM1927-9)
- Supplier Quality Statement of Requirements (GM1927-3)
- Required Quality Information letter (GM1927-4)
Task Number: 3

Task Name: Risk Assessment & Sourcing

Task Owner: Buyer

Task Timing: Initial assessment prior to sourcing
Second assessment in the Prototype / Gamma / Validation Vehicle timeframe

Task Description: Risk assessment is a tool to assess the potential for problems early in the vehicle development process, and to determine which parts and/or suppliers will require additional focus by General Motors. It is intended that the assessment be conducted on all new parts / suppliers. A supplier is selected by a quality assured sourcing decision approved by all Key Stakeholders.

Deliverables: A completed Risk Assessment form GM1927-7 for each part (including Subcontractors for Module suppliers – critical or major issues).
- Initial assessment will be available for review at sourcing meeting
- A level of risk assigned for each supplier with known information.
- Supplier selected with SQ signature on sourcing recommendation form.

Customer for Deliverables: Supplier Quality Engineer, Purchasing, PDT

Necessary Inputs: Source of Input:
- Technical documents Engineer
- Design stability Engineer
- Supplier ‘s technical capability Supplier/Engineer
- Supplier’s manufacturing process capability on similar parts Supplier/SQE
- Supplier’s past quality history and performance reports SQE/Supplier
- Supplier’s manufacturing site information Supplier/Buyer
- Supplier’s sub-contractor plan Supplier/Buyer
- QS-9000 status Supplier/Buyer/SQE
- Preliminary DFMEA, PFMEA, and Flow Diagram Supplier/SQE
- Historical program management experience by supplier SQE
  (Launch history, lessons learned, etc.)
- Reference Project Experience Supplier
- Complexity of management structure Buyer
- Regional SQ support availability SQE
- Capacity of system Supplier/Buyer/SQE
- Customer Impact of part Engineer/SQE
- Supplier Assessment (PSA, QSA, STEP, etc.) SQE/Team

Resources: Purchasing, Supplier Quality, Engineering and Supplier.

Methodology:
- The first risk assessment is conducted prior to the Sourcing decision.
  If a Technical Review is held, the risk assessment should be conducted directly following this review. The Buyer, SQE and Engineer evaluate the information presented throughout the sourcing process by the supplier and evaluate that information as it applies to the questions on the risk assessment form.
  If the buyer does not conduct a Technical Review, the Buyer has the responsibility to contact the SQE and Engineer for their joint input in completing the risk assessment.
- The risk assessment must be updated at least once prior to the last prototype build event.
- Come to agreement with the cross-functional sourcing team to select the supplier with the best qualifications.
Task Number: 3 continued

Task Name: Risk Assessment & Sourcing

Methodology (Continued)

For Modular Suppliers:

- Subcontractor Risk Assessment completed by GM buyer prior to source selection for directed buys.

OR

- Subcontractor Risk Assessment completed within 30 days of module business award for non-directed buys. Supplier must complete the Subcontractor Risk Assessment and review the results with the GM SQE at the APQP Kick-off meeting.

- For sub-components not sourced, supplier must provide a detailed sourcing plan to the SQE. SQE must schedule a follow-up meeting to review the risk assessments for commodities sourced subsequently.

- SQE must immediately review the list of high risk sub components with Divisional Management to determine if additional GM Commodity Supplier Quality Engineers are required to support the program.

- SQE must follow the revised APQP process and work closely with the supplier during the APQP process for sub components.

SQE Responsibility:

- Participate in the initial risk assessment process at the time of the technical review.
- Work jointly with the Creativity Team to identify activities and actions required to eliminate or reduce risk in each category on the risk document.
- Sign sourcing recommendation for selected supplier.
- Determine the appropriate level of APQP follow-up and Run @ Rate based on the risk level
  - High risk will have customer-monitored APQP and Run @ Rate
  - Medium and Low risk can be either customer or supplier-monitored for APQP or Run @ Rate (discretion of SQE / Division)
- Update the risk assessment a second time prior to Program Review #3, which is targeted near the last prototype / gamma / Validation Vehicle build event.
- Adjust APQP and Run @ Rate plan based on changes in the risk level.

Supplier Responsibilities:
Provide all necessary data required prior to sourcing. (See necessary inputs)

Additional Information:
WWP Early Warning Risk Assessment Form (GM1927-7)
Task Number: 4
Task Name: Supplier Program Reviews
Task Owner: SQE for Kick-off Meeting. Supplier for remaining meetings
Task Timing: Four reviews as shown on APQP Project Plan

Task Description:
The purpose of the Supplier Program Reviews is to review the progress of items according to the APQP Project Plan (GM1927-1) and track the status and progress of items listed on the APQP Timing Chart (GM1927-2). The reviews are also intended to review the APQP Open Issues list (GM1927-5) and identify any additional GM and supplier issues that require resolution. These review meetings are intended as an APQP team review of the part and process development and to capture the learnings from each build event. These reviews are coordinated by the GM SQE and conducted on all parts tracked as customer-monitored APQP. For parts that are supplier monitored APQP, the supplier is expected to conduct these program reviews internally.

Deliverables:
- Updated APQP Timing Chart (GM1927-2)
- Updated APQP Open Issues List (GM1927-5)
- Completed APQP Kick-off Meeting Checklist (GM1927-14)
- GM & Supplier APQP Contact List completed (GM-1927-17)
- Supplier Process Capability (GM1927-20) and RPN Reduction Plan (GM1927-21)

Customer for Deliverables: SQE, Buyer, Product Engineer, Readiness Coordinator, Manufacturing as appropriate.

Necessary Inputs: Source of Input:
- Program timing for key events: Engineer/Buyer
- Detail timing for tools, facilities, etc.: Supplier
- Lessons Learned Checklist (GM1927-12): SQE
- APQP Open Issues List (GM1927-5): Supplier/SQE
- APQP Timing Chart (GM1927-2): Supplier/SQE

Resources: Buyer, Engineer, SQE, Readiness Coordinator, Manufacturing as appropriate.

Methodology:
- **Supplier Program Review #1 (APQP Kick-off Meeting)**
  This meeting should occur within 30 days of the supplier receiving formal notification of the business award. The meeting contains both instructions to the supplier, and report out by the supplier. The SQE uses the instructional portion of the meeting to relay GM’s expectations relative to APQP and the timing of the program. The supplier is expected to give updates on the following:
  - APQP Kick-off Meeting Checklist (GM1927-14)
  - APQP Open Issues list (GM1927-5)
  - APQP Timing Chart (GM1927-2)
  - Lessons Learned Review Criteria (GM1927-11) plus any specific commodity Lessons Learned Criteria checklist
  - AIAG APQP DFMEA checklist (A-1)
  - Preliminary Run @ Rate Plan

  **For Modular Suppliers:**
  - Modular System Subcontractor Risk Assessment Form for all subcomponents sourced
  - Modular Supplier-Subcontractor Program Status Matrix (GM1927-25M)
  - Modular Supplier & Subcontractor Manufacturing and Facilities Plan (Greenfield/Transplant)
  - Modular Supplier Program Management and Capability Plan
  - Modular Supplier Quality Spill Management Plan
  - Sub-component Sourcing Plan
Task Number: 4 continued

Task Name: Supplier Program Reviews

Methodology: (continued)

- **Supplier Program Review #1 (APQP Kick-off Meeting)** (continued)
The GM & Supplier APQP Contact Checklist (GM1927-17) is used to track all individuals involved in the APQP project.

*For High Risk Modules, as identified by the Early Warning Risk Assessment (GM1927-7), schedule Executive Reviews with GM divisional management and supplier executives within 30 days of the conclusion of the program review. Suppliers should be prepared to discuss major open issues identified during each review and documented on the Open Issues List.

*The Executive Reviews should be conducted in conjunction with all Supplier Program Reviews.*

- **Supplier Program Review #2**
This meeting should occur at least 2 weeks prior to GM’s Beta / Integration Vehicle Quality Valve Review. The SQE provides feedback relative to program timing. The supplier is expected to give updates on the following:
  - APQP Open Issues List
  - APQP Timing Chart
  - Review identified build concerns
  - Supplier Manufacturing Assessment of Design (GM1927-19 Letter #2)
  - Process Flow Chart review including AIAG APQP Process Flow Checklist (A-6)
  - AIAG APQP Design Information Checklist (A-2)
  - DFMEA status plus AIAG APQP DFMEA Checklist (A-1)
  - Gage concept review status
  - Facilities/Equipment/Serial Tooling update including AIAG APQP New Equipment Checklist (A-3)
  - PFMEA review including AIAG APQP PFMEA Checklist (A-7)
  - Establish initial RPN Reduction Plan baseline (GM1927-21)
  - GP-11 Prototype Part Approval Status
  - Process capability data gained from early builds
  - Control Plan review including AIAG APQP Control Plan Checklist (A-8)
  - Lessons Learned

*For Modular Systems:*
  - Modular System Subcontractor Risk Assessment form for all sub components sourced
  - Modular Supplier-Subcontractor Program Status Matrix (GM1927-25M)
  - Modular Subcontractor Detailed Status Matrix (GM1927-26M)
  - Modular Supplier & Subcontractor Manufacturing & Facilities Plan updated (Greenfield/Transplant)
  - Directed Buy check list (GM1927-23M)
  - Back-up plan for high risk sub components

*SQE may request above information for specific high risk subcontractors as needed*

- **Supplier Program Review #3**
This meeting should occur a minimum of 2 weeks prior to GMs Gamma / Validation Vehicle Quality Valve Review. The SQE provides feedback relative to program timing and provides a risk assessment update. The supplier is expected to give updates on the following:
  - APQP Open Issues List
  - APQP Timing Chart
  - Review identified build concerns
  - Supplier Manufacturing Assessment of Prototype (GM1927-19 Letter #3)
  - Capability concerns based on historical data and proposed design
  - Design review status
  - Progress of Facility/Equipment/Tooling/Fixtures/Gages
  - Tooling update including AIAG APQP New Equipment Checklist (A-3)
  - GP-11 Plan review
Task Number: 4 continued

Task Name: Supplier Program Reviews

- **Supplier Program Review #3** (continued)
  - PFMEA review including AIAG APQP PFMEA Checklist (A-7)
  - RPN Reduction Plans and progress from baseline (GM1927-21)
  - Control Plan review including AIAG APQP Control Plan Checklist (A-8)
  - Process Control Plan Audit Worksheet review (GM1927-16)
  - Lessons Learned
  - GP-12 Plan

  *For Modular Systems:
  - Lessons Learned including issues from prototype build experience
  - Modular System Subcontractor Risk Assessment form for all sub components sourced
  - Modular Supplier-Subcontractor Program Status Matrix (GM1927-25M)
  - Modular Subcontractor Detailed Status Matrix (GM1927-26M)
  - Directed buy checklist (GM1927-23M)
  - Modular Supplier & Subcontractor Manufacturing & Facilities Plan updated (Greenfield/Transplant)
  - Back-up plan for high risk sub component

  *SQE may request the above information for specific high risk subcontractors as needed

  *All functional build issues for module and sub components identified during prototype builds must be reviewed and documented

- **Supplier Program Review #4**
  This meeting should be conducted a minimum of 2 weeks prior to GM’s Production / Plant Vehicle Readiness Quality Review. The SQE provides feedback relative to program timing. The supplier is expected to give updates on the following:
  - APQP Open Issues List
  - APQP Timing Chart updates
  - Review identified build concerns
  - Supplier Manufacturing Assessment of Manufacturing Process Capability and Production Readiness (GM1927-19 Letter #4)
  - AIAG APQP Design Information Checklist (A-2)
  - Process Flow Chart review including AIAG APQP Process Flow Checklist (A-6)
  - DFMEA status including AIAG APQP DFMEA Checklist (A-1)
  - Tooling status including AIAG APQP New Equipment Checklist (A-3)
  - Gage and Fixture status, Gage Approval and Gage R&R
  - PFMEA status including AIAG APQP PFMEA Checklist (A-7)
  - Supplier’s Process Capability with respect to the design tolerances
  - RPN Reduction Plans (GM1927-21)
  - Control Plan review including AIAG APQP Control Plan Checklist (A-8)
  - GP-12 Plan
  - GP-12 Issues – Updates to FMEAs, Control Plans, etc.
  - PPAP status update
  - Run @ Rate status update
  - Lessons Learned

  *For Modular Systems:
  - Modular System Subcontractor Risk Assessment form for all sub components sourced
  - Modular Supplier-Subcontractor Program Status Matrix (GM1927-25M)
  - Modular Subcontractor Detailed Status Matrix (GM1927-29M)
  - Modular Supplier & Subcontractor Manufacturing & Facilities Plan updated (Greenfield/Transplant)
  - Modular Supplier Quality Spill Management Plan

  *SQE may request the above information for specific high risk subcontractors as needed
Task Number: 4 continued

Task Name: Supplier Program Reviews (continued)

SQE Responsibility:
- Use APQP Kick-off Meeting Presentation (GM1927-15) to provide overview of Global APQP.
- Prepare the GM & Supplier APQP Contact Checklist (GM1927-17) with names of GM contacts; forward to the supplier to obtain names for their team.
- Provide program timing information at all reviews.
- Fill out the APQP Kick-off Meeting Checklist (GM1927-14) (if applicable by SQ Region).
- Review Lessons Learned experience at the APQP Kick-off Meeting to re-emphasize discussion from the Technical Review (GM1927-10 and 11)
- Throughout the program, insure that Lessons Learned are being documented by the supplier in the appropriate FMEA (design, process, system) and in the APQP Open Issues List.
- Confirm that the supplier’s process capability and RPN reduction plans will satisfy design and PPM requirements.
- Drive supplier developed action plans whenever the Manufacturing Assessment Letters (GM1927-19) indicate problems achieving Zero PPM.
- Identify and communicate key timing and program issues to GM management.
- Commodity Supplier Quality Engineers, if assigned to a specific sub-component, should participate in all four Supplier Program Reviews.

Supplier Responsibility:
- Complete and review all items listed above.
- Provide names for the GM & Supplier APQP Contact Checklist (GM1927-17) and distribute the completed list to the APQP team.
- Lead activities relating to Program Review #2-4
- Assure that all Timing Charts are adhered to and any necessary recovery plans are comprehensive and protect program timing and objectives.
- Complete appropriate documentation in advance of Program Reviews.
- Modular suppliers must ensure that subcontractors participate in Supplier Program Reviews, as necessary.

Additional Information:
Appendix 1 Document Usage Matrix
APQP Project Plan (GM1927-1)
APQP Timing Chart (GM1927-2)
APQP Open Issues list (GM1927-5)
Lessons Learned Process Overview (GM1927-10)
Lessons Learned Review Criteria (GM1927-11)
Lessons Learned Criteria Checklist (GM1927-12)
APQP Kick-off Meeting Checklist (GM1927-14)
APQP Kick-off Meeting Presentation (GM1927-15)
GM & Supplier APQP Contact List (GM1927-17)
Process Control Plan Audit Worksheet (GM1927-16)
Supplier Manufacturing Assessment Letters (GM1927-19)
Process Capability Over Time (GM1927-20)
RPN Reduction Summary Chart (GM1927-21)
AIAG Advanced Product Quality Planning and Control Plan manual checklists A-1 through A-8
Directed Buy Check List (GM1927-23M)
Sub Contractor Program Status Matrix (GM1927-25M)
Sub Contractor Detailed Status Matrix (GM1927-26M)
Task Number: 5

**Task Name:** Timing Chart Review and APQP Open Issues list Update

**Task Owner:** Supplier

**Task Timing:** Reviewed at APQP Program reviews throughout the program

**Task Description:** A detailed review of all timing charts and concerns is conducted periodically to ensure that program deliverables are executed on schedule. These reviews are conducted on GM monitored parts tracked using the APQP process.

**Deliverables:**
- APQP Timing Chart GM1927-2
- APQP Open Issues list GM1927-5

**Customer for Deliverables:** Supplier Quality

**Necessary Inputs:**
- Open issues
- Detail timing for tools, facilities, gages etc.

**Source of Input:**
- SQE/Supplier/Engineer
- Supplier

**Resources:** Supplier, SQE, Engineer, or other members of the program team as appropriate

**Methodology:**
- Supplier provides a high level timing chart to SQE for review at all program reviews GM1927-2.
- Supplier updates timing chart on an ongoing basis as timing changes occur.
- Supplier and SQE communicate concerns and issues on an ongoing basis.
- Supplier updates the APQP Open Issues list GM1927-5 and reviews with SQE at all program reviews.
- Supplier leads activity to maintain program timing schedule to a successful PPAP submission and Run @ Rate.
- Sub-component milestone shall be pulled ahead by 6 weeks to support timing for modular system.

**SOE Responsibility:**
- Review the APQP Timing Chart and APQP Issues List at all supplier program reviews.
- Drive supplier to develop recovery plans on issues impacting timing or quality.
- Identify and communicate key timing and program issues with GM management

**Supplier Responsibility:**
- Create and maintain an APQP Timing Chart and APQP Open Issues List
- Maintain additional detail behind each high level APQP Timing Chart item. Additional detail must be tied to high level chart to ensure timing is updated automatically.
- Review the APQP Timing Chart and APQP Issues List at all supplier program reviews.
- Maintain detailed planning to complete each program timing event on schedule.
- Develop recovery plans on issues impacting timing and drive the plan to stay on-time for the program.
- Identify and communicate any changes to SQE; supplier must utilize APQP Open Issues list to capture all issues, including lessons learned.
- Identify and communicate key timing and program issues with SQE.

**Additional Information:**
- APQP Timing Chart (GM1927-2)
- APQP Open Issues list (GM1927-5)
Task Number: 6

Task Name: Feasibility and Manufacturing Assessment Letters

Task Owner: Supplier

Task Timing: Team Feasibility Commitment Letter – prior to Sourcing
Feasibility / Manufacturing Assessment letters – times indicated below for each letter

Task Description: Four times during the program, each Supplier evaluates their status and issues a letter:

- To provide a communication tool that suppliers can use to formally address and communicate issues to General Motors relative to the manufacturability of the part at specific stages of in the program.
- To facilitate dialog and surface issues within the supplier’s organization.

Deliverables:
- Team Feasibility Commitment (reference QS-9000 4.2.3.3)
- Supplier Feasibility / Manufacturing Assessment Letters GM1927-19

Customer for Deliverables: Buyer, Supplier Quality Engineer, Design Release Engineer

 Necessary Inputs:
- Existing APQP Open issues
- Detail timing for tools, facilities, etc.
- Historical performance data (PR/R’s, internal scrap reports, etc.)
- Projected tool capability (Ppk)
- Projected tool capacity

Source of Input:
- SQE/Supplier/Engineer
- Supplier
- Supplier
- Supplier

Resources: Supplier, Supplier Quality Engineer, Design Release Engineer

Methodology:
All Tier 1 suppliers must furnish the following letters to GM.

In the modular systems, the Tier 1 is also responsible to obtain the Supplier Manufacturing Assessment letters from the module subcontractors. These Sub contractor documents shall be maintained on file for review by the Supplier Quality Engineering as requested.

- Team Feasibility Commitment (reference QS-9000 4.2.3.3)
  This document (Letter 1) is provided to the buyer prior to the sourcing decision. It is the supplier’s initial assessment of the manufacturing feasibility of the proposed design.

- Supplier Manufacturing Assessment of Design (GM1927-19 Letter 2)
  In support of Supplier Program Review #2, the supplier should submit this letter to the SQE one week prior to the program review date. However, the letter must be available to the SQE no later than the day of the Supplier Program Review. A review of the design, DFMEA, DFM, error-proofing features in the design, and historical performance of similar designs should be conducted to determine the manufacturability of the design, prior to submission of the letter. The letter must be signed by the Manufacturing Plant Manager.

- Supplier Manufacturing Assessment of Prototype (GM1927-19 Letter 3)
  In support of Supplier Program Review #3, the supplier should submit this letter to the SQE one week prior to the program review date. However, the letter must be available to the SQE no later than the day of the Supplier Program Review. In this assessment, the design is reviewed against the prototype manufacturer’s concerns, PR/R performance, open issues from the previous assessment, and design changes. The letter must be signed by the Manufacturing Plant Manager.
Task Number: 6 continued

Task Name: Feasibility and Manufacturing Assessment Letters

- **Supplier Manufacturing Assessment of Manufacturing Process Capability and Production** (GM1927-19 Letter 4)
  After completing Run @ Rate, the supplier submits this letter to the SQE. This letter documents the supplier’s formal transfer of responsibility from the supplier’s engineering organization to the supplier’s manufacturing organization. The letter should clearly state whether the process flow, process procedures, and tooling are 100% production intent. If the process is not ready, the letter must indicate what actions are necessary, who is responsible, and the implementation dates. The letter must be signed by the Manufacturing Plant Manager.

**SQE Responsibility:**
- Review the feasibility letters from the supplier.
- Identify and communicate concerns to the supplier where corrective actions need further development.
- Identify and communicate any design/engineering concerns to the PDT/Design Release Engineer.
- Forward any commercial issues to the buyer for evaluation and resolution.
- Identify and communicate key timing and program issues with GM management.
- Review Subcontractor letters as appropriate on modular systems.

**Supplier Responsibility:**
- Submit the Team Feasibility Commitment (Letter 1) as part of the initial quote package to GM Purchasing.
- Submit the Supplier Manufacturing Assessment of Design (Letter 2) to the SQE.
- Submit the Supplier Manufacturing Assessment of Prototype (Letter 3) to the SQE.
- Submit the Supplier Manufacturing Assessment of Manufacturing Process Capability and Production (Letter 4) to the SQE.
- Adjust timing chart as changes occur.
- Document issues on the APQP Open Issues List.
- Develop and lead activities to resolve critical issues and drive to maintain program timing for GM program events.
- Maintain Subcontractor letters on file for modular systems; forward to Supplier Quality Engineer when requested.

**Additional Information:**
AIAG Advanced Product Quality Planning and Control Plan manual Appendix E—APQP Team Feasibility Commitment form (Letter 1)
Supplier Manufacturing Assessment of Design (GM1927-19 Letter 2)
Supplier Manufacturing Assessment of Prototype (GM1927-19 Letter 3)
Supplier Manufacturing Assessment of Manufacturing Process Capability and Production (GM1927-19 Letter 4)
APQP Open Issues List (GM1927-5)
APQP Timing Chart (GM1927-2)
Task Number: 7

Task Name: Develop, review and update Process Flow Charts

Task Owner: Supplier

Task Timing: Initial chart – prior to sourcing
Prototype draft – GP-11 timeframe
Production chart – PPAP submission

Task Description: Supplier develops, updates and reviews flow chart with SQE. The purpose of flow chart is to provide a logical pictorial representation of the process flow that can be used as the foundation for PFMEA’s, control plans, work station layouts, etc.

Deliverables:
- Process Flow Chart
- Process Flow Chart depicting the module production system
- Process Flow Chart depicting sub component production system

Customer for Deliverables: Supplier Quality

Necessary Inputs: Information on each step of the process
Source of Input: Supplier

Resources: Supplier, SQE, and Supplier Development Engineer.

Methodology:
- Supplier develops a high-level flow chart as part of bid package requirement.
- Supplier updates flow chart to reflect prototype process and presents updated chart to the SQE.
- Supplier updates flow chart to reflect production process and presents updated chart to the SQE.
- Supplier communicates any changes on an ongoing-basis.

SQE Responsibility:
- Review the preliminary process flow chart prior to sourcing to determine if suppliers may have omitted some key operations.
- Review the prototype flow chart to ensure identification of inspection and rework operations.
- Review the production flow chart for completeness and continue with a comparison to the production line:
  - Walk the manufacturing line to ensure the chart is representative of the process and includes all receiving, storage, production, inspection, rework, packaging and labeling operations, and shipping.
  - Ensure the flow chart can be linked to the PFMEA and control plan.
- Contact the GM Supplier Development Engineer if additional information or expertise in lead-time reduction is required.
Task Number: 7 continued

Task Name: Develop, review and update Process Flow Charts

Supplier Responsibility:
- Create a preliminary process flow chart using a similar process.
- Create and maintain a prototype flow chart that represents the prototype manufacturing process. Ensure there is identification for inspection and rework operations.
- Update the prototype process flow to represent the actual production process.
- Ensure the process flow chart is linked to the PFMEA and control plan.
- Document all items in the flow chart with the respective nomenclature (store, move, inspect, correct, etc.).
- Identify and communicate any changes to SQE.
- If additional information or expertise in lead-time reduction is required, contact the GM Supplier Quality Engineer to request the name of a Supplier Development Engineer to provide assistance.

Additional Information:
AIAG Advanced Product Quality Planning and Control Plan manual Process Flow Chart checklist A-6
Task Number: 8

Task Name: DFMEA

Task Owner: GM Design / Release Engineer

Task Timing: Initiated before or after design concept

Task Description: The DFMEA is a living document that is initiated before or at design concept and is continually updated as changes occur or additional information is obtained throughout the phases of product development. It supports the design process in reducing the risk of failure by: 1) aiding in the evaluation of design requirements, DFM, and DFA 2) increasing the probability that potential failure modes have been considered 3) and establishing a priority system for design improvements.

Deliverables: DFMEA

Customer for Deliverables: Engineer, Supplier, Supplier Quality Engineer

Necessary Inputs:
- Design intent
- Vehicle requirements
- Manufacturing/Assembly requirements
- Lessons Learned Criteria checklist

Source of Input:
- Engineer
- Engineer
- Engineer
- SQE/Engineer

Resources: Engineer

Methodology:

- Warranty
- Marketing
- Prior model EWOs
- Build concerns
- Current SQE launch & problem reflection
- APQP SQE and Supplier input
- GM Lessons Learned shared with supplier

Teamwork to:
1. Bring Lessons Learned into FMEA format
2. Determine RPNs and identify KPCs

Compare with prior model start-ups and revise design guidelines and data bases accordingly

Revise with new Lessons Learned from validation and prototype builds

Forward to Task 12 to use in development of PFMEA

DFMEA
Continue with work to reduce risk (high RPNs, KPC/PQC's)
Task Number: 8 Continued

Task Name: DFMEA

SQE Responsibility:
- Confirm that the Supplier is working with the GM Design / Release engineer on development of the DFMEA; if not, take appropriate action to initiate this team activity.
- Confirm that a DFMEA has been completed by the responsible engineering function or the supplier.
- Confirm that the supplier has access to necessary information from the GM DFMEA as input into the PFMEA.
- Provide a copy of the lessons learned checklist to design responsible engineer and the supplier.
- *For modular suppliers confirm that a DFMEA has been completed for all sub components by the responsible engineering function or the sub contractor.*

Supplier Responsibility:
- If design responsible, complete the DFMEA with participation of the GM Design / Release engineer. In addition, complete the Design FMEA checklist (A.I.A.G. APQP, Appendix A, A-1). Develop and implement RPN reduction plans and strive to continuously reduce RPN.
- If not design responsible, provide any lessons learned to GM Design / Release engineer and support the development of the DFMEA.
- If GM is design responsible and does not provide access to necessary information from the DFMEA, document this issue on the APQP Open Issues List.
- *For Modular Suppliers:*
  - If the subcontractor is design responsible ensure that the DFMEA & the DFMEA checklist are complete for all sub-components. Monitor and drive the development and implementation of RPN reduction plans on sub components.
  - If the subcontractor is not design responsible ensure that any lessons learned are provided to GM engineering for input in developing the DFMEA

Additional Information:
APQP Open Issues list (GM1927-5)
AIAG Advanced Product Quality Planning and Control Plan manual Design FMEA checklist A-1
**Task Number:** 9

**Task Name:** Conduct Design Reviews

**Task Owner:** GM Design / Release Engineer

**Task Timing:** Initial review – prior to beta build
Subsequent reviews occur on an on-going basis

**Task Description:** Conduct design reviews to ensure the design has been adequately defined to begin construction of tools and gages.

**Deliverables:** Defined and measurable KPCs/PQCs, GD&T, appearance specifications, and performance and material testing requirements.

**Customer for Deliverables:** Supplier

<table>
<thead>
<tr>
<th>Necessary Inputs</th>
<th>Source of Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>KCDS Workshop</td>
<td>Engineer / SQE / Supplier</td>
</tr>
<tr>
<td>GD&amp;T Review</td>
<td>Engineer / SQE / Supplier</td>
</tr>
<tr>
<td>Appearance specifications</td>
<td>Engineer</td>
</tr>
<tr>
<td>Performance and material specifications</td>
<td>Engineer</td>
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<tr>
<td>Production Assembly Documents (PADs) – if available</td>
<td>Engineer</td>
</tr>
<tr>
<td>Bill of Material (BOM) (\textsuperscript{M} critical for modular parts)</td>
<td>Engineer</td>
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</tbody>
</table>

**Resources:** Engineer, Supplier Quality Engineer, Supplier, \textsuperscript{M} Subcontractors

**Methodology:**
- KCDS workshop is conducted and led by the engineering organization responsible for the design; GM or the supplier engineer, if required. SQE, GM Design / Release engineer and supplier participate in workshop.
- GD&T review is conducted and led by the engineering organization responsible for the design; GM or the supplier engineer. The purpose of the review is to define design dimensioning and tolerancing on the drawing as these items relate to the actual function of the part. SQE, GM Design / Release engineer and supplier participate in the review.
- Design reviews are conducted and led by the responsible engineering organization on an ongoing-basis. SQE participation is on an as-required basis determined by the agenda.
- Any recommendations/improvements to the design record are to be documented and submitted to GM for approval.

\textsuperscript{M} For Modular Suppliers:
- \textsuperscript{M} For subcomponents, the same process is used to determine lead responsibility in conducting these reviews.
- \textsuperscript{M} The Module Supplier and SQE participate as necessary in the reviews.

**SQE Responsibility:**
- Participate in the KCDS workshop and GD&T review.
- Participate in design reviews that address changes in the manufacturing process, quality, timing or program risk.
- Inquire whether or not the design has a 3-point datum scheme that matches the part in car position.
- Inquire whether or not the selected KPCs/PQCs are reasonable and can be measured with variable or attribute gages.
- Inquire whether or not the supplier’s manufacturing capabilities can achieve the specified tolerances on a continual basis.
**Task Number:** 9 Continued

**Task Name:** Conduct Design Reviews

**Supplier Responsibility:**
- If design responsible, schedule and lead the KCDS workshop, GD&T review and Design Reviews; invite the GM Design / Release engineer to participate.
- If GM has design responsibility, participate in KCDS workshop, GD&T review and design reviews.
- Communicate any concerns relative to the KPCs/PQCs or GD&T scheme and the manufacturability of the part.
- Develop an understanding of the engineering change process with the GM Design / Release Engineer.
- Discuss any open action items defined on the AIAG Design Information Checklist (A-2).
- Document any open issues on the APQP Open Issues List (GM1927-5).
- Ensure the manufacturing process can achieve the specified tolerances on a continual basis.
- Obtain approval for design revisions from GM Design/Release Engineer

**Additional Information:**
APQP Open Issues (GM1927-5)  
KCDS Manual GM1805QN  
AIAG Advanced Product Quality Planning and Control Plan manual, Design Information Checklist A-2
Task Number: 10

Task Name: Conduct Gage, Tooling and Equipment Reviews

Task Owner: Supplier

Task Timing: The gage, tooling and equipment reviews begin in the beta timeframe with the concept approval. Subsequent reviews occur on an on-going basis until PPAP approval.

Task Description: A Gage, Tooling and/or Equipment Review is conducted to ensure that the manufacturing process is being designed, built and certified to produce parts with quality at rate according to GM program requirements.

Deliverables: 
- Certified Gage to approved design.
- Verification that Tooling and Equipment can meet product design intent through process capability studies.

Customer for Deliverables: Supplier Quality Engineer, Design Release Engineer

Necessary Inputs: 
- Approved GD&T and Math Data
- KPC & PQC
- Process Capability Requirements
- Timing requirements
- Capacity requirements
- Error proofing

Source of Input: 
- Design/Release/Product Engineer
- Design/Release/Product Engineer / Supplier
- SQE / Supplier
- Buyer / SQE / Supplier
- Buyer
- Supplier

Resources: 
- Engineer, Supplier, Supplier Quality Engineer, GM Gage Group (available in some regions)

Methodology: 
- Review gage, tooling and equipment concept starting at Supplier Program Review #1 (APQP Kick-off)
- Conduct gage, tooling and equipment reviews throughout build process.
- Evaluate gage for fit and function, repeatability and reproducibility (GR&R).
- Approve gage per GM 1925 Fixture Standards or other requirements applicable to the region.
- Verify that Tooling and Equipment can meet product design intent and achieve process capability requirements.
- Review gage concept for the module and for the sub components.
- For modules, ensure that functional gaging is in place to support build requirements.

SQE Responsibility: 
- At first Supplier Program Review (APQP Kick-off meeting):
  - Confirm production process planned for manufacturing the parts
  - Confirm production concept for equipment and facilities:
    - manual or transfer lines
    - new equipment or expansion of old equipment
    - new facilities or expansion of existing facilities
    - maximum planned capacity
    - GM owned or shared line
**Task Number:** 10 continued

**Task Name:** Conduct Gage, Tooling and Equipment Reviews

**SQE Responsibility:** (continued)

- Review plans and timing to obtain gages, tools and equipment in line with program targets for parts, PPAP and Run @ Rate. Also verify that supplier is working to complete the following activities at appropriate times:
  - Designs
  - Purchase orders issued
  - Construction and buy-off

- Review timing and plans according to activities shown in the following flow diagram:

- Review plans and progress until SOP, as appropriate.
  - Confirm that timing is on schedule to meet program requirements.
  - Confirm that gage agrees with functional part usage, complies with GD&T, and includes measurement of KPCs and PQCs.
  - Ensure gage instructions are executed per Production Assembly Documents (PADs) or other assembly documents.
  - Ensure suppliers are aware of GM 1925 Fixture Standards or requirements applicable to the region.
  - Verify integrity of fixture for fit and function and gage R&R utilizing first parts off production tools.
  - Evaluate Coordinate Measuring Machine (CMM) report to ensure gage accuracy.
  - Ensure part changes are incorporated into gages and tooling.
Task Number: 10 continued

Task Name: Conduct Gage, Tooling and Equipment Reviews

Supplier Responsibility:
- Review all timing and inform GM SQE about any changes from original project timing.
- Design, build and obtain certification of gages and validation of tooling and equipment.
- Lead reviews with General Motors relative to the design, build and certification of the gage(s), tooling and equipment. Preferably coordinated with Supplier Program Reviews.
- Inform GM about any design and process changes regarding e.g. (see PPAP):
  - New or modified tools, rearrangement of existing tooling or equipment
  - Product and process changes impacting fit, form, function, performance and durability of saleable product.
  - Test/inspection methods
- Before tools can be grained, dimensional verification is required by GM (verify with SQE on regional requirements).
- Ensure tooling and equipment will produce parts to process capability requirements.
- Ensure PFMEA has been incorporated into tooling and equipment
- Ensure GD&T scheme is incorporated in design and build of gages & tooling

Additional Information:
AIAG Measurement Systems Analysis Manual
GM1925 General Motors Fixture Standards
Task Number: 11

Task Name: GP-11 Pre-prototype and Prototype Process

Task Owner: Supplier

Task Timing: The GP-11 plan – by Program Review #2
GP-11 requirements - prior to the prototype material required date

Task Description: The purpose of GP-11 is to ensure part problems are identified and corrected in order to minimize the impact of part variation upon design evaluation, manufacturing, and assembly. The additional requirements specified in the Analysis/Design/Validation (A/D/V) section of GP-11 applies to critical and major key commodities and requires the supplier to submit an A/D/V report and DFMEA that has been approved by a GM validation engineer. The A/D/V report summarizes the plan and testing results of the design and product validation.

Deliverables:
- Serialized parts with GP-11 documentation
- Approved DFMEA and A/D/V plan for all critical and major key commodities

Customer for Deliverables: Supplier Quality, Engineering

Necessary Inputs: Source of Input:
- Inspection data Supplier
- DFMEA Supplier
- ADVP&R form Supplier
- Flow Chart - Preliminary Supplier
- PFMEA - Preliminary Supplier
- Control Plan - Preliminary Supplier

Resources: Supplier, Engineer, Validation Engineer, SQE

Methodology:
- Pre-prototype and prototype parts are made to GM authorized drawings, templates, models, and/or other engineering design records.
- Parts are numerically serialized and referenced to test/inspection results.
- A complete characteristic inspection is performed on three (3) parts, unless different quantities are specified by the procuring division.
- A key product characteristic (KPC) inspection is conducted on all parts.
- A material certification is obtained to provide evidence of compliance to GM product specifications.
- A GP-11 warrant is completed for each part number and shipment to GM.
- Design and/or product validation is performed - if specified in the Statement of Requirements (SOR), component or technical specifications or drawings.
- The design and/or product validation plans and results are submitted to GM validation engineer for approval.
- Suppliers follow submission requirements specified in the prototype purchase order. If the submission requirements are not specified in the purchase order, the supplier follows the procedure specified in GP-11, section 2-1, level B.

M For Modular Suppliers:
- Supplier must ensure that all subcontractors follow the requirements defined in GP11 and the above steps.
- All functional and build issues for the module and sub-components identified during the prototype builds should be reviewed at Supplier Program Review #3 and documented on the APQP Open Issues List (GM1927-5).
Task Number: 11 continued

Task Name: GP-11 Pre-prototype and Prototype Process

SQE Responsibility:
- Verify the supplier’s understanding of GP-11 and any regional specific requirements.
- Assist, as required, in the review of documentation defined by the submission requirements identified in the prototype purchase order.
- Assist in the resolution of supplier quality issues identified during GP-11 inspection and the prototype build.

Supplier Responsibility:
- Adhere to requirements specified in GP-11.
- Develop GP-11 Plan:
  - confirm engineering change level required for manufacturing and measuring through discussions with the design / release engineer.
  - what level (type) of checking fixture will be used i.e. CMM holding fixture, or completed gage.
  - identify what KPCs or data points will be checked.
- Ship parts and documentation as specified in GP-11 unless otherwise specified by the procuring division.
  - if parts do not meet design requirements, contact the design / release engineer to review nonconformances.
  - do not ship nonconforming parts unless there is an approval from the design / release engineer.
- Revise the flow chart, PFMEA, and control plan as problems are identified throughout GP-11 and the prototype build.
- Update the APQP Open Issues List and APQP Timing Chart as problems and changes occur.
- Modular suppliers are expected to adhere to GP11 for the module and sub-components.
- Modular suppliers should participate in Supplier Program Reviews #2 and #3 as applicable.

Additional Information:
APQP Open Issues list (GM1927-5)
APQP Timing Chart (GM1927-2)
GP-11, General Motors Procedure for Suppliers of Material for Pre-prototype and Prototype
Task Number: 12

Task Name: PFMEA Development

Task Owner: Supplier

Task Timing: Initial draft – prior to sourcing
Updates prior to prototype and PPAP
Updates after lessons learned

Task Description: The purpose of the PFMEA is to assure that potential failure modes of the process have been considered and addressed. It is a living document that must be developed for every new part.

Deliverables:
- PFMEA

Customer for Deliverables: Supplier Quality, Supplier

Necessary Inputs:
DFMEA
Lessons learned from previous programs
Process Flow chart
Warranty data
PR/Rs on similar parts
Supplier Performance Report
Supplier’s manufacturing process capability on similar parts
Error proofing techniques

DFM / DFA Workshop results (modular systems)

Source of Input:
Engineer/Supplier
Supplier/SQE
Supplier
Engineer/SQE
Supplier/SQE
Supplier/SQE
Supplier/SQE
Engineers/SQE/Asm.Plant

Resources: Supplier Quality, Engineering and Supplier, *Assembly Plant

Methodology:
*Suppliers should complete the DFMEA, DFM and DFA prior to the PFMEA initiation for module and sub-components.

Teamwork to:
1. Bring Lessons Learned into FMEA format
2. Determine RPNs and identify KCCs

Clearly identify where in the process flow the prevention of error occurrence and defect outflow will be addressed

PFMEA
Continue with work to reduce risk (high RPNs, KCCs/PQCs)

Revise with new Lessons Learned from validation and prototype pre builds

- DFMEA (KPC/PQCs)
- Warranty
- Marketing
- Prior model EWOs
- Build concerns/ PRRs
- Current SQE launch & problem reflection
- APQP SQE and Supplier input
- GM Lessons Learned shared with supplier
Task Number: 12 continued

Task Name: PFMEA Development

Methodology: continued

- The PFMEA is to be reviewed and updated as necessary each time a design change is made or a processing change is implemented. Any and all potential areas for failure are to be included in the PFMEA and appropriate corrective actions implemented.

SQE Responsibility:

- Attend initial PFMEA development team meeting, provide GM data (Warranty, PR/Rs, Lessons learned, etc.), and discuss PFMEA methodology.
- Monitor progression of PFMEA development and confirm participation of multiple cross-functional team members.
- Ensure that action plans have been adequately defined for high RPNs.
- Review PFMEA with supplier.
- **M For Modular Suppliers:** Review the PFMEAs with the module supplier for sub-components.

Supplier Responsibilities:

- Initiate PFMEA prior to sourcing as part of the bid package. This preliminary PFMEA should include critical error prevention and error detection ideas and consider any lessons learned from previous programs.
- Drive simple and inexpensive devices into the process to help prevent and detect errors.
- Prepare PFMEA with input from a multi-disciplinary team (Assembly, Manufacturing, Materials, Quality, Service, Suppliers, etc.) and identify KCCs for use in control plan.
- **M Develop System FMEA with manufacturing, engineering, suppliers, and SQEs**
- Ensure that the current process controls and results of the recommended action on the PFMEA are listed on the control plan.
- If the process, material, or manufacturing location changes, revise the PFMEA and re-evaluate the effect on severity, occurrence, and detection.
- Develop and implement RPN reduction plans, and strive to continuously reduce RPN through the use of error occurrence prevention and defect outflow detection.

Additional Information:
AIAG Potential Failure Mode and Effects Analysis Reference Manual
AIAG Advanced Product Quality Planning and Control Plan manual Process FMEA Checklist A-7
RPN Reduction Summary Chart (GM1927-21)
Task Number: 13

Task Name: Develop and Update Control Plans

Task Owner: Supplier

Task Timing: Initial draft prior to Sourcing
Updates prior to prototype and PPAP
Updates parallel PFMEA changes

Task Description: The purpose of the control plan is to define the method being used to control all KPCs/PQCts and KCCs for parts being built for powertrain and vehicle builds. It may be developed using the control plan format referenced in the AIAG APQP Manual.

Deliverables:
- Control Plan

Customer for Deliverables: Supplier Quality

Necessary Inputs:
- Control plans on similar components
- AIAG APQP manual
- Preliminary process flow chart and PFMEA
- Preliminary PFMEA

Source of Input:
- Supplier
- AIAG
- Supplier
- Supplier

Resources: Supplier and SQE

Methodology:
- Supplier develops a preliminary control plan using an existing control plan on a similar part. This first version of the control plan is then submitted with the quality portion of the supplier’s bid package.
- Supplier develops a prototype control plan using the preliminary control plan as a foundation. The control plan is to reflect the process in place to produce pre-prototype and prototype parts and is to be updated as changes are made to the process.
- The supplier develops a pre-launch control plan (GP12) and production control plan using the preliminary control plan as a foundation. The PFMEA and statistical data are used to determine which steps require additional controls. The pre-launch control plan does not need to be a separate document from the production control plan. Pre-launch controls can be documented on the production control plan as long as they are clearly identified as such.

SQE Responsibility:
- Verify that the supplier used the PFMEA and statistical data to determine what controls are necessary.
- Verify that the supplier updates the control plan as solutions to open issues are identified.
- Verify that pre-launch issues have been incorporated into the production control plan.
- Walk the production floor and verify that the controls listed on the plan are in place and being used. Complete the Process Control Plan Audit Checklist GM1927-16 as part of the audit of the production process.
**Task Number:** 13 continued

**Task Name:** Develop and Update Control Plans

**Supplier Responsibility:**
- Develop a preliminary control plan using an existing control plan on a similar part; submit this document as part of your quotation to the GM.
- Develop a prototype control plan to support production of GP-11 parts; use this experience in the development of the production control plan.
- Ensure the control plan is linked to the PFMEA and process flow chart.
- Develop a pre-launch control plan (see Task 14) for use on the first production parts shipped to assembly plants. Use the pre-launch control plan to validate the effectiveness of the production control plan.
- Identify and communicate any changes to SQE.
- Update the control plan as solutions to open issues are implemented.
- **M** Manufacturing review of control plan.
- **M** Extend control plan to include installation at assembly plant

**Additional Information:**
Quality System Audit Checklist (GM1927-16)
AIAG Advanced Product Quality Planning and Control Plan manual—Control Plan Checklist A-8
Task Number: 14

Task Name: Early Production Containment (GP-12)

Task Owner: Supplier

Task Timing: GP-12 control plan review at PPAP
GP-12 containment during timeframe specified by program

Task Description: The purpose of GP-12 is to establish a containment plan during start-up and acceleration, so that any quality issues are quickly identified at the supplier’s facility and not at the GM customer’s facility. This procedure applies to all new and changed parts that require a new PPAP for the start-up or acceleration. The containment plan is referred to as the Pre-Launch Control Plan and is developed in the control plan format referenced in the AIAG APQP Manual.

Deliverables: Early Production Containment Plan

Customer for Deliverables: Supplier Quality, GM Manufacturing or Assembly Facility

Necessary Inputs:  
- Preliminary Control Plan  
- GP-12 timetable  
- GP-12 Procedure

Source of Input:  
- Supplier  
- SQE  
- GM SupplyPower

Resources: Supplier and SQE

Methodology:
- Supplier follows the GP-12 procedure:  
  - Identification of the person responsible for the containment process.  
  - Development of a pre-launch control plan. (Reference GP-12)  
  - Prompt implementation of containment / correction when non-conformances are discovered.  
  - Use of the Early Production Containment Plan for the time specified by GM.  
  - Use of green dots (signed by a senior management) on shipping labels to designate compliance.

SQE Responsibility:
- Review the supplier’s containment process and pre-launch control plan at PPAP.  
- Verify that PR/R, prototype and pilot issues are addressed by the containment process. 
- Verify that high RPNs are addressed by the pre-launch control plan. 
- Verify that the supplier used the PFMEA and statistical data to determine what additional controls were necessary. (short term capability data on actual process or long term capability data on similar processes)  
- Provide GP-12 timing to supplier (varies by program)  
- Review supplier’s initial GP-12 data to assess compliance to process intent.
Task Number: 14 continued

Task Name: Early Production Containment (GP-12)

Supplier Responsibility:
- Develop an early production containment plan as specified in GP-12.
- Develop and implement a pre-launch control plan.
- Insure that all non-conformances are contained within the facility.
- Any non-conformances found by GM manufacturing locations must be root caused and additional checking provisions must be added to the pre-launch checklist.
- Continue with GP-12 processes in accordance with the procedure; do not exit the process before ‘Zero Defects’ has been achieved in the GP-12 containment area.
- Update the prototype process flow to represent the actual production process.
- Identify and communicate any changes to SQE.
- Contact the GM SDE if additional information or expertise in lead-time reduction is required.

M Require compliance to GP12 from all sub-contractors for modular systems. This will result in sub-contractors pulling ahead GP12 timing by 6 weeks, in order to allow the modular system to support GP12 timing.
M Manage GP12 activities with sub-contractors; maintain records of GP12 data for sub-contractors.

Additional Information:
AIAG Advanced Product Quality Planning and Control Plan manual—Control Plan Checklist A-8
AIAG Production Part Approval Manual
Task Number: 15

Task Name: Production Part Approval (PPAP)

Task Owner: SQE

Task Timing: Prior to PPAP Submit Date

Task Description: The purpose of production part approval is to determine if all customer engineering design record and specification requirements are properly understood by the supplier and that the process has the potential to produce product meeting these requirements during an actual production run at the quoted production rate.

Deliverables:
- PPAP status of all parts for all programs

Customer for Deliverables: Purchasing, Engineering, Supplier Quality, VLE Teams, Assembly Plants, Manufacturing Plants, Production Control & Logistics

Necessary Inputs:
- Design Records of Saleable Product
- Engineering Change Document
- Customer Engineering Approval (GM364), if required
- Design FMEA
- Process Flow Diagrams
- Process FMEA
- Dimensional Results
- Material, Performance Test Results
- Initial Process Study
- Measurement Systems Analysis Studies
- Qualified Laboratory Documentation
- Control Plan
- Part Submission Warrant
- Appearance Approval Report (AAR), if applicable
- Bulk Material Requirements Checklist (for bulk material only)
- Sample Product
- Master Sample
- Checking Aids
- Records of Compliance

Source of Input:
- Supplier
- Engineer/Supplier

For Modular Supplier:
- Sub-component warrants signed and forwarded to GM Tier 1

Resources: Purchasing, Supplier Quality, Product Engineering, Material Engineering, Validation Engineering, Dimensional Management, Part Approval Laboratory, Appearance Laboratory, Paint Engineering
Task Number: 15 continued

Task Name: Production Part Approval (PPAP)

Methodology:
- Buyer purchases or contracts part and establishes initial PPAP submission date and enters date into GPS.
- Determine submission level, quantity of samples needed and request samples.
- Confirm PPAP submission date with supplier and update GQTS as required.
- Supplier submits PPAP package according to AIAG PPAP requirements for the appropriate submission level on the date agreed to by the Buyer/Readiness/SQE. Level 5 PPAP Packages are reviewed at the supplier location for approval. Level 1,2,3, &4 PPAP Packages are submitted to the Part Approval Activity for approval.
- Evaluate the PPAP package submitted by the supplier.
- Notify supplier of part status and authorize shipment of material to schedule.
- On Directed Buy components, Buyer purchases or contracts sub-component for modular system and establishes the initial PPAP date at least 6 weeks prior to the module PPAP date and enters it into GPS.
- A modular system may not be initially submitted at a level higher than Interim A. Full approval can only be achieved when capability of the module has been successfully demonstrated in the car assembly plant (minimum 300 cars produced).

SQE/Part Approval Activity Responsibility:
- Determine submission level and number of samples to review.
- Drive adherence to PPAP submission date.
- Review supplier warrant for level one submissions.
- Review supplier warrant, samples, dimensional, material/functional and appearance data for level two submissions.
- Level 3 Submissions:
  - Review supplier warrant, samples, dimensional, material/functional and appearance data, PFMEA, process control plan, GP-12, process flow diagram, process capability studies and measurement system studies.
- Level 4 submissions:
  - Review supplier warrant, dimensional, material/functional and appearance data, PFMEA, process control plan, GP-12, process capability studies and measurement system studies.
- Schedule PPAP review for level 5:
  - Review at supplier location supplier warrant, dimensional, material/functional and appearance data, PFMEA, process control plan, GP-12, process capability studies and measurement system studies for level 5 submissions.
- Ensure any special documentation is provided and reviewed with PPAP package.
- Determine part status in accordance with the AIAG PPAP manual.
- Review Interim PPAP submissions.
- Ensure adequate recovery plans are provided for interim part approval.
- Determine PPAP interim part class in accordance with the GM specific section of the AIAG PPAP manual.
- Follow up on interim status until full PPAP is achieved.
- Resolve reject part status issues.
- Update GQTS to reflect current part status.
Task Number: 15 continued

Task Name: Production Part Approval (PPAP)

Supplier Responsibility:
- Accurately complete the Production Part Submission Warrant and provide with PPAP package.
- Provide additional detail to ensure the reason for submission is clearly defined and understood.
- Provide Appearance Approval Report (AAR) for parts with color, grain and gloss per PPAP level requested.
- Provide Two sample parts per cavity or quantity agreed to and retain master sample at supplier location per PPAP level requested.
- Provide design record and detail drawings per PPAP level requested.
- Provide engineering change documents that show changes included in part but not specified on the drawing per PPAP level requested.
- Provide dimensional data showing results of part checked per PPAP level requested.
- Provide check aids upon request.
- Provide material, performance and durability test results as specified on design record or provide material lab approval with PPAP package per PPAP level requested.
- Provide process flow diagram, PFMEA, process control plan and GP-12 plan per PPAP level requested.
- Provide capability studies per PPAP level requested.
- Provide measurement system studies per PPAP level requested.
- Provide GM364 with appropriate GM engineer signature where Engineering approval is specified on drawing.
- Provide Scope of laboratory accreditation per PPAP level requested.
- Obtain approval from the SQE for deviations. Deviations shall be documented on the GM1411.
- Provide GM1411 with SQE signature for any part submitted for interim approval. Provide any other appropriate signature dependent on issue as required on the GM1411.
- The supplier shall document containment plans until the SQE is satisfied process capability has been achieved.
- Provide any supporting documentation upon request by the SQE.

Additional Information:
- AIAG Production Part Approval manual
- AIAG Statistical Process Control manual
- AIAG Measurement Systems Analysis (MSA) manual
- AIAG Advanced Product Quality Planning and Control Plan manual
- AIAG Potential Failure Mode and Effects manual
- AIAG Quality System Requirements (QS-9000)
- GM Interim Approval Worksheet GM-1411
Task Number: 16

Task Name: Conduct Run @ Rate

Task Owner: Supplier

Task Timing: Eight (8) weeks prior to the Start of Production / Start of Acceleration (based on region)

Task Description: The Run @ Rate activity verifies that the supplier’s actual manufacturing process is capable of producing components that simultaneously meet:

1. GM’s on-going quality requirements, as stated in the Production Part Approval Process (PPAP)
2. Daily Contracted Capacity
3. GM’s daily volume requirement (LCR/MCR)

Verify other elements of systems readiness to ensure that potential start up problems are addressed.

Deliverables:

- Completed Run @ Rate worksheets for each part documenting that the process meets all Run @ Rate requirements for quality and tooled capacity.

Customer for Deliverables: Supplier Quality and Purchasing

Necessary Inputs: Supplier Quality and Purchasing

<table>
<thead>
<tr>
<th>Necessary Inputs</th>
<th>Source of Input</th>
</tr>
</thead>
<tbody>
<tr>
<td>PPAP documentation</td>
<td>Supplier</td>
</tr>
<tr>
<td>GM’s daily requirement</td>
<td>Buyer/GQTS</td>
</tr>
<tr>
<td>Supplier’s Quoted Tool Capacity</td>
<td>Supplier &amp; Buyer (numbers must agree)</td>
</tr>
<tr>
<td>Planned &amp; unplanned downtime record</td>
<td>Supplier</td>
</tr>
<tr>
<td>Completed GP9 form for all sub-components of the module</td>
<td>Supplier</td>
</tr>
</tbody>
</table>

Resources: SQE, Buyer, Engineer, and Supplier

Methodology: (refer to Run at Rate diagram at end of the task)

- The supplier prepares a Run @ Rate plan and presents the plan at the APQP Kick-off meeting.
- The SQE and supplier confirm the accuracy of the contracted capacity and compare this number to the GM planned daily rate or Lean Capacity Rate (LCR).
- Using the Run @ Rate plan, Risk Assessment and other knowledge about the parts and supplier, the SQE determines if the Run @ Rate is required.
- If a Run @ Rate is not required, the SQE statuses the parts as exempt and obtains approval from the Directors of Supplier Quality and Purchasing.
- If a Run @ Rate is required, the SQE determines whether it should be customer or supplier monitored.
- If the Run @ Rate is to be supplier monitored, the supplier conducts the Run @ Rate on the day indicated in the Run @ Rate plan. Any changes to this date must be communicated to GM through GQTS. Upon completion of the run, the supplier enters the data into GQTS.
- For customer-monitored Run @ Rates, the supplier confirms the Run @ Rate date with the SQE. The supplier is to keep the SQE apprised of any tooling changes that may effect the Run @ Rate date.
- Run @ Rates must be completed at all sub-contractors and have a ‘pass’ status prior to passing the Run @ Rate for the Tier 1 part.
- The supplier conducts preliminary runs and completes as much as the paperwork as possible prior to the actual run date.
- On the day of the Run @ Rate, the supplier conducts the actual run with the SQE in attendance. The supplier must forward the documents to the SQE or enter the data into GQTS (when operational) within one day of the run.
- GM evaluates the data and provides a Run @ Rate status.
- If the Run @ Rate status is open or fail, the supplier must update the APQP Open Issues List.
Task Number: 16 continued

Task Name: Conduct Run @ Rate

Methodology: (continued)

For Modules:
- The Run @ Rate Plan must address the module & all sub-components.
- All sub-component Run @ Rates must be completed 6 weeks prior to Run @ Rate and monitored by the supplier, as appropriate.
- SQE may decide to participate in sub-component Run @ Rate, as appropriate.
- Preliminary Run @ Rate should be conducted as a PPAP run. Open issues and concerns should also be identified at this time.
- Staged Run @ Rate must be conducted at least 8 weeks before SORP. To effectively conduct module Run @ Rate, a simulated broadcast is required from the assembly plant.
- Run @ Rate must confirm supplier ability to meet assembly plant line rate utilizing simulated broadcasts. Supplier must meet assembly plant line rate to be at ‘Open’ status.
- Run @ Rate status must remain open until 30 days of demonstrated ability to support assembly line rate at full acceleration utilizing line broadcasts.
- All Run @ Rates for modules must be GM monitored.

SQE Responsibility:
- Based on Early Warning Risk Assessment, determine if the Run @ Rate should be customer or supplier monitored and communicate this decision to the supplier at the APQP kick-off meeting.
- Evaluate the supplier’s Run @ Rate plan at the APQP Kick-off meeting.
- Confirm that the QTC is accurate and is greater than GM’s daily requirement (LCR)
- Attend Run @ Rates designated as customer monitored. (Review PPAP documentation, sub-supplier requirements and manufacturing process).
- Ensure utilization of gage(s) as stated in supplier process flow chart and control plan
- Status customer-monitored Run @ Rates in GQTS.

Supplier Responsibilities:
- Develop a Run @ Rate plan and provide to the SQE at the APQP kick-off meeting.
- Confirm with the SQE that the QTC is accurate and is greater than GM’s daily requirement (LCR)
- Conduct preliminary run at rates prior to the planned Run @ Rate to confirm readiness.
- Complete Run @ Rates for all sub-suppliers.
- Conduct Run @ Rates on all parts requiring a Run @ Rate.
- Complete worksheets contained in GP9 for all Run @ Rates and forward to the SQE.
- Status supplier-monitored Run @ Rates in GQTS.

Additional Information:
General Motors Run @ Rate Procedure GM-1960
**Task Number:** 16 continued

**Task Name:** Conduct Run @ Rate

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**Run @ Rate Methodology**

- **Is Run @ Rate Required?**
  - Yes: Customer or Supplier Monitored?
  - No: SQE statuses Run @ Rate as exempt

- **Customer or Supplier Monitored?**
  - Customer: Supplier confirms Run @ Rate date with SQE
  - Supplier: Supplier conducts preliminary Run @ Rate and begins R@R questionnaire prior to actual run date

- **Supplier conducts Run @ Rate**
  - Supplier completes paperwork & enters into GQTS
  - Supplier Quality and Purchasing Director approve exemption

- **SQE statuses Run @ Rate as pass, open, fail or staged.**
  - Yes: Supplier updates APQP open issues list with Run @ Rate issue

- **Is Run @ Rate Status Open or fail?**
  - Yes: SQE statuses Run @ Rate as pass, open, fail or staged.
Task Number: 17

Task Name: Lessons Learned-Communicate & Update

Task Owner: Supplier

Task Timing: Key Stakeholder’s meeting through Launch

Task Description: Lessons learned that have been compiled from other programs and placed in a common “Lessons Learned” file are to be reviewed as they relate to the current part and program. The purpose is to maximize the knowledge gained from previous programs and not revisit the same quality or design issues.

Deliverables:
- Updated Lessons Learned file that includes knowledge gained from this program.

Customer for Deliverables: SQ, Engineering, PDT (Product Development Team), Supplier

Necessary Inputs: SQE/Lessons Learned database
Source of Input: Engineer

Resources: SQE, Engineering, Lessons Learned databases

Methodology:
- **Initial Lessons Learned Review (Key Stakeholders Meeting):** The SQE should check the Common Corporate Lessons Learned commodity listing to see if a corporate Lessons Learned file exists; if yes, the SQE shares this information at the Key Stakeholders meeting. The SQE should ensure a copy is provided to the buyer for inclusion in the RFQ package. The direction for the supplier is to use the information during the development of the DFMEA (as required) and the PFMEA.
  - If the commodity is not included in the Common Corporate list, the SQE and Release Engineer should develop a list of lessons learned that can accompany the RFQ.
- **Lessons Learned Update (Technical Review):** SQE provides an overview to suppliers on the lessons learned process and how it fits into APQP. (GM1927-10 & 11)
- **Lessons Learned Update (Kick-off Meeting):** SQE reviews any additional information that has been obtained on lessons learned from local or regional databases. Supplier reviews the completed Lessons Learned Review Criteria. Open issues relative to the Lessons Learned are incorporated into the APQP Open Issues List.
- **Lessons Learned Update (Program Review 2):** Supplier reviews solutions to issues identified in the Kick-off meeting and new items added to the list after the beta build.
- **Lessons Learned Update (Program Review 3):** Supplier reviews solutions to issues identified on the APQP Open Issues list and new items added to the list after the prototype build. As solutions are identified, the DFMEA, PFMEA, flow chart, and control are updated and reviewed by the supplier.
Task Number: 17 continued

Task Name: Lessons Learned--Communicate & Update

Methodology: (continued)
- **Lessons Learned Update (Program Review 4):** Supplier reviews solutions to issues identified on the APQP Open Issues List and new items added to the list after the PPAP and Run @ Rate attempts. As solutions are identified, the DFMEA, PFMEA, flow chart, and control are updated and reviewed by the supplier.
- **Lessons Learned Update (Post Launch Review):** Supplier reviews solutions to issues identified on the APQP Open Issues List and new items added to the list during the launch. As solutions are identified, the DFMEA, PFMEA, flow chart, and control are updated and reviewed by the supplier.

SQE Responsibility:
- Review the Common Corporate Lessons Learned list for the specific commodity.
- If commodity is not on the list, work jointly with the Release Engineer to develop a Lessons Learned list for the commodity.
- It is recommended that the SQE communicate with counterparts in other regions and divisions in the development of the list.
- Provide this list of Lessons Learned to the Buyer for inclusion into the RFQ package.
- Review the Lessons Learned list at the APQP Kick-off meeting, as well as, any additional information that has been obtained from regional lessons learned databases.
- Ensure the Lessons Learned list is updated after each Supplier Program Review; there are four (4) required reviews during the APQP process.

Supplier Responsibilities:
- Supplier is responsible to support the Lessons Learned process and provide information at each of the Supplier Program Reviews during the APQP process.

Additional Information:
Lessons Learned Process Overview (GM1927-10)
Lessons Learned Flow Chart Process Overview (GM1927-11)
Appendix 1

Document Usage Guidelines by Global Region and
Global APQP Documents 1927-1 through 26M
Appendix 1

Document Usage Guidelines by Global Region

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(1) Advanced Purchasing RFQs only
(2) Customer Monitored APQP only
Appendix 2

Modular APQP
Supplement & Definitions

Information about modular parts and systems that drive unique process activities in Global APQP
Modular APQP

Modularity Supplement

Goal
The goal of adding special Modular activities to Global Advanced Product Quality Planning is to ensure the proper development and implementation of a quality system throughout the supply chain.

Purpose
To provide module suppliers with additional information and requirements that are necessary to effectively implement the Global APQP process from a modularity standpoint. Conformance to these requirements by the module supplier is imperative.

Applicability
The modular activities and documents designated by the symbol $^{M}$ shall be used by all module suppliers to enhance the Global APQP process. Compliance to these requirements will result in greater control by the module supplier over the supply chain. These specific activities are located in Tasks 1 through 16 along with dedicated modular forms GM1927-22M, 23M, 24M, 25M, 26M. In addition, Modular remarks have been added to Global APQP forms 1927-4, 6, 7, 13, and 18.

The guidelines and requirements provided by this supplement apply to all manufacturers that will produce product for the final module assembly.

Implementation
Implementation and adherence to the APQP guidelines is a requirement of QS-9000. It is intended that the module suppliers clearly convey all applicable quality system requirements to their sub contractors.

Recognizing a common set of requirements will assist in an effective implementation of the Global APQP process on modules. Proper implementation will result in the manufacturing of world-class module assemblies.
Global APQP

Modularity Supplement

With the shift toward lean manufacturing processes, Modularity will continue to play a key role in reducing inventory and floor space requirements at GM manufacturing facilities. Suppliers are being asked to take on additional assembly responsibility along with sequencing parts directly to the GM assembly line. As First Tier suppliers, new responsibilities are being added that require a larger scope as program managers for design and assembly activities. Program management responsibilities also include APQP activities at other suppliers that provide components and parts for the modular assembly. As the supplier responsibilities increase, it is appropriate for the GM Global APQP process to remain synchronized with corresponding levels of communication and monitoring.

Definitions: A module is defined as an assembly of parts, components, and/or sub-modules delivered to the main production line for installation to the vehicle as a single unit. A sub-module is an assembly of parts, components, and/or sub-assemblies delivered to a feeder line for installation to another sub-module or module. Modular parts can also be sent to a sequencing center prior to shipment into the assembly facility.

Be aware that many parts can be shipped in sequence to the GM facility without being classified as a module. In order to help clarify when the supplemental modular activities must be used in a project, GM has developed a list of those parts that qualify as modular parts. Please contact your Buyer or SQE if you have questions about parts qualifying as modules.

Modules: overhead trim system, instrument panels, bumper/fascias, condenser/radiator/fan, cockpit, convertible top, doors, exhaust, exterior lighting, fixed glass, floor console, floor covering, front suspension/cradle, fuel tank, powertrain, rear shelf, rear suspension, seats.

It is extremely important that suppliers follow the additional steps identified in the Global APQP tasks as part of their program management plan.
Modular APQP - Program Management Plan

Scope:

- Module supplier shall follow all the requirements of Global APQP.

- Module supplier is responsible for implementing these requirements with their sub contractors. It is strongly recommended that these requirements be followed for medium and high-risk sub contractors.

- Module supplier could implement additional requirements with their sub contractors as necessary to support the program.

- A lead SQE assigned for each high-risk module shall manage the Global APQP process including specific modular requirements with the module supplier.

- Adequate resources shall be assigned by the module supplier to support all program requirements for the module and sub components.

- For directed buys, the module supplier shall utilize the SOR and RASIC (GM1927-22M) to determine APQP responsibility.

- Module supplier shall perform an Early Warning Risk Assessment (GM1927-7) for major sub components of the module. Major sub components would be those listed on the Modular Supplier – Subcontractor Program Status Matrix (GM1927-25M).

- Module supplier is responsible for the overall module including all sub components, Module supplier shall provide updates to the GM Supplier Quality organization

- Module supplier is responsible for ensuring dedicated resources are available at the assembly plants to support all pre-builds and launches. Additional supplier resources may be required to support assembly plant builds for extended periods of time depending on the complexity of the module.

- The SOR and Program Management RASIC must be developed during the sourcing activity and utilized for clear definition of roles and responsibilities during the APQP process deployment.
Flow Chart:

MODULE APQP - PROGRAM MANAGEMENT

Follow Global APQP Process

Lead GM SQE Assigned

Key Stakeholders Meeting

Review SOR, Directed Buy Checklist & Responsibility

Technical Reviews & Risk Assessment

Breakdown Module into Sub Components

Module supplier conducts Risk Assessment for Sub Components

Module supplier reviews Risk Assessment with GM Lead SQE

Utilize Program Management RASIC to determine APQP Responsibility for sub components

Module Supplier

Majority of parts

APQP Led by Supplier

GM Commodity SQE (if assigned) participates in APQP process for High Risk Sub Contractor with Module Supplier

Module Performance Reviews at Alpha, Beta Prototype, Pilot and SOA

Adjust GM Involvement Depending on Build Performance

Sub Contractor APQP Management

High

Medium/ Low

APQP Led by Supplier

Module supplier manages Sub Contractors & report status. GM not involved in APQP

GM Manages APQP with Supplier

Proprietary, Directed Buy

GM WWP Sourcing Process

Module Supplier’s Sourcing Process

Quality Valve or Gate Reviews

GM وإ ýO 2000 45 GM 1927
Appendix 3

Glossary of Terms
Appendix 4
Glossary of Terms

A/D/V P&R: An acronym that stands for “Analysis/Development/Validation Plan and Report.” This form is used to summarize the plan and results for validation testing. Additional information can be found in the GP-11 procedure.

AIAG: Automotive Industries Action Group, an organization formed by General Motors, Ford and Daimler-Chrysler to develop common standards and expectations for automotive suppliers.

AP: Advanced Purchasing

APO: (General Motors) Asian Pacific Operations

APQP Project Plan: A one-page summary of the GM APQP process that describes the tasks and the timeframe in which they occur.

BOM: Bill of Materials

BOP: Bill of Process

Brownfield Site: An expansion of an existing facility.

CMM: Coordinate Measuring Machine

Cpk: Capability Index for a stable process

Defect outflow detection: A phrase used in the Supplier Quality Statement of Requirements that refers to in-process or subsequent inspection used to detect defects in parts.

DFM/DFA: Design for Manufacturability / Design for Assembly

DFMEA: An acronym that stands for “Design Failure Modes and Effects Analysis.” It is used to identify the potential failure modes of a part, associated with the design, and establish a priority system for design improvements.

DPV: Defects per vehicle

Error occurrence prevention: A phrase used in the Supplier Quality Statement of Requirements that refers to poke yoke or error-proofing devices used to prevent errors in the manufacturing process from occurring.

EWO: Engineering Work Order

GD&T: Geometric Dimensioning & Tolerancing

GME: General Motors Europe

GM 9000: A document provided through Boise Cascade that houses GM specific requirements (General Procedures – GPs) that are referenced in QS 9000.

GP: General Procedures

GPS: Global Purchasing System
GQTS: Global Quality Tracking System

GR&R: Gage Repeatability and Reproducibility

Greenfiled Site: A new supplier facility that is built to support a program.

KCC: An acronym that stands for Key Control Characteristics. It is a process characteristic where variation can affect the final part and/or the performance of the part.

KCDS: Key Characteristic Designation System

Kick-off meeting: The first APQP supplier program review.

KPC: An acronym that stands for Key Product Characteristic. It is a product characteristic for which reasonably anticipated variation could significantly affect safety, compliance to governmental regulations, or customer satisfaction.

LAO: (General Motors) Latin American Operations

LCR: An acronym that stands for “lean capacity rate.” It is the GM daily capacity requirement.

MCR: An acronym that stands for “maximum capacity rate.” It is the GM maximum capacity requirement.

Module: An assembly of sub-components delivered to the GM main production line for installation to the vehicle as a single unit.

MPC: Material Production Control

MPCE: Material Production Control Europe

MSQE: Module Supplier Quality Engineer; Lead SQE for the Tier 1 supplier of the modular assembly.

MRD: Material Required Date; date material must be delivered in order to allow a build event to begin (Pilot, SOR, etc.)

NAO: (General Motors) North American Operations

NBH: New Business Hold

N.O.D.: Notice of Decision

PAD: Production Assembly Documents

PC&L: Production Control & Logistics

PDS: Product Description System

PDT: Product Development Team

PFMEA: An acronym that stands for “Process Failure Modes and Effects Analysis.” It is used to identify potential failure modes associated with the manufacturing and assembly process.

PPAP: Production Part Approval Process

PPM: 1) Program Purchasing Manager
   2) Parts per Million (rejects and returns to suppliers)
Ppk: Performance index for a stable process

PQC: Product Quality Characteristic

PR&R: Product Problem & Resolution

PSA: Potential Supplier Assessment, a subset of the Quality System Assessment (QSA)

QSA: Quality Systems Assessment

QTC: An acronym that stands for “Quoted Tool Capacity.”

RASIC: Responsible, Approve, Support, Inform, Consult

RFQ: An acronym that stands for “Request For Quotation.”

RPN: An acronym that stands for “Risk Priority Number” (FMEA)

RPN Reduction Plan: An action plan that describes what is being done to reduce the risk priority number for all items listed in the PFMEA.

SDE: An acronym that stands for “Supplier Development Engineer”

SFMEA: System Failure Mode and Effects Analysis

SMT: An acronym that stands for “Simultaneous Management Team”

SOA: An acronym that stands for “Start of Acceleration.”

SOR: An acronym that stands for “Statement of Requirements.”

SPC: Statistical Process Control

SQE: An acronym that stands for “Supplier Quality Engineer.”

SQIP: Supplier Quality Improvement Process

SSTS: Sub-system Technical Specifications

S.T.E.P: Sourcing Team Evaluation Process, a supplier assessment focused on a specific technology or process at a supplier’s facility.

MSubcontractor: The supplier of a sub-component to a module supplier (Tier 2, 3,…).

MSub-module: An assembly of parts, components and/or sub-assemblies delivered to a feeder line for installation to another sub-module of module.

Team Feasibility Commitment: An AIAG APQP form that is provided at the Technical Review. It is the supplier’s concerns with the feasibility of manufacturing the part as specified.

UG: Unigraphics

VDP: Vehicle Development Process

VLE: Vehicle Line Executive
**Warranty Risk & Reward:** A incentive program to aide in the reduction of warranty. It includes financial risk to the supplier when committed IPTV targets are not achieved, and rewards to the supplier when IPTV targets are achieved. It is only applicable on parts that are contracted as such by the buyer.

**WWP:** Worldwide Purchasing