This PPAP File Is Under Construction
Production Part Approval Process

- Provides proof of capability
- Made up of documents from APQP
PPAP Applies To:

• Parts taken from a significant run
• One hour to one shift
• 300 parts minimum, normally
  – Lesser quantities needs customer approval
• One part from each position for multiple cavity, die, mold, tool pattern to be measured
PPAP Purpose

• Ensure that customer design record and specification requirements are understood

• Ensure that the process has potential to produce product meeting these requirements
Formal Submission

- Always required
- Prior to first production shipment of a new part or product
- When a discrepancy is corrected on a previously submitted part
- In case of an engineering change to:
  - Design records
  - Specifications
  - Materials
- Use of optional construction or material
- Production uses new or modified tools, dies, molds, patterns, etc.
- Refurbishing or rearranging of existing tooling or equipment
- Changes in process or method of manufacture
- Tooling and equipment is transferred from/to a different location
- Change in subcontractor source for:
  - Parts
  - Materials
  - Services (heat treat, plating)
- Production resumes after being inactive for more than one year
- Customer requests shipments to be suspended due to a customer concern
- Customer may waive or require partial submission (get in writing!)
- Applies to Tier 1 and Tier 2. Tier 3 ‘On the way’
Submission Waiver

- Waiver is for submission only, NOT entire PPAP activity
- Customer initiated
- PPAP file shall be reviewed and updated, including name of individual granting waiver and date
PPAP Submission

• Supplier must notify customer and customer will determine need for part submission
• Purpose is to identify changes that may affect direct customer or ultimate purchaser
• Suppliers are responsible for subcontracted materials and services
Part Submission Warrant
Appearance Approval Report
(CFG-1002 5/95)

• Not applicable to all parts - Customer will specify

• Not all items must be completed - customer will specify

• Appearance evaluation

• Colour Evaluation - 1 for each colour
Samples

- Two sample parts - or as agreed to in the control plan
- Master samples retained by supplier for length of part approval
- Show customer approval date
- May be modified by customer
Customer and Supplier Design Records

- Must be maintained
- CAD/CAM math data
- Part(s) prints and latest revision levels
- Material specifications and latest revision levels
- Detail drawings
- Any authorized engineering changes incorporated in the part but not in the design record
Engineering Changes

• Any authorized engineering changes incorporated in the part but not in the design record
Dimensional Results

• Referenced to part drawing
• On a marked drawing
• Includes:
  – Cross-sections
  – Tracings from optical comparator
  – Sketches
Checking Aids

• Fixtures
• Models
• Templates
• Mylars
• Submission of checking aids
  – Specific to part being tested or inspected
  – May be waived by customer
Test Results Specified on Design Record

- Material tests
- Performance tests
- Durability tests
Process Flow Diagrams

- Updated after production trial run
- Need to indicate special characteristics generated at each step
- Generates characteristics matrix (optional)
- Completed during APQP
Design FMEA

- When the supplier has design control responsibility, a DFMEA must be submitted
Design FMEA Form
Process FMEA

- Must follow flow of process flow diagram
- Must include ALL process special characteristics (as a minimum)
Process FMEA Form
Control Plans

• Includes product and process special characteristics
• Includes SPC requirements
• Follows flow of process flow chart and PFMEA
• May be for a ‘family’ of parts if reviewed for commonality
• May require customer approval
Process Performance Evaluation

- Process potential studies for special characteristics and/or compliance characteristics
- Supporting studies
- Control charts
- Ppk ≥ 1.67
- Customer specific requirements
- Use the AIAG Fundamental SPC Manual
Measurement System Variation

• New or modified gages, measurement and test equipment
• Gage R&R studies for all special characteristics
• Follow AIAG Measurement System Analysis reference manual
Design Engineering Approval

• When required on customer’s part drawing or specification
Submission Levels

• Identified by customer

• Factors which may determine submission level:
  – QS 9000 compliance
  – Recognition status
    • Chrysler’s quality excellence
    • Ford’s Q1
    • GM’s supplier of the year
  – Part criticality
  – Experience with prior part submission
  – Supplier expertise with the commodity
  – Different suppliers may assign different submission levels to the same location
Level Requirements Chart
Forms

- Use forms referenced and documented in PPAP
- Exact facsimiles may be used
- Facsimiles must have customer approval prior to first submission
Process Requirements

- Supplementary layout results sheets
- Sketches
- Tracings (e.g., Optical comparator)
- Cross-sections
- CMM inspection point results
- Geometric dimensioning and tolerance sheets
- Other auxiliary drawings used with part drawing
- Copies must accompany dimensional results
- Each document must contain
  - part number
  - Change level
  - Drawing date
  - Supplier’s name
- Tracing shall be included when optical comparator is necessary for inspection
Part-Specific Inspection or Test Device

• If product, whole or in part, requires a specific device for inspection and/or test, it shall be submitted upon customer request
• Certify that all aspects of the device agree with part dimensional requirements
• All engineering change levels up to submission must be incorporated in the device
• Suppliers are responsible for device maintenance for the life of the device
• Gage R&R per customer requirements must be conducted (see the AIAG MSA reference manual)
Customer Identified Special Characteristics

- Customer safety
- Compliance with regulations
- Function
- Fit
- Appearance
Preliminary Process Capability Studies

- Performance evaluation
- Acceptable level determined for special characteristic prior to submission
- Evaluated using variables data
- Determine if process is likely to produce product that will meet customer requirements
- Other methods for evaluation can be used with customer approval
- Studies are short term - $P_{pk}$
Length

• Will not measure long-term (Cpk) variation in:
  – Materials
  – Methods
  – Equipment
  – Measurement system
  – Environment
Data

• Collect and analyze the data in the order produced and use control charts

• Collect and record all process information for each study:
  – Speeds
  – Feeds
  – Material
  – Hardness
  – Temperature
  – pressure
  – Etc.
Measurement System Analysis

• Do gage R&R prior to study on new gages and equipment
• Collect 25 or more sub-groups
• 100 individual readings, minimum
• Sampling plan can influence appearance of stability
Analysis

• Analyze control chart for instability
• if unstable, take corrective action
• Contact customer if stability cannot be achieved
• For stable processes calculate $P_p$ and $P_{pk}$
• Preliminary data can be replaced by long term data with customer approval
• For certain processes, other analytical tools, such as individual and moving range charts, are appropriate
• $P_p$ and $P_{pk}$ must be $\geq 1.67$
• When $1.33 \leq P_{pk} \leq 1.67$ process may not meet customer requirements. After part approval, begin production with additional attention to characteristic until ongoing $C_{pk} > 1.33$ achieved.
• $P_{pk} < 1.33$
  – Process is substandard for meeting customer requirements. if given interim approval, process improvement must be given high priority and documented in corrective action plan. Increased inspection and/or testing until $C_{pk} \geq 1.33$ is demonstrated. Revised control plan for interim actions must be reviewed and approved by the customer.
Unstable Processes

• $C_{pk}$ data is useless data for unstable processes
• Process may not meet customer requirements
• Special causes should be identified, evaluated and eliminated where possible
• Use 100% inspection and increased SPC sampling until a $C_{pk}$ of $> 1.33$ is demonstrated or until customer is satisfied
• Process improvement is a high priority and must be documented in a corrective action plan
• Revise control plan for customer approval
Stability Not Achieved by Submission Date?

• Corrective action plan required
• Interim revised control plan (100% inspection)
• Control plan must be approved by customer
Appearance Approval Requirements

- A separate Appearance Approval Report (AAR) for each part or series of parts when designated an ‘Appearance Item’
- After completion of required criteria, record required data
- Certain customers may not require entries in all spaces
- Completed AAR and representative parts submitted
- Receive parts disposition from customer
- AARs and part disposition must accompany warrant at final submission (see Appendix A for instructions)
Dimensional Evaluation

- On all parts and product materials with dimensional requirements
- Third party inspection services
  - Results must be submitted on their letterhead
  - Must be ‘certified’ lab
- Checked print must be used
- Indicate date on which Measurements took place
- Indicate date of the design record change level and any authorized engineering change document not yet incorporated in the design record but incorporated in the part
- If design record is math data, a hard copy must be submitted and marked to show where Measurements took place
- One of the parts must be identified and maintained as a ‘Master Sample’ (see PPAP page 14)
- Parts outside the specification should not be submitted without prior customer approval. Customer must be notified. Plan must be developed to address the problem.
Part Weight

- Determine part weight without packaging or shipping material
- Report weight in kilograms to 3 decimal places
- Weight Determination
  - Weigh 10 parts randomly selected and report the average weight
  - For parts less than 0.100 kilogram, weigh 10 parts together and report the average weight
Material Tests

• Chemical
• Physical
• Metallurgical
• Must perform tests required by material specifications and control plans
• If required, outside services must be performed by a ‘qualified’ source or customer’s qualified laboratory by special arrangement
• Third party laboratory services
  – Results must be submitted on their letterhead or normal report format
  – Name of laboratory that performed tests must be indicated
Required Tests

• All tests required in design records and related specifications are to be listed in a convenient format with quantity tested and actual results of each test, indicating:
  – Design record change level
  – Specific designation number, date and change level of the test specification
  – Testing date
  – Material supplier name
  – Subcontractor name for services
  – When required by customer, code number for material from customer’s approved source list
General

• Supplier is responsible for meeting all applicable specifications
• Do not submit parts and documentation results if they are outside specification
• Take corrective action to meet all design record requirements
• Contact customer if unable to meet all requirements
• Comply with customer developed material specifications and/or approved source list
• See AIAG PPAP reference manual Appendix A
Performance Tests

• Reporting
  – Indicate design record change level
  – Indicate number, date and change level of specifications
  – Indicate date that testing took place

• Supplier’s responsibility
  – Meet all applicable specifications
  – Do not submit if results are outside specification
  – Take corrective action required to meet all design record requirements
  – Contact customer if unable to meet all requirements
Parts Submission Warrant

• Upon satisfactory completion of all required Measurements and tests, enter all required information on the warrant (See AIAG PPAP reference manual Appendix A)

• A separate warrant is required for each part number

• Certain customers will not require entries in all spaces

• Responsible supplier official verifies:
  – Measurements and tests conform to customer requirements
  – Required documentation is available for proper submission level
  – Signs warrant and provides date, title and telephone number
Engineering Changes

- Inspection and testing requirements are determined by the extent of the changes.
- If certain dimensions are changed, the dimensional evaluation may be limited to those areas affected by the change.
- For guidance, contact the customer’s part approval activity.
Multiple Cavity Molds, Tools, Dies and Patterns

- Complete dimensional layer required from one part from each cavity as a minimum
- Supplier must identify by specific cavity for each part submitted
Master Sample and Record Retention

- Supplier must retain a complete record of findings and master sample(s) for each submission, including SPC results and, where applicable, appearance approval.
- Record should show conformance to all test specifications, including:
  - Dimensional
  - Chemical
  - Metallurgical
  - Physical
  - Other
- SPC results
- Appearance approval, if applicable
- Inspection results
- Laboratory test results
- Preliminary process capability results
- Preliminary process performance results
- Measurement System Analysis results
- Process flow diagrams
- Process FMEA
- Design FMEA (where applicable)
- Control plans
- Subcontractor warrants
- Subcontractor supporting documentation
- Subcontractor appearance approval (where applicable)
- Subcontractor master sample(s)
General

• Suppliers are required to complete and retail copies of all documentation identified in “requirements for Approval” regardless of submission level
• records of PPAP are to be maintained for the life of the part plus one calendar year
• Master samples retained
  – Same as PPAP, or
  – Until a new master sample is produced for the purpose of a customer approval
• Master sample must be identified by
  – Part number
  – Drawing level or revision level
  – Customer approval date
• Sample storage
  – Customer can modify retention for large parts
  – May be waived (must be in writing)
Part Submission Status

• NEVER ship production quantities before receiving customer approval (‘should’ be in writing)
• Supplier ‘may’ be notified of disposition
• Supplier must ensure that future production continues to meet all customer requirements
• “Self Certifying” suppliers send approved documentation unless customer advises otherwise
• No production parts can be shipped until approval is received
Approval Options

• Approval for Production
  – meets all customer specifications and requirements
  – Supplier authorized to ship production quantities to customer releases

• Interim approval
  – Permits shipment on a limited time or piece quantity basis
  – Granted when supplier has:
    • Clearly defined root cause of nonconformance
    • Prepared an interim action plan agreed to by the customer
    • Resubmission is required unless customer revises drawings or specifications to
      agree with part
  – Must meet agreed upon action plan by expiration date or be rejected
  – No additional shipments authorized except by extension of interim approval

• Rejection
  – Submission, parts and/or accompanying documentation do not meet customer
    requirements
  – Product and documentation must be corrected
  – New submission required
  – No part shipments until approval