SUPPLIER PPAP HANDBOOK
NORTH AMERICA

Revision D – May 24, 2018

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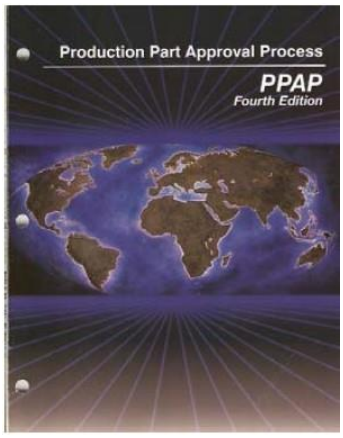
Foreword



The Quality Assurance staff at Prestolite Electric Inc. has prepared this handbook for new and existing Suppliers of manufacturing-based purchased goods to Prestolite.

Its purpose is to define the approval process of new or revised parts, or parts resulting from new or significantly revised production methods.

As a Supplier to Prestolite, it is your responsibility to ensure that you ship only parts that have been approved and meet specifications.

The procedures outlined in this handbook apply to Prestolite Electric North American facilities. If you have questions regarding the contents or processes described in this handbook, please contact the Quality or Supplier Quality representative of the Prestolite location to which your documentation is being submitted.

Please note that Blue Text in this handbook indicates the term or concept is further explained in “Appendix A – Definitions”.

The requirements in this handbook were drafted to be fully compliant with the Automotive Industry Action Groups (AIAG) Production Part Approval Process (PPAP) standard. Prestolite Electric may have specific Customer requirements and additions to this standard that need to be fully understood before attempting to successfully submit a PPAP for review and approval.

Production Part Approval Process (PPAP)

Purpose

The purpose of the Production Part Approval Process (PPAP) is:

- ✓ To provide the evidence that all customer engineering design record and specification requirements are properly understood and fulfilled by the manufacturing organization.

- ✓ To demonstrate that the now established manufacturing process has the potential to produce product that consistently meets all requirements during an actual production run at the quoted production rate.

Ultimately, PPAP is for the Suppliers benefit; it ensures that you are capable of routinely and repeatedly producing product that meets Customer expectations. Doing a thorough job in preparation of PPAP will reduce potential internal costs (i.e. scrap, rework, chargebacks, Customer dissatisfaction).

When is PPAP Submission Required?

In general, a PPAP is required anytime a new part or a change to an existing part or process is being planned. It's the discretion of Prestolite Electric to determine when and if a PPAP submission will be required. As a Supplier you should have the type of quality system that develops all of the requirements of a PPAP submission regardless of whether you have been asked to deliver a submission. In the event a PPAP submission is not requested, Prestolite Electric reserves the right to request any of these documents at any time during the life of the product.

Prestolite Electric reserves the right to request a PPAP submission for a variety of reasons including but not limited to the following:

- ✓ New part or product
- ✓ New supplier
- ✓ New process or technology
- ✓ Changes to existing product(s):
    - Change to construction, material, or component
    - New, additional or modified tools
    - Upgrade or re-arrangement of existing tools

- Tooling, production, or equipment transferred to a different site
- Change of supplier or non-equivalent materials/services
- Product when tooling has been inactive for 12 months
- Product or process changes on the components of the product
- Change in test or inspection method
- Bulk material: New source of raw material
- Change in product appearance attributes
- Change in production process or method
- Change of sub-supplier or material source

The Supplier is expected to retain and/or submit records and documentation in accordance with “Appendix B – Retention/Submission Requirements Table.” These requirements differ based on the Level of PPAP requested by Prestolite.

If there are any questions concerning the need for a PPAP Submission, please contact a Prestolite Electric Quality or Supplier Quality representative.

Significant Production Run

The AIAG PPAP standard defines a "significant production run" as a production quantity that totals a minimum of 300 **consecutive** parts.

Unless otherwise agreed upon by Prestolite Electric and the Supplier, sampling should be taken from no less than 300 pieces from a production run, utilizing production equipment, tooling and production employees operating at the standard production rate.

The intent is to ensure that all production and dimensional data is a reflection of the actual production process to be used during production.

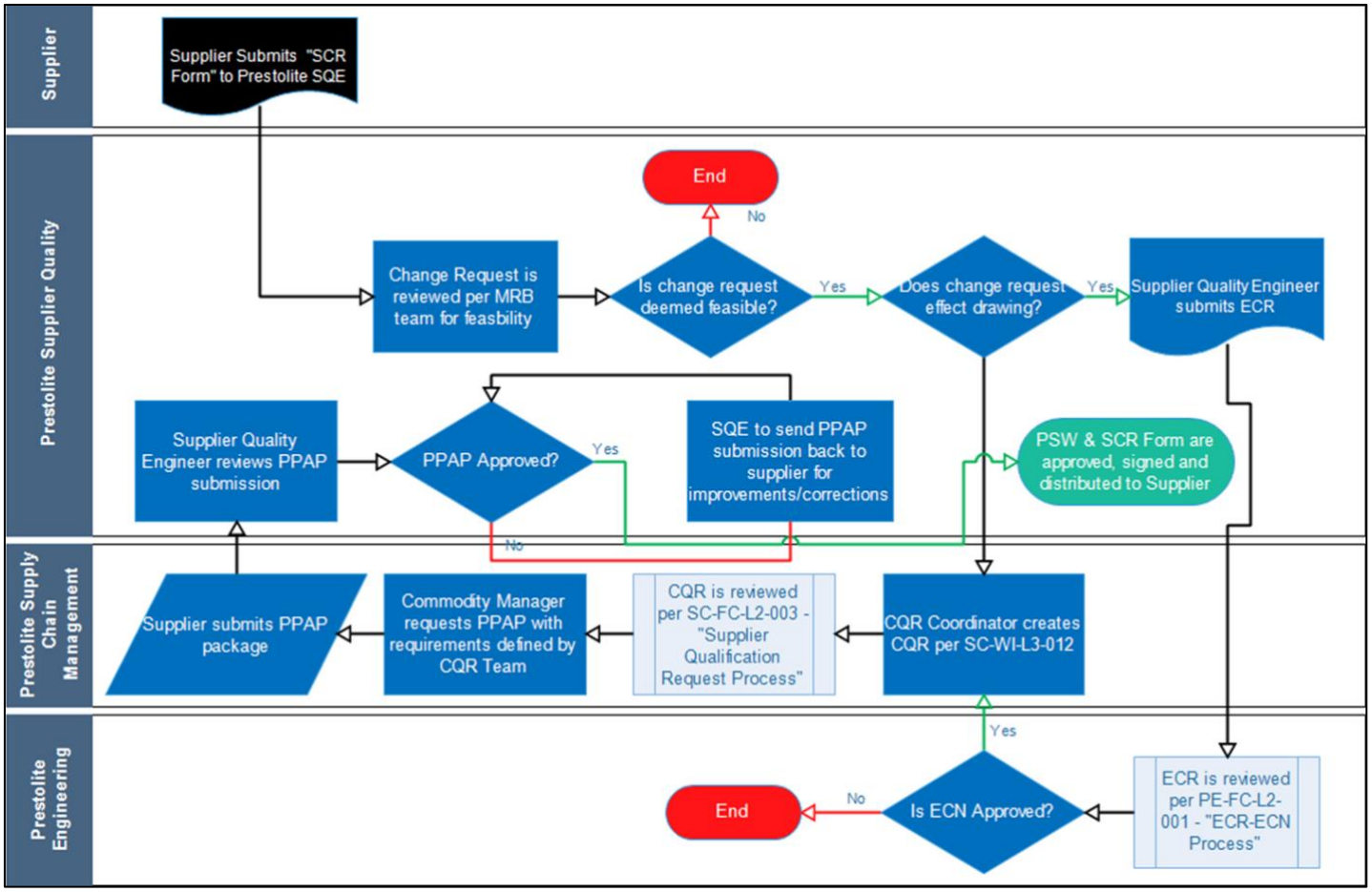
Parts from each unique process (i.e. duplicate assembly line and/or work cell, each position of a multiple cavity die, mold, tool or pattern) must be measured and representative parts tested.

Supplier Change Request (SCR) Instructions

Whenever the Supplier is planning a change that affects the part or the process making the part you must get approval from Prestolite Electric prior to initiating any activity.

The Supplier Change Request (SCR) must be approved by Prestolite's CQR team. Executing a change without the consent of Prestolite could affect future business opportunities.

Supplier Change Process Overview



Acronyms:

SQE – Supplier Quality Engineer
MRB – Material Review Board
CQR – Component Qualification Review
PSW – Part Submission Warrant
PPAP – Production Part Approval Process
ECR – Engineering Change Request

Elements of a PPAP Submission

Prestolite Electric PPAP submission requirements are compliant with the existing AIAG PPAP standard. One or more of the following elements may be required as part of your formal submission depending upon your assigned submission level:

1. Design Records & Ballooned Drawings
2. Approved Engineering Change Documents, if any
3. Customer Engineering Approval, if required
4. Design FMEA
5. Process Flow Diagrams
6. Process FMEA
7. Control Plan
8. Measurement Systems Analysis (MSA)
9. Dimensional Results
10. Material, Performance Test Results
11. Initial Process Studies
12. Qualified Laboratory Documentation
13. Appearance Approval Report (AAR), if applicable
14. Sample Production Parts
15. Master Sample(s)
16. Checking Aids
17. Records of Compliance with Customer-Specific Requirements
    a. Special Processes Audits, if required
18. Part Submission Warrant (PSW)

Prestolite has many of these forms available to Suppliers at no charge by contacting your Prestolite Quality or Supplier Quality representative. Suppliers may use Prestolite supplied forms or any other AIAG compliant forms.

Special Characteristics

Special characteristics are those features that most affect the outcome of a product or process. Controls must be designed and implemented as part of your company's advanced quality planning. Special attention is required during this phase to identify and control variables that affect the conformance of the product.

Special characteristics may be designated on Prestolite drawings, engineering standards, DFMEA, PFMEA, and/or other product documentation. These characteristics indicate government, safety, environmental regulations, or product function is affected. Suppliers must ensure their personnel understand the significance of special characteristics, and their necessary impact on manufacturing processes and support functions.

Prestolite's expectation is that you will address all Special Characteristics in the control plan and ensure that you have a robust process for consistently achieving all Special Characteristic requirements as they are defined in the Prestolite part print.

Prestolite uses two (2) different symbols to identify special characteristics:

 = Characteristics that require SPC to measure process stability, capability, and control for the life of the part are identified with a **diamond**.

 = Characteristics where verification is mandatory but where on-going process control is not automatically mandated are identified with a **pentagon**.

Note: Additional requirements pertaining to critical features may be designated within notes

Special Characteristics are mandatory for Element 11 - Initial Process Studies, which is sometimes referred to as the capability element. Prestolite requires capability studies for all Special Characteristics and any process related characteristics that either you or Prestolite identify as critical.

As a Supplier developing product for Prestolite, your team may discover process, and sometimes additional product characteristics, that are critical to part performance. Even if the Prestolite print does not clearly define any Special Characteristics, Prestolite expects that Suppliers will identify Special Characteristics for their processes and methods.

PPAP Submission Levels

Submission levels define which elements are required to be submitted.

The levels are used for different reasons and applications. The level to be submitted is determined by Prestolite Electric, and unless otherwise noted, always defaults to Level 3 which is a full PPAP submission.

There are five (5) submission levels:

Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to the customer.

May apply to: Catalog/commodity parts; re-certification of existing parts previously approved by Prestolite at levels(s) 3, 4, or 5.

Level 2 - Warrant with product samples and limited supporting data submitted to the customer.

May apply to: Simple material changes, simple revision level only changes or simple print updates not affecting form-fit-function. This level can also be applied to low and medium risk parts within a product family.

Level 3 (Prestolite Default Submission Level) - Warrant with product samples and complete supporting data submitted to customer.

May apply to: New parts, changes affecting form-fit-function, reliability, or performance. All products resourced to new suppliers, serial production parts, and existing high risk parts undergoing a part number change.

Level 4 - Warrant and other requirements as defined by the customer.

May apply to: This level is reserved for special applications only; may only be applied with prior approval from the designated Prestolite Quality or Supplier Quality representative.

Level 5 - Warrant with product samples and complete supporting data reviewed at the supplier's manufacturing location.

May apply to: On site review as requested by the designated Prestolite Quality or Supplier Quality representative.

Note: Changes to existing parts will be handled on a case-by-case basis and submissions other than Level 3 must have prior approval from your Prestolite Quality or Supplier Quality representative.

PPAP Submission Requirements

Prestolite Electric requires all PPAP submission to be submitted electronically.

It is preferred that the PPAP submission be transmitted as one (1) PDF file; all PPAP elements in one continuous file.

If this is not possible then we request that each element be in PDF format and not native format such as MS Excel or Word.

All PPAP submissions must be in English and delivered to your Prestolite Quality or Supplier Quality representative. Failure to submit in English format will delay the approval process and could result in rejection of the submission.

Submission Status

The PPAP review and approval process will be managed by your Prestolite Quality or Supplier Quality representative.

The PPAP submission will be dispositioned with one of the following statuses:

> Approved: A formal acceptance of the submission within the guidelines of any and all criteria set forth by Prestolite Electric.
>
> Rejected: The submission is not acceptable and needs to be resubmitted after correction for approval. (Note: Submission to the wrong revision level or part number will constitute an automatic rejection.)

Prestolite does not grant INTERIM PPAP approval – Supplier PPAP must be fully approved before product can be supplied to Prestolite for production intent.

Ongoing Requirements

As a supplier to Prestolite Electric, the expectation is that you will build your product and processes to be robust not only for the launch of the product, but for the life of the product. The expectation is that your system will include verification of the parts and the part requirements on an "on-going basis". This may include building periodic conformance testing into your overall process such as routine dimensional analysis, functional analysis and process verification.

Our recommendation is that you have designated intervals for verifying Special Characteristics and key process related methods. All of these must be identified on the control plan as part of your ongoing process to verify that your product meets Prestolite's requirements.

Prestolite reserves the right at any time throughout the life of the product to request evidence of this ongoing conformance.

PPAP Record Retention

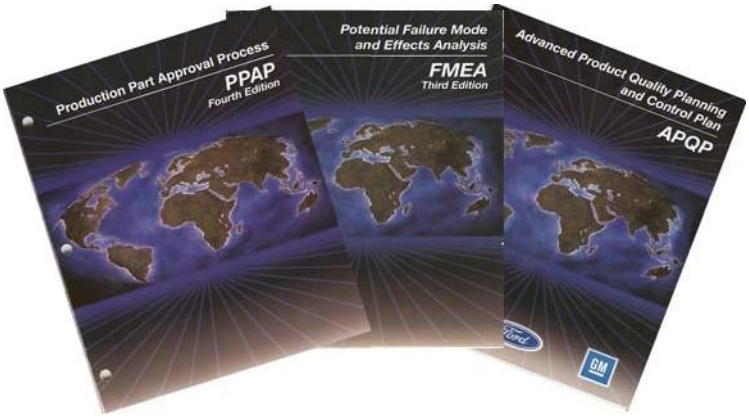
PPAP records, regardless of submission level, must be maintained for the length of time that the parts is active plus one (1) calendar year.

The Supplier must ensure that the appropriate PPAP records from a superseded part PPAP file are included, or referenced in the new PPAP file.

Note: An example of an appropriate document/record that should be carried forward from the old file to the new part file would be a material certification from a raw material supplier for a new part that represents only a dimensional change from the old part number.

Additional PPAP Information & Training

Suppliers are encouraged to refer to the AIAG website (www.aiag.org) for additional information, training and materials regarding the AIAG PPAP standard.



AIAG has developed industry Standard publications for many of the elements discussed in this handbook. They go into specific detail on the concepts and will assist you with planning your approach. Additionally, you can register for AIAG training on these, and many other important industry standards.

Element 1 - Design Records & Ballooned Drawings

The purpose of design record is to ensure the Supplier is aware of the Prestolite's product requirements. Submission of the design record used by the Supplier will give Prestolite assurance that the most current revision is available.

A ballooned drawing shows the parts or assemblies in a part print with numbered "balloons" that point to individual dimensions and requirements of the part. The numbers on the ballooned drawing must correlate with the numbers found on the dimensional data sheet (see Element 9 – Dimensional Results). A ballooned drawing must be submitted as part of PPAP for every submission level where dimensional results are requested.

Suppliers must create ballooned drawings using Prestolite drawings. The submission of ballooned Supplier drawings is prohibited and will result in an automatic rejection of the PPAP submission.

Every dimension and/or requirement on the design record must be ballooned and numbered for reference and measurement, including:

- ✓ Dimensions and tolerances of parts
- ✓ Drawing Notes
- ✓ Electrical requirements (i.e. performance data, functional tests, etc.)
- ✓ Visual features (i.e. color, texture, etc.)
- ✓ Chemical characteristics (i.e. cure time, etc.)
- ✓ Physical and mechanical properties (i.e. tensile strength, plating thickness, heat-treat hardness, etc.)

When dimensions are specified at multiple locations on the drawing, the data for each location should be numbered separately.

Element 2 - Approved Engineering Change Documents

The Supplier must have approved engineering changes documents for those changes not yet recorded in the design record but incorporated in the product, part, or tooling.

A Supplier Change Request (SCR) must be approved by Prestolite prior to making any proposed changes. The Supplier is not authorized to proceed without an approved SCR from Prestolite.

Element 3 - Customer Engineering Approval

Where specified by Prestolite's Customer, the Supplier must have evidence of Customer engineering approval. It is rare to receive such a request, however the Supplier must demonstrate compliance where required.

Element 4 – Design FMEA

Design FMEA stands for Design Failure Mode and Effects Analysis (DFMEA) and shows evidence that potential failure modes and their associated risks have been addressed in order to eliminate or minimize their effects through product design changes and improvements.

DFMEA is only required when the part is designed by the Supplier and must address all Special Characteristics and any potential voice of the Customer inputs identified by Prestolite Electric.

The date on the DFMEA should show release prior to print release. Severity, Occurrence and Detection ratings are used when performing FMEA activities. These rating scales must be compliant with the AIAG FMEA standards.

The DFMEA supports the design process by reducing the risk of failures. The DFMEA should be initiated before the design concept is finalized. Each item/function needs to be addressed. Any potential failure mode of the item/function should be defined as completely as possible.

Prevention is the preferred method to address the design failure mode. If prevention is not possible, then highlight detection controls. The DFMEA is not meant to be a standalone document and the results of the DFMEA should be used in the creation of the Process FMEA.

Element 5 – Process Flow Diagrams

The purpose of Process Flow Diagrams is to document and clarify all the steps required in the manufacturing of a part. The primary process steps must match both the Control plan and the Process FMEA. Process Flow Diagrams must include the entire manufacturing process (receiving through shipping).

Element 6 – Process FMEA

Process FMEA stands for Process Failure Mode and Effects Analysis and is used to show evidence that potential failure modes and risks have been assessed at the manufacturing process level.

FMEA is a cross-functional activity that can lead to inconsistency; particularly when specific team members are not trained. A number of organizations provide good training on both DFMEA and PFMEA. In addition the AIAG standard is the industry reference for comprehensive details on FMEA and can be purchased through their website.

Examples of common mistakes made on FMEA:

- ✓ Misapplication of Severity, Occurrence and Detection
- ✓ Over estimating the effectiveness of a “Recommended Action"
- ✓ Applying RPN thresholds arbitrarily
- ✓ Not recognizing all potential failures
- ✓ Misapplication of ranking scales
- ✓ Confusing Failure Modes with Effects or Failure Modes with Causes
- ✓ Allowing the PFMEA to turn into a design review

A PFMEA should be performed for every part, piece of equipment, or process involved in manufacturing. PFMEA is a cross-functional activity that is performed internally, updated routinely, and reviewed periodically.

Severity, Occurrence and Detection ratings are used when performing FMEA activities. These rating scales, as well as the FMEA format, must be compliant with the AIAG FMEA standard.

The supplier should have a documented risk reduction process. PFMEA are living documents, and as such, whenever Supplier Corrective Actions (SCAR) are issued to the Supplier by Prestolite, the Supplier must consider the impact to the PFMEA and make any necessary adjustments.

The recommended actions in any FMEA should address the initial high RPN numbers to minimize risk in the manufacturing process. The goal is to drive the final RPN number as low as possible.

Element 7 – Control Plan

A Control Plan defines the operations, processes, materials, equipment, methodologies, and Special Characteristics (as determined by Prestolite and Suppliers) for controlling variations in key product or process characteristics integral to the manufacturing process. Its purpose is to communicate the Supplier's decisions during the entire manufacturing process from materials purchase through final shipping.

Specifically, the control plan should address the following:

- ✓ Methods of production
- ✓ Identification of special characteristics' controls
- ✓ Secondary or outsourced operation
- ✓ Types of process equipment at each operation
- ✓ Types of test equipment used to measure each characteristic
- ✓ Specifications, sampling strategy, control and reaction methods used
- ✓ Periodic conformance testing and product verification

All processes must have a Control Plan that defines all methods used for process control and complies with the customer-specified requirements. The control plan must clearly state each step in the process; the specification & all special characteristics must be addressed for product and process.

A Control Plan should address all testing requirements, inspections, and measurements that are required to make a quality product. Suppliers should also include other details they know to be vital in the process.

The Control Plan cannot be excessively dependent on visual inspection and should target prevention techniques wherever possible.

The Control Plan should be developed in stages from proto-type through production. Early planning on the Control Plan will usually result in a more robust process. Suppliers are encouraged to develop a pre-launch control plan early in the development of a new product.

It's vital the Control Plan describes the actions required within the manufacturing process flow to ensure that all process outputs are in a state of control and that every step in the process requiring disposition has a defined "Control Method" and "Reaction Plan" outlined on the control plan. This includes all forms of testing, inspection, measurement, and process setup. The "Reaction Plan" should clearly define any contingency planning that may need to be addressed during the manufacturing of the product.

Finally, the Control Plan should be a living and active part of your overall quality system. Prestolite prefers that all suppliers develop the Control Plan methodology as part of their everyday practice and Quality system. Control Plans should not be developed just for a PPAP submission.

In certain instances, Prestolite may also request that a specific pre-launch Control Plan be developed that minimizes the overall risk of specific product concerns during the launch phase. Unless otherwise requested the Control Plan for all PPAP submissions is the ''production" control plan.

The Control Plan methodology is formally defined in the AIAG Advanced Product Quality Planning (APQP) standard. Suppliers must utilize an AIAG compliant format when developing Control Plans.

Element 8 – Measurement Systems Analysis (MSA)

Measurement system analysis (MSA) is a mathematical method of determining how much the variation within the measurement process contributes to overall process variability. MSA is used to ensure the use of the right measurement system for running production.

MSA guidelines for stability, bias, linearity, repeatability and reproducibility are formally defined in the AIAG MSA standard.

A Gage Repeatability and Reproducibility (GR&R) Study is used to ensure that measurements recorded in the manufacturing process are reasonably consistent regardless of how many times they are performed, or by whom they are performed. GR&R studies can be useful to Suppliers in that they can identify equipment that is in need of service, or operators who may need additional training on the equipment.

Prestolite requires Suppliers to perform GR&R studies of all measurement tools identified in the Control Plan (in process and offline gages).

The minimum requirements for Prestolite Suppliers are:

- ✓ % R&R should be at 10% or less for special characteristics
- ✓ Marginal gages between 10% and 30% need an action plan to address and improve the method of measurement.
- ✓ Gages with R&R at 30% or more cannot be used

Element 9 – Dimensional Results

The purpose of this element is to show conformance to the Prestolite print on dimensions and all other print requirements. Prestolite requires a full dimensional layout on all PPAP submissions, except Level 1, for all drawings related to the part.

PPAP dimensional results are to be documented on a "Dimensional Data Sheet", or a suitable equivalent worksheet, for Prestolite's review. The measurements detailed on the data sheet must correlate with your ballooned drawing from Element 1 – Design Records & Ballooned Drawings.

All dimensional results submitted for PPAP must be measured for compliance to the Prestolite print. The use of Supplier prints for dimensional layouts is prohibited and will result in an automatic rejection of the PPAP submission.

The parts used for dimensional data must be from production tooling and randomly sampled from a run at production rate.

The dimensional report must address the following:

- ✓ All dimensions
- ✓ All applicable notes
- ✓ Any dimensions contained on reference prints

Important: The parts measured to compete Element 9 – Dimensional Results, should be the same parts submitted as formal samples in Element 14 – Sample Product Parts.

Be advised, the following conditions will result in rejection of the PPAP submission:

- ✓ Failure to perform dimensional layout to Prestolite print
- ✓ Any dimension or requirement that is outside of print requirements

Any concerns identified by the Supplier in the dimensional results should be brought to the attention of Prestolite Engineering or Supplier Quality before submitting your PPAP submission.

Element 10 – Material, Performance Test Results

Material, Performance Test Results is a general category for all test/measurement results other than dimensional. The Supplier must confirm, through the submission of documentation, that material composition is confirmed and acceptable performance is demonstrated.

A Certificate of Compliance (COC) is acceptable but not preferred. Prestolite prefers to have results in the format of Certificate of Analysis (COA). COA will show actual test results to a known standard rather than simply certifying that a material meets the standard.

Material Test Results

Material Test Results should be provided in the form of a material composition report typically called a Certificate of Analysis (COA) from an accredited lab. It's the Supplier's responsibility to confirm the conformance of their material to applicable standards for PPAP submission. It's also the Supplier's responsibility to plan for ongoing material conformance testing and identify this as a separate requirement (line item) in the Control Plan. This ensures that the Supplier has a plan for continual conformance to the material standard.

Performance Test Results

Performance Test Results should meet the specifications. Performance results may include data confirming any referenced specifications in the part print or specific testing required by Prestolite. Prestolite will communicate specific material, performance, and testing requirements either the in part print, reference specifications, or by specific request prior to PPAP approval. It is the responsibility of the Supplier to confirm the data and format for this requirement with Prestolite Engineering or Supplier Quality.

Element 11 – Initial Process Studies

The purpose of the Initial Process Study is to determine if the manufacturing process is capable of producing parts that will meet Prestolite requirements. Initial process studies (capability) are mandatory for all Special Characteristics. Studies performed on Special Characteristics must be performed per AIAG MSA standard (i.e., actual production parts randomly sampled from a significant production run).

In general, Prestolite requires a capability index of ≥ 1.67 as acceptance criteria for initial process studies at the time of PPAP for Special Characteristics. Where Prestolite Customer requirements differ, the Supplier will be notified of the specific requirement for capability.

If the process that produces the parts involves multi-cavity tooling, the Cpk index must reflect a process study from each individual cavity.

The supplier must maintain on-going capability data for all Prestolite Special Characteristics. Ongoing process capability is to be maintained at Ppk ≥ 1.33. The requirement for maintenance of ongoing process capability should be included in the production Control Plan.

Element 12 – Qualified Laboratory Documentation

The purpose of Qualified Laboratory Documentation is to ensure that the testing for PPAP has been done by a qualified lab. If your organization performs testing or measurement internally or externally at an outside facility then proof of Laboratory Scope and/or accreditation is required.

Internal Labs located at the Supplier

All suppliers that have testing or measurement performed on site must provide the following in this section of the PPAP submission.

- ✓ A copy of the Laboratory Scope
- ✓ Documentation showing that the laboratory is qualified for the types of measurement or tests conducted (i.e., personnel competency and training)

External Labs located offsite from the Supplier

If the Supplier is using external laboratories for measurement and testing the Supplier must submit the following in this section of the PPAP submission.

- ✓ A copy of the laboratory's Third Party accreditation
- ✓ Results must be on company letterhead and include:
  - The name of the Lab
  - Date of testing
  - Standards used for testing have to be identified

Element 13 – Appearance Approval Report (AAR)

This element is used to provide additional definition when a specification or print reference does not exist. It is rare to receive such a request, however the Supplier must demonstrate compliance where required.

AAR typically applies only for parts with color, grain, or surface appearance requirements.

Where specified by Prestolite's Customer, the Supplier must submit an AAR as part of the PPAP submission.

Element 14 – Sample Production Parts

The Supplier must provide sample product when specified by Prestolite. Where required, Prestolite will provide the Supplier with the required number of parts to be submitted.

In the event Prestolite does require the submission of sample product, each individual sample part must be tagged and identified as a PPAP sample, and at a minimum, include the Prestolite part number, revision level, and Supplier name. The exterior of the shipping container must also be clearly labeled as containing "Unapproved PPAP Sample Parts" to avoid misplacement or inadvertent mixing with approved production parts.

Element 15 – Master Sample(s)

Master Sample(s) are required on a case-by-case basis, and only when Level 5 PPAP is requested.

Where Master Sample(s) are requested, Prestolite requires the Supplier to retain at least one (1) Master Sample Part per cavity, mold, tool, etc., that is representative of the PPAP production run. Master Samples should be identified with an approval date.

The Supplier's Master Sample(s) must be readily available for review or reference should part concerns arise.

Element 16 – Checking Aids

This requirement is used to identify where Checking Aids are used in the Supplier's processes and to ensure they have been properly validated.

There are many different types of checking aids. Examples of checking aids include but are not limited to fixtures, variable and attribute gages, models, and templates. If a fixture is used to check physical print dimensions, either in-process or offline, then it is a Checking Aid.

Checking aids must be documented through a formal print and all additional verification data submitted with PPAP. The Supplier should review the design of the Checking Aid with Prestolite prior to building the check fixture to avoid additional costs.

Checking aids must have evidence of the following submitted with the PPAP:

- ✓ Conformance to the design print
- ✓ Evidence of Repeatability in measuring the part
- ✓ GRR studies for all Special Characteristic related features

Element 17 – Records of Compliance with Customer-Specific Requirements

Special Processes Audits

Suppliers with internal or outsourced "Special Processes," as identified by AIAG are required to show conformance with relevant AIAG Special Process documents:

- ✓ CQI-9 Heat Treat Assessment
- ✓ CQI-11 Plating System Assessment
- ✓ CQI-12 Coating System Assessment
- ✓ CQI-15 Welding System Assessment
- ✓ CQI-17 Soldering System Assessment
- ✓ CQI-23 Molding System Assessment
- ✓ CQI-27 Casting System Assessment

Prestolite expects Suppliers to comply with the Assessment process and Assessor qualification requirements as outlined by each of the CQIs.

As a minimum, a self-audit is required to be performed annually by the Supplier and/or their outsourced sub Suppliers using the applicable AIAG CQI Assessment. Suppliers are encouraged to submit a current Assessment of each applicable Special Process as part of their PPAP submission; this should also include Assessor qualifications.

Element 18 – Part Submission Warrant (PSW)

The purpose of the Part Submission Warrant (PSW) is to document the submission and the approval or rejection of purchased parts prior to production. It must be submitted as part of the PPAP at every submission level.

The Supplier must verify that all of the measurement and test results show conformance with Prestolite's requirements and that all required documentation is submitted and/or retained according to the AIAG PPAP standard.

When the Supplier signs the PSW they are affirming that the PPAP samples provided are representative parts made from specified materials, and that they meet Prestolite's drawings and specifications using production intent tooling and processes.

A separate PSW must be completed for each part number unless otherwise agreed upon by Prestolite Quality or Supplier Quality.

Appendix A - Definitions

A – C

Actual Production Run
The production run that PPAP data is sampled from must be conducted using production tooling, equipment, environment (including production operators), facility, cycle time, etc. It should be performed once the supplier's process is considered ready for production.

Advanced Product Quality Planning (APQP)
APQP is a framework of procedures and techniques used to develop products in various industries. It was developed by AIAG for the automotive industry.

Automotive Industry Action Group (AIAG)
AIAG (The Automotive Industry Action Group www.aiag.org) is a group based in Southfield Michigan originally created to develop recommendations and a framework for the improvement of quality in the American Automotive Industry.

Approved Status
Approved indicates that the part or material PPAP submission has been deemed acceptable and will meet customer requirements.

Ballooned Drawings
A ballooned drawing shows the parts or assemblies in a part print with numbered "balloons" that identifies individual dimensions and requirements of the part.

Capability Index
Process capability index is a statistical measure of product or process capability. The ability of a process to produce output within specification limits. The concept of process capability only holds meaning for processes that are in a state of statistical control.

Certificate of Analysis (COA)
Certificate of Analysis (COA) normally is from an accredited lab that confirms the material content meets a known standard. Material Test Results should be provided in the form of a material composition report.

Certificate of Conformance (COC)
A certification of material/part that states the material/part meets the agreed upon specification per customer requirements.

Checking Aids
Any tool, gage or assembly equipment that verifies the physical or performance requirements of a part for the customer.

Control Plan
The Control Plan follows the PFMEA and Process Flow steps, and provides step by step details on how the process is controlled to product specification and how to respond to potential issues in the event of non-conformances.

Cpk
Cpk is an index that measures "process capability" and also accounts for process centering. It "estimates" the capability that could be achieved over time assuming a stable process. It looks at how close a process is running to its specification limits, relative to the natural variability of the process. The larger the index, the less likely it is that any item will be outside the specs. It uses a population estimator to calculate the standard deviation and therefore "estimates" what the process is capable of producing in the future.

D - E

Design Failure Mode Effects Analysis (DFMEA)
DFMEA is the application of the Failure Mode and Effects Analysis method specifically to product design. It is an analytical method performed cross-functionally and used in engineering to document and explore the ways that a product design might fail in real-world use.

Design Record
A copy of the drawing or related specifications. If the customer is design responsible this is a copy of customer drawing that is sent together with the Purchase Order (PO). If supplier is design responsible this is a released drawing in supplier's release system.

Detection Rating
The rating scale utilized in FMEA to evaluate the ability of the current design or process control to actually "detect" a failure mode based on the assessed testing method and the quality of evidence.

Dimensional Results
A list of all dimensions or requirements identified on the ballooned drawing and control plan. This list shows the product characteristics, specifications, measurement results, measurement method or final disposition.

Electronic Submission
Electronic submission is the sending of files and the final PPAP using IT applications (i.e. email, FTP sites).

Existing Part
A part currently made by a supplier.

G - 0

Gage R&R
Gauge R&R measures the amount of variability induced in measurements that comes from the measurement system itself and compares it to the total variability observed to determine the viability of the measurement system. A Gage R&R study is used to determine the repeatability and reproducibility of a specific gage or measurement device.

Initial Process Studies
The purpose of initial process studies (CpK, Ppk) is to determine if the production process is likely to manufacture product that will meet our requirements.

Interim Status
Interim approval permits shipment of material for production requirements on a limited time or piece quantity basis.

Levels
Determine which of the 18 elements are required at the time of submission. Level 3 is the default submission unless you have prior agreement with Prestolite.

Master Samples
A sample signed off by Customer and Supplier that are used to train operators on subjective inspections such as visual or for noise. It documents the current revision level of the product being manufactured.

Material Test Results
Specific requirements defined by Prestolite that validates the design verification plan and report and summarizes appropriate performance and functional test results.

Measurement System Analysis (MSA)
MSA usually contains the Gage R&R for the critical or high impact characteristics, and a confirmation that gauges used to measure these characteristics are calibrated.

New Part
A part made from an approved, new or changed drawing that the current part number or revision level has not been used in mass production.

Occurrence Rating
The rating scale utilized in FMEA that estimates how many times a potential failure may occur.

P - R

Part Submission Warrant (PSW)
This is the form that summarizes the whole PPAP package. This form shows the reason for submission (i.e. design change, annual revalidation, etc.) and the level of documents submitted to the customer. If there are any deviations, the supplier should note on the warrant or inform the customer that PPAP cannot be submitted.

Performance Test Results
Performance Test Results covers all tests for a product, part or product materials when performance or functional requirements are specified by the design record, control plan or customer request.

Production Part Approval Process (PPAP)
PPAP is used to establish confidence in component suppliers and their production processes, by demonstrating that all customer engineering design records and specification requirements are properly understood by the supplier. It validates that the process has the potential to produce product consistently meeting these requirements during an actual production run at the quoted production rate.

Ppk
Ppk is an index that measures actual "process performance" or whether the sample that you have generated from the process is capable of meeting customer requirements. Ppk estimates total standard deviation by using individual values and it tells you how the process has performed in the past. It should be used only for measuring the capability of past performance over the long term when identifying issues and determining future improvement.

Process Failure Mode Effects Analysis (PFMEA)
The PFMEA follows the Process Flow steps and identifies potential modes of failure during the fabrication and assembly of each component. The PFMEA is a living document that serves to continuously address and reduce the potential of failure and non-conforming product.

Process Flow Diagram
Process Flow Diagram is a process map in the form of a flow chart that outlines all steps in the production process, including incoming components. In PPAP, it should focus on the manufacturing process, including rework and repair.

Rejected Status
Used when a PPAP is determined to be unacceptable at the current part number or revision level and requires re-submission for approval.

Risk Priority Number (RPN)
During an FMEA activity and after ranking the severity (S), occurrence (0) and detection (D) an RPN number can be easily calculated by multiplying these 3 numbers together: RPN = Severity (S) x Occurrence (0) x Detection (D)

RPN Threshold
An RPN threshold is a specific number chosen as the point when action on a failure mode is required. For example, if you have an RPN threshold of 50, then any failure mode with an RPN value higher than 50 would require action on the right hand side of the FMEA form. Prestolite discourages against using arbitrary RPN thresholds and encourages suppliers to improve the top 20%-30% of the highest RPN values generated during the FMEA exercise.

S - Z

Sample Production Parts
Sample parts are the parts delivered with the PPAP submission and should be the same parts measured in the dimensional report. The default quantity is 3 parts for all submissions unless there is a multi-cavity mold. For multi-cavity molded parts suppliers need to provide 1 part per cavity.

Severity Rating
The rating scale utilized in FMEA to determine and estimate the "severity" of the failure modes based on the functional requirements and their effects.

Special Characteristics
A Special Characteristic is the key measurable characteristic(s) of a product or process whose performance standards or specification limits must be met in order to satisfy the customer. These are typically the most important characteristics of the part design.

Supplier Change Request (SCR)
This document is used for initiating all supplier changes through Prestolite.

Appendix B – Retention/Submission Requirements Table

		Submission Level				
Required Elements		***Level 1***	***Level 2***	***Level 3***	***Level 4***	***Level 5***
1	Design Record & Ballooned Drawings	**R**	**S**	**S**	*	**R**
2	Approved Engineering Change Documents	**R**	**S**	**S**	*	**R**
3	Customer Engineering Approval	**R**	**R**	**S**	*	**R**
4	Design FMEA	**R**	**R**	**S**	*	**R**
5	Process Flow Diagrams	**R**	**R**	**S**	*	**R**
6	Process FMEA	**R**	**R**	**S**	*	**R**
7	Control Plan	**R**	**R**	**S**	*	**R**
8	Measurement Systems Analysis (MSA)	**R**	**R**	**S**	*	**R**
9	Dimensional Results	**R**	**S**	**S**	*	**R**
10	Material, Performance Test Results	**R**	**S**	**S**	*	**R**
11	Initial Process Studies	**R**	**R**	**S**	*	**R**
12	Qualified Laboratory Documentation	**R**	**S**	**S**	*	**R**
13	Appearance Approval Reports (AAR)	**S**	**S**	**S**	*	**R**
14	Sample Production Parts	**R**	**S**	**S**	*	**R**
15	Master Sample(s)	**R**	**R**	**R**	*	**R**
16	Checking Aids	**R**	**R**	**R**	*	**R**
17	Records of Compliance with Customer-Specified Requirements	**R**	**R**	**S**	*	**R**
18	Part Submission Warrant (PSW)	**S**	**S**	**S**	**S**	**R**

S = Supplier must submit to the Customer and retain a copy of record/documentation on site

R = Supplier must retain record/documentation on site and make available Customer upon request

***** = Supplier must retain record/documentation on site and submit to Customer upon request

Appendix C – Revision History

Revision	*Revision Date*	*Page(s)*	*Description of Change*
PRE	November 8, 2016	All	Initial DRAFT
A	November 15, 2016	4 & 29	(P. 4) Referenced Appendix B; (P. 29) Added Appendix B to handbook
B	August 28, 2017	5	Added process flow diagram to SCR section
C	September 28, 2017	10	Removed interim status for PPAP; Prestolite no longer grants interim approval
D	May 24, 2018	7	Added verbiage to Special Characteristics section to include consideration of safety related characteristics