



American Metal Technologies, LLC

Supplier PPAP Handbook

Scope

This document describes the forms and practices those suppliers to American Metal Technologies (AMT) should adhere to when submitting "Production Part Approval Process" (PPAP) books & documents. Suppliers must note that the AIAG PPAP and other handbooks are referred to frequently in this packet. If needed, this packet and the forms it describes can be available electronically if requested.

Outline

First and foremost, suppliers are required to adhere to applicable AIAG, AIQG and/or ISO Standards and other industrial requirements when submitting PPAP documentation. It also must be noted that most AMT supplier PPAP documents are reviewed by our customers as well. Therefore, the proper labeling and organization of data and information must be put to good use to communicate the processes effectively. With today's age of fast technology and telecommunications, it is best to have information easily accessible and linked for easy review. For those reasons, AMT suppliers are required to submit an entire PPAP package that is in PDF format.

A PDF PPAP Package is an electronic PPAP submission that must include ALL sections required. Additional requirements may be requested, and those items must be placed in the package as well. This book must be organized per the referenced handbook and must be legible if printed. Preferred size of paper to be 8½x11" or 11x17" excluding blueprints. Please make use of bookmarks, where available, to help searching from section to section. The package's content section requirements are as follows:

- Title Page**
- Checklist/Contents List**
- Section 01 Design Records (Blueprints)**
- Section 02 Engineering Change Documents**
- Section 03 Customer Engineering Approvals**
- Section 04 Design FMEA (DFMEA)**
- Section 05 Process Diagram (Flow Map)**
- Section 06 Process FMEA (PFMEA)**
- Section 07 Control Plan**
- Section 08 Measurement Analysis (MSA/GR&R)**
- Section 09 Dimension Data (Per Cavity)**
- Section 10 Record of Material / Performance Test Results**
- Section 11 Initial Test Studies**
- Section 12 Qualified Laboratory Documents**
- Section 13 Appearance Approval Report (AAR)**
- Section 14 Sample Production Parts**
- Section 15 Master Sample**
- Section 16 Checking Aids**
- Section 17 Customer Specific Requirements (CSR's)**
- Section 18 Part Submission Warrant (PSW)**

Here is a summary of the subjects involving the packaged PPAP.

Title Page

The first page of the book must be a title page that contains the following information:

- Supplier name
- Customer (*American Metal Technologies*)
- Customer's Customer (*if known*)
- Part number & blueprint revision
- Part name/description
- *Suppliers may include company logos and such on this page.*

Checklist/Contents

This page is used to show what sections of the PPAP book are included (based on PPAP level). The part number and revision, as well as a "checked" list of the sections included.

Section 1 - Design Records for Details

This section must include an up to date, released "bubbled" print that reflects the full layout dimensionals shown in Section 9. Bubbled print means that all items that apply to supplier manufacturing must be numbered or itemized for ease of reference. Suppliers may choose to use prints that AMT has bubbled, or they may choose their own.

Section 2 - Authorized Engineering Change Documents

This section must include ANY engineering changes that are requested or were authorized, that do not adhere to the current blueprint being PPAP'ed. This section must include detailed information of what and when the item(s) will/have been changed. This may include any presentations, specs, e-mails, or other documentation that may explain the issues.

Section 3 - Customer Engineering Approval

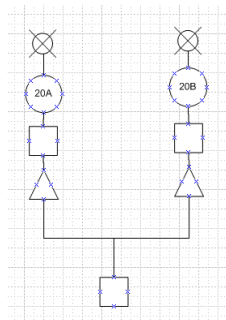
This section includes e-mails or signed documentation that shows that the changes requested from Section 2 are/were approved.

Section 4 - Design FMEA

This section contains the Design Failure Mode and Effects Analysis. This would be received from AMT or their customer and should be placed into the PPAP book.

Section 5 - Process Flow Diagram

This section contains the supplier's process flow diagram also known as the flow map. This diagram, which may span over several pages, should depict the supplier's process in its entirety (Receiving, Manufacturing, Inspection, Shipping, etc.). The process steps should be labeled and numbered to track the process steps in the PFMEA (Section 6) and Control Plan (Section 7). Processes that need several pages should be linked so that process can be followed correctly. When there are separate (sub) processes that lead to a main process (sand cast mold making and sand cast core making) it may be best to have those linked in parallel on the same sheet as shown in Picture 1.



Picture 1

Section 6 - Process FMEA

This section contains the supplier's Process Failure Mode and Effects Analysis chart. This should follow the supplier's process in its entirety (Receiving, Manufacturing, Inspection, Shipping, etc.). The process steps should be labeled and numbered to track the Process Flow Diagram in Section 5. Special Impact Characteristics (SIC), High Impact Characteristics (HIC), and other means of high interest to a customer should be noted in the CLASS column of the chart. The scales in which this chart operates are very important. For each of the three scales (severity, occurrence, and detection) a factor of 1 is highly unlikely. This tends to mean that your process is either nearly perfect in occurrence or detection (doubtful unless proven), or that the severity is negligible. A factor of 9 or 10 states that either there are some poor process faults for occurrence or detectable capabilities should be improved, or there are some serious safety issues that need to be addressed. In either case, please be aware of how exactly you show and grade your process.

Section 7 - Control Plan

This section contains the supplier's Process Control Plan chart. This section should follow process steps listed in the Process Flow Diagram (Section 5) and the Process FMEA (Section 6). ALL dimensions that are bubbled on the print including items that are not on the print that pertain to your process should be shown here, as well as the means you use to control them, and how frequent your checks are. Remember that more critical dimensions may have a higher check frequency. Special Impact Characteristics (SIC), High Impact Characteristics (HIC), and alike should be shown in the SPECIAL CHAR. CLASS column of the chart.

Section 8 - Measurement System Analysis Studies

This section includes any Gage Repeatability & Reproducibility (GR&R) studies that are requested by AMT. These include attribute (gages that involve only a yes or no answer only) and variable (gages with readings that vary) GR&R studies. Critical dimensions should have a GR&R study when applicable. Customers may require all gages used to validate product to require a GR&R. The AIAG handbook is useful for detailing methods for validation. Rule of thumb is attribute GR&R's uses a 100-piece study & variable GR&R's use the ten pieces, checked by three people, three different times that gather 90 total readings and use the ANOVA method. *Note that percentages for Total Gage R&R under % Study Variation and % Tolerance should be $\leq 20\%$. It is highly preferred to have all variable GR&R studies done using Minitab® software. A combined GR&R and capability data summary should be in your first page(s). The summary should be in order with the data, and the capability data separated by cast cavity or similar.

Section 9 - Dimensional Results

This section must include a full dimensional report. It must include bubbled print items and other critical dimensions that may not be shown on the print. Five pcs. from each cavity are required. When casting features are not fully dimensioned on the print, the casting supplier must provide a full-part laser scan inspection with one piece per cavity that will compare all casting features to the master 3D CAD Data File. The inspection will include casting profile tolerances back to the datum plan. A detailed laser scan inspection report must be provided with the full dimensional report. If an item is shown out of tolerance, please list a brief explanation. For example, if a measurement is shown long on a cast face that will be machined, please write "Machine Stock" next to the measurement. Material specifications itemized on print must be noted as OK if specifications are met. However, material specification details should be placed in Section 10, which will be discussed later in Section 10. You must contact AMT Supplier Quality before submitting any PPAP that has any out-of-print conditions.

Section 10 - Records of Material/ Performance Test Results

This section includes material certifications and information (hardness, tensile strength, composition, salt tests etc.). Use a competent testing source with the correct scope and credentials. Submitted parts MUST be noted exactly and meet the material specifications stated on the print. Scaled x-ray pictures or scratch tests with details of what is shown should be placed in this section. Your suppliers of materials for parts should have their own PPAP shown here as well. For example, Supplier XYZ makes a valve that gets assembled into your part number 123, and you ship 123 to AMT, then you need a PPAP from supplier XYZ included.

Section 11 – Initial Process Studies

This section contains the capability study data. Capability studies must be done on critical measurements unless otherwise directed by AMT. The data should be separated by cavity. Results should be summarized in the same order as the GR&R and capability data summary in Section 8. It is highly preferred to have all capability studies done using Minitab® software. Limits for the studies should be observed as the following unless otherwise directed: All linear dimensions and angles tied back to a true position should have a minimum CPK & PPK of 1.0. All other true positions should have a minimum CPK & PPK of 1.67

Section 12 - Qualified Laboratory Documents

This section must include all supplier(s) TF, AS and ISO certifications, quality lab capabilities, and reaction plans used. If suppliers choose to use any outside sources for part dimensional verifications permanently or just for PPAP then those sources Qualified Lab Documents are required also.

Section 13 - Appearance Approval Report (AAR)

This section should contain a filled out and signed Appearance Approval Report. If not required, leave this section blank.

Section 14 - Sample Production Parts

This page provides the documentation of the requested sample amount of PPAP parts that were supplied to AMT.

Section 15 - Master Sample

Confirmation page stating that the master sample PPAP parts (each cavity) will be preserved at the supplier's facility for future referencing.

Section 16 - Checking Aides

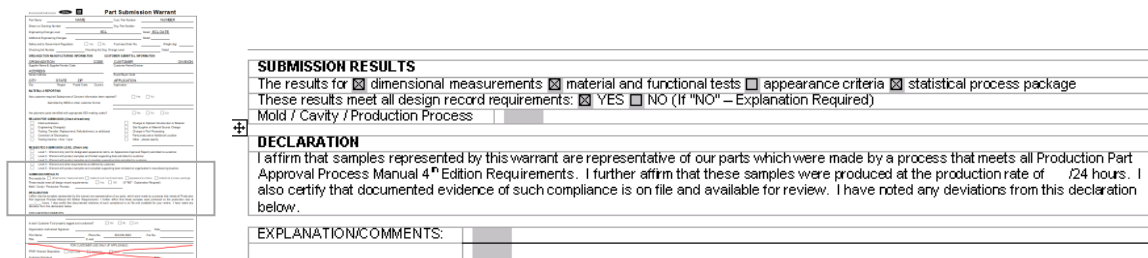
Gaging, packaging, or other "checking aides" instructions used on the floor are reported here.

Section 17 - Customer Specific Requirements

A weight study with an average of 10 pieces in units of kilograms and Run-At-Rate details are posted here. Suppliers must include pictures of tooling owned by the customer. Make the view far enough away to show the whole tool, then include close ups of the ID tags. Include all specifications from the customer used to manufacture the parts so that data can be analyzed properly.

Section 18 – Part Submission Warrant

Purchase Submission Warrant (PSW) must be inserted here. Unless otherwise discussed, all suppliers must submit an AIAG version of a PSW. All sections detailing this PPAP must be completed, use "N/A" for sections that don't require information. If a dimensional reading is out justly, a print change is requested, or if the parts were made incorrectly, make sure to check the "NO" box under "Submission Results" (Picture 2) and state why under "Explanation/Comments". For Mold / Cavity / Production Process, enter these details: Cast Type, Cavity #'s, and a brief process flow description. Here is an example: Sand Cast / Cavities 4-6 / Mold, Pour, Shake, Heat Treat, Blast, Clean, Pack.



The image shows a screenshot of a Part Submission Warrant (PSW) form. The form is divided into several sections. The 'SUBMISSION RESULTS' section contains checkboxes for 'dimensional measurements', 'material and functional tests', 'appearance criteria', and 'statistical process package'. Below this, there is a line for 'These results meet all design record requirements:' with 'YES' checked and 'NO' unchecked. The 'Mold / Cavity / Production Process' field is filled with 'Sand Cast / Cavities 4-6 / Mold, Pour, Shake, Heat Treat, Blast, Clean, Pack'. The 'DECLARATION' section contains a paragraph where the supplier affirms that the samples are representative of their parts and were produced at a rate of 1/24 hours. The 'EXPLANATION/COMMENTS' section is currently blank.

Picture 2

Final Notes Summary

When first given the job, be sure to ask questions about what level of PPAP you will be performing (Picture 3) and any other requirements or studies that may be need. You may request a PPAP checklist, or any forms needed to help you create your PPAP. Information is the key. Obtaining and using it will make this process run as smooth, and benefit all parties involved.

REQUESTED SUBMISSION LEVEL (Check one)

- Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to customer.
- Level 2 - Warrant with product samples and limited supporting data submitted to customer.
- Level 3 - Warrant with product samples and complete supporting data submitted to customer.
- Level 4 - Warrant and other requirements as defined by customer.
- Level 5 - Warrant with product samples and complete supporting data reviewed at supplier's manufacturing location.

Picture 3

Once your PPAP packet is ready, create a file in PDF format to send it to AMT. This will be reviewed by one or more individuals. Your PPAP may be rejected, and corrections may be needed, so give yourself enough time for adjustments.

After all changes and notes have been addressed and/or closed, an approved signed approved PSW can be sent to you. Please note that on occasion, an interim PSW may be sent if not all elements meet the outcome needed, so some changes may need to occur either in your process, quality checking, or PPAP package before a fully approved PSW can be signed. (Picture 4). AMT also reserves the right not to submit a fully approved PSW if the customer has not signed AMT's PSW in return due to supplier issues.

Part Name		NAME	Cust. Part Number	NUMBER
Sheet or Drawing Number			Orig. Part Number	
Engineering Change Level	ECL		Detail ECL DATE	
Additional Engineering Changes			Detail	
Safety and/or Government Regulation		<input type="checkbox"/> Yes <input type="checkbox"/> No	Purchase Order No.	Weight (kg)
Checking Aid Number	Checking Aid Eng. Change Level		Detail	
ORGANIZATION MANUFACTURING INFORMATION		CUSTOMER SUBMITTL INFORMATION		
ORGANIZATION	CODE	CUSTOMER	DIVISION	
Supplier Name & Supplier/Vendor Code		Customer Name/Division		
ADDRESS		Buyer/ Buyer Code		
Street Address				
CITY	STATE	ZIP	APPLICATION	
City	Region	Postal Code	Country	
MATERIALS REPORTING				
Has customer required Substantive of Concern information been reported?		<input type="checkbox"/> Yes <input type="checkbox"/> No		
Submitted by MDS or other customer format:				
Are polymeric parts identified with appropriate ISO marking codes?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
REASON FOR SUBMISSION (Check at least one)				
<input type="checkbox"/> Initial submission	<input type="checkbox"/> Engineering Change(s)	<input type="checkbox"/> Change to Optional Construction or Material		
<input type="checkbox"/> Tooling Transfer, Replacement, Refurbishment, or additional	<input type="checkbox"/> Correction of Discrepancy	<input type="checkbox"/> Sub-Supplier or Material Source Change		
<input type="checkbox"/> Tooling Inactive > 1 year	<input type="checkbox"/> Tooling Inactive > 1 year	<input type="checkbox"/> Change in Post Processing		
		<input type="checkbox"/> Parts produced at Additional Location		
		<input type="checkbox"/> Other - please specify		
REQUESTED SUBMISSION LEVEL (Check one)				
<input type="checkbox"/> Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to customer.				
<input type="checkbox"/> Level 2 - Warrant with product samples and limited supporting data submitted to customer.				
<input type="checkbox"/> Level 3 - Warrant with product samples and complete supporting data submitted to customer.				
<input type="checkbox"/> Level 4 - Warrant and other requirements as defined by customer.				
<input type="checkbox"/> Level 5 - Warrant with product samples and complete supporting data reviewed at organization's manufacturing location.				
SUBMISSION RESULTS				
The results for <input type="checkbox"/> dimensional measurements <input type="checkbox"/> material and functional tests <input type="checkbox"/> appearance criteria <input type="checkbox"/> statistical process package				
These results meet all design record requirements:		<input type="checkbox"/> Yes <input type="checkbox"/> NO (if "NO" - Explanation Required)		
Mail / City / Production Process				
DECLARATION				
I affirm that the samples represented by this warrant are representative of our parts, which were made by a process that meets all Production Part Approval Process Manual 4th Edition Requirements. I further affirm that these samples were produced at the production rate of _____ parts. I also certify that documented evidence of such compliance is on file and available for your review. I have noted any deviation from this declaration below.				
EXPLANATION/COMMENTS:				
Is each Customer Tool properly tagged and numbered?		<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> N/A		
Organization Authorized Signature		Date		
Print Name	Phone No.	888-666-5555	Fax No.	
Title	E-mail			
FOR CUSTOMER USE ONLY (IF APPLICABLE)				
PPAP Warrant Disposition:		<input type="checkbox"/> Approved <input type="checkbox"/> Rejected <input type="checkbox"/> Other		
Customer Signature		Date		
Print Name		Customer Tracking Number (optional)		

Picture 4