RGBSI Aerospace & Defense

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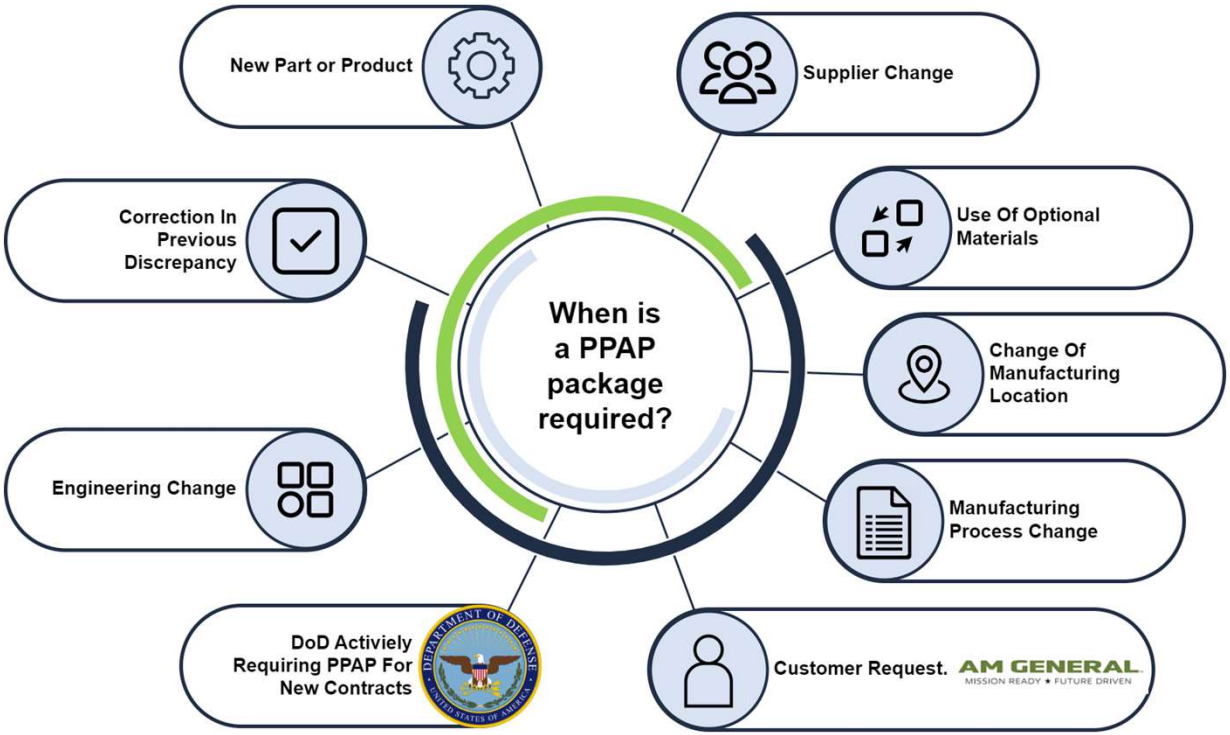
Production Part Approval Process (PPAP) Training

Production Part Approval Process

Definition: The Automotive Industry Action Group (AIAG) Production Part Approval Process (PPAP) is an industry standard that outlines the process to demonstrate engineering design and product specifications are met by the supplier's manufacturing process. PPAP principles help reduce delays and non-conformances during part approval by providing a consistent approval process.

Purpose: "To provide the evidence that all customer engineering design records and specification requirements are properly understood by the organization and that the manufacturing process has the potential to produce product consistently meeting these requirements during an actual production run at the quoted production rate." (*AIAG PPAP Manual 4th Edition)*

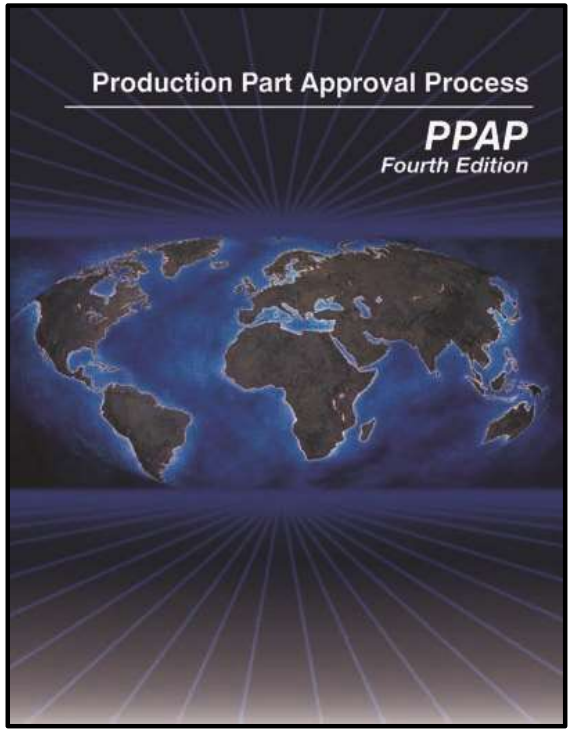


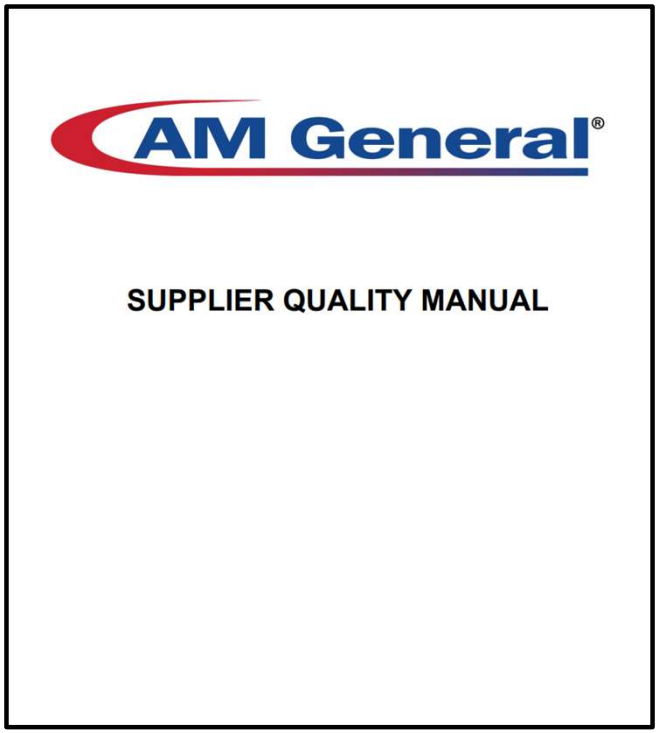
PPAP Resources

This training will provide direction on compiling a PPAP package using *AIAG PPAP Manual 4th edition*, *JLTV Specific Requirements*, and the *AMG PPAP Workbook: Supplier Quality Guidelines*.

The AM General (AMG) PPAP workbook includes all 18 elements in their respective forms, including instructions on accurate and thorough completion of required documentation. RGBSI A&D is honored to partner with AMG to help guide suppliers through PPAP and answer any questions that may arise.

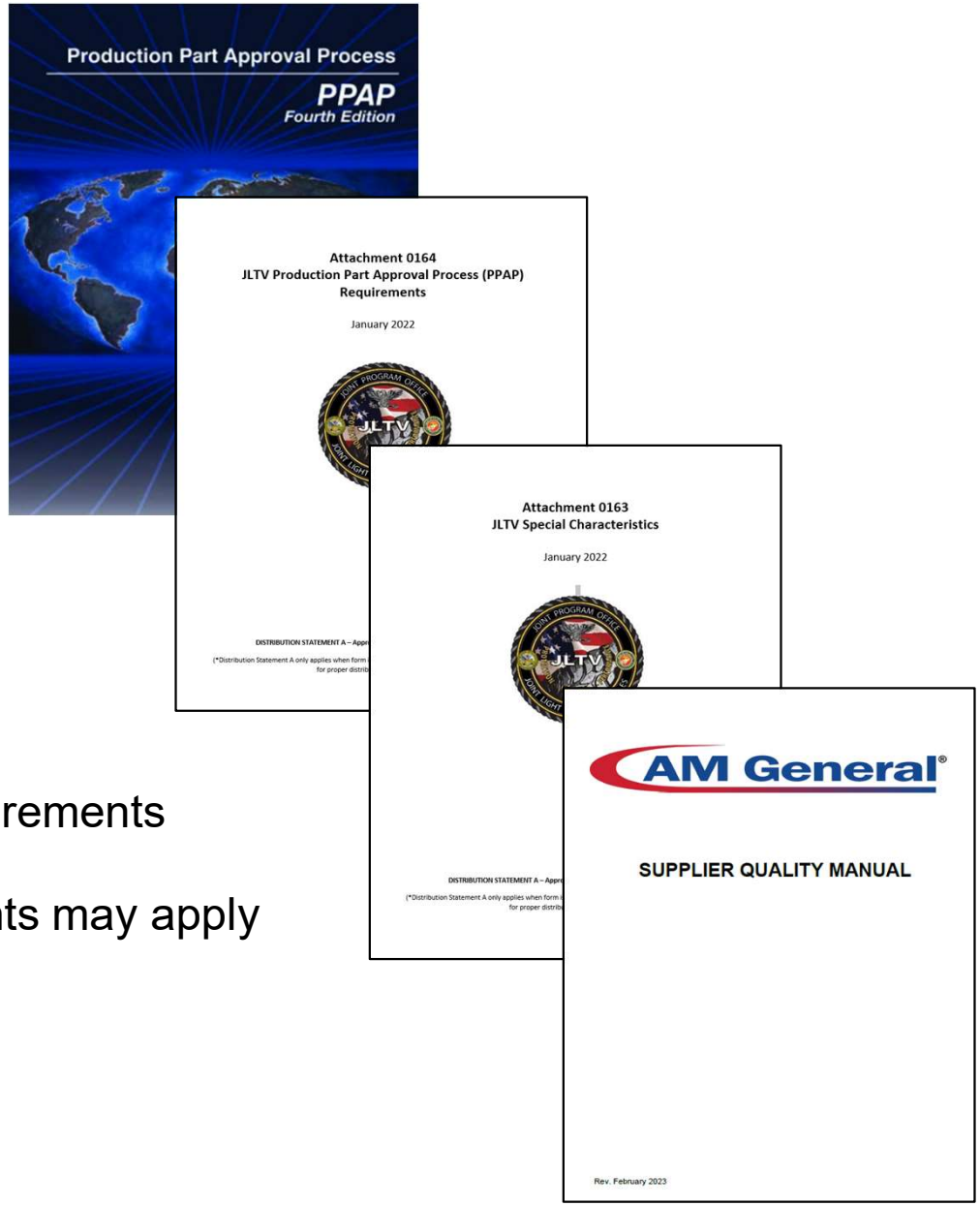
Unless specifically stated, all requirements of *AIAG PPAP Manual 4th edition* apply





PPAP Resources

- AIAG PPAP Manual 4th Edition
- JLTV PPAP Requirements - Attachment 0164
- JLTV Special Characteristics - Attachment 0163
- AM General Supplier Quality Manual
  - AM General Fastener Requirements
  - AM General Weld Requirements
  - AM General Paint/Coating Requirements
  - AM General Armor Material Requirements
  - AM General Radiographic Inspection Requirements
- Additional, Commodity-specific JLTV requirements may apply



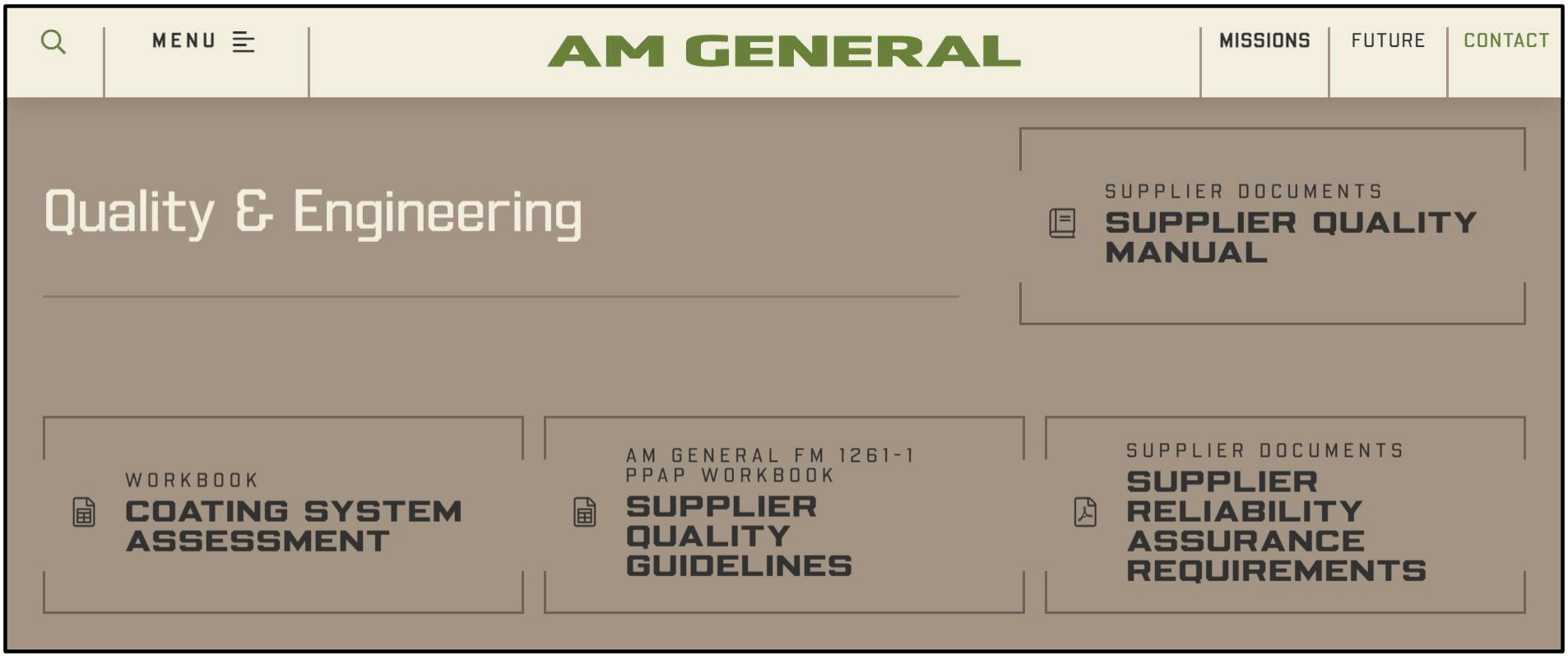
AM General Resources

AM General (AMG) provides resources to all suppliers to ensure that PPAP packages provided to AMG will be standardized. These resources are provided on AMG's official website:

AM General Supplier Resources

Resources are listed under "*Quality & Engineering*":

- *Supplier Quality Manual*
- *PPAP Workbook: Supplier Quality Guidelines*
- *Coating System Assessment*
- *Supplier Reliability Assurance Requirements*



PPAP Approval Types

Interim PPAP approvals may be granted to authorize a supplier permission to ship for a limited period or in a limited quantity. Interim Approval will only be granted when the organization has both:

1. Clearly defined the non-compliances preventing approval
2. Prepared an action plan agreed upon by AM General

Interim approvals require action plans in place to meet full production PPAP approval and must be agreed to by AMG Supplier Quality. A supplier must submit both a Part Submission Warrant (PSW) and an Interim Recovery Worksheet for materials in need of Interim approval.

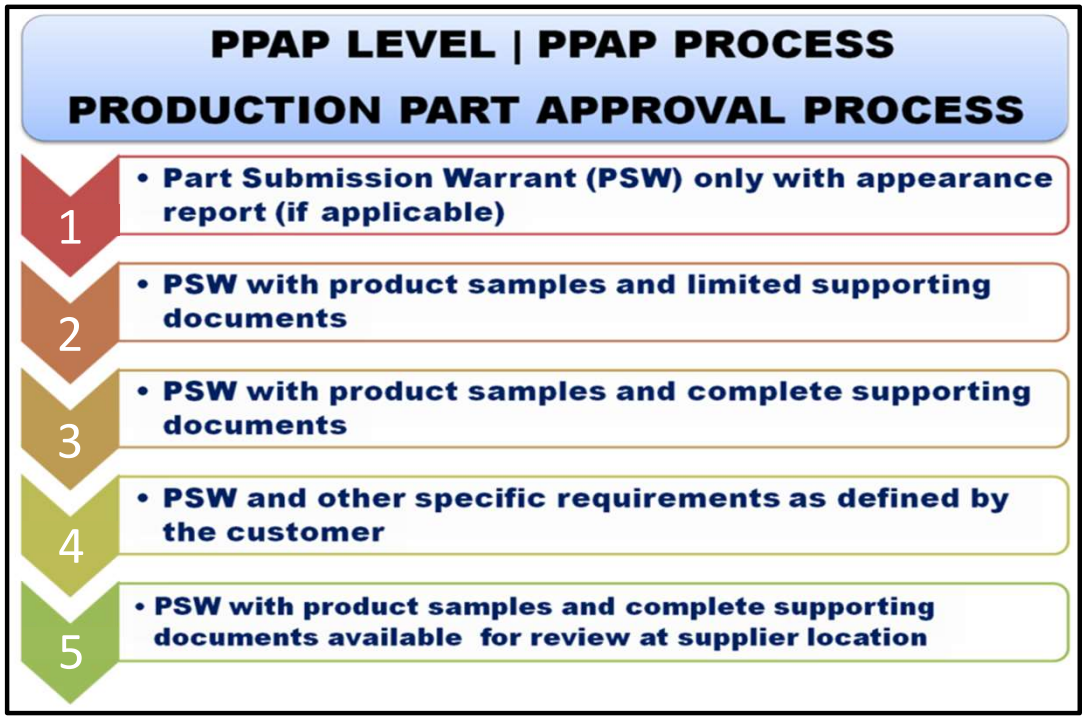
All interim approvals require action plans in place to achieve full PPAP approval within 120 days.

Element	Description	Interim Level 3	Full Level 3
1	Design Record	X	X
2	Authorized Engineering Change Documents	X	X
3	Customer Engineering Approval (if required)	X	X
4	Design Failure Mode and Effects Analysis (Design FMEA)		X
5	Process Flow Diagram(s)		X
6	Process Failure Mode and Effects Analysis (Process FMEA)		X
7	Control Plan		X
8	Measurement Systems Analysis (MSA) Studies		X
9	Dimensional Results	X	X
10	Records of Material / Performance Test Results	X	X
11	Initial Process Studies		X
12	Qualified Laboratory Documentation	X	X
13	Appearance Approval Report (AAR)		X
14	Sample Production Parts	X	X
15	Master Sample (Actual or Picture)	X	X
16	Checking Aids	X	X
17	Customer Specific Requirements, i.e. Component First Article Test (CFAT) Results.		X
18	Part Submission Warrant	X	X

PPAP Levels and Elements

AM General requires that all suppliers submit a Level 3 PPAP package for JLTV production.

All parts shall achieve Full or Interim (on an exception basis) PPAP Approval to the requirements specified herein. Note, that AM General is **NOT** authorized to waive or modify any PPAP requirement without Government approval for the JLTV Program.



Element	Level 1	Level 2	Level 3	Level 4	Level 5
1 Design Records	R	S	S	*	R
- For proprietary components/details	R	R	R	*	R
- For all other components/details	R	S	S	*	R
2. Engineering Change Documents	R	S	S	*	R
3. Customer Engineering Approval	R	R	S	*	R
4. Design Failure Mode & Effect Analysis	R	R	S	*	R
5. Process Flow Diagrams	R	R	S	*	R
6. Process Failure Mode & Effect Analysis	R	R	S	*	R
7. Process Control Plan	R	R	S	*	R
8. Measurement System Analysis Studies	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. Apperance Approval Report (AAR)	S	S	S	*	R
14. Sample Product	R	S	S	*	R
15. Master Sample	R	R	R	*	R
16. Checking Aids	R	R	R	*	R
17. Records of Compliance for Customer Requirements	R	R	S	*	R
18. Part Submission Warrant (PSW)	S	S	S	S	S
Bulk Material Checklist	S	S	S	S	S

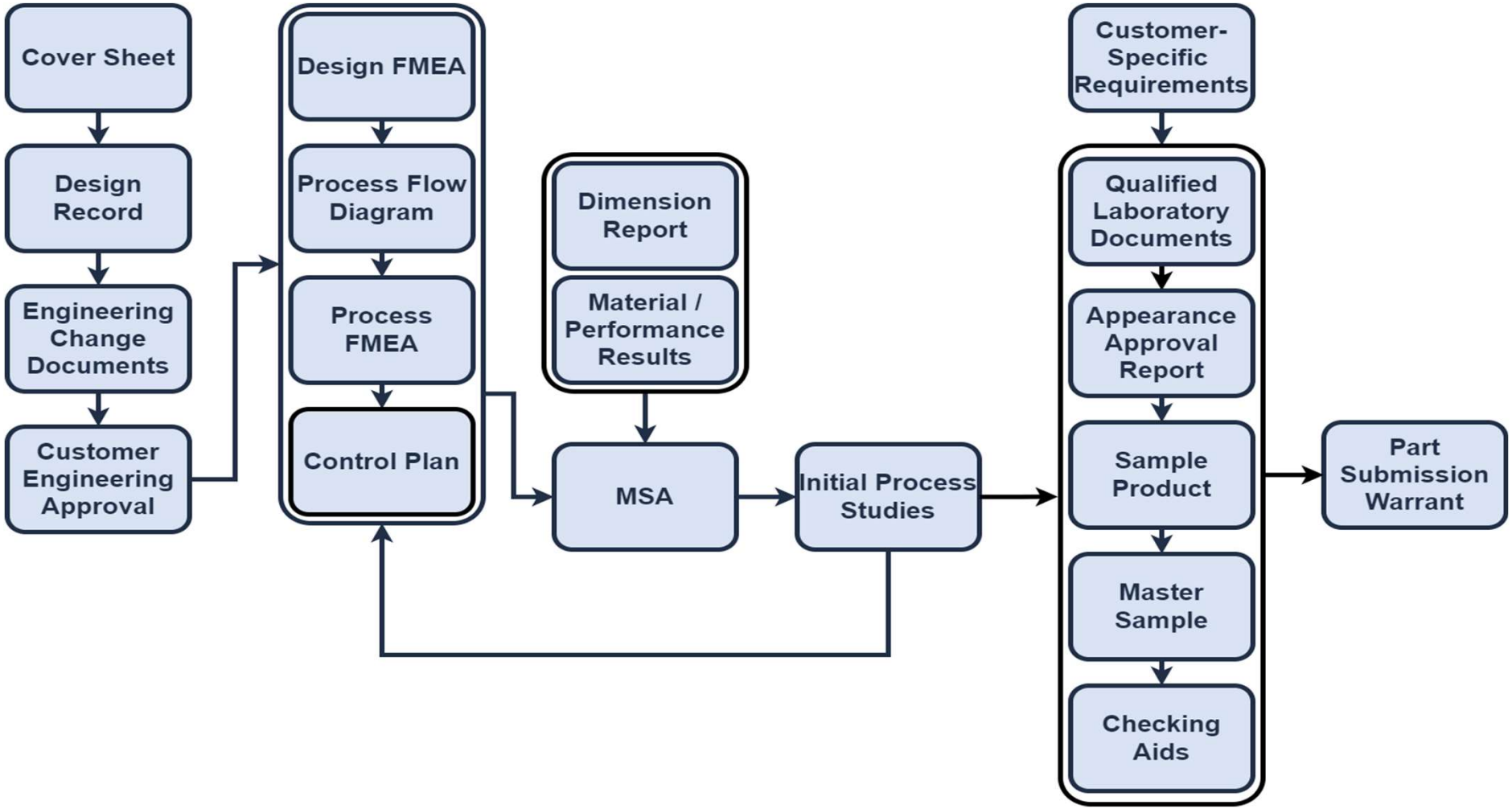
S - Submit to the customer. (S)

R - Retain at manufacturing location and make available to the customer if requested. (R)

* - Retain at manufacturing location and submit to the customer if requested. (*)

JLTV PPAP Workflow

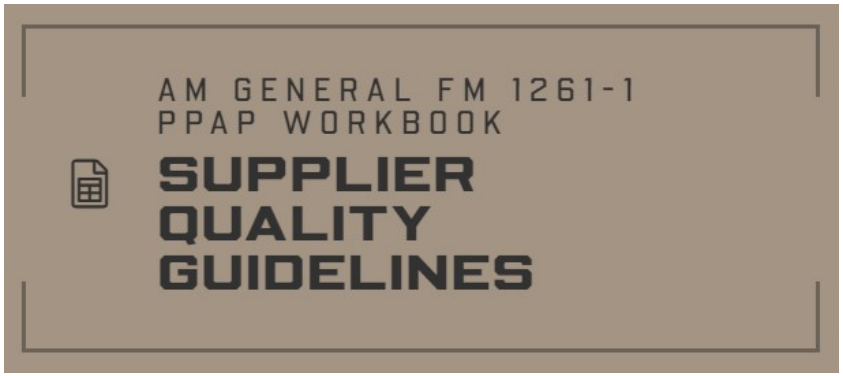
The following training material provides instruction for the completion of all level 3 PPAP requirements for the JLTV program, including the definition, purpose, and how to satisfy requirements of each element defined by the *AIAG PPAP Manual 4th edition*. A sample PPAP workbook has been provided as a part of this training as guidance for accurate PPAP completion.

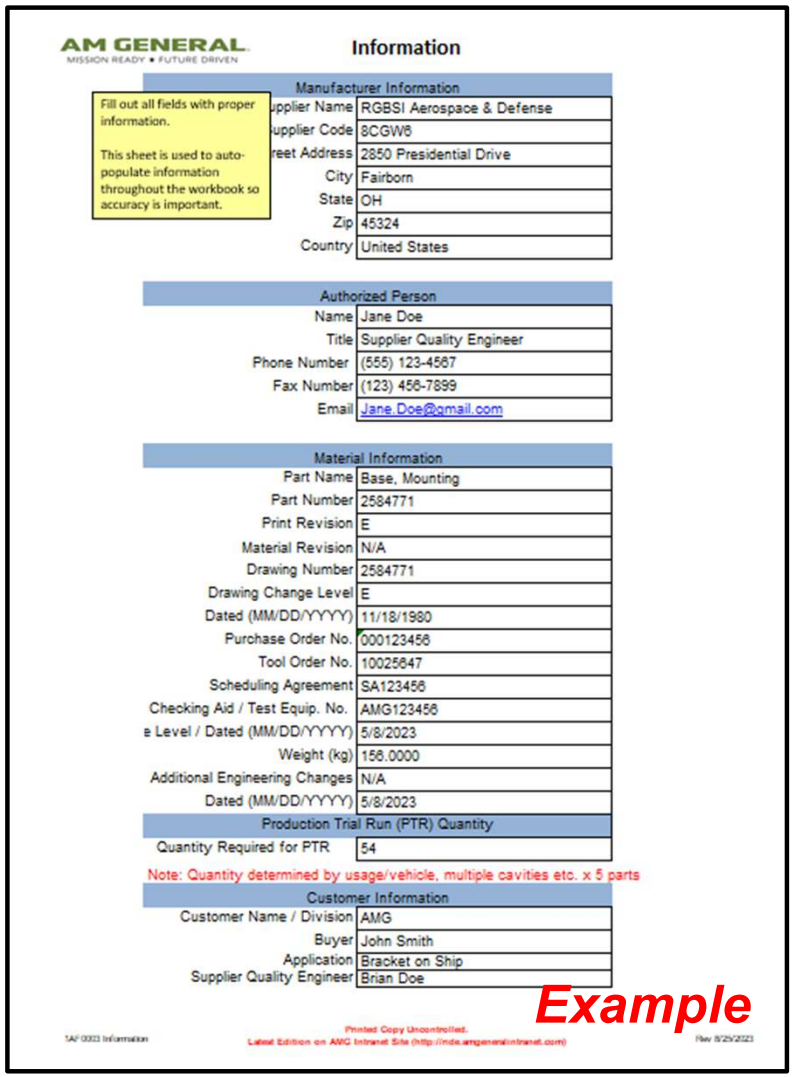


AMG PPAP Workbook

The information sheet must be filled out with accurate information about the manufacturer, authorized personnel, material information, production trial run (PTR) quantity, and customer information. This sheet will be used to auto-fill information throughout the PPAP package.

AM General Supplier Resources





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Information

Fill out all fields with proper information.

This sheet is used to auto-populate information throughout the workbook so accuracy is important.

Manufacturer Information	
Supplier Name	RGBSI Aerospace & Defense
Supplier Code	8CGW6
Street Address	2850 Presidential Drive
City	Fairborn
State	OH
Zip	45324
Country	United States

Authorized Person	
Name	Jane Doe
Title	Supplier Quality Engineer
Phone Number	(555) 123-4567
Fax Number	(123) 456-7899
Email	Jane.Doe@gmail.com

Material Information	
Part Name	Base, Mounting
Part Number	2584771
Print Revision	E
Material Revision	N/A
Drawing Number	2584771
Drawing Change Level	E
Dated (MM/DD/YYYY)	11/18/1980
Purchase Order No.	000123456
Tool Order No.	10025647
Scheduling Agreement	SA123456
Checking Aid / Test Equip. No.	AMG123456
e Level / Dated (MM/DD/YYYY)	5/8/2023
Weight (kg)	156.0000
Additional Engineering Changes	N/A
Dated (MM/DD/YYYY)	5/8/2023

Production Trial Run (PTR) Quantity	
Quantity Required for PTR	54

Note: Quantity determined by usage/vehicle, multiple cavities etc. x 5 parts

Customer Information	
Customer Name / Division	AMG
Buyer	John Smith
Application	Bracket on Ship
Supplier Quality Engineer	Brian Doe

Example

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PPAP Submission Requirements

The submission requirements sheet contains specific PPAP instructions and submission requirements for JLTV Production, including the conditions of an interim PPAP approval.

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PPAP Submission Requirements — *Example*

ALL PPAP SUBMISSIONS must be submitted electronically to eQLM

Supplier Name	0	Purchase Order No.	0
Supplier Code	0	Reason for Request	
Part Name	0	Application	0
Part Number	0	Date Issued	
Revision	0	Submission Due Date	

UNLESS OTHERWISE SPECIFIED IN WRITING BY AM GENERAL SUPPLIER QUALITY REPRESENTATIVE (SQE) :

Default submission is Level 3	Submission Level					
PPAP Submission Requirements and Detail Description	1	2	3	4	5	P
0a) PPAP Coversheet	S	S	S	S	S	S
0b) Part Submission Warrant (PSW)	S	S	S	S	S	S
1) Design Records (Bubble Print all features, notes, and specifications)	R	S	S	S	S	S
2) Engineering or Supplier Change Request (AMG Process Change Notification) - if applicable	R	S	S	S	R	S
3) Customer Engineering Approval - if applicable.	R	R	S	S	R	S
4) Design Failure Modes Effects Analysis (DFMEA) - supplier design responsible	R	R	S	S/R/O	R	S
5) Process Flow Diagram (PFD)	R	R	S	S/R	R	S
6) Process Failure Modes Effects Analysis (PFMEA)	R	R	S	S/R	R	S
7) Process Control Plan	R	R	S	S	R	S
8) Measurement System Analysis (MSA) - Measurement equipment must be supported with MSA.	R	R	S	S	R	R
9) Dimensional Results - 6 Piece full layout required. (Prototype quantities SQE defined)	R	S	S	S	R	S
10) Material / Performance Test Results. PRINT NOTES: Material, Surface Finish, Labeling, Performance, Paint Process, Coating, Welding Documentation IE WPS/PQRs/Welder Certs, Plating, Heat Treat, Fat Report etc. And all Certificates of Conformance Related to Special Processes.	R	S	S	S	R	S
11) Initial Process Studies - Must be provided for all print, specification, AMG SQE deemed critical characteristics, and internal supplier deemed critical characteristics. (Additional process studies maybe requested based upon 6 pc. dimensional layout results standard deviation and distribution.)	R	R	S	S	R	S
12) Qualified Laboratory Documentation. (Internal and or 3rd Party required for all tests conducted.)	R	S	S	S/R	R	R
13) Appearance Approval Report (AAR) - if applicable	R	S	S	S/R/O	R	S
14) PPAP Sample Product- PTR Production Trial Run parts/ upon request prior to production order	S	S	S	S	R	R
15) Master Sample (Submit/Retain Photo Documentation of PPAP layout part(s) Retain Part.	R	R	S	S/R	R	R
16) Checking Aids (Fixture, gage, template, etc) - if applicable	R	R	S	S/R/O	R	R
17) Records of Compliance with Customer Specific Requirements. If applicable (CQI, Capacity, Etc.)	R	R	S	S/R	R	R
18a) Part Submission Warrant (PSW)	S	S	S	S/R	R	S
18b) Interim Part Submission Warrant (PSW) - if applicable	R	R	S	S/R	R	R
Bulk Materials Refer to AIAG PPAP 4th ed. Table 4.1 and Appendix F						

Fill out cells not auto-populated. Review submission requirements.

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PPAP Submission Requirements — *Example*

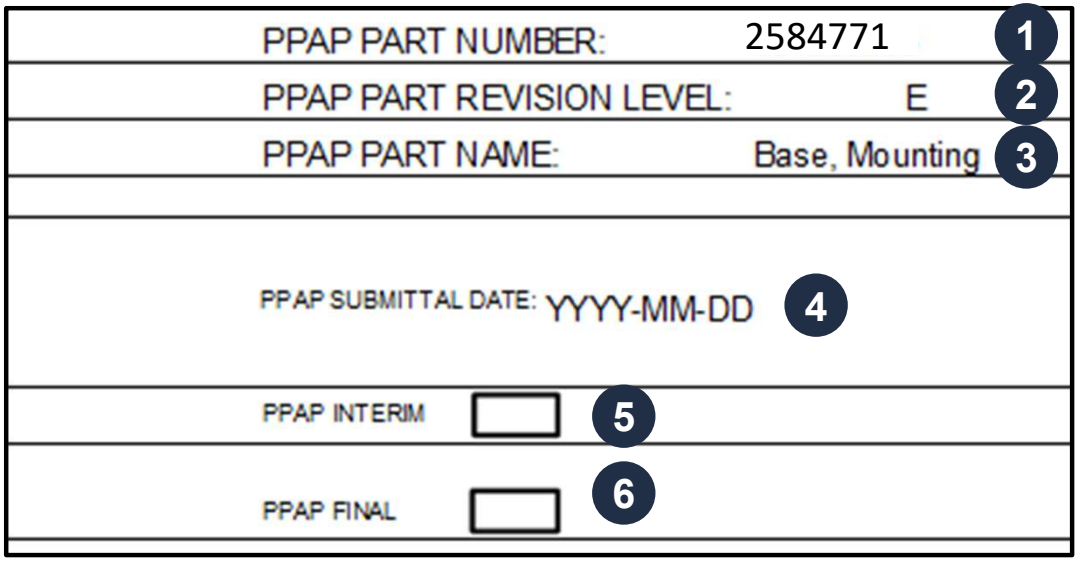
Submission Instructions Below
PPAP Submission Package is to have each Element submitted in AM General or AIAG approved format and in PDF format. For areas that are not applicable, include a sheet for the Element with N/A. Example: For non-design responsible suppliers, the element sub-divider would indicate: "DFMEA N/A" **NOTE-Use ALT+Enter to go to a new line in the box below. Just using the Enter key will exit the box.**
1: The "Information" tab feeds the rest of the workbook with information automatically so make sure the information is correct and accurate.
2: All elements of the PPAP document must be submitted as a PDF and each element must be submitted separately and in the correct order. Included in the name of each element are the element number, the element description, the Part Number, and the revision number. Example: (1. Design Record-PPAP #12345678 Rev A) (2. Engineering Change Document-PPAP #12345678 Rev A)
3: The "PPAP Cover Sheet" Must be submitted as item 0 with the rest of the PPAP workbook.
4: PPAP element #1 Design Records (Bubble Print all features, notes, and specifications). Be fully sure to account for: a. Every print note and related test requirement must be accounted for and ballooned. b. Every print characteristic must be accounted for and ballooned. c. Every subcomponent part number must be accounted for and ballooned and a separate subcomponent PPAP must be submitted following the level 3 submission requirements. d. Every referenced specification must be accounted for and ballooned. Every clause, note, test requirement, etc. applicable to design record requirements are to also be individually e. The collection of all ballooned numbers shall be sequential and have a resultant value or outcome ("complies" or "acknowledged" etc. are not permissible).
5: If a process step is on the Process Flow Diagram then it must be on the PFMEA AND the Control Plan. All steps must match in numbering and sequence.
6: For element "10. Mat Perf Test (FAT Report)", all documents submitted must be submitted in a folder marked "10 Material performance test results-PPAP #12345678 Rev A" and all test results must have the part number, the print revision, and the print note that the test refers to at the top of the first page. The documents must be saved with the following format "10A Name of test-PPAP #12345678 Rev A" and additional documented testing must be saved in sequence, for example "10B Name of test-PPAP #12345678 Rev A" "10C Name of test-PPAP #12345678 Rev A"
7: All Component First Article Test (CFAT) results shall be placed within folder 10.
8: For elements 14 and 15 the 6 dimensional parts should be used for the 1 master sample and the 5 PTR samples.
9: For element 17 (Records of compliance) all documents submitted must be submitted in a folder marked "17 records of compliance-PPAP #12345678 Rev A" and all test results must have the part number, the print revision, and the print note that the test refers to at the top of the first page. The documents must be saved with the following format "17A Name of record-PPAP #12345678 Rev A" and additional documented testing must be saved in sequence, for example "17B Name of record-PPAP #12345678 Rev A" "17C Name of record-PPAP #12345678 Rev A"
10: All sub components for an assembly must also have a level 3 PPAP (at minimum) and must be submitted in their own PPAP folder within element 10 Material performance test results folder.

All documents shall be submitted in AM General or AIAG approved format.

0. PPAP Cover Sheet

Definition: The PPAP Cover Sheet must be attached with the PPAP package with information for the PPAP part, submission date, and the type of PPAP approval.

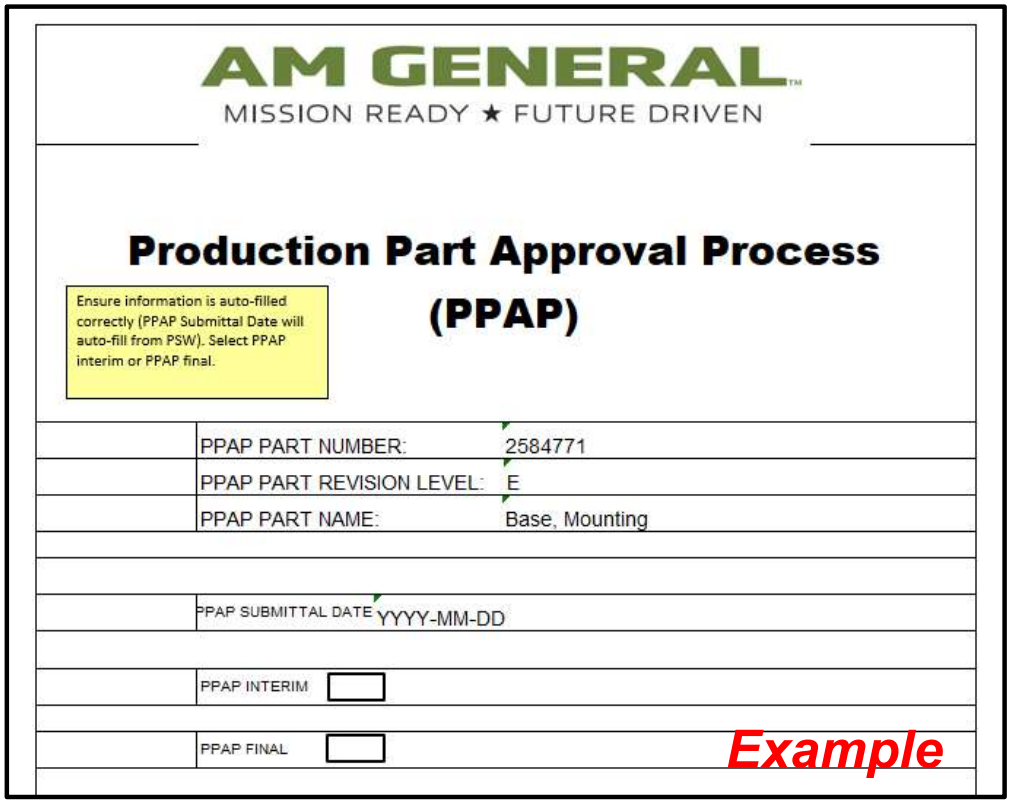
Purpose: Provide information needed to identify the PPAP and its status



1	**PPAP Part Number**: The unique identifier assigned to a part. Auto-filled from Information tab.	3	**PPAP Part Name**: Nomenclature, descriptive title or label for a part. Auto-filled from Information tab.	5	**PPAP Interim**: Specifies that the PPAP package is in an interim status.
2	**PPAP Part Revision Level**: Identifier of design record revision used. Auto-filled from Information tab.	4	**PPAP Submittal Date**: Date PPAP package was submitted to the customer. Auto-filled from PSW tab.	6	**PPAP Final**: Specifies that the PPAP package is in a final status.

0. PPAP Cover Sheet

How to: Ensure information is auto-filled correctly from the Information and PSW tabs. Select PPAP interim or PPAP final depending on the type of approval granted in coordination with AMG Supplier Quality.



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Production Part Approval Process

(PPAP)

Ensure information is auto-filled correctly (PPAP Submittal Date will auto-fill from PSW). Select PPAP interim or PPAP final.

PPAP PART NUMBER:	2584771
PPAP PART REVISION LEVEL:	E
PPAP PART NAME:	Base, Mounting
PPAP SUBMITTAL DATE	YYYY-MM-DD
PPAP INTERIM	☐
PPAP FINAL	☐

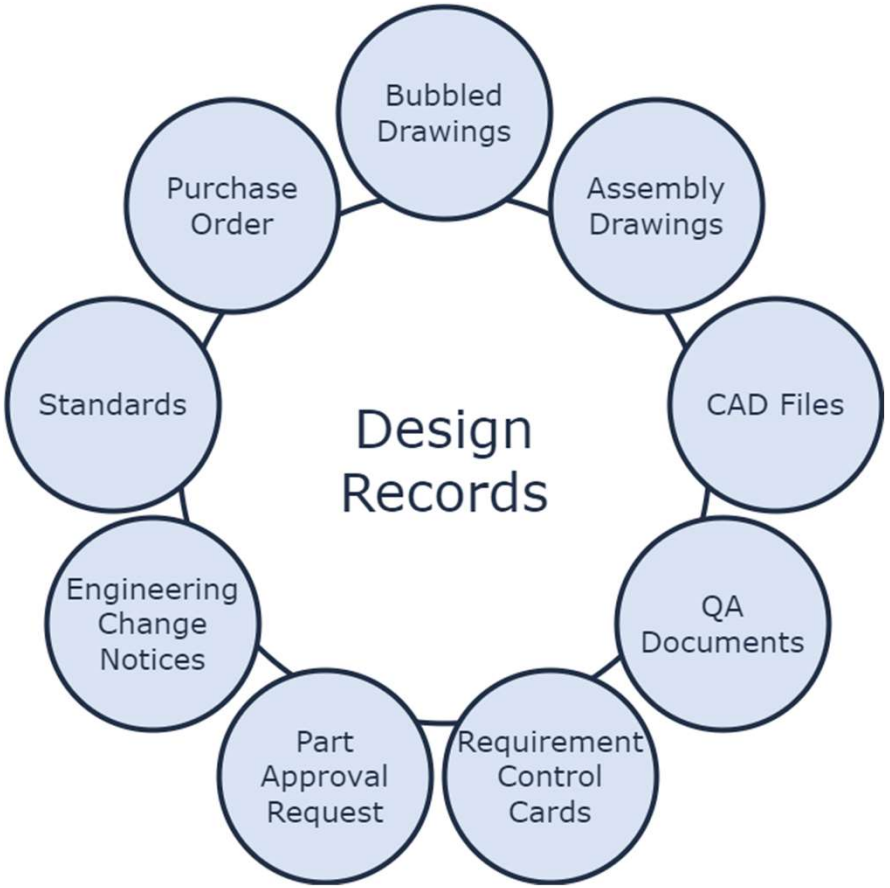
Example

Element 0 Cover Sheet	
JLTV Requirements	**Inadmissible**
Attach this file as element 0 to be the first element seen by reviewers.	**Supplier cannot submit a PPAP package without its cover sheet.**

1. Design Record

Definition: Records of the engineering specifications and requirements, including all physical and digital information, that fully define the product (component, sub-assembly, or assembly).

Purpose: To fully define the part and to be used as a reference throughout the PPAP package.

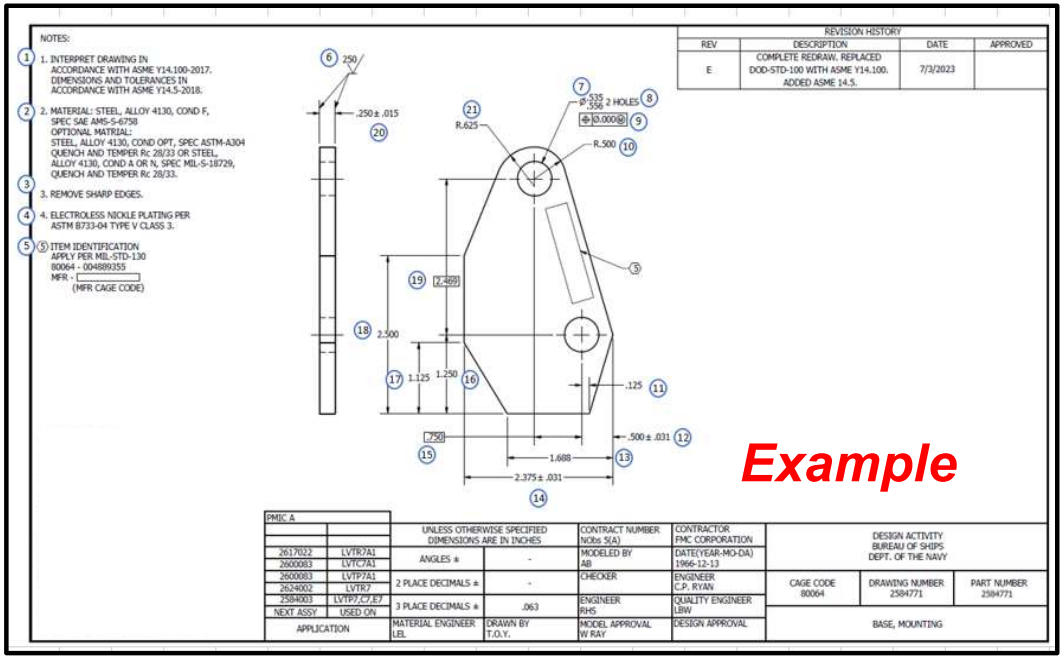


1. Design Record

How to: Design records are required for every component in the PPAP.

For Bubbled Drawings:

- Add bubbles from the top left to the bottom left in a clockwise direction.
- Ensure to bubbled drawing notes first and follow all requirements for bubbling x2 or more callouts.
- Attach final bubbled drawings and any standards or specifications, along with uploading any 3D models as required.

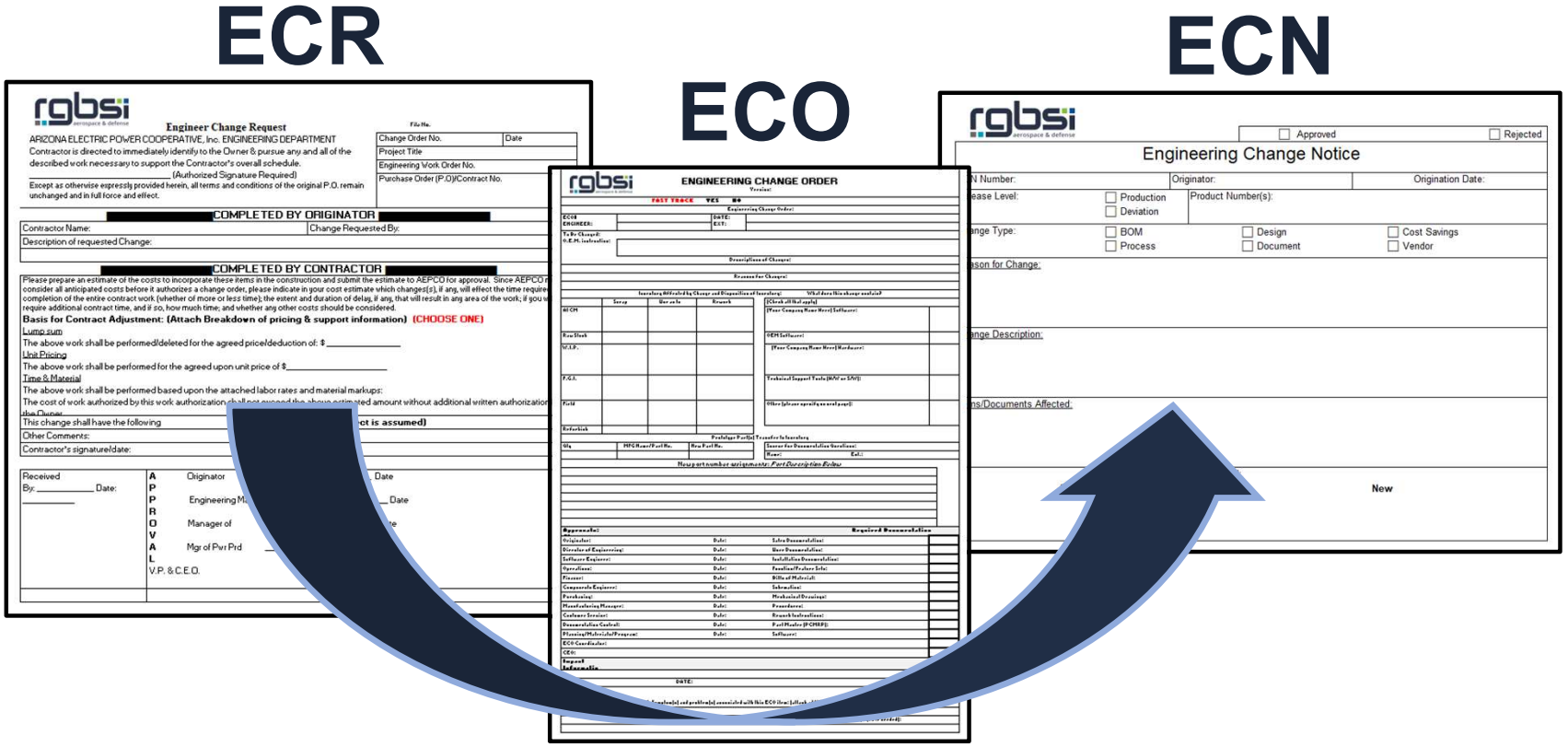


Element 1 Design Record	
JLTV Requirements	**Inadmissible**
Fully released production drawings without water marks.	Advanced released or preliminary documents, or no documents.
For Supplier owned drawings, include both the division "note form" or "word" drawing at minimum.	Misalignment of revision no. with PO and drawing requirements.
A copy of the signed/stamped title block on the supplier drawing. Assembly and detail level drawing also included.	Experimental/Development PO (even if listed as a "placeholder" for production), Advanced Procurement PO, no evidence of demand forecast or forecast does not match expected volume.
Appropriate revisions across all drawing levels & corresponding to purchase order (PO) revision call-out	

2. Engineering Change Documents

Definition: The Engineering Change Document outlines any changes to the design not included in the design record that is implemented on the product, part, or tooling.

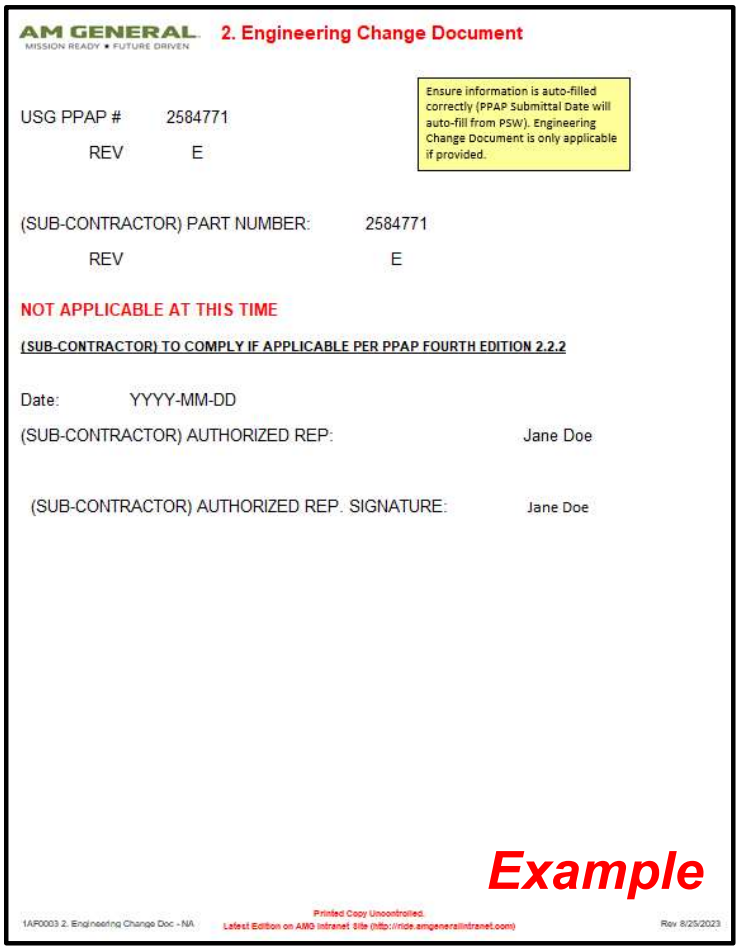
Purpose: Provide a record of changes that aren't included in the design record but are needed to address an issue in the design or tooling.



2. Engineering Change Documents

How to: The organization shall provide any authorized engineering change documents for those changes not yet recorded in the design record but incorporated in the product, part, or tooling.

Suppliers must submit the form shown below stating this requirement is "NOT APPLICABLE AT THIS TIME" if no change documents are needed. This will be submitted with the PPAP package. Ensure that information is auto-filled correctly from the Information and PSW tabs.



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2. Engineering Change Document

Ensure information is auto-filled correctly (PPAP Submittal Date will auto-fill from PSW). Engineering Change Document is only applicable if provided.

USG PPAP # 2584771
REV E

(SUB-CONTRACTOR) PART NUMBER: 2584771
REV E

NOT APPLICABLE AT THIS TIME

(SUB-CONTRACTOR) TO COMPLY IF APPLICABLE PER PPAP FOURTH EDITION 2.2.2

Date: YYYY-MM-DD

(SUB-CONTRACTOR) AUTHORIZED REP: Jane Doe

(SUB-CONTRACTOR) AUTHORIZED REP. SIGNATURE: Jane Doe

Example

1AP0003 2. Engineering Change Doc - NA

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Rev 8/25/2023

Element 2 Engineering Change Documents	
JLTV Requirements	**Inadmissible**
If authorized by a Government - approved Request for Deviation (RFD), the Government approved redlined drawing shall accompany the PPAP submittal.	Redlined drawings missing or incomplete.

3. Customer Engineering Approval

Definition: If required, the supplier shall have evidence of customer engineering approval.

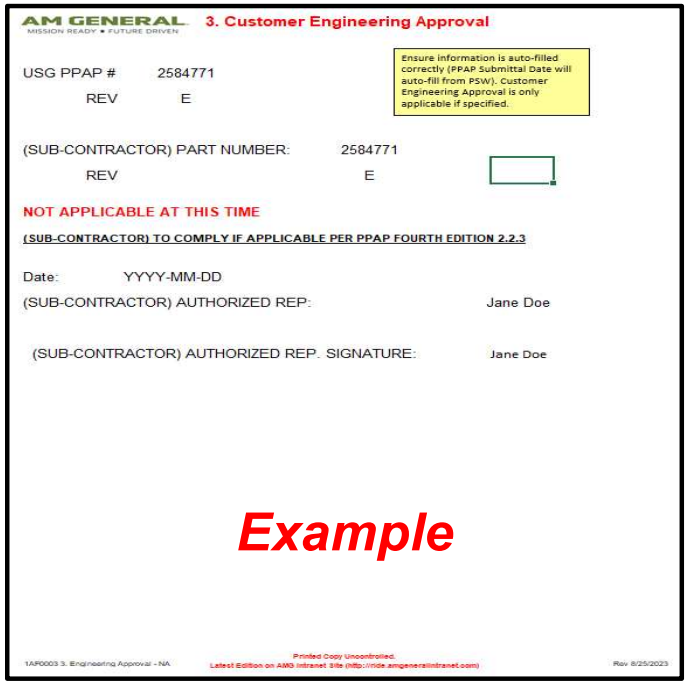
Purpose: Approval of part / assembly design requirements to prepare for production.

How to: For suppliers that do not have any engineering change documents, a form is required to show that Customer Engineering Approval is “NOT APPLICABLE AT THIS TIME”.

Traditional Engineering Change Management Process

Issue identified and Documented	ECR Created	ECR Accepted by Engineering	ECO Planned and Initiated	ECO Actioned by Engineering	ECO Changes Reviewed & Approved	ECN Released to Stakeholders

Customer Engineering Approval



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3. Customer Engineering Approval

USG PPAP # 2584771
REV E

Ensure information is auto-filled correctly (PPAP Submittal Date will auto-fill from PSW). Customer Engineering Approval is only applicable if specified.

(SUB-CONTRACTOR) PART NUMBER: 2584771
REV E

NOT APPLICABLE AT THIS TIME

(SUB-CONTRACTOR) TO COMPLY IF APPLICABLE PER PPAP FOURTH EDITION 2.2.3

Date: YYYY-MM-DD
(SUB-CONTRACTOR) AUTHORIZED REP: Jane Doe

(SUB-CONTRACTOR) AUTHORIZED REP. SIGNATURE: Jane Doe

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1AP0003 3. Engineering Approval - NA
Rev 8/25/2023

Example

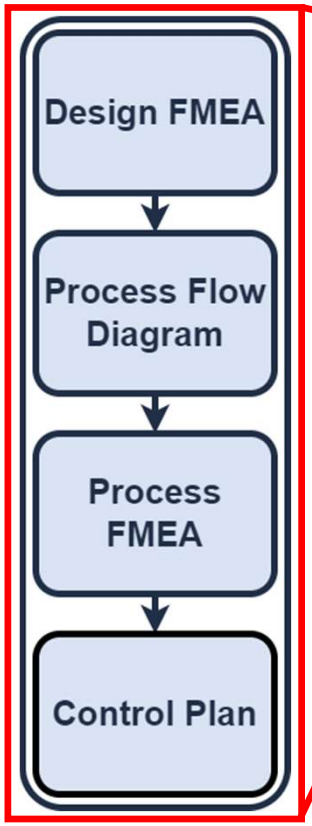
Element 3 Engineering Approval	
JLTV Requirements	**Inadmissible**
Only fully - released and approved drawings shall be utilized for PPAP unless a Government approved RFD is in place.	Released and approved drawings missing or incomplete.

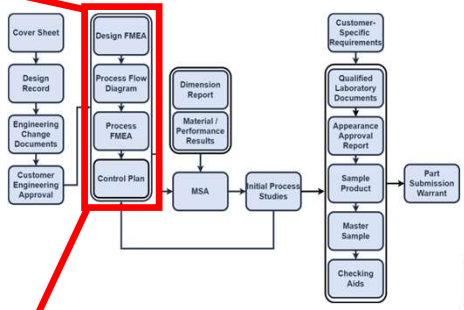
4. Design Failure Mode & Effects Analysis

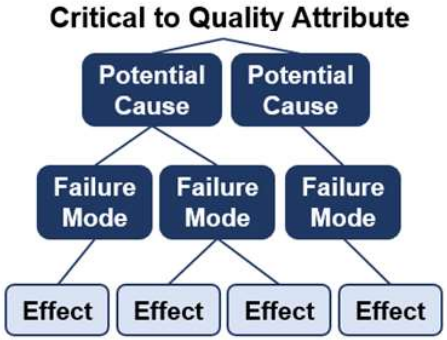
For Design Responsible Suppliers Only

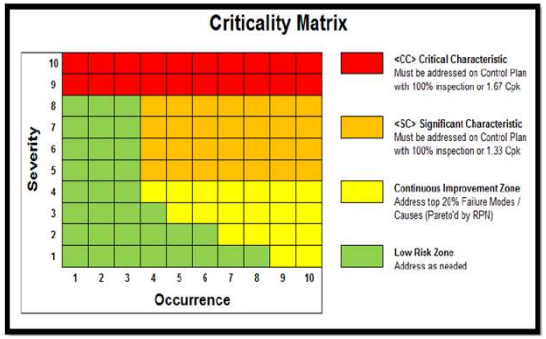
Definition: Design Failure Mode and Effects Analysis (DFMEA) looks at the probability of part failure from design and its effect on the intended function of the product. The DFMEA is a living document.

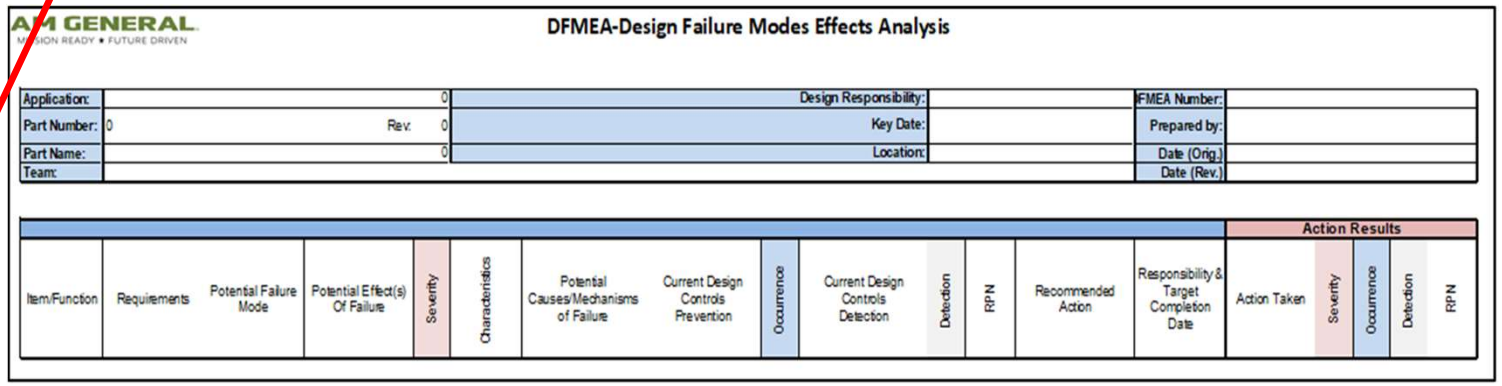
Purpose: A necessary tool used to identify and prioritize risk areas in the design and their mitigation plans prior to volume production. The information in the DFMEA will flow to following elements such as the Process Flow Diagram, PFMEA, and the Control Plan.











4. Design Failure Mode & Effects Analysis

For Design Responsible Suppliers Only

How to: The top portion of the DFMEA form provides details for part and supplier information.

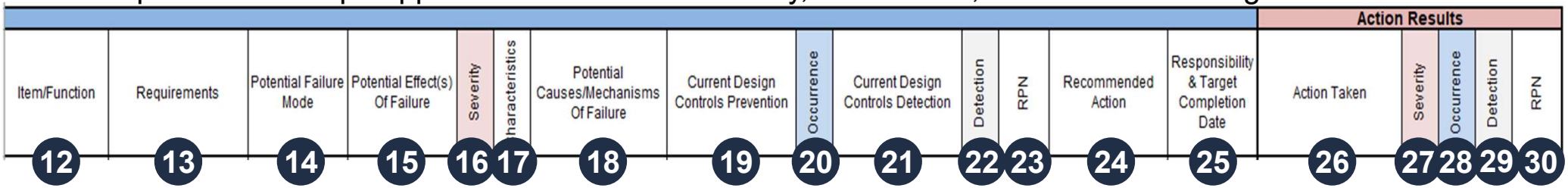
Application:	1	Design Responsibility:	5	DFMEA Number:	8
Part Number:	2	Key Date:	6	Prepared by:	9
Part Name:	3	Location:	7	Date (Orig.)	10
Team:	4			Date (Rev.)	11

1. **Application**: Specific use or purpose of a process, system, or equipment.
2. **Part Number**: Unique identifier and revision letter assigned to a part.
3. **Part Name (Nomenclature)**: Descriptive title or label for a part.
4. **Team**: Members involved with initiating, processing, and completing the DFMEA.
5. **Design Responsibility**: Authoritative design group for part or system.
6. **Key Date**: DFMEA Study Deadline / Milestone Date.
7. **Location**: Geographic site where the part is manufactured.
8. **DFMEA Number**: Unique identifier for DFMEA Study.
9. **Prepared By**: Individual or team who conducted and documented the DFMEA.
10. **Date (Orig.)**: Initial Completion DFMEA Completion Date.
11. **Date (Rev.)**: Date of most recent revision to DFMEA Document.

4. Design Failure Mode & Effects Analysis

For Design Responsible Suppliers Only

How to: The bottom portion of the DFMEA form contains the JLTV DFMEA template. The DFMEA Ratings tab is a reference provided to help suppliers determine the severity, occurrence, and detection rating values.



Severity x Occurrence x Detection = RPN

12 **Item/Function**: The design item or function being addressed.

13 **Requirements**: The specifications or requirements for the design item.

14 **Potential Failure Mode**: The way a part or process could potentially fail.

15 **Potential Effect(s) Of Failure**: Potential failure mode consequences.

16 **Severity**: (Original) Impact of the potential failure mode consequences.

17 **Characteristics**: Key Performance Characteristic Classification Type.

18 **Potential Causes/Mechanisms Of Failure**: Potential reasons that lead to a failure.

19 **Current Design Controls Prevention**: Controls in place to prevent design failures.

20 **Occurrence**: (Original) Likelihood or probability that a failure mode might happen.

21 **Current Design Controls Detection**: Controls in place to detect design failures.

22 **Detection**: (Original) Likelihood that the current controls will find a failure.

23 **RPN**: (Original) Risk Priority Number, a numerical value used to quantify risk.

24 **Recommended Action**: Steps proposed to reduce or eliminate the risk of failure.

25 **Responsibility & Target Completion Date**: Actions Taken Deadline / Milestone.

26 **Action Taken**: Steps that have been implemented to address a potential failure.

27 **Severity**: (Updated) Impact of the potential failure mode consequences.

28 **Occurrence**: (Updated) Likelihood or probability that a failure mode might happen.

29 **Detection**: (Updated) Likelihood that the current controls will find a failure.

30 **RPN**: (Updated) Risk Priority Number, a numerical value used to quantify risk.

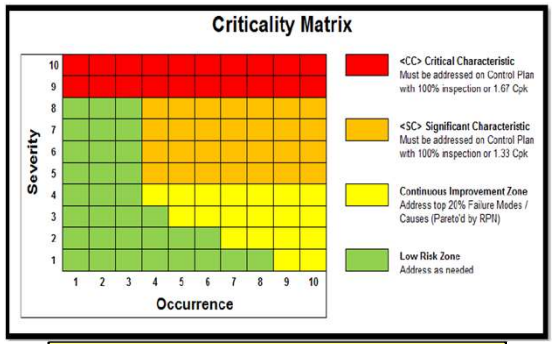
4. Design Failure Mode & Effects Analysis

For Design Responsible Suppliers Only

How to: A completed DFMEA form will include all failure modes, severity, occurrence, detection, and RPN data populated according to AIAG/JLTV design requirements. This includes any mitigated RPN value under Action Results being lower than the RPN of the initial design.

Application:	Bracket on Ship					**Design Responsibility:**		Bureau of Ships		**FMEA Number:**	128856							
Part Number:	2584771	Rev: E				**Key Date:**		7/8/2023		**Prepared by:**	Jane Doe							
Part Name:	Base, Mounting					**Location:**		Washington D.C.		**Date (Orig.)**	7/5/2023							
Team:	John Doe, Jane Doe, Brian Doe									**Date (Rev.)**	7/8/2023							
												Action Results						
Item/Function	Requirements	Potential Failure Mode	Potential Effect(s) Of Failure	Severity	Characteristics	Potential Causes/Mechanisms Of Failure	Current Design Controls Prevention	Occurrence	Current Design Controls Detection	Detection	RPN	Recommended Action	Responsibility & Target Completion Date	Action Taken	Severity	Occurrence	Detection	RPN
1/ Interpret Drawing dimensions and tolerances to specifications	ASME Y14.100-2017 ASME Y14.5-2018	Dimensions and Tolerances not interpreted according to spec	Part dimensions are incorrect, production interruption	8		Specification not available	APQP planning process - Obtain and provide drawing specifications	2	Part Production Approval Process verify specifications	1	16							0
2/ Material / Steel Alloy	Alloy 4130, COND F, SAE AMS-S-6758	Incorrect material	Material fails testing, resulting in field failures	7		Incorrect purchasing agreement	Part Drawing verification at time of PO	1	PO verification Material CoC	2	14							0
3/ Remove Sharp edges	No sharp edges on part	Part has sharp edges	Injury to operator or end customer	6		Process design fails to remove sharp edges	PFMEA design to incorporate sharp edge removal process	3	PFMEA Design validation	1	18							0
4/ Electroless Nickle Plating	ASTM B733-04 Type V Class 3	Incorrect plating	Material fails testing, resulting in field failures	8	SC	Process design fails to ensure correct plating process	PFMEA Design to incorporate Electroless Nickle Plating process verification in accordance with requirements	6	PFMEA Design validation	4	192	Implement Reverse PFMEA audit schedule with high frequency Implement Process Audit schedule with high frequency	Quality Manager, Systems Manager	Reverse PFMEA and Process Audit schedules created. Plating process audited via Reverse PFMEA and Process Audits on 1/month frequency for each audit	8	6	1	48
5/ Item Identification	MIL-STD-130 80064 - 004889355 MFR Cage Code	Items not identified per spec	Items incorrectly identified, failed PPAP submission, delayed production start	8		Specification not available	APQP planning process - Obtain and provide drawing specifications	2	Part Production Approval Process verify specifications	1	16							0
6/ Part Dimension	250	Part fails to meet dimensional spec	Part dimensions are incorrect, production interruption	8		Tooling failure	PFMEA and Control Plan to mitigate risk	2	PFMEA and Control Plan detection control process	3	48							0

Ensure information is filled correctly. Only fill out if design responsible supplier. Reference DFMEA Ratings provided in tab "4c DFMEA Ratings".

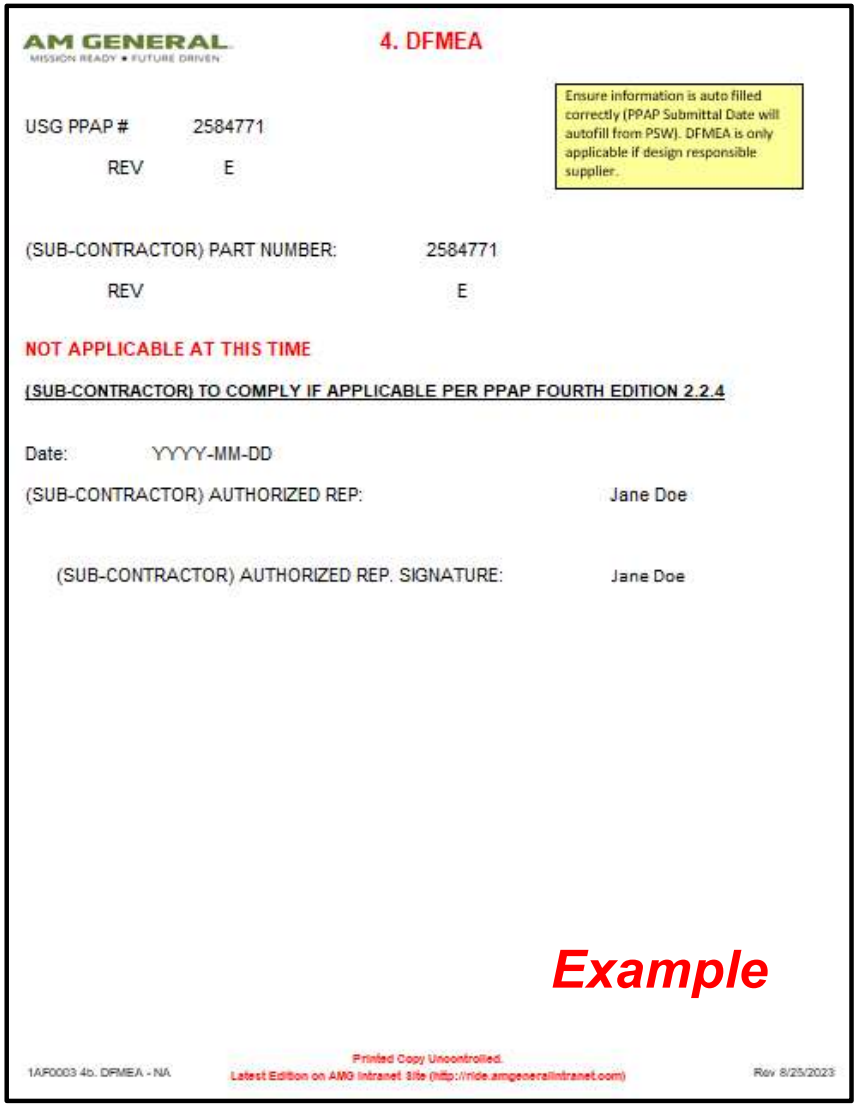


Item 4 identified as Significant Characteristic

Example

4. Design Failure Mode & Effects Analysis

How to: For non-design responsible suppliers, a form is required to show that a DFMEA is "NOT APPLICABLE AT THIS TIME."



AM GENERAL
MISSION READY • FUTURE DRIVEN

4. DFMEA

Ensure information is auto filled correctly (PPAP Submittal Date will autofill from PSW). DFMEA is only applicable if design responsible supplier.

USG PPAP # 2584771

REV E

(SUB-CONTRACTOR) PART NUMBER: 2584771

REV E

NOT APPLICABLE AT THIS TIME

(SUB-CONTRACTOR) TO COMPLY IF APPLICABLE PER PPAP FOURTH EDITION 2.2.4

Date: YYYY-MM-DD

(SUB-CONTRACTOR) AUTHORIZED REP: Jane Doe

(SUB-CONTRACTOR) AUTHORIZED REP. SIGNATURE: Jane Doe

Example

1AF0003 4b. DFMEA - NA

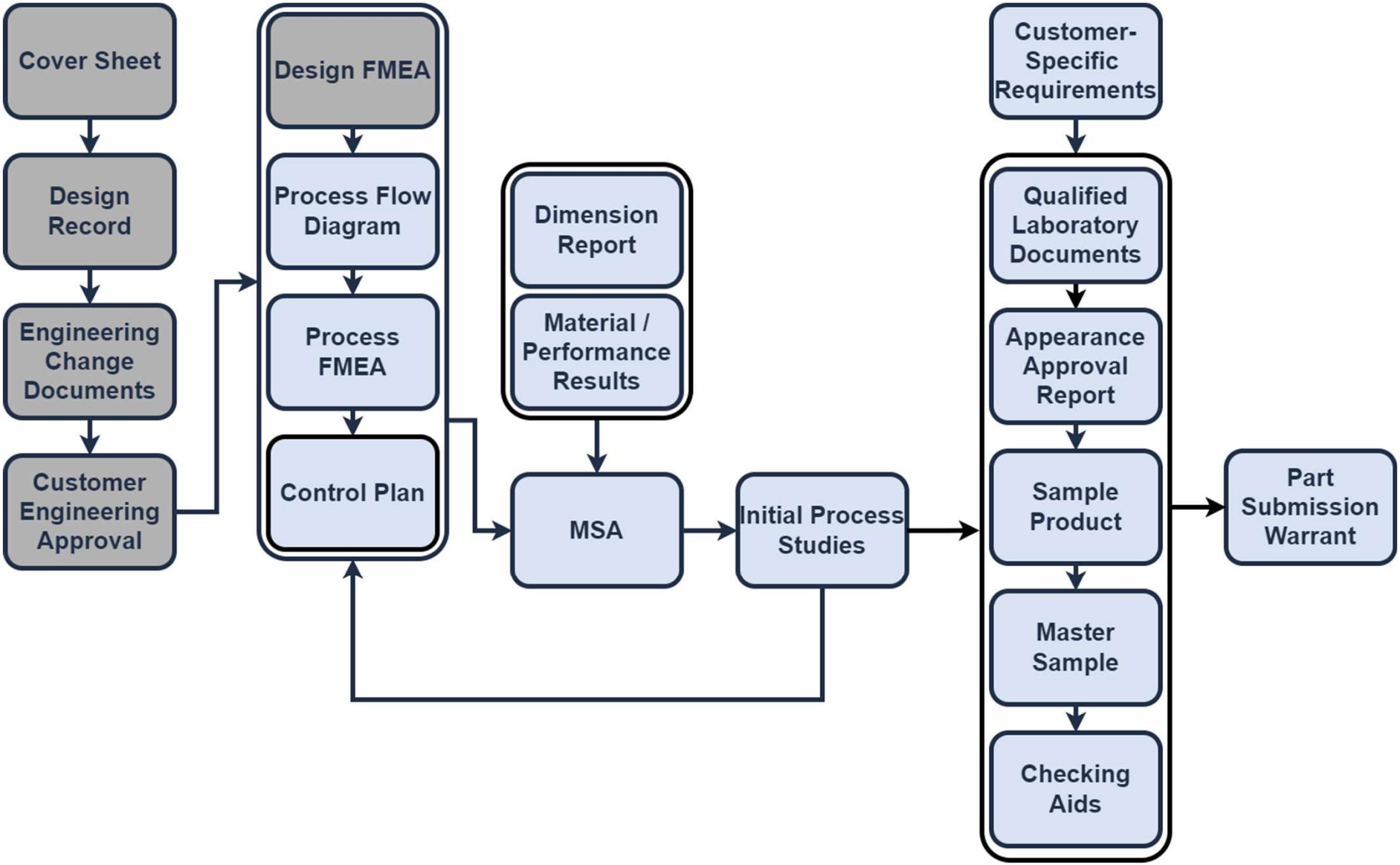
Printed Copy Uncontrolled.
Latest Edition on AMG Intranet Site (http://ride.amgeneralintranet.com)

Rev 8/25/2023

Element 4 Design Failure Modes Effects Analysis (DFMEA)	
JLTV Requirements	**Inadmissible**
DFMEA is required at the component level for all parts where the manufacturer is design responsible. This includes product built by the Contractor at the Contractor's facilities.	No DFMEA produced by a producer with design authority.
DFMEA shows risk analysis that addresses design and prior failures from similar	Areas of high risk not addressed with adequate process controls.
Documented evidence of a Design FMEA.	No evidence customer data, prior failures & escapes from a similar design used in
Evidence that document is dynamic and updated based on learning.	Insufficient scope that does not address customer requirements and all potential
Evidence that customer requirements are understood and addressed.	No evidence that critical items, features, severity indexes etc. are transferred to the
Evidence that lessons learned, quality history, standard work etc. are incorporated	
All high RPN, high Severity items are addressed with an adequate action plan or	
Identification of key characteristics.	
Critical characteristics shall be identified, recorded, and implemented with a Severity Rank of 9 or 10.	Critical characteristics that fail to demonstrate a minimum CpK of 1.67, demonstrate a robust Government-approved error proofing system that ensures product conformance, or be subject to 100% inspection.
Significant characteristics shall be identified, recorded, and implemented with a Severity Rank of 5, 6, 7, 8 with a corresponding Occurrence Rank of 4, 5, 6, 7, 8, 9, or 10.	Significant characteristics that fail to demonstrate a minimum CpK of 1.33, demonstrate a robust Government-approved error proofing system that ensures product conformance, or be subject to 100% inspection.

JLTV PPAP Workflow

Next PPAP Element: 5. Process Flow Diagram



5. Process Flow Diagram

Definition: Graphical outline of all steps and sequences of the manufacturing process for a part, from start to finish that meets the customer needs, requirements, and expectations.

Purpose: The Process Flow Diagram is the foundation on which the PFMEA and Process Control Plan are built, providing key insights for evaluating and controlling the process.

Legend:
○ Operation ⇨ Transportation □ Inspection D Delay ▽ Storage

Step	Operation or Event	Description of Operation or Event	Evaluation and Analysis Methods
10		Transporting Material to Plant	Material received in warehouse
20		Inspect Material Once Arrived	Visual inspection of material to check for damage
30		Store Material Until Use	Material stored in racks inside warehouse
40		Bring Material to Line	Material moved on rack to designated line
50		Cut Outer Shape from Steel	Outer shape cut from material using sharp machine
60		Drill Holes	Hole features produced by using a custom ø.545 drill
70		Remove Sharp Edges	Sharp edges removed through trimming
80	SC	Add Nickel Plating	Add the Electroless Nickel Plating
90		Add Item Identification	Item Identification stamped through press
100		Final Inspection of Part	Final part inspected to match print
110		Package Part	Part packaged through current packaging instructions
120		Store Final Product	Final product stacked in warehouse in final packaging
130		Ship to Customer	Item shipped to customer out of warehouse

5. Process Flow Diagram

How to: The supplier must completely and accurately define each step of the production process, from receiving incoming materials to shipping finished product, including external processes.

Application	1	Issue Date	4
Supplier Name	2	Part Name	5
Supplier Code	3	Part Number	6

Legend: ○ Operation ⇨ Transportation □ Inspection D Delay ▽ Storage

Step (7)	Operation or Event (8)	Description of Operation or Event (9)	Evaluation and Analysis Methods (10)
10	⇨	Transporting Material to Plant	Material received in warehouse
20	□	Inspect Material Once Arrived	Visual inspection of material to check for damage
30	▽	Store Material Until Use	Material stored in racks inside warehouse
40	⇨	Bring Material to Line	Material moved on rack to designated line
50	○	Cut Outer Shape from Steel	Outer shape cut from material using sharp machine

1. **Application**: Specific use or purpose of a process, system, or equipment.
2. **Supplier Name**: Name of the company or entity providing materials or services.
3. **Supplier Code**: Known as CAGE (Commercial and Government Entity) Code.
4. **Issue Date**: Official release date of the Process Flow Diagram.
5. **Part Name (Nomenclature)**: Descriptive title or label for a part.
6. **Part Number**: Unique identifier and revision letter assigned to a part.
7. **Step**: Operational sequence number denoting the operation steps.
8. **Operation or Event**: Defined operation type. (See Legend)
9. **Description of Operation or Event**: Manufacturing operation name.
10. **Evaluation and Analysis Methods**: Process methods of operation or inspection.

5. Process Flow Diagram

How to: The Process Flow Diagram is a living document subject to on-going revisions. Subsequent process changes must be documented in the Process Flow Diagram and alternate process paths/formal rework loops should be documented as part of the main flow diagram. Ensure to use symbology to identify all Key Characteristics in the Process Flow Diagram.

Ensure information is auto filled correctly and fill out Issue Date. Complete process flow diagram to match current process.

Legend:
○ Operation ⇨ Transportation □ Inspection D Delay

Example

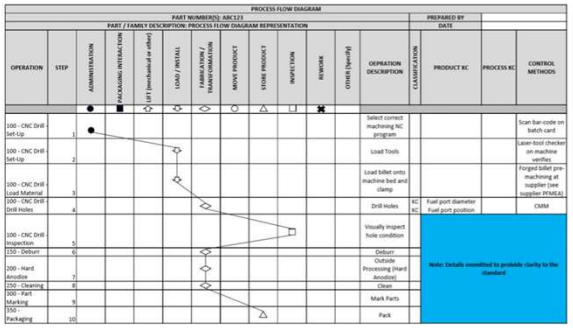
Step	Operation or Event	Description of Operation or Event	Evaluation and Analysis Methods
10		Transporting Material to Plant	Material received in warehouse
20		Inspect Material Once Arrived	Visual inspection of material to check for damage
30		Store Material Until Use	Material stored in racks inside warehouse
40		Bring Material to Line	Material moved on rack to designated line
50		Cut Outer Shape from Steel	Outer shape cut from material using sharp machine
60		Drill Holes	Hole features produced by using a custom ø.545 drill
70		Remove Sharp Edges	Sharp edges removed through trimming
80	SC	Add Nickel Plating	Add the Electroless Nickel Plating
90		Add Item Identification	Item identification stamped through press
100		Final Inspection of Part	Final part inspected to
110		Package Part	Part packaged through
120		Store Final Product	Final product stacked i
130		Ship to Customer	Item shipped to customer out of warehouse

Op. 80 identified as Significant Characteristic

5. Process Flow Diagram

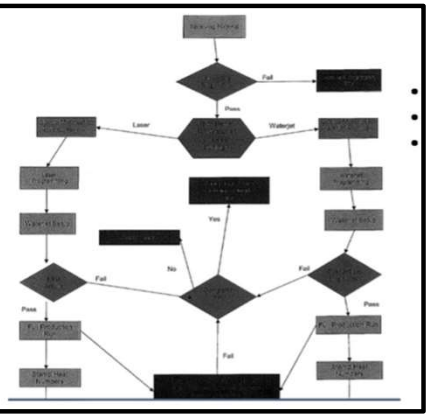
PFD Example- Acceptable

- Clearly defined steps
- Easy to follow step by step
- Proper usage of process symbols
- Allows for quick review of steps that add value and steps that do not add value



PFD Example- Unacceptable

- Illegible
- Confusing flow
- Non-standard format

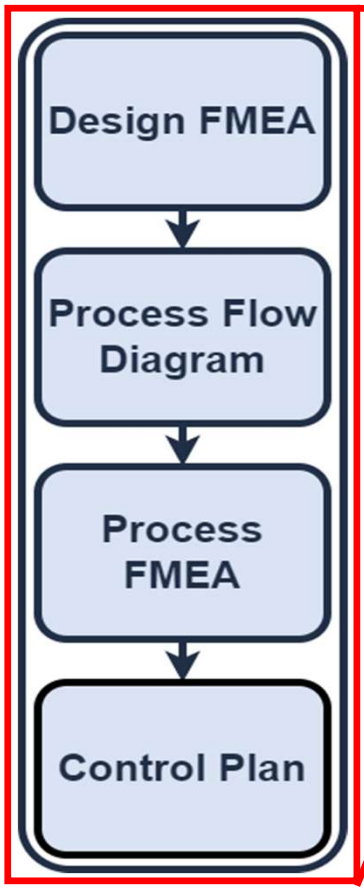


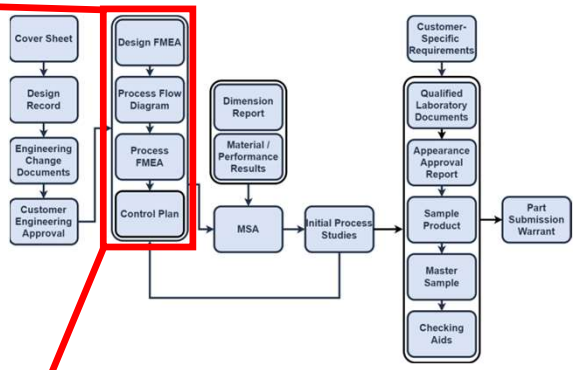
Element 5 Process Flow Diagram (PFD)	
JLTV Requirements	**Inadmissible**
Process map represents actual process used and is visibly a living document (contains active revision identification for process changes).	No process map exists.
Standard flow chart format should used or equivalent information clearly identified - multiple formats are acceptable.	A process flow exists that contains insufficient information in describing the process flow.
Key performance indicators (KPIs) and key performance objectives (KPOs) are identified.	Route Sheets/Travelers do not contain adequate information.
Identify where critical to quality (CTQ) features are produced.	Traveler or operation sheet does not clearly show all sources of variation.
Identify if flow map represents a part family.	Alternate flow paths are not documented.
Route Sheets/Travelers are acceptable if they contain adequate information.	CTQ features are not documented.
Alternate flow paths, rework, outside operations, storage, inspection etc. are shown.	

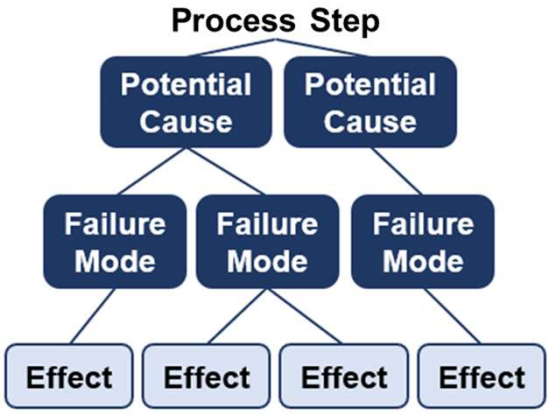
6. Process Failure Mode & Effects Analysis

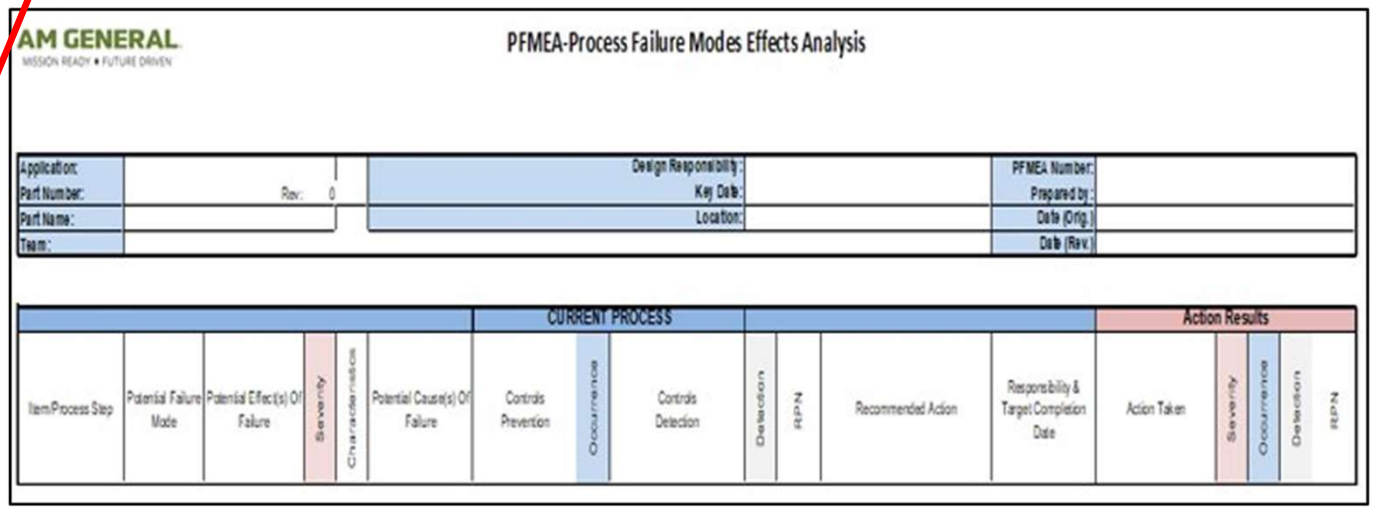
Definition: Process Failure Mode & Effects Analysis (PFMEA) is a disciplined review and analysis of a new or revised process and is conducted to anticipate, resolve, or monitor potential process problems for a new or revised product program. The PFMEA is a living document.

Purpose: The PFMEA is a tool used to identify and prioritize risk areas and their mitigation plans prior to volume production. The information in the PFMEA will flow to following elements such as the Process Flow Diagram and the Control Plan.









6. Process Failure Mode & Effects Analysis

How to: A single Process FMEA may be developed for a family of similar parts or materials provided a formal review of risk priority numbers is performed to ensure consistency with the process being developed.

Application:	1	
Part Number:	2	
Part Name:	3	
Team:	4	

Design Responsibility:	5	
Key Date:	6	
Location:	7	

PFMEA Number:	8	
Prepared by:	9	
Date (Orig.)	10	
Date (Rev.)	11	

1	**Application**: Specific use or purpose of a process, system, or equipment.
2	**Part Number**: Unique identifier and revision letter assigned to a part.
3	**Part Name (Nomenclature)**: Descriptive title or label for a part.
4	**Team**: Members involved with initiating, processing, and completing the PFMEA.
5	**Design Responsibility**: Authoritative design group for part or system.

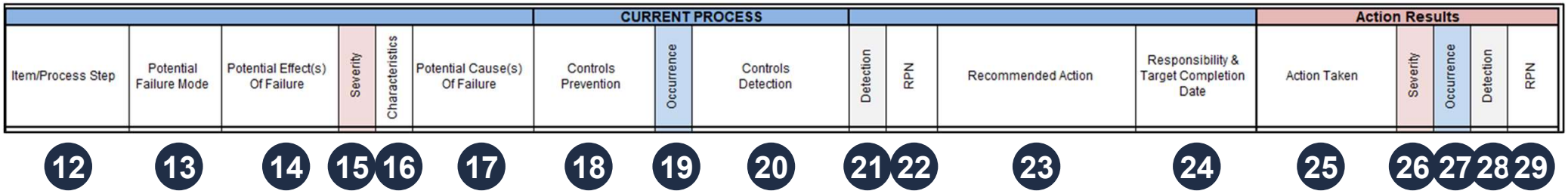
6	**Key Date**: PFMEA Study Deadline / Milestone Date.
7	**Location**: Geographic site where the part is manufactured.
8	**PFMEA Number**: Unique identifier for PFMEA Study.
9	**Prepared By**: Individual or team who conducted and documented the PFMEA.
10	**Date (Orig.)**: Initial Completion PFMEA Completion Date.

11	**Date (Rev.)**: Date of most recent revision to PFMEA Document.

6. Process Failure Mode & Effect Analysis

How to: The Process FMEA should be completed using a cross-functional team.

Severity x Occurrence x Detection = RPN



12 **Item/Process Step**: The operational sequence number denoting the operation steps.

13 **Potential Failure Mode**: The way a part or process could potentially fail.

14 **Potential Effect(s) Of Failure**: Potential failure mode consequences.

15 **Severity**: (Original) Impact of the potential failure mode consequences.

16 **Characteristics**: Key Performance Characteristic Classification.

17 **Potential Cause(s) Of Failure**: Potential reasons that lead to a failure.

18 **Controls Prevention**: Current Controls in place to Prevent the Failure Mode.

19 **Occurrence**: (Original) Likelihood or probability that a failure mode might happen.

20 **Controls Detection**: Current Controls in place to Detect the Failure Mode.

21 **Detection**: (Original) Likelihood that the current controls will find a failure.

22 **RPN**: (Original) Risk Priority Number, a numerical value used to quantify risk.

23 **Recommended Action**: Steps proposed to reduce or eliminate the risk of failure.

24 **Responsibility & Target Completion Date**: Actions Taken Deadline / Milestone.

25 **Action Taken**: Steps that have been implemented to address a potential failure.

26 **Severity**: (Updated) Impact of the potential failure mode consequences.

27 **Occurrence**: (Updated) Likelihood or probability that a failure mode might happen.

28 **Detection**: (Updated) Likelihood that the current controls will find a failure.

29 **RPN**: (Updated) Risk Priority Number, a numerical value used to quantify risk.

6. Process Failure Mode & Effect Analysis

Application:	Bracket on Ship	**Design Responsibility:**	**PFMEA Number:**
Part Number:	2584771 Rev: E	**Key Date:**	**Prepared by:**
Part Name:	Base, Mounting	**Location:**	**Date (Orig.)**
Team:			**Date (Rev.)**

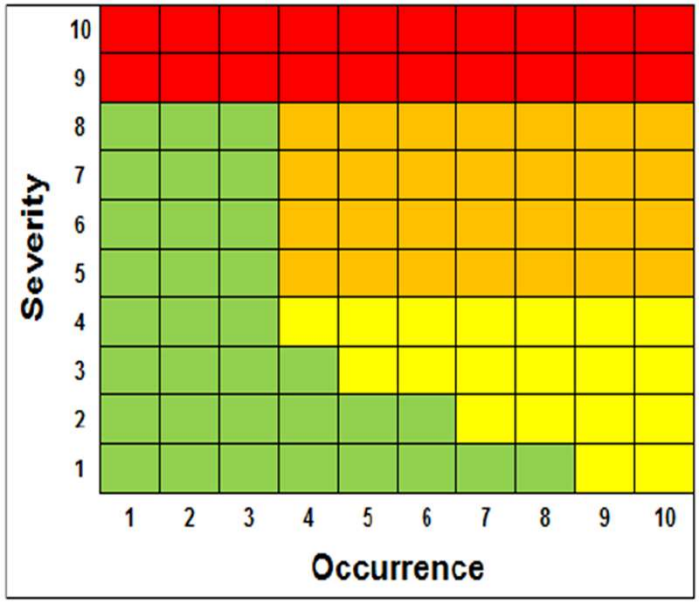
Ensure information is filled correctly.
Reference PFMEA Ratings provided in tab "6b PFMEA Ratings".
PFMEA should align with 5. Flow.

											Action Results				
Item/Process Step	Potential Failure Mode	Potential Effect(s) Of Failure	Severity	Characteristics	Potential Cause(s) Of Failure	Occurrence	Current Controls	Detection	RPN	Recommended Action	Responsibility & Target Completion Date	Action Taken	Severity	Occurrence	Detection	RPN
10/Transporting Material to Plant	Damage to Material in transit	Material cannot be used	7		Material not properly secured	3		5	105	Method to check that material is secured before shipping for each shipment	Supplier 7/10/23	Method created to check material is properly secured through gauges before transporting	7	3	1	21
	Wrong material	Material with incorrect plating used	7		Mis-identified material	3	CoA	6	126	Implement Inspection criteria and Work Instructions	Quality 7/10/23	WI and Inspection criteria created to guide verification of CoA to material received	6	2	1	12
20 / Inspect Material once arrived	Unable to detect damaged material	Damaged material is put through process, waste of time and labor	6		Lack of gauges to check for damaged material	3	Visual check of material	4	72	Create gauge to check material for damage before storage	Quality 7/10/23	Gauges implemented to check the material for damage	6	2	1	12
30 / Store material until use	Damage to Material in Storage	Material needs to be repaired before going on the line	5		Improper storage of material, not stacked correctly	3	Material has standard storage process that has support for material	4	60	Create gauge to check that material is being properly stored	Quality 7/10/23	Gauges implemented to check the material is not experiencing sag while stored	3	3	3	27
40/Bring Material to Line	Material damaged while being moved	Material needs to be repaired before going on the line	5		Improper support during moving	3	Material remains on rack it was stored in	5	75	Ensure rack that material is stored on creates proper support during transport	Quality 7/10/23	Rack has proper shape to ensure damage isn't incurred during movement	3	2	3	18
50/Cut Outer Shape From Steel	Shape of cutout too large	Post processing needed to get the correct shape	6		Undetected wear in machine	3	Visual check of machine	6	108	Automated check of machine shape at end of each shift	ME 7/12/23	Program created to check shape of machine creating cutout	3	3	4	36
60/Drill Holes	Incorrect location of holes	Scrap part	6		Improper datum	3	Manual datum of machine, gauge to check location of holes after	5	90	More automated system for setting the datum of the machine and checking hole location after	ME 7/12/23	Program created to datum machine and check hole location	7	3	3	63
70/Remove Sharp Edges	Not removing all sharp	Rerun process to remove the rest	3		Process looses efficiency over	5	Visual check to see if all sharp edges removed	4	60	More automated system for checking for sharp edges and	ME 7/12/23	Program created to automate checking for	2	3	3	18
80/Add Nickel Plating	Plating not added	Failure to meet customer specifications	8	SC	Plating process failure	6	Error-Proof system for validating process within specifications	6	288	Scheduled PM to validate machine performance Process Start of Shift, Mid Shift, End of Shift checks	ME QE 7/12/23	PM's scheduled and verified Shift Process checks verified	8	2	2	32

Op. 80 identified as Significant Characteristic

Example

6. Process Failure Mode & Effect Analysis



<CC> Critical Characteristic
Must be addressed on Control Plan with 100% inspection or 1.67 Cpk

<SC> Significant Characteristic
Must be addressed on Control Plan with 100% inspection or 1.33 Cpk

Continuous Improvement Zone
Address top 20% Failure Modes / Causes (Pareto'd by RPN)

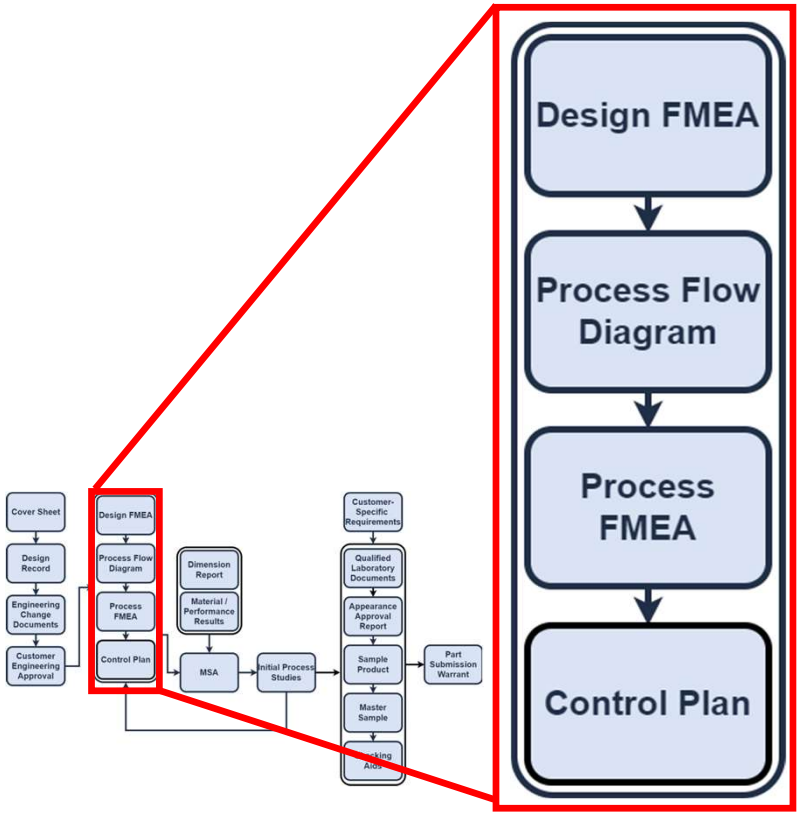
Low Risk Zone
Address as needed

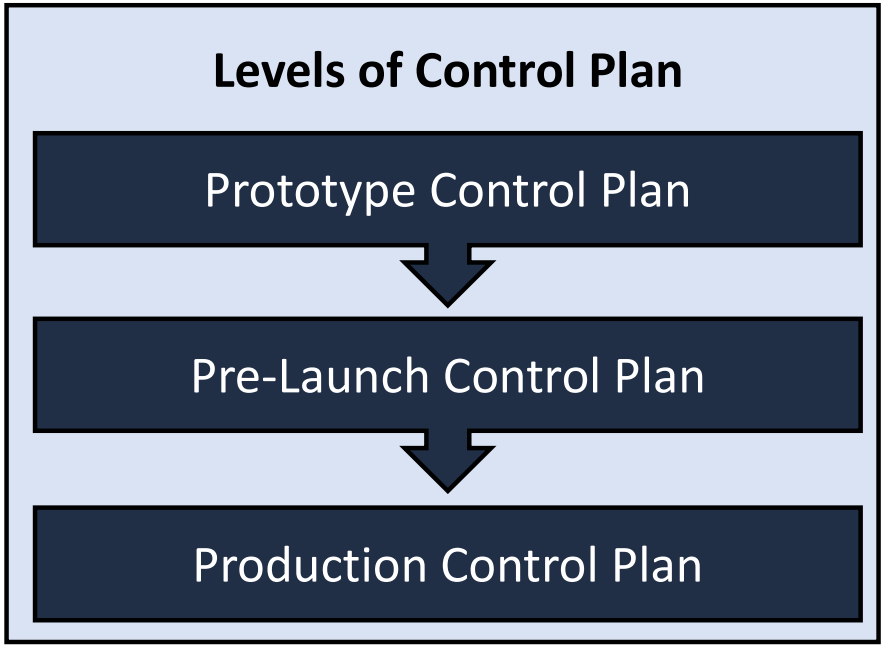
Element 6 Process Modes Effects Analysis (PFMEA)	
JLTV Requirements	**Inadmissible**
Documented evidence of a PFMEA that meets the standard.	No PFMEA produced by a producer.
PFMEA illustrates linkage to Process Flow Map and DFMEA.	Areas of high risk not addressed with adequate process controls.
PFMEA shows risk analysis that addresses process risks and prior internal defects and/or Customer escapes taken into account from similar designs.	Lack of linkage to DFMEA.
Customer CTQ Features (e.g., KPC1, KPC2, etc.) identified on PFMEA.	No evidence customer data, prior failures & escapes from a similar design used in analysis.
Producer self-selected key characteristics identified on PFMEA where appropriate.	No identification of Customer and/or self-selected key characteristics where appropriate.
Critical characteristics shall be identified, recorded, and implemented with a Severity Rank of 9 or 10.	Critical characteristics that fail to demonstrate a minimum CpK of 1.67, demonstrate a robust Government-approved error proofing system that ensures product conformance, or be subject to 100% inspection.
Significant characteristics shall be identified, recorded, and implemented with a Severity Rank of 5, 6, 7, 8 with a corresponding Occurrence Rank of 4, 5, 6, 7, 8, 9, or 10.	Significant characteristics that fail to demonstrate a minimum CpK of 1.33, demonstrate a robust Government-approved error proofing system that ensures product conformance, or be subject to 100% inspection.

7. Control Plan

Definition: The Control Plan is a written description of the systems for controlling production parts and processes. The production control plan is a living document and should be updated to reflect the addition/deletion of controls based on corrective actions and experience gained by producing parts (AM General approval may be required for alterations to Control Plan).

Purpose: Describe steps to key inspection and control activities with intent to control the design features and the process variables to ensure product quality. The Control Plan is a **living document** that is revised and updated throughout the life of the product.





7. Control Plan

How to: The Process Control Plan must include each process step identified on the Process Flow Diagram and Process FMEA.

- Includes the controls identified in the Process FMEA
- Addresses product and process characteristics at each process step
- Describes and identifies all Special Characteristics

AM GENERAL
MISSION READY ★ FUTURE DRIVEN

CONTROL PLAN

☐ Prototype ☐ Pre-Launch ☑ Production

Control Plan Number	Key Contact/Phone Jane Doe / ((55) 5) -4567	Date (Orig.)	Date (Rev.)
Part Number/Revision 2584771/E	Core Team	Customer Engineering Approval/Date (If Req'd.)	
Part Name Base, Mounting	Supplier/Plant Approval/Date	Customer Quality Approval/Date (If Req'd.)	
Supplier Name RGBSI Aerospace & Defense / Supplier Code 8CGW6	Other Approval/Date (If Req'd.)	Other Approval/Date (If Req'd.)	

PART/ PROCESS NUMBER	PROCESS NAME/ OPERATION DESCRIPTION	MACHINE, DEVICE JIG, TOOLS FOR MFG.	CHARACTERISTICS			SPECIAL CHAR. CLASS	METHODS					REACTION PLAN
			NO.	PRODUCT	PROCESS		PRODUCT / PROCESS SPECIFICATION / TOLERANCE	EVALUATION / MEASUREMENT TECHNIQUE	SAMPLE SIZE	SAMPLE FREQ.	CONTROL METHOD	
10	Transport Material to Plant	Forklift	2	Correct Material for process in the plant	Receive material and transport to storage			Visual Inspection	Material Container	100%	CoA Inspection Criteria Inspection Work Instructions	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
20	Inspect Material	Gage 11	1, 2	Material in good condition	Inspect material using gage for damage		No damage to material	Visual Inspection Gage Inspection	3 pieces	Every Container	Inspection Work Instructions Gage Calibration schedule	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
30	Store material	Forklift	2, 5	Material stored in correct location with no damage	Store material in defined location using forklift and ERP		No damage to material Stored in correct location	Visual Inspection Validate via ERP	1 container	1/shift	ERP System Material Handling Procedure	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
40	Bring Material to line	Forklift	5	Material delivered to production station	Deliver location to production station		No damage to material Stored in correct location	Visual Inspection Validate via ERP	1 container	100%	ERP System Material Handling Procedure Op Verification	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)

Ensure information is filled correctly. Complete control plan for all necessary processes while ensuring the balloon print is referenced. Control Plan should align with PFMEA and Process Flow Diagram.

Example

7. Control Plan

How to: The information at the top must be filled out to display details on the part, team involved, and approval dates.

☐ Prototype ☐ Pre-Launch (1) ☑ Production					
Control Plan Number (2)		Key Contact/Phone (7) Jane Doe / ((55) 5) -4567		Date (Orig.) (11)	Date (Rev.) (12)
Part Number/Revision (3) 2584771/E		Core Team (8)		Customer Engineering Approval/Date (If Req'd.) (13)	
Part Name (4) Base, Mounting		Supplier/Plant Approval/Date (9)		Customer Quality Approval/Date (If Req'd.) (14)	
Supplier Name (5) RGBSI Aerospace & Defense	Supplier Code (6) 8CGW6	Other Approval/Date (If Req'd.) (10)		Other Approval/Date (If Req'd.) (15)	

1	**Prototype, Pre-launch, Production**: Product lifecycle phases.
2	**Control Plan Number**: Unique Identifier facilitating Quality Management tracking.
3	**Part Number / Revision**: Unique identifier and revision letter assigned to a part.
4	**Part Name (Nomenclature)**: Descriptive title or label for a part.
5	**Supplier Name**: Name of the company or entity providing materials or services.
6	**Supplier Code**: Known as CAGE (Commercial and Government Entity) Code.
7	**Key Contact / Phone**: Point of Contact & Contact Phone Number.
8	**Core Team**: Key group of individuals responsible for production execution.
9	**Supplier / Plant Approval / Date:** Authorization date of by the supplier or mfg plant.
10	**Other Approval / Date**: Secondary authorization date for control plan approval.
11	**Date (Orig.)**: Original date when the control plan was created.
12	**Date (Rev.)**: Date when the control plan was revised or updated.
13	**Customer Engineering Approval / Date**: Engineering authorization date.
14	**Customer Quality Approval / Date**: Quality Management authorization date.
15	**Other Approval / Date**: Additional validation or authorization date.

7. Control Plan

How to: The columns contain the information that is needed when filling out the plan. The plan outlines the process, the characteristics involved, the methods to control the process, and the plan if the controls fail.

PART/ PROCESS NUMBER	PROCESS NAME/ OPERATION DESCRIPTION	MACHINE, DEVICE JIG, TOOLS FOR MFG.	CHARACTERISTICS			SPECIAL CHAR. CLASS	METHODS					REACTION PLAN
			NO.	PRODUCT	PROCESS		PRODUCT / PROCESS SPECIFICATION / TOLERANCE	EVALUATION / MEASUREMENT TECHNIQUE	SAMPLE SIZE	SAMPLE FREQ.	CONTROL METHOD	
16	17	18	19	20	21	22	23	24	25	26	27	28

16 **Part / Process Number**: The operational sequence number denoting the operation steps.

17 **Process Name / Operation Description**: Manufacturing operation name.

18 **Machine Device, Jig, Tools for MFG**: Unique identifier for MFG equipment and tooling.

19 **No.**: Number of machine, device jig, or tool.

20 **Product**: Define final product when the process is complete. (See DFMEA)

21 **Process**: Manufacturing Process Key Performance Characteristics (See PFMEA)

22 **Special Char. Class**: Key Performance Characteristic Classification Type.

23 **Product / Process Spec / Tolerance**: MFG Process Allowable Tolerance Limits.

24 **Evaluation / Measurement Technique**: MFG operation measurement method.

25 **Size**: Quantity of parts inside the sample size.

26 **Freq.**: Sampling rate frequency. Time between samples.

27 **Control Method**: Strategy or technique employed to monitor the system.

28 **Reaction Plan**: Predefined set of steps to follow in response to a deviation.

7. Control Plan

☐ Prototype ☐ Pre-Launch ☑ Production

Control Plan Number	Key Contact/Phone Jane Doe / ((55) 5) -4567	Date (Orig.)	Date (Rev.)
Part Number/Revision 2584771/E	Core Team	Customer Engineering Approval/Date (If Req'd.)	
Part Name Base, Mounting	Supplier/Plant Approval/Date	Customer Quality Approval/Date (If Req'd.)	
Supplier Name RGBSI Aerospace & Defense / Supplier Code 8CGW6	Other Approval/Date (If Req'd.)	Other Approval/Date (If Req'd.)	

PART/ PROCESS NUMBER	PROCESS NAME/ OPERATION DESCRIPTION	MACHINE, DEVICE JIG, TOOLS FOR MFG.	CHARACTERISTICS			SPECIAL CHAR. CLASS	METHODS				CONTROL METHOD	REACTION PLAN
			NO.	PRODUCT	PROCESS		PRODUCT / PROCESS SPECIFICATION / TOLERANCE	EVALUATION / MEASUREMENT TECHNIQUE	SAMPLE SIZE	SAMPLE FREQ.		
10	Transport Material to Plant	Forklift		Correct Material for process in the plant	Receive material and transport to storage			Visual Inspection	Material Container	100%	CoA Inspection Criteria Inspection Work Instructions	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
20	Inspect Material	Gage 11		Material in good condition	Inspect material using gage for damage		No damage to material	Visual Inspection Gage Inspection	3 pieces	Every Container	Inspection Work Instructions Gage Calibration schedule	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
30	Store material	Forklift		Material stored in correct location with no damage	Store material in defined location using forklift and ERP system		No damage to material Stored in correct location	Visual Inspection Validate via ERP	1 container	1/shift	ERP System Material Handling Procedure	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
40	Bring Material to line	Forklift		Material delivered to production station	Deliver location to production station		No damage to material Stored in correct location	Visual Inspection Validate via ERP	1 container	100%	ERP System Material Handling Procedure Op Verification	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
50	Cut Outer Shape From Steel	Cutting Machine	13,14,17,18, 21	Outer shape of final product	Cuts outer shape out of steel sheet		0.031	Automated check of outer dimensions	100	Per Shift	Automated check of shape before moving to next process	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
60	Drill Holes	Drilling Machine	7,8,9,11,12, 15,16,19	Two ø.545 holes	Drills two holes into the outer shape		0.01	Go/No Go Gauge	100	Per Shift	Gauge check before moving to next process	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
70	Remove Sharp Edges	Trimming machine	N/A	N/A	Removes outer sharp edges in		All sharp edges removed	Visual inspection	100	Per Shift	Visual check before moving to next process	Control of Non-Conforming Material Procedure
80	Add Nickel Plating	Plating Booth	4	Material receives Nickle plating	Part processes through plating booth	SC	ASTM B733-04 Type V Class 3	Visual inspection Machine Validation chekclist	1	3x/Shift	Machine Validation Work Instructions HMI Machine specs	Control of Non-Conforming Material Procedure (XXX-QA-PR-001)
90	Identification	machine			identification onto part			pressue when stamping part			to next process	Procedure (XXX-QA-PR-001)

Op. 80 identified as Significant Characteristic

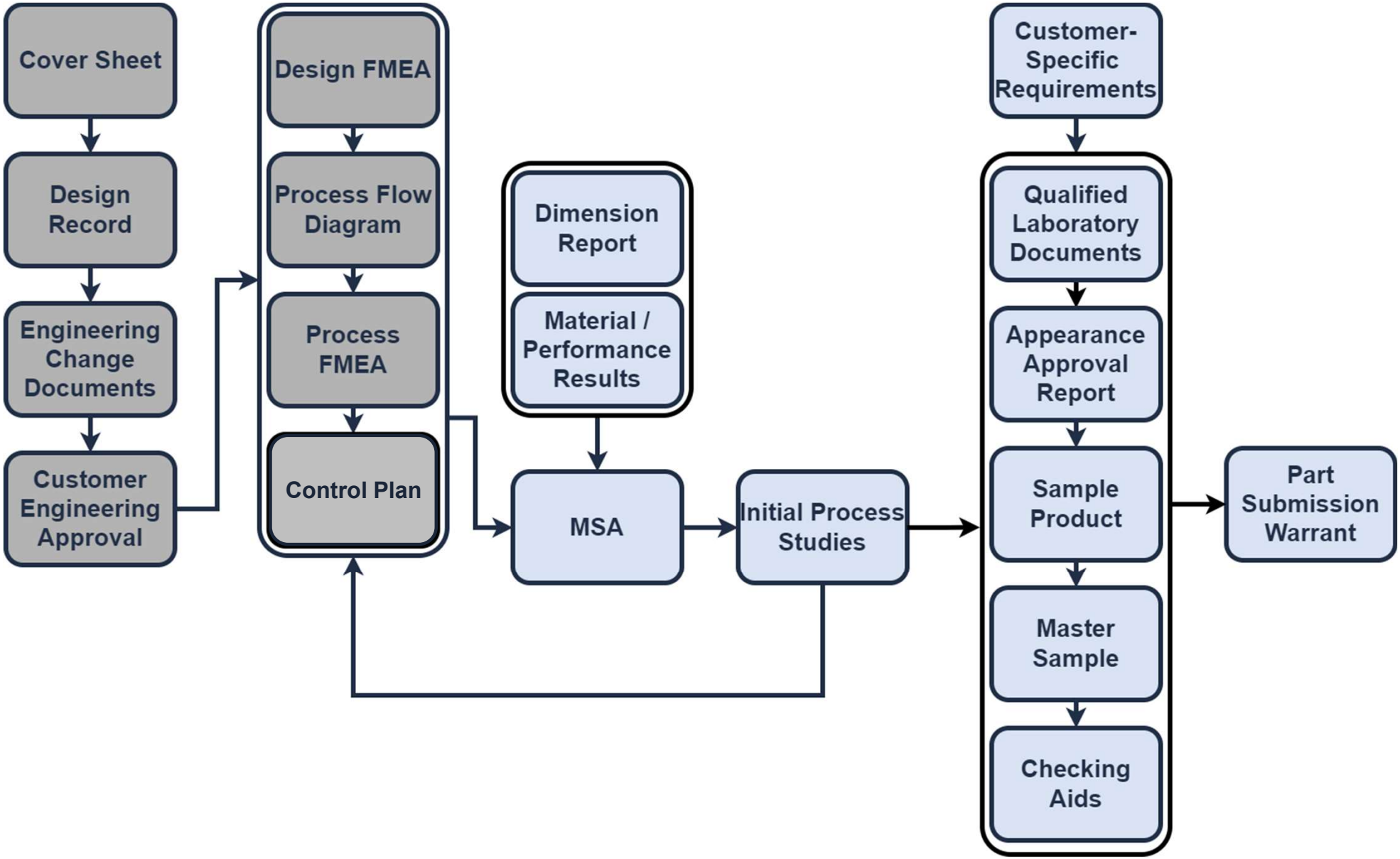
Example

7. Control Plan

Element 7 Process Control Plan	
JLTV Requirements	**Inadmissible**
Documented evidence Process Control Plan meets AIAG 2.2.7.	No documented evidence of a Process Control Plan or the one presented does not meet AIAG 2.2.7.
Listed finished dimensions and tolerances match the drawing.	High risk items identified on the PFMEA are not adequately addressed.
Control Plan includes controls for all UTC Member defined KCs and any producer identified KCs from PFMEA.	No reaction plan exists.
Control Plan includes controls for any high severity and high RPN failure modes identified on the PFMEA (e.g. early warning, control, system redundancies and mistake-proof methods).	No inspection frequencies.
Key Process Inputs, Settings, Control Methods, and SPC chart type are defined for each critical operation.	
Control Plan accounts for outside/sub-tier processes, where appropriate [i.e., sub-tier performs process that generates a KPC].	
Reaction plans exist for nonconforming condition/out of control situations (e.g. containment, customer notification, recovery, communication, stop the process and inform supervision).	

JLTV PPAP Workflow

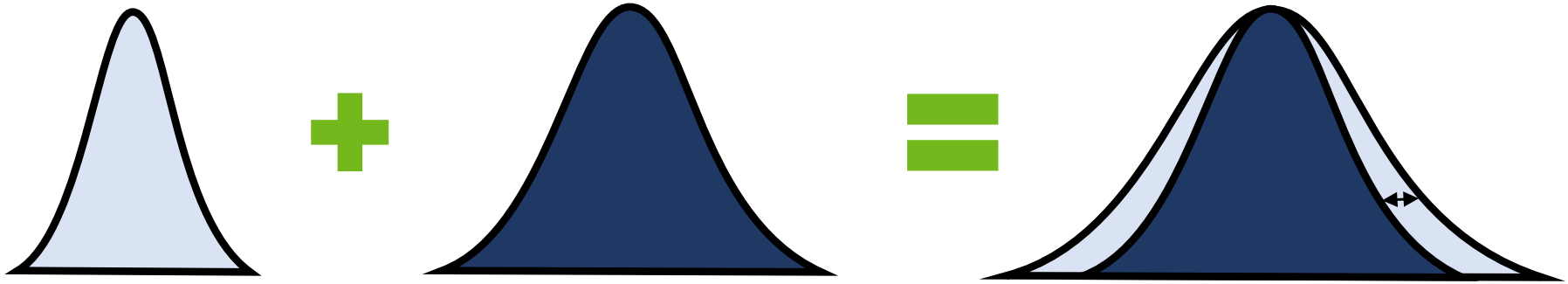
Next PPAP Element: 8. Measurement System Analysis

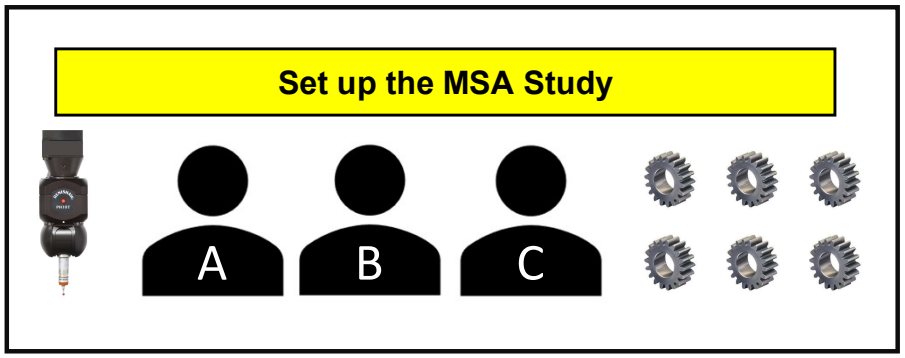


8. Measurement System Analysis

Definition: Measurement System Analysis (MSA) is the statistical method used to show the variation in the measurement system, which includes Gage R&R, Linearity, Stability, Bias, etc.

Purpose: The Measurement System Analysis connects to measurement data used in nearly every manufacturing process.

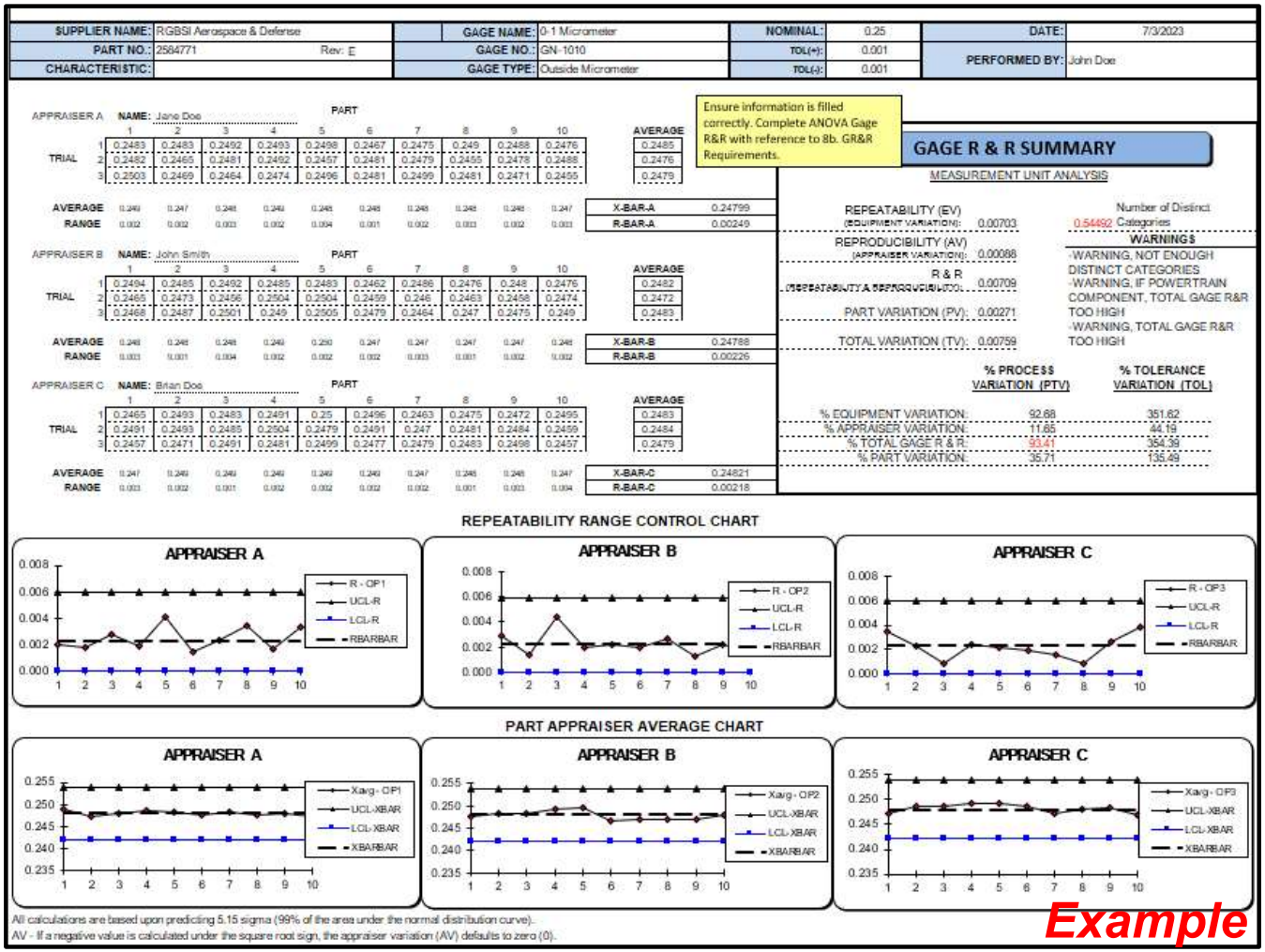




8a. Measurement System Analysis

How to: The supplier must populate all information in the PPAP workbook for:

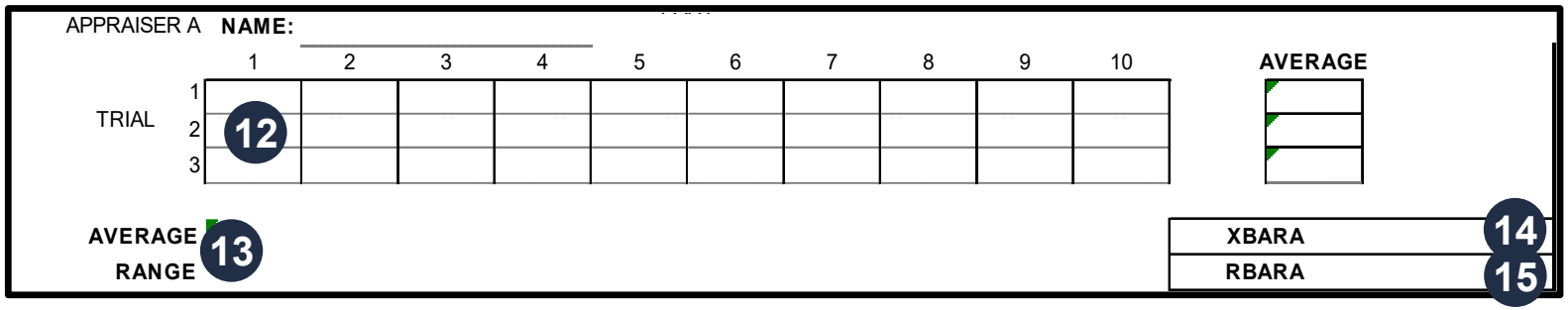
- Supplier Info
- Part Info
- Characteristic Info
- Gage Info
- Dimension / TOL Info
- Appraiser Info
- ANOVA (Analysis of Variance)
- Gage R&R



8a. Measurement System Analysis

How to: Supplier / Part / Characteristic / Gage / Dimension / Tolerance / Appraiser Information

SUPPLIER NAME:	1	GAGE NAME:	4	NOMINAL:	7	DATE:	10
PART NO.:	2	GAGE NO.:	5	TOL(+):	8	PERFORMED BY:	11
CHARACTERISTIC:	3	GAGE TYPE:	6	TOL(-):	9		

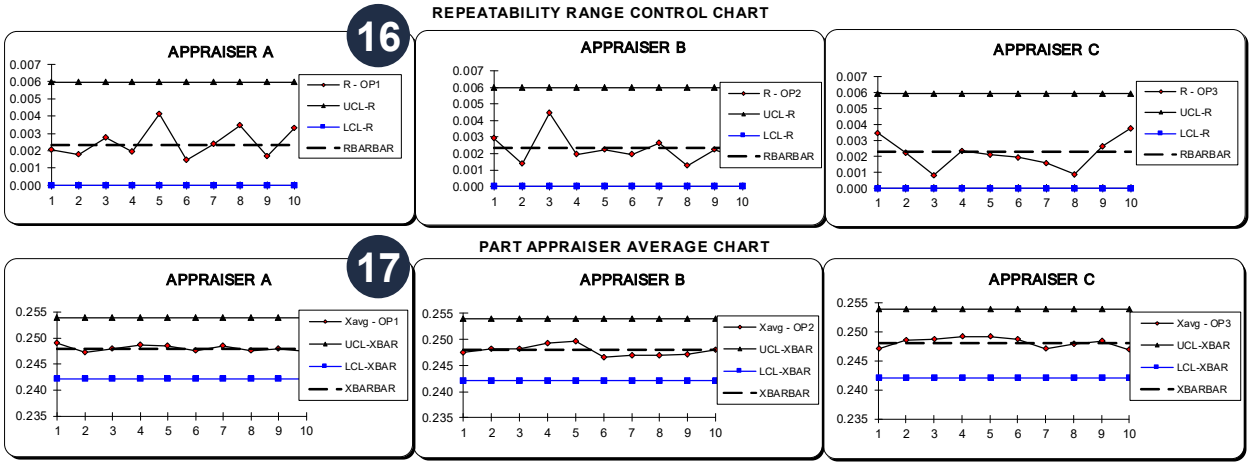


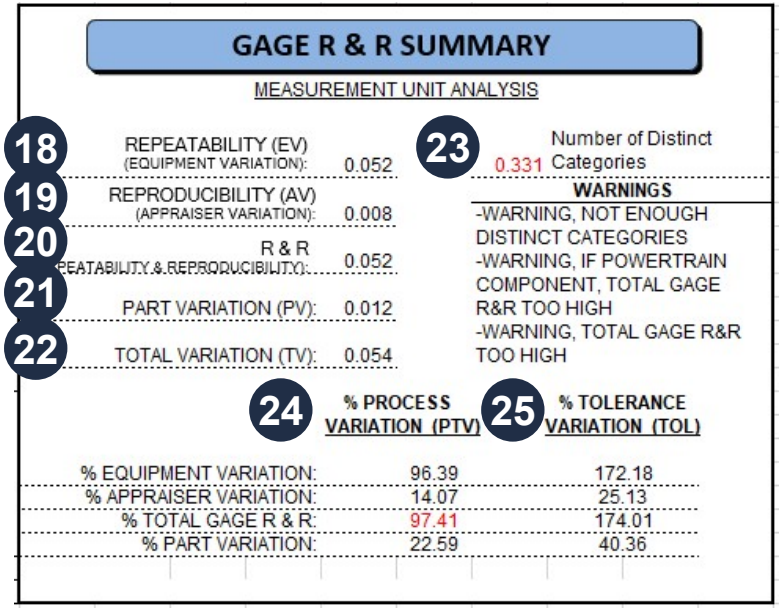
Repeat for Appraisers B & C

1	**Supplier Name**: Name of the company or individual providing the product.	6	**Gage Type**: Category or classification of the measuring device.	11	**Performed By**: Individual or team who carried out the measurement study.
2	**Part Number**: Unique identifier assigned to a specific part or component.	7	**Nominal**: Target or desired value for a specific dimension.	12	**Trial Data**: Raw data collected during the measurement study.
3	**Characteristic**: A distinct attribute or property of a part or process. Bubbled Print.	8	**Tol(+)**: Maximum allowable increase from the nominal value.	13	**Average & Range**: Mean and max/min of the data set.
4	**Gage Name**: Specific name or model of the measurement device used.	9	**Tol(-)**: Minimum allowable decrease from the nominal value.	14	**XBARA**: Average of all the subgroup means in the study.
5	**Gage Number**: Unique identifier assigned to a specific measuring device.	10	**Date**: Date of the measurement system analysis study.	15	**RBARA**: Average of all the subgroup ranges in the study.

8c. Measurement System Analysis

How to: ANOVA Gage R&R





16	**Repeatability Range Control Chart**: Tracks time variation from measurements.
17	**Part Appraiser Average Chart**: Average measurement per appraiser per part.
18	**Equipment Variation (EV):** Variability due to the measurement instrument.
19	**Appraiser Variation (AV):** Variability due to the individual performing the test.
20	**Gage R&R (GRR):** Combined estimate of repeatability & reproducibility.
21	**Part Variation (PV):** Variation detected in the parts measured in the study.
22	**Total Variation (TV):** Overall variability from all sources of variation.
23	**No. Of Distinct Categories:** measurement of variation in sample parts
24	**% Process Variation (PTV)**: Variation as a percentage of total process output.
25	**% Tolerance Variation (TOL)**: Variation as a percentage of total tolerance.

8d. Measurement System Analysis

How to: Attribute Agreement Analysis

Part Number 25			Gage Name 28			Date Performed 31			Appraiser A			
Part Name 26			Gage Number 29			Gage Type 32			Appraiser B 34			
Characteristic 27			Pass Condition 30			Fail Condition 33			Appraiser C			
DATA TABLE												
PART	A-1	A-2	A-3	B-1	B-2	B-3	C-1	C-2	C-3	Reference	Reference Value	Code
1	35									36	37	38

25 **Part Number**: Unique identifier assigned to a specific part or component.

26 **Part Name (Nomenclature)**: Descriptive title or label for a part.

27 **Characteristic**: A distinct attribute or property of a part or process.

28 **Gage Name**: Specific name or model of the measurement device used.

29 **Gage Number**: Unique identifier assigned to a specific measuring device.

30 **Pass Condition**: Acceptable result for characteristic; this is the Upper Limit.

31 **Date Performed**: Date when Attribute Agreement Analysis performed.

32 **Gage Type**: The category or classification of the measuring device.

33 **Fail Condition**: Rejectable result for characteristic; this is the Lower Limit.

34 **Appraiser**: Personnel performing analysis.

35 **Part Data**: Pass/fail results captured in the analysis. "0" is Fail, "1" is Pass.

36 **Reference**: Actual pass/fail result of the part being measured.

37 **Reference Value**: Actual value of the part being measured.

38 **Code**: Pass / Fail Results. “+” for a pass, “x” for a fail.

8d. Measurement System Analysis

How to: Crosstabulation Analysis for Appraisers A, B, and C

A * B Crosstabulation

			B		Total
			0	1	
A	0	Count	0	2	2
		Expected Count	0.2	1.8	2.0
	1	Count	2	14	16
		Expected Count	1.8	14.2	16.0
Total		Count	2	16	18
		Expected Count	2.0	16.0	18.0

Repeated results for
A * C Crosstabulation
B * C Crosstabulation

Kappa	A	B	C
A	-	-0.12	-0.12
B	-0.12	-	0.44
C	-0.12	0.44	-

Kappa results

DETERMINATION	
A x B	Poor Agreement
A x C	Poor Agreement
B x C	Some Agreement

Determination for each crosstabulation

8. Measurement System Analysis

AM GENERAL
MISSION READY ★ FUTURE DRIVEN

Attribute Agreement Analysis

Part Number	Gage Name	Date Performed	Appraiser A
2584771 Rev: E	Go/No-Go Pin Set	7/3/2023	Jane Doe
Part Name	**Gage Number**	**Gage Type**	**Appraiser B**
Base, Mounting	GN-1020	Gage Pins	John Smith
Characteristic	**Pass Condition**	**Fail Condition**	**Appraiser C**
7	0.5555	0.5355	Brian Doe

Ensure information is filled correctly. Complete Gage R&R Attribute Agreement with reference to 8b. GR&R Requirements. For the Pass/Fail conditions, the Pass is the maximum condition and Fail is the minimum condition. The "Reference" column is to show if the information in the data matches the expected outcome. The "Code" column is for pass or fail of the gage, with

DATA TABLE

PART	A-1	A-2	A-3	B-1	B-2	B-3	C-1	C-2	C-3	Reference	Reference Value	Code
1	1	0	1	1	0	1	0	1	1	1	0.5479	x
2	1	1	1	1	1	1	1	1	1	1	0.5537	+
3	1	1	1	1	1	1	1	1	1	1	0.5455	+
4	1	0	1	0	1	1	0	1	1	0	0.5602	x
5	1	1	1	1	1	1	1	1	1	1	0.5529	+
6	1	1	1	1	1	1	1	1	1	1	0.5531	+
7												

AB Tabulation

1	2	3
d	a	d
d	d	d
d	d	d
b	c	d
d	d	d
d	d	d

BC Tabulation

1	2	3
b	c	d
d	d	d
d	d	d
a	d	d
d	d	d
d	d	d

AC Tabulation

1	2	3
b	c	d
d	d	d
d	d	d
b	c	d
d	d	d
d	d	d

Example

Risk Analysis

A * B Crosstabulation

			B		Total
			0	1	
A	0	Count	1	1	2
		Expected Count	0.2	1.8	2.0
	1	Count	1	15	16
		Expected Count	1.8	14.2	16.0
Total		Count	2	16	18
		Expected Count	2.0	16.0	18.0

B * C Crosstabulation

			C		Total
			0	1	
B	0	Count	1	1	2
		Expected Count	0.2	1.8	2.0
	1	Count	1	15	16
		Expected Count	1.8	14.2	16.0
Total		Count	2	16	18
		Expected Count	2.0	16.0	18.0

A * C Crosstabulation

			C		Total
			0	1	
A	0	Count	0	2	2
		Expected Count	0.2	1.8	2.0
	1	Count	2	14	16
		Expected Count	1.8	14.2	16.0
Total		Count	2	16	18
		Expected Count	2.0	16.0	18.0

Kappa	A	B	C
A	-	0.44	-0.12
B	0.44	-	0.44
C	-0.12	0.44	-

DETERMINATION	
A x B	Some Agreement
A x C	Poor Agreement
B x C	Some Agreement

Example

8. Measurement System Analysis

How to: Meet all AM General MSA Requirements

Variable Analysis

Anova Method is only acceptable method.

- Select a minimum of 10 parts.
- Select a minimum of 3 operators.

Results

-Number of distinct categories shall be 5 or greater.
-For Powertrain and like type components Total Gage R&R shall be less than 10%.
-For all other components Total Gage R&R shall be less than 20%.
-Please consult your SQE for any variable results over these limits.

Attribute Agreement Analysis

Attribute Risk Method is only acceptable method.
-Select a minimum of 3 operators, perform 3 trials.
-Select a minimum of 50 parts.
-Validate selected parts with variable gage such as CMM.
-10% below and above boundary limits.
-25% at and around upper and lower boundary limit.
-30% between boundary limits to represent range of normal process variation.

Results

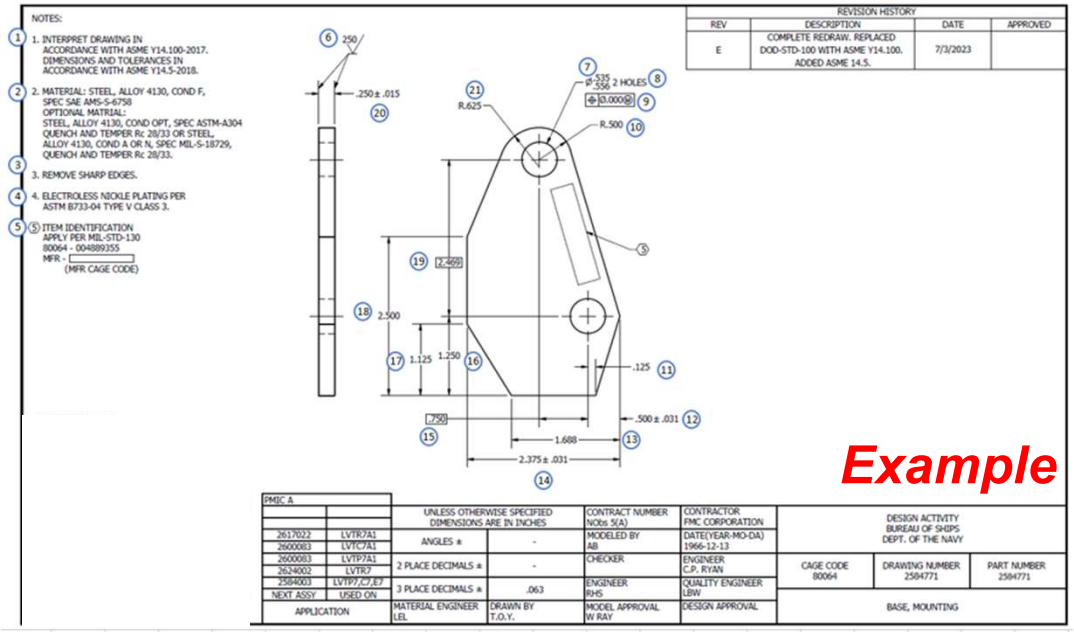
-Kappa coefficient between operators must exceed 0.70, greater than 0.80 preferred.
-Kappa coefficient operator to standard must exceed 0.70, greatet than 0.80 preferred.

Element 8 Gage Repeatability & Reproducibility (GR&R)	
JLTV Requirements	Inadmissible
Demonstrated Gage Capability Studies completed for all measurement devices.	Gages used have inadequate measurement resolution.
Gage resolution specified meeting 10:1 ground rule.	Only gage calibration system.
Producer action plan(s) in place to address unacceptable gage capability results.	No or inadequate action plan for gage capability results that do not meet requirements.

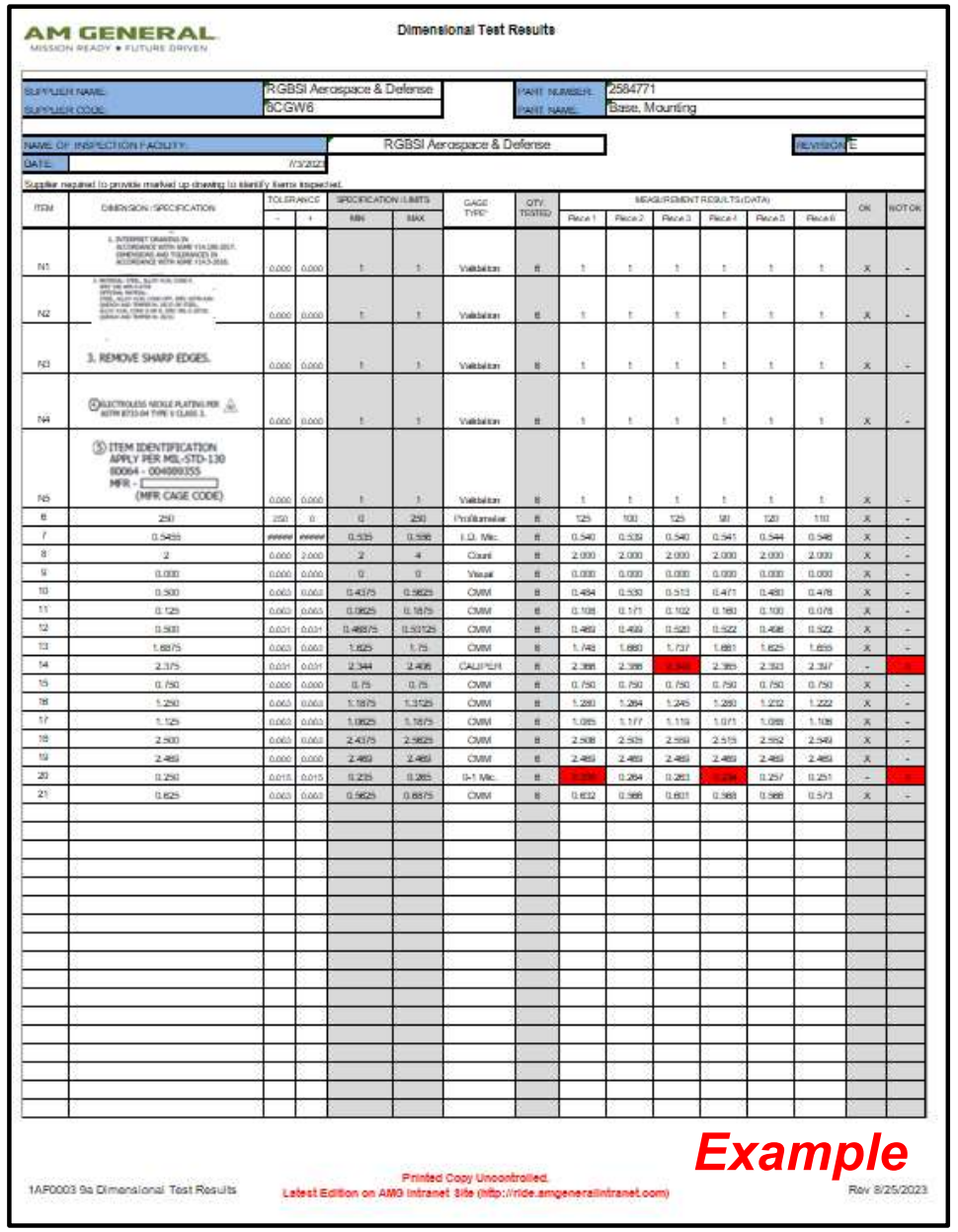
9. Dimensional Results

Definition: Dimensional results show that the physical part measurements meet the drawing requirements.

Purpose: Ensure that the production process can produce parts according to print requirements. If there are issues with meeting the drawing requirements, changes must be made to the Process Flow, PFMEA, or the Control Plan to fix the cause of the issue.



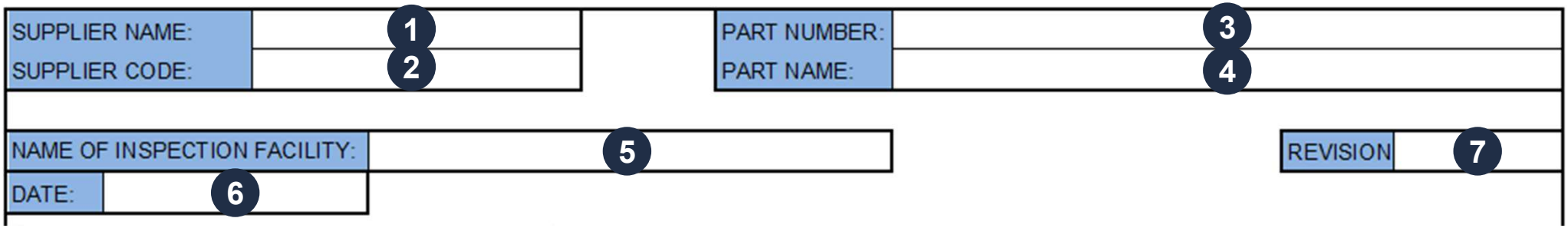
Example



Example

9. Dimensional Results

How to: For the top portion of the Dimensional Results form, information needs to be filled out to provide details on the supplier, the part it is being completed on, and the inspection facility involved.



1	**Supplier Name**: Name of supplier that produced sample part.
2	**Supplier Code**: Unique code (typically a Cage Code) identifying the supplier.
3	**Part Number**: Unique number assigned to identify the sample part.
4	**Part Name**: Name given to a part or product.
5	**Name of Inspection Facility**: Facility that performed inspection to sample parts.
6	**Date**: Date of when inspection on sample parts was performed.
7	**Revision**: identifier of design record revision used to produce sample parts.

9. Dimensional Results

How to: For the bottom portion of the Dimensional Results form, information needs to be filled out for all 6 parts. The dimension information needs to be entered in from the bubbled drawing with accurate information. The results must be entered as taken, with failing measurements resulting in the cell turning red. This shows a failure in the measurement to meet the requirement dimension and tolerance, which causes in a failure of the inspection of the part.

Supplier required to provide marked up drawing to identify items inspected.

ITEM	DIMENSION / SPECIFICATION	TOLERANCE		SPECIFICATION / LIMITS		GAGE TYPE*	QTY. TESTED	MEASUREMENT RESULTS (DATA)						OK	NOT OK
		-	+	MIN	MAX			Piece 1	Piece 2	Piece 3	Piece 4	Piece 5	Piece 6		
ex	4	1.000	1.000	3	5	Caliper	6	4.000	4.000	4.000	4.000	4.000	2.000	-	X
8	9	10	11	12	13	14	15			16				17	18

8 **Item**: Identified note or dimension from drawing to be measured on sample part.

9 **Dim / Spec**: Specified measurable extent of feature as specified on the drawing.

10 **Tolerance -**: Low tolerance of dimension as specified in the drawing.

11 **Tolerance +**: High tolerance of dimension as specified in the drawing.

12 **Spec / Limits Min**: Low limit (or minimum) of dimension as specified in the drawing.

13 **Spec / Limits Max**: High limit (or maximum) of dimension as specified in the drawing.

14 **Gage Type**: Type of gage used to measure dimension.

15 **QTY Tested**: Quantity of parts with dimension inspected.

16 **Data**: Dimensional data of measured results for each individual part.

17 **OK**: Checkbox specifying dimension measured on parts are acceptable to drawing.

18 **Not OK**: Checkbox specifying dimension measured on parts are not acceptable to drawing

9a. Dimensional Results

How to: A completed Dimensional Results form will have all the items filled out for all the necessary dimensions in the bubbled drawing. It will also determine if the part passes or fails the inspection.

SUPPLIER NAME:	TRUE	PART NUMBER:	2584771
SUPPLIER CODE:	8CGW6	PART NAME:	Base, Mounting
NAME OF INSPECTION FACILITY:	RGBSI Aerospace & Defense	REVISION:	E
DATE:	7/3/2023		

Supplier required to provide marked up drawing to identify items inspected.

ITEM	DIMENSION / SPECIFICATION	TOLERANCE		SPECIFICATION / LIMITS		GAGE TYPE*	QTY. TESTED	MEASUREMENT RESULTS (DATA)						OK	NOT OK
		-	+	MIN	MAX			Piece 1	Piece 2	Piece 3	Piece 4	Piece 5	Piece 6		
N1	IRPRET DRAWING IN ORDANCE WITH ASME Y14.100-2017. ENSIONS AND TOLERANCES IN ORDANCE WITH ASME Y14.5-2018.	0.000	0.000	1	1	Validation	6	1	1	1	1	1	1	X	-
N2	ITEEL, ALLOY 4130, COND F, 45-5-6758 ATRIAL: IY 4130, COND OPT, SPEC ASTM-A30 D TEMPER Rc 28/33 OR STEEL, , COND A OR N, SPEC MIL-S-18729, D TEMPER Rc 28/33.	0.000	0.000	1	1	Validation	6	1	1	1	1	1	1	X	-
N3	VE SHARP EDGES.	0.000	0.000	1	1	Validation	6	1	1	1	1	1	1	X	-
N4	DLESS NICKLE PLATING PER 733-04 TYPE V CLASS 3.	0.000	0.000	1	1	Validation	6	1	1	1	1	1	1	X	-
N5	M IDENTIFICATION LY PER MIL-STD-130 64 - 004889355 t - [redacted] (MFR CAGE CODE)	0.000	0.000	1	1	Validation	6	1	1	1	1	1	1	X	-
6	250	250	0	0	250	Profilometer	6	125	100	125	90	120	110	X	-
7	0.5455	0.0105	0.0105	0.535	0.556	I.D. Mic.	6	0.540	0.539	0.540	0.541	0.544	0.546	X	-
8	2	0.000	2.000	2	4	Count	6	2.000	2.000	2.000	2.000	2.000	2.000	X	-
9	0.000	0.000	0.000	0	0	Visual	6	0.000	0.000	0.000	0.000	0.000	0.000	X	-
10	0.500	0.063	0.063	0.4375	0.5625	CMM	6	0.484	0.530	0.513	0.471	0.480	0.476	X	-
11	0.125	0.063	0.063	0.0625	0.1875	CMM	6	0.108	0.171	0.102	0.160	0.100	0.078	X	-
12	0.500	0.031	0.031	0.46875	0.53125	CMM	6	0.469	0.499	0.520	0.522	0.496	0.522	X	-
13	1.6875	0.063	0.063	1.625	1.75	CMM	6	1.748	1.660	1.737	1.661	1.625	1.655	X	-
14	2.375	0.031	0.031	2.344	2.406	CALIPER	6	2.366	2.386	2.340	2.365	2.393	2.397	-	X
15	0.750	0.000	0.000	0.75	0.75	CMM	6	0.750	0.750	0.750	0.750	0.750	0.750	X	-
16	1.250	0.063	0.063	1.1875	1.3125	CMM	6	1.280	1.264	1.245	1.280	1.232	1.222	X	-
17	1.125	0.063	0.063	1.0625	1.1875	CMM	6	1.085	1.177	1.119	1.071	1.088	1.106	X	-
18	2.500	0.063	0.063	2.4375	2.5625	CMM	6	2.506	2.505	2.559	2.515	2.552	2.549	X	-
19	2.469	0.000	0.000	2.469	2.469	CMM	6	2.469	2.469	2.469	2.469	2.469	2.469	X	-
20	0.250	0.015	0.015	0.235	0.265	0-1 Mic.	6	0.230	0.264	0.263	0.234	0.257	0.251	-	X
21	0.625	0.063	0.063	0.5625	0.6875	CMM	6	0.632	0.566	0.601	0.568	0.566	0.573	X	-

For Drawing notes, enter "1" in results columns if verified good, "0" if verified fail.

Ensure information is filled correctly. Complete dimensional test on selected parts and record results.

Example

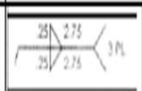
9b. Weld Dimensional Results

How to: A completed Weld Dimensional Results form will have all the items filled out for all the necessary Weld dimensions in the bubbled drawing. It will also determine if the parts pass or fails the inspection.

SUPPLIER NAME:	RGBSI Aerospace & Defense	PART NUMBER:	2584771
SUPPLIER CODE:	8CGW6	PART NAME:	Base, Mounting
NAME OF INSPECTION FACILITY:	RGBSI Aerospace & Defense	REVISION:	E
DATE:	7/3/2023		11/18/1980

Example

Supplier required to p... ed up print to identif... d items.

ITEM	WELD DESCRIPTION	WELD SYMBOL	WPS#	PQR# (IF NOT PRE-QUALIFIED)	DIMENSION / SPECIFICATION WIDTH	DIMENSION / SPECIFICATION LENGTH	WIDTH SPEC LIMITS		LENGTH SPEC LIMITS		Gage	Weld Check Results									OK	NOT OK
												Piece 1			Piece 2			Piece 3				
							-	+	-	+		WELD WIDTH	WELD LENGTH	WELD PASS/FAIL	WELD WIDTH	WELD LENGTH	WELD PASS/FAIL	WELD WIDTH	WELD LENGTH	WELD PASS/FAIL		
W1	Double Fillet		MBW-WPS-STL-013		0.25	2.75	0.25	0.25	2.75	2.75	Caliper	0.25	2.75	Pass	0.25	2.75	Pass	0.25	2.75	Pass	X	-
																					-	#N/A

Ensure information is filled correctly. Weld symbol and weld description will come from the bubbled print.
PQR#: Procedure Specification Record
WPS#: Welding Procedure Specification
PQR# will only be filled out upon request.

1. **Document Information:** Fill out information providing details about supplier, part, and inspection facility.
2. **Weld Description:** Document the weld description from the part print.
3. **Weld Symbol:** Document the weld symbol from the part print.
4. **WPS#:** Document WPS#.
5. **PQR#:** Document PQR (If not prequalified).
6. **Weld Spec:** Width and Length specifications.
7. **Weld Spec Limits:** Document Weld check limits.
8. **Gage:** Document gage type used to inspect welds.
9. **Weld Check Results:** Document results from Weld measurements.
10. **OK/Not OK:** Document if weld passed all part inspections.

9. Dimensional Results

Element 9 Dimensional Test Results	
JLTV Requirements	**Inadmissible**
100% dimensional inspection is required for a minimum of six (6) parts for each PPAP submittal, including subcomponents if the part or assembly is purchased at a higher level than the lowest level defined in the JLTV Technical Data Package and Computer Software Package. In the event that less than three parts are ordered, all parts shall be subject to 100% dimensional inspection.	Dimensional inspection only for one part.
Additional sample parts represent all process streams.	Some features checked in an over-inspection found to be out-of-tolerance.
All dimensional characteristics are accounted for (ref. ballooned prints).	Missing or incomplete dimensional characteristics.
CTQ features are identified.	Features found to be unaccounted for.
Zero non-conformances.	
For design authority suppliers, 100% of outline drawing characteristics, with actual values.	
If the product drawing relies upon the 3D CAD model to fully define the part, the PPAP shall include evidence that all measured samples conform to the geometry and associated GD&T requirements defined by the 3D CAD model.	

10a. Material / Performance Test Results

Definition: The Material and Performance Test Results are a summary of all the tests performed on the part as specified in the drawing. It also includes the First Article Test (FAT) Report.

Purpose: These test results are important documentation to prove that the part meets all its performance expectations and can perform in the necessary application.

Material and Performance Test Results

AM GENERAL
MISSION READY ★ FUTURE DRIVEN

MATERIAL AND PERFORMANCE TEST RESULTS

(ATTACH COPY OF ALL LAB TESTING DOCUMENTATION TO ELEMENT 17, RECORDS OF COMPLIANCE)

SUPPLIER NAME:	RGBSI Aerospace & Defense	PART NUMBER:	2584771
SUPPLIER CODE:	8CGW6	PART NAME:	Base, Mounting
NAME OF INSPECTION FACILITY:	RGBSI Aerospace & Defense	REVISION:	E
DATE:	7/3/2023		

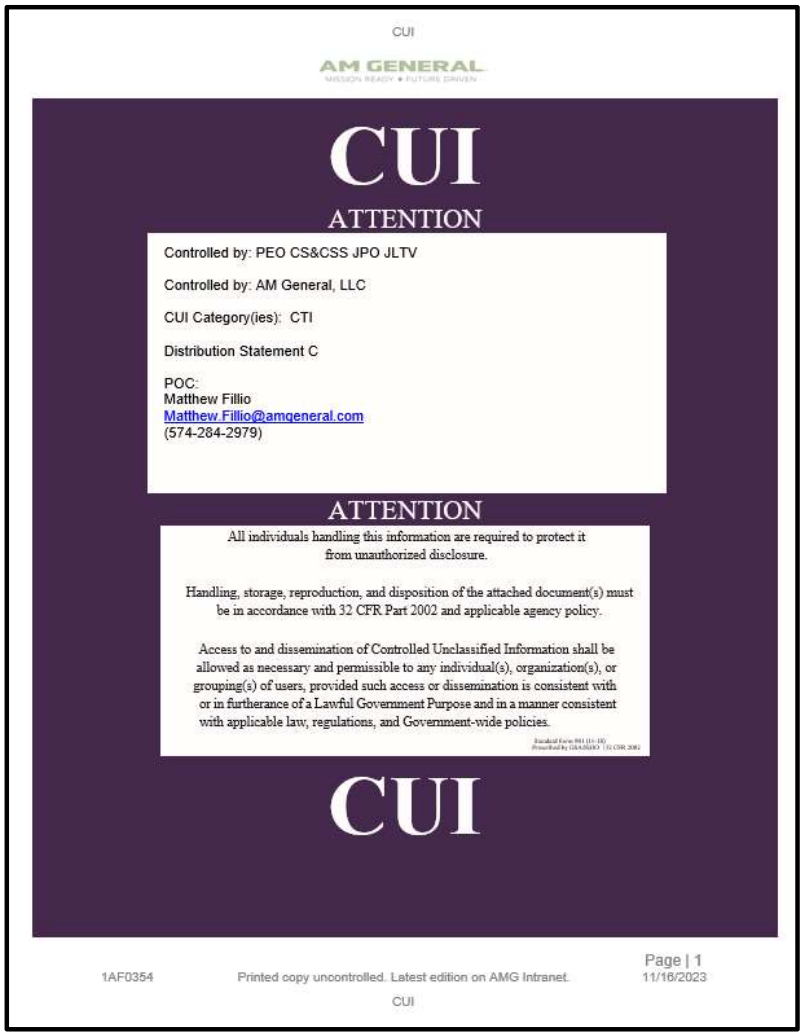
2 Material / Performance Spec. Number	3 Specification / Limits	4 Test Date	5 QTY Tested	6 Test Results	7 OK	7 NOT OK
WSS-M2P177-C3 Corrosion Cycle	C3 -9 weeks rust > 1mm spread	1/1/2023	6	EXAMPLE 6 parts -9 week cyclical testing; Exhibits >1mm rust	X	

1. **Header**: Main information about the Material and Performance Test Results report.
2. **Material Spec. Number**: Specification number for test being performed.
3. **Specification/Limits**: Specifications to which parts are being tested.
4. **Test Date**: Date when test report was completed.
5. **QTY Tested**: Quantity of parts tested.
6. **Test Results**: Reported test results.
7. **OK/NOT OK**: Mark if parts passed testing.

10b. First Article Test Report Resources

Definition: The First Article Test Report is a summary of all the tests performed on the part as specified in the drawing, presented as CUI documentation in the AM General required format.

How To: For all Component First Article Testing (CFAT) please use the AMG CFAT Workbook (1AF0354) found on the Supplier resource website. Use the same document for all First Article Testing (FAT) as well.


CUI

AM GENERAL

CUI

ATTENTION

Controlled by: PEO CS&CSS JPO JLTV

Controlled by: AM General, LLC

CUI Category(ies): CTI

Distribution Statement C

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ATTENTION

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CUI

1AF0354 Printed copy uncontrolled. Latest edition on AMG Intranet. Page | 1 11/16/2023

CUI

10. Material / Performance Test Results

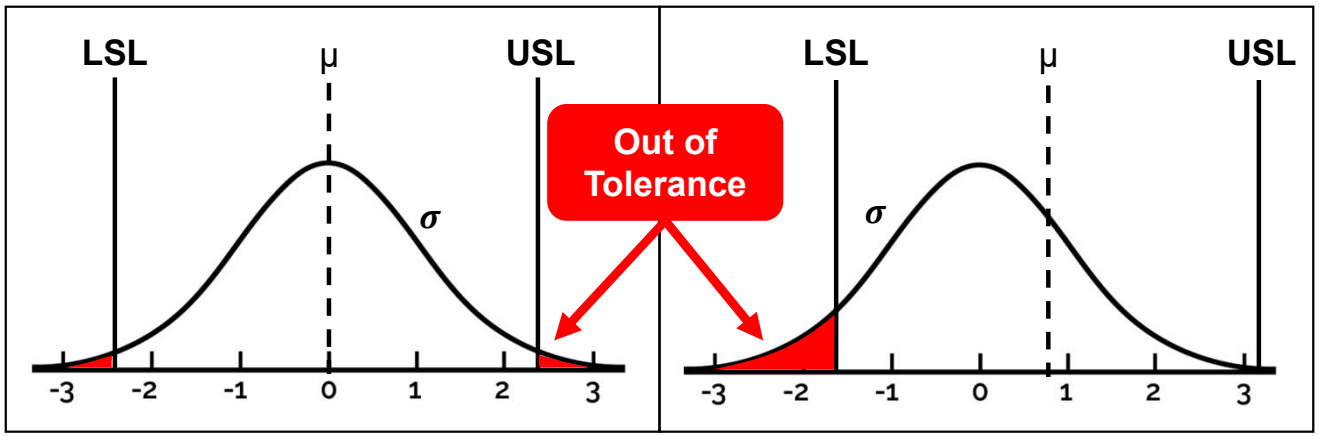
Element 10 Materials Testing, Performance Testing, First Article Test (FAT) Report	
JLTV Requirements	**Inadmissible**
Compliance to the following are required to be documented, as applicable: Raw Materials Certifications, Performance Test Reports (which identify that all specified performance requirements on the Design Record have been demonstrated), Surface Finish Requirements, Marking/Labeling Requirements, Paint/Plating Requirements, Welding Documentation (necessary to demonstrate conformance to specified weld requirements such as procedure specifications, certifications, procedure qualification requirements, etc.).	Documentation for Raw Materials Certifications or Performance Test Reports are missing or incomplete.
Compliance information for any other material or material process (e.g. heat treatment) or performance test requirement specified in the Design Record but not included in the list above shall be included.	
The supplier is responsible for presenting Certificates of Conformance (COC) and Material Test Reports for Raw Materials for review.	Certificates of Conformance missing or incomplete.

11. Initial Process Studies

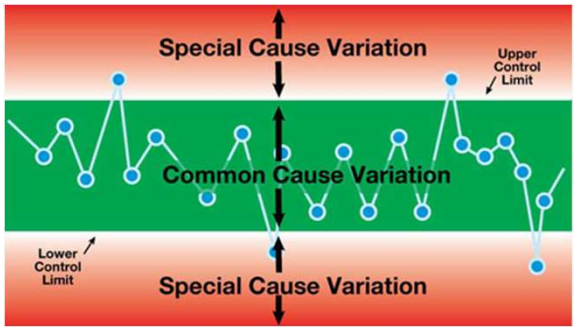
Definition: Includes all SPC charts to prove processes producing critical/significant characteristics have stable variability.

Purpose: To ensure that the process can produce special characteristics that meet the organization's standard. **If Process is not stable,** the organization shall identify, evaluate and, wherever possible, eliminate special causes of variation prior to PPAP submission.

	Idealistic *Natural Variation*	Realistic *Process Centering*
Capability *Under Statistical Process Control*	$C_p = \frac{USL - LSL}{6\sigma_{c_p}}$	$C_{pk} = \text{Min}\left(\frac{\text{USL} - \bar{x}}{3\sigma_{c_p}}, \frac{\bar{x} - \text{LSL}}{3\sigma_{c_p}}\right)$ $\sigma_{c_p} \rightarrow$ *sample set*
Performance *New Process*	$P_p = \frac{USL - LSL}{6\sigma_{p_p}}$	$P_{pk} = \text{Min}\left(\frac{\text{USL} - \bar{x}}{3\sigma_{p_p}}, \frac{\bar{x} - \text{LSL}}{3\sigma_{p_p}}\right)$ $\sigma_{p_p} \rightarrow$ *entire dataset*



Statistical Process Control:
The application of statistical methods to monitor and control the quality of a production process

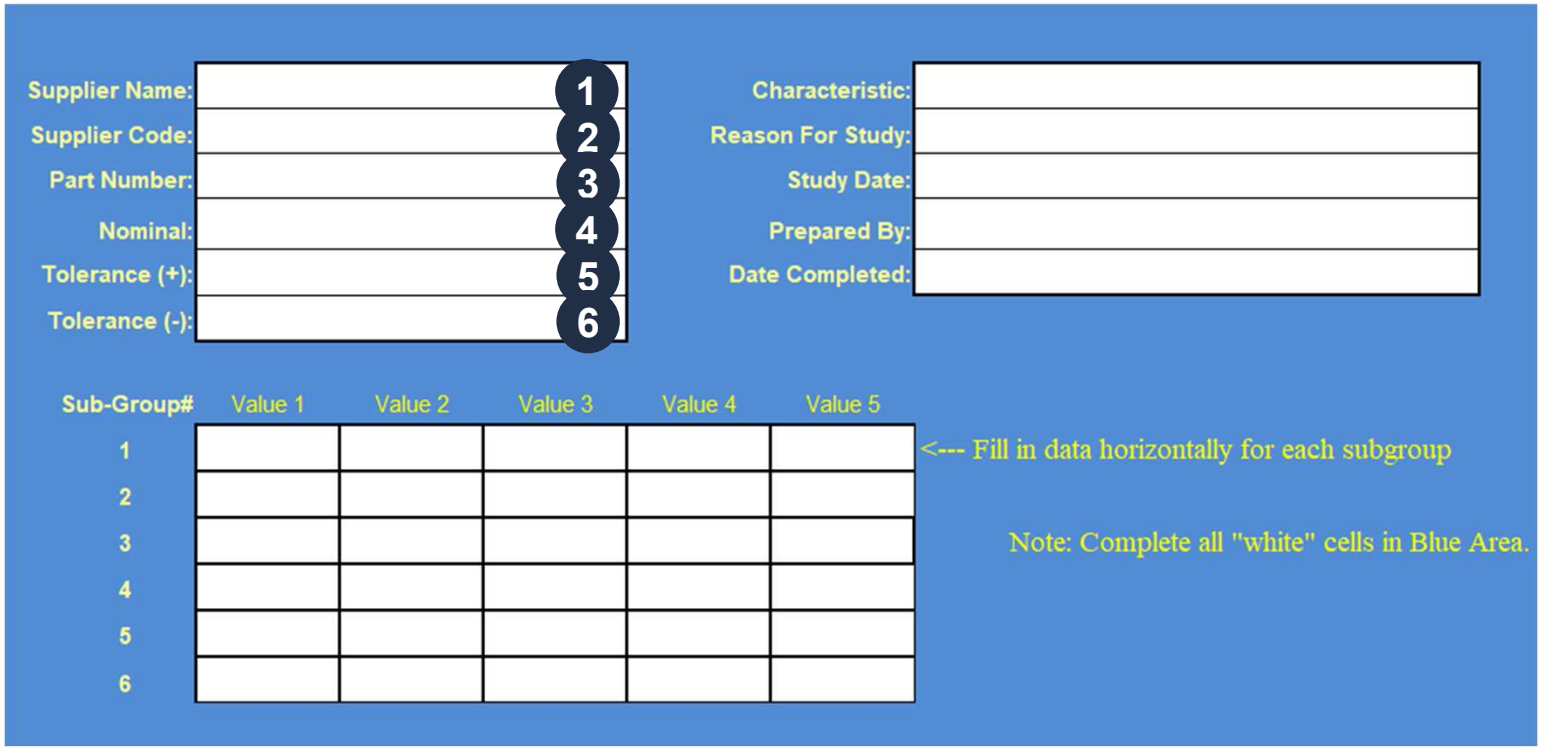


$$\bar{X} = \frac{x_1 + x_2 + x_3 + \ldots x_n}{n}$$

$$\sigma = \sqrt{\frac{\sum(x - \bar{x})^2}{n-1}}$$

11. Initial Process Studies

How to: Fill out the relevant information outlined below to document the supplier, part number, and tolerance of the dimension being measured.



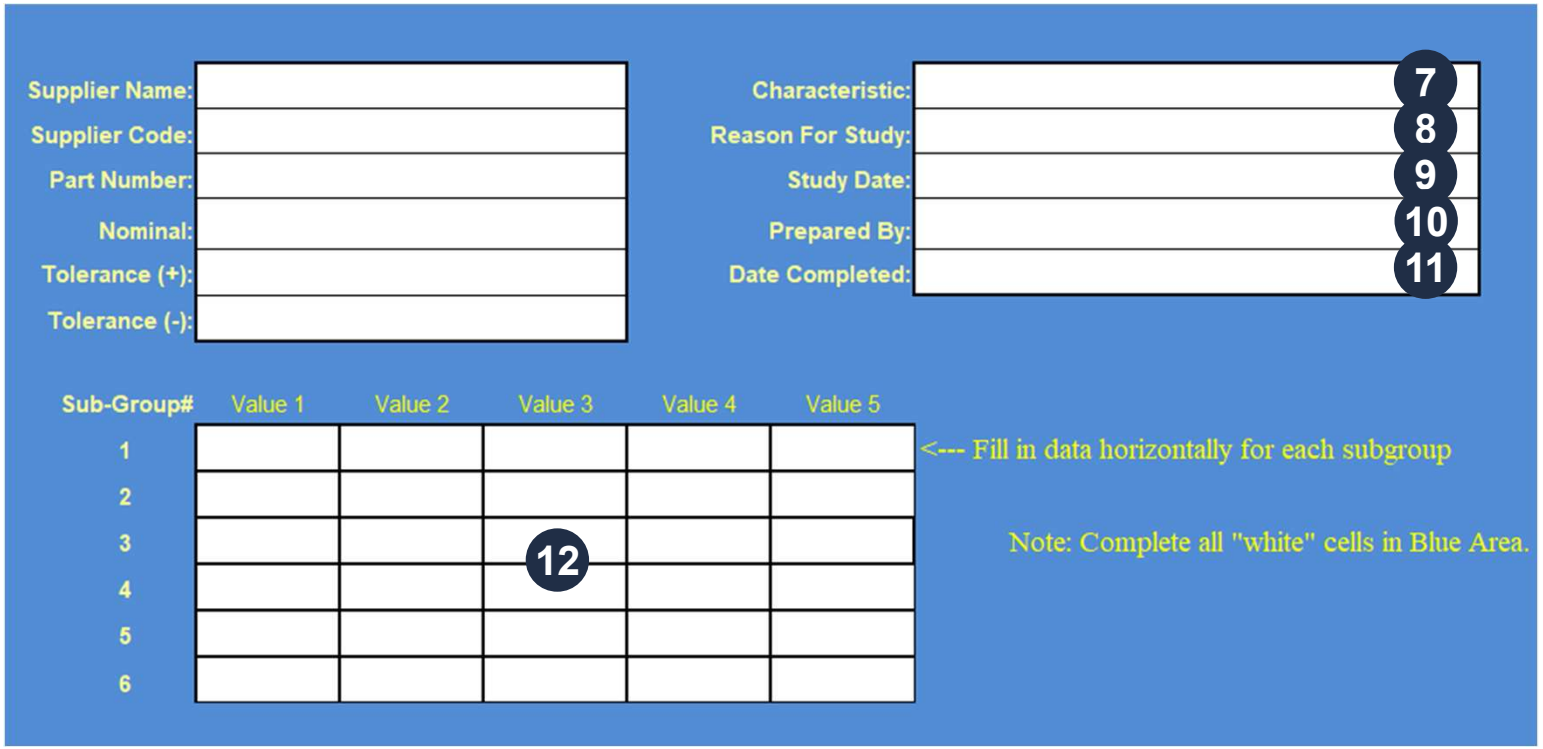
Supplier Name:	1	Characteristic:	
Supplier Code:	2	Reason For Study:	
Part Number:	3	Study Date:	
Nominal:	4	Prepared By:	
Tolerance (+):	5	Date Completed:	
Tolerance (-):	6		

Sub-Group#	Value 1	Value 2	Value 3	Value 4	Value 5
1					
2					
3					
4					
5					
6					

1. **Supplier Name**: Name of the company or entity providing materials or services.
2. **Supplier Code**: Known as CAGE (Commercial and Government Entity) Code.
3. **Part Number / Revision**: Unique identifier and revision letter assigned to a part.
4. **Nominal**: Designated size of a dimensioned feature.
5. **Tolerance (+)**: Allowable value that a measured feature can be above nominal size.
6. **Tolerance (-)**: Allowable value that a measured feature can be below nominal size.

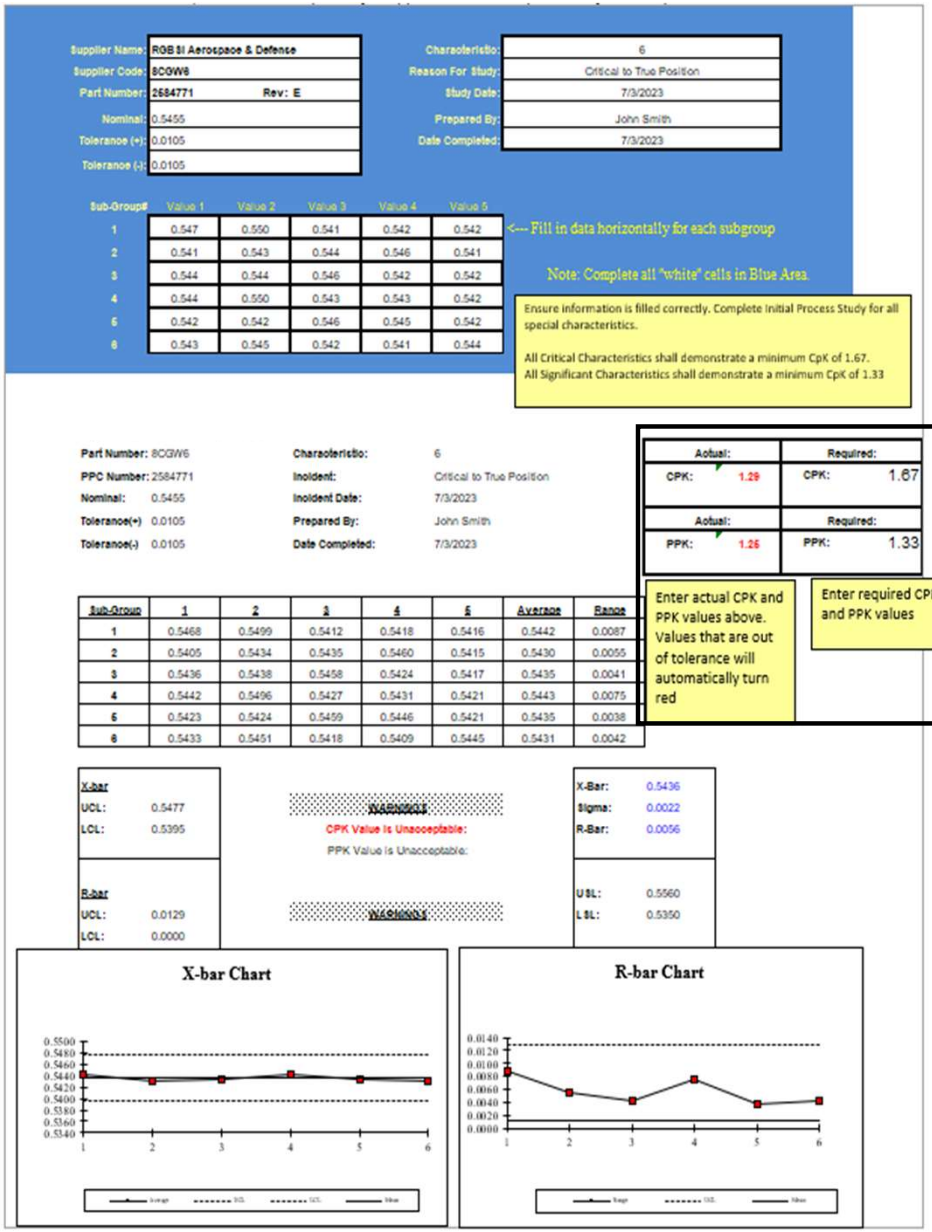
11. Initial Process Studies

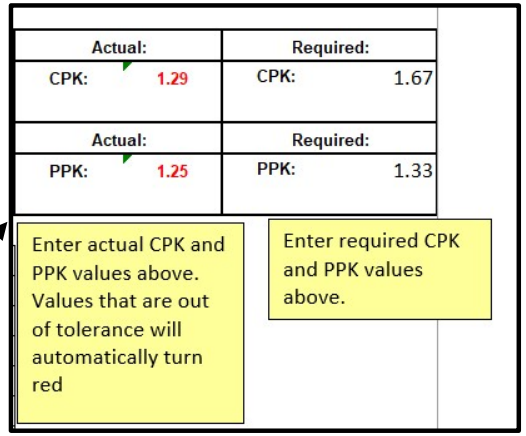
How to: Fill out the relevant information outlined below to document the characteristic, study details, and the dimensions taken on the part.



7	**Characteristic**: Dimensioned feature of a part defined by design data.
8	**Reason For Study**: Include number of request form, or reason for initiating this study.
9	**Study Date**: When was this study initiated.
10	**Prepared By**: Name of personnel who initiated the study.
11	**Date Completed**: Date that study was completed.
12	**Sub-Group Data**: Values of measured data taken from sample parts.

11. Initial Process Studies





Element 11 Initial Process Studies (IPS)	
JLTV Requirements	**Inadmissible**
All defined KPCs are identified on the PFMEA, Process Flow Map, Control Plan and work instructions.	KPCs are not documented on PCP.
The requirements for significant production runs (PPAP Manual 2.1) and Quality Indices (PPAP Manual 2.2.11.2) shall be in accordance with PPAP Manual (Fourth Edition) Appendix H. All other PPAP Manual 2.2.11 requirements apply as written in the PPAP Manual (Fourth Edition).	
Producer can show evidence that SPC is being implemented for PW defined or self-selected KCs using control charts.	No evidence that control charts exist for either Customer/Producer KCs.
Initial Process Studies shall be performed on all special characteristics. All Critical Characteristics shall demonstrate a minimum CpK of 1.67, all Significant Characteristics shall demonstrate a minimum CpK of 1.33.	

Example

12. Qualified Laboratory Documentation

Definition: Record certification / documentation of the testing facilities used to generate reports to satisfy JLTV PPAP testing / inspection requirements.

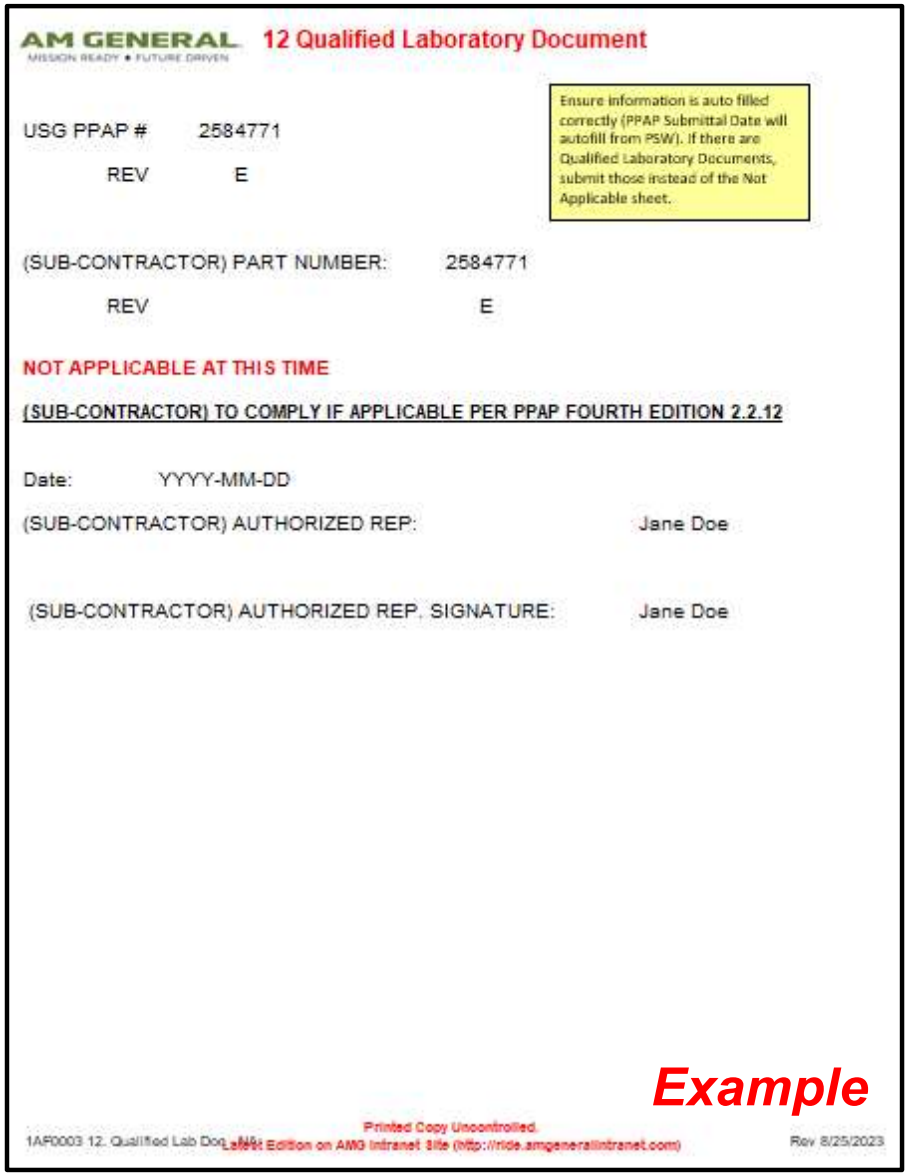
Purpose: Ensures that any identified laboratory is qualified for the type of measurements or tests conducted.

How to: Provide Certificates of Registration / Conformance as a part of the PPAP Package.

Example documents to include: A2LA Lab Accreditation

12. Qualified Laboratory Documentation

How to: If the Qualified Laboratory Documentation isn't required, fill out the "NOT APPLICABLE AT THIS TIME" form and attach to the PPAP Package.



AM GENERAL 12 Qualified Laboratory Document

Ensure information is auto filled correctly (PPAP Submittal Date will autofill from PSW). If there are Qualified Laboratory Documents, submit those instead of the Not Applicable sheet.

USG PPAP # 2584771

REV E

(SUB-CONTRACTOR) PART NUMBER: 2584771

REV E

NOT APPLICABLE AT THIS TIME

(SUB-CONTRACTOR) TO COMPLY IF APPLICABLE PER PPAP FOURTH EDITION 2.2.12

Date: YYYY-MM-DD

(SUB-CONTRACTOR) AUTHORIZED REP: Jane Doe

(SUB-CONTRACTOR) AUTHORIZED REP. SIGNATURE: Jane Doe

Example

Printed Copy Uncontrolled.
1AP0003 12. Qualified Lab Doc...
Latest Edition on AMG Intranet Site (http://ride.amgeneralintranet.com)
Rev 8/25/2023

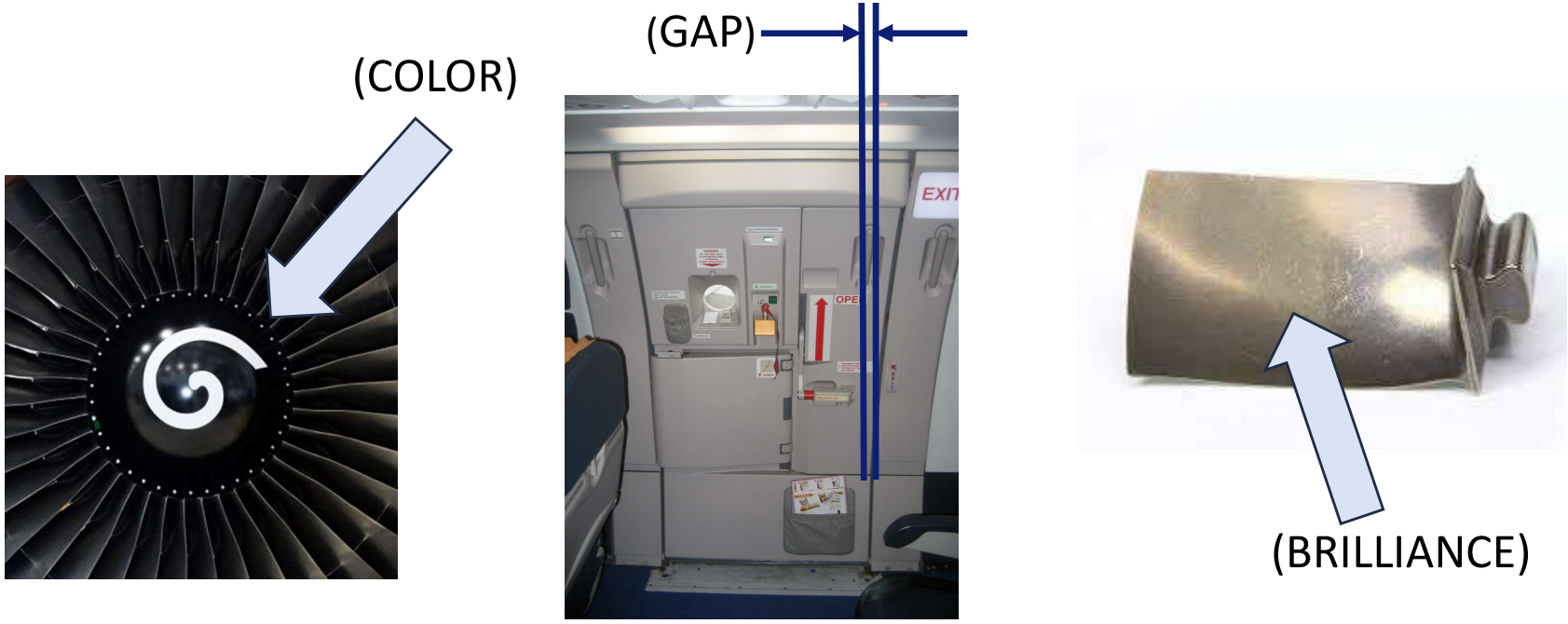
Element 12 Qualified Lab Documents	
JLTV Requirements	**Inadmissible**
Inspection and testing for PPAP shall be performed by a qualified laboratory as defined by customer requirements (e.g., an accredited laboratory). The qualified laboratory (internal or external to the organization) shall have a laboratory scope and documentation showing that the laboratory is qualified for the type of measurements or tests conducted.	Missing or incomplete qualified lab documentation.
When an external/commercial laboratory is used, the organization shall submit the test results on the laboratory letterhead or the normal laboratory report format. The name of the laboratory that performed the tests, the date (s) of the tests, and the standards used to run the tests shall be identified.	

13. Appearance Approval Report

Definition: Certification that a part meets the customer's aesthetic and design requirements based upon for the physical appearance requirements.

Purpose: To ensure that the product appears to be in the correct condition with the specified finish, dimensions, and formality.

Things to look for:



13. Appearance Approval Report

How to: If an Appearance Approval Report is required, fill out the form with the appropriate appearance measurements. These appearance requirements will be called out in the Design Record. If the Appearance Approval Report isn't required, fill out the "NOT APPLICABLE AT THIS TIME" form and attach to the PPAP Package.

AM GENERAL 12 Qualified Laboratory Document

MISSION READY • FUTURE DRIVEN

Ensure information is auto filled correctly (PPAP Submittal Date will autofill from PSW). If there are Qualified Laboratory Documents, submit those instead of the Not Applicable sheet.

USG PPAP # 2584771

REV E

(SUB-CONTRACTOR) PART NUMBER: 2584771

REV E

NOT APPLICABLE AT THIS TIME

(SUB-CONTRACTOR) TO COMPLY IF APPLICABLE PER PPAP FOURTH EDITION 2.2.12

Date: YYYY-MM-DD

(SUB-CONTRACTOR) AUTHORIZED REP: Jane Doe

(SUB-CONTRACTOR) AUTHORIZED REP. SIGNATURE: Jane Doe

Example

Printed Copy Uncontrolled.

1AF0003 12. Qualified Lab Doc - NA Latest Edition on AMG Intranet Site (http://ride.amgeneralintranet.com) Rev 8/25/2023

rgbsi aerospace & defense

Appearance Approval Report

PART NUMBER	DRAWING NUMBER	APPLICATION (VEHICLES)	
PART NAME	BUYER CODE	E/C LEVEL	DATE
ORGANIZATION NAME	MANUFACTURING LOCATION		SUPPLIER CODE
REASON FOR SUBMISSION	☐ PART SUBMISSION WARRANT ☐ SPECIAL SAMPLE ☐ RE-SUBMISSION ☐ PRE TEXTURE ☐ FIRST PRODUCTION SHIPMENT ☐ ENGINEERING CHANGE		OTHER

APPEARANCE EVALUATION

ORGANIZATION SOURCING AND TEXTURE INFORMATION		PRE-TEXTURE EVALUATION	AUTHORIZED CUSTOMER REPRESENTATIVE SIGNATURE AND DATE
		CORRECT AND PROCEED	
		CORRECT AND RESUBMIT	
		APPROVED TO ETCH/TOOL/EDM	

COLOR EVALUATION

COLOR SUFFIX	TRISTIMULUS DATA DL*	Da*	Db*	DE*	CMC	MASTER NUMBER	MASTER DATE	MATERIAL TYPE	MATERIAL SOURCE	HUE RED	YEL	GRN	BLU	VALUE LIGHT	DARK	CHROMA GRAY	CLEAN	GLOSS HIGH	LOW	METALLIC BRILLIANCE HIGH	LOW	COLOR SHIPPING SUFFIX	PART DISPOSITION

COMMENTS:

Example

ORGANIZATION SIGNATURE	PHONE NO.	DATE	AUTHORIZED CUSTOMER REPRESENTATIVE SIGNATU	DATE

Element 13 Appearance Approval	
JLTV Requirements	**Inadmissible**
Required when appearance requirements are specified in the Design Record.	Missing or incomplete data when appearance requirements are specified.

14. Sample Production Parts

Definition: Sample parts from the initial production run (PPAP run) with the exact number required being defined by the customer.

Purpose: To ensure that the product being produced on the line meets the customer's expectations and requirements.

How to: Fill out all the appropriate information on the Sample Part label and attach it to the sample part. Take pictures of the part and include them in the Sample Part tab.

STOP!

MOVE TO QUALITY HOLD

Instructions for using this label:
This label is to be secured to all four sides of all the dunnage for the Quality Hold material. This label must be printed on YELLOW 8.5X11 paper so that it will be clearly visible.

INSPECTION VERIFICATION REQUIRED	
Part Number	2584771
Part Print Revision	E
Material Revision	F
Supplier Name	RGBSI Aerospace & Defense
Supplier Code	8CGW6
Supplier Inspected By & Date	John Smith
Reason (as applicable):	
PTR / PPAP	☑ Check box for PTR Submission
CAR #	
Deviation #	
Special Inspection Required	☑ Check box if special inspection required
Safety Items - Certification Required	☑ Check box if certifications required
First Shipment, New Revision	☑ Check box if first shipment of a new revision
Note:	

Example

1. **Part Number**: Unique identifier and revision letter assigned to a part.
2. **Part Print Revision**: Iteration of the design record used to product sample part.
3. **Material Revision**: Iteration of the material used to product sample part.
4. **Supplier Name**: Name of supplier that produced sample part.
5. **Supplier Code**: Unique code (typically a Cage Code) identifying the supplier.
6. **Supplier Inspected By & Date**: Supplier personnel who performed inspection and date.
7. **Reason**: Reason for providing a sample product.
8. **Note**: Option for supplier personnel to include additional information.

14. Sample Production Parts

AM GENERAL
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14 Sample Parts

Ensure information is auto filled correctly (PPAP Submittal Date will autofill from PSW). Sample parts must include a label as shown in 14b. Sample Parts-PTR Label.

USG PPAP # 2584771

REV E

(SUB-CONTRACTOR) PART NUMBER: 2584771

REV E

(SUB-CONTRACTOR) TO COMPLY IF APPLICABLE PER PPAP FOURTH EDITION 2.2.14

Dat

(SUB-CONTRACTOR) AUTHORIZED REP: Jane Doe

(SUB-CONTRACTOR) AUTHORIZED REP. SIGNATURE: Jane Doe

Example

1AF0003 14a. Sample Parts — Printed Copy Uncontrolled. Latest Edition on AMG Intranet Site (http://ride.amgeneralintranet.com) — Rev 8/25/2023

STOP!

MOVE TO QUALITY HOLD

Instructions for using this label:
This label is to be secured to all four sides of all the dunnage for the Quality Hold material. This label must be printed on YELLOW 8.5X11 paper so that it will be clearly visible.

INSPECTION VERIFICATION REQUIRED	
Part Number	2584771
Part Print Revision	E
Material Revision	F
Supplier Name	RGBSI Aerospace & Defense
Supplier Code	8CGW6
Supplier Inspected By & Date	John Smith
Reason (as applicable):	
PTR / PPAP	☑ Check box for PTR Submission
CAR #	
Deviation #	
Special Inspection Required	☑ Check box if special inspection required
fety Items - Certification Required	☑ Check box if certifications required
First Shipment, New Revision	☑ Check box if first shipment of a new revision
Note:	

Of the initial 6 Sample Parts, 5 must be submitted for PTR, and the remaining part must be held as a Master Sample Part per Element 15.

Example

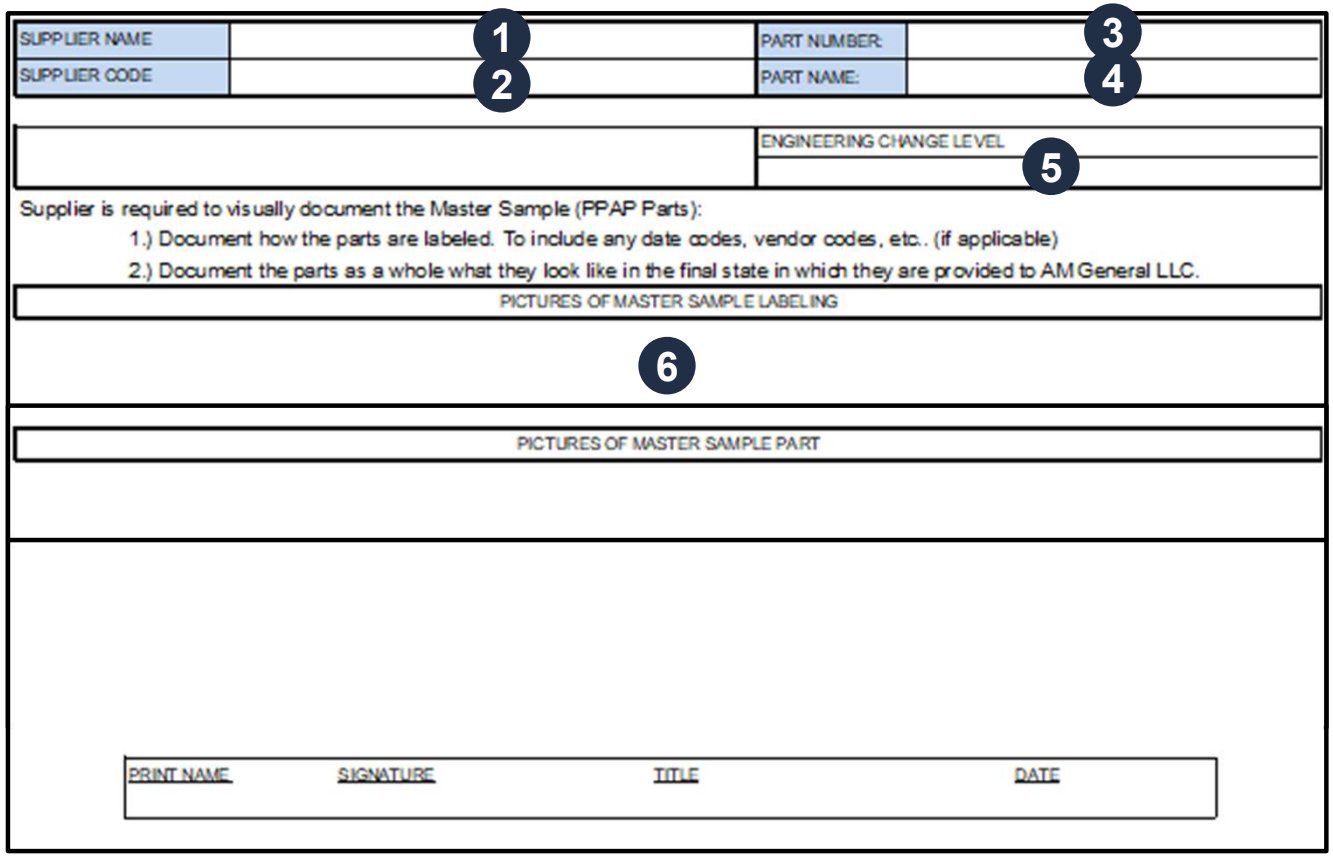
Element 14 Sample Parts	
JLTV Requirements	**Inadmissible**
A PPAP must be performed on production parts.	Missing or incomplete PPAP.
Correct number of sample parts must be supplied as specified by the customer.	Incomplete number of sample parts.
PPAP Sample Parts Label required on all samples parts or boxes containing sample parts.	Sample Part Label missing or missing appropriate information (Part/Supplier/PO).

15. Master Sample

Definition: An official sample signed off by customer and supplier that is used to train operators on subjective inspections such as visual or for noise.

Purpose: Master sample required for each manufacturing cell, mold cavity, machine, etc.

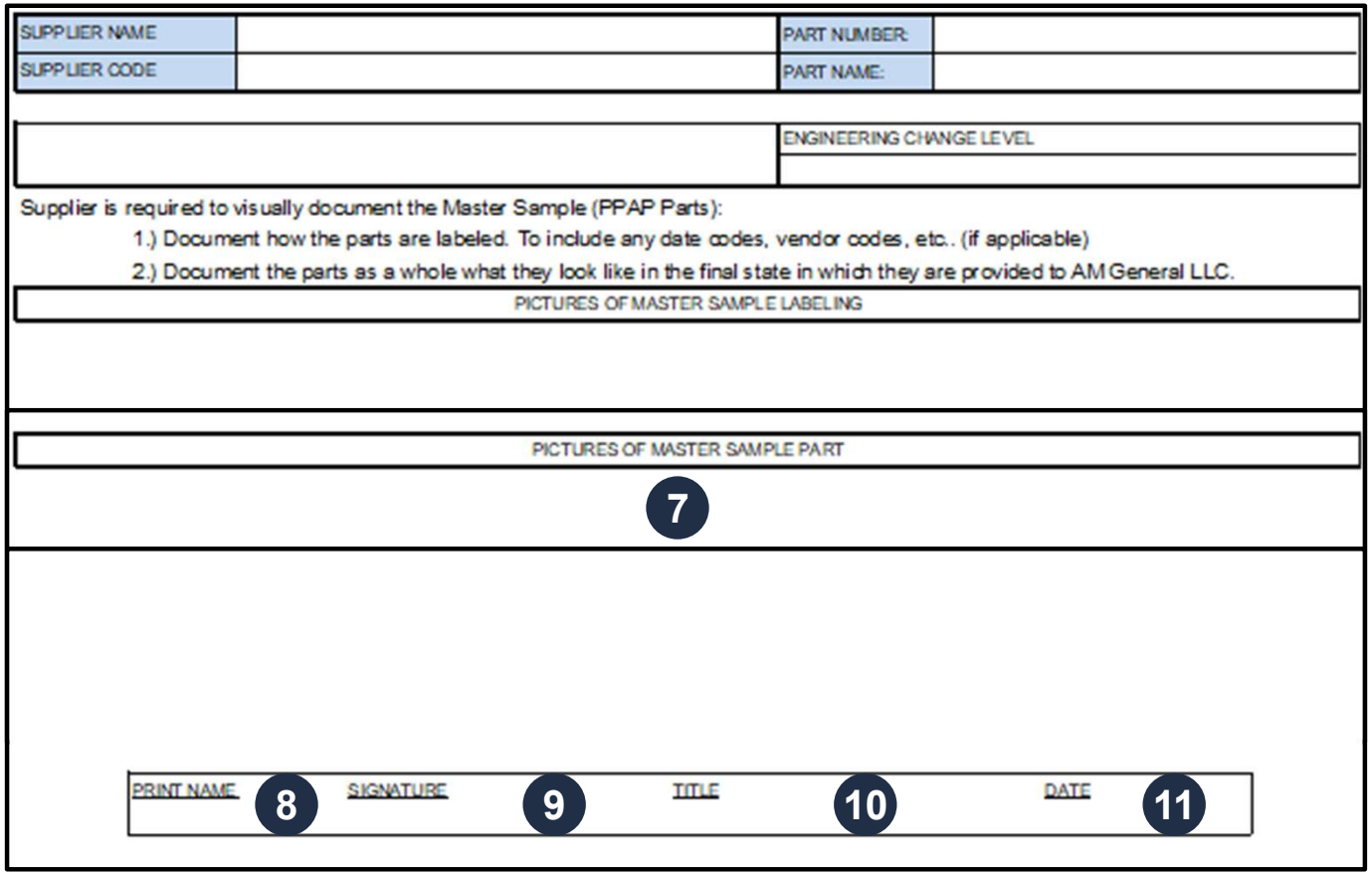
- Used as a benchmark for process control and qualifying inspection procedures.
- Must be stored and identified with part number and approval date for the life of the product.



1	**Supplier Name**: Name of supplier that produced sample part.
2	**Supplier Code**: Unique code (typically a Cage Code) identifying the supplier.
3	**Part Number**: Unique identifier and revision letter assigned to a part.
4	**Part Name (Nomenclature)**: Descriptive title or label for a part.
5	**Engineering Change Level**: What level is the part's design record currently on.
6	**Picture of Master Sample Labeling**: Image of label to be attached to this form.

15. Master Sample

How to: Add a picture of the master sample to the form shown below and fill out all the relevant information.



SUPPLIER NAME		PART NUMBER:	
SUPPLIER CODE		PART NAME:	

	ENGINEERING CHANGE LEVEL

Supplier is required to visually document the Master Sample (PPAP Parts):

1.) Document how the parts are labeled. To include any date codes, vendor codes, etc.. (if applicable)

2.) Document the parts as a whole what they look like in the final state in which they are provided to AM General LLC.

PICTURES OF MASTER SAMPLE LABELING

PICTURES OF MASTER SAMPLE PART

7

PRINT NAME 8	SIGNATURE 9	TITLE 10	DATE 11

7 **Pictures of Master Sample Part**: Attached images of completed Master Sample.

8 **Print Name**: Printed name of personnel who completed this form.

9 **Signature**: Signature of personnel who completed this form.

10 **Title**: Title of personnel who completed this form.

11 **Date**: Date of when this form is completed by personnel.

15. Master Sample

AM GENERAL
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PPAP Master Sample "Picture" Documentation

SUPPLIER NAME	RGBSI Aerospace & Defense	PART NUMBER	2584771
SUPPLIER CODE	8CGW6	PART NAME	Base, Mounting

	ENGINEERING CHANGE LEVEL	E

Supplier is required to visually document the Master Sample (PPAP Parts):

1.) Document how the parts are labeled. To include any date codes, vendor codes, etc.. (if applicable)

2.) Document the parts as a whole what they look like in the final state in which they are provided to AM General LLC.

PICTURES OF MASTER SAMPLE LABELING

Ensure information is filled out correctly. Pictures need to be clear and all pictured wording legible. Place pictures of Master Sample Labeling and Master Sample Part here.

PICTURES OF MASTER SAMPLE PART

PRINT NAME	SIGNATURE	TITLE	DATE

Example

1AF0003 15. Master Sample Photo

Printed Copy Uncontrolled.
Latest Edition on AMG Intranet Site (http://ride.amgeneralintranet.com)

Rev 8/25/2023

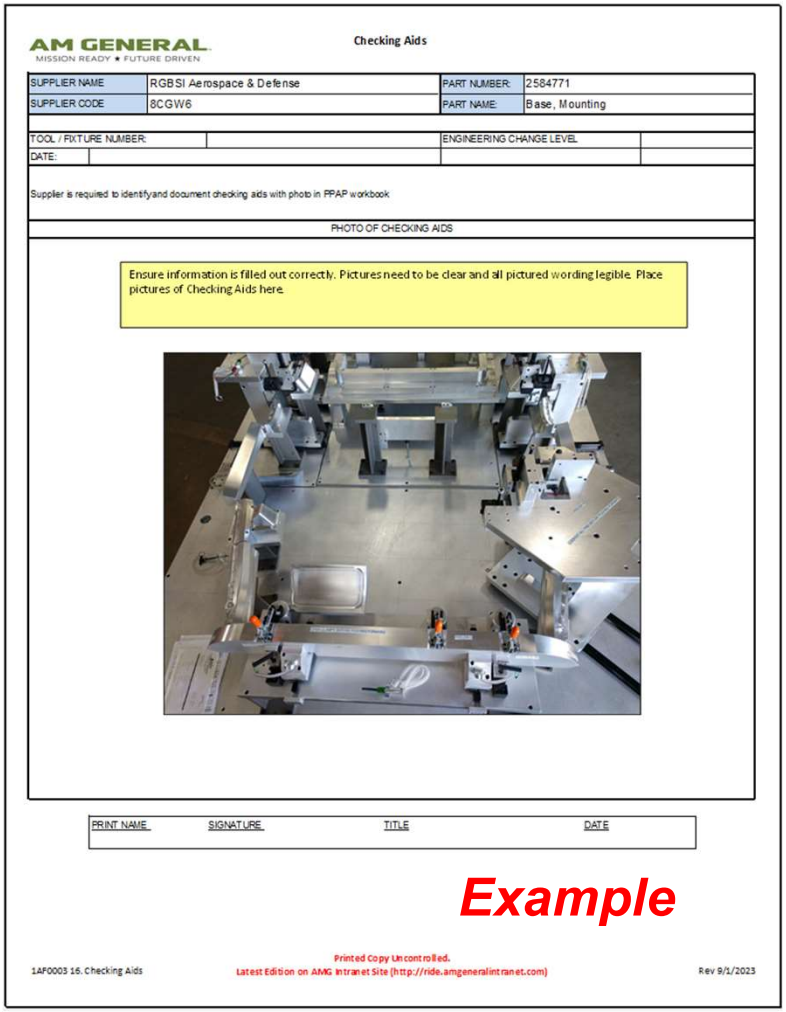
Element 15 Master Sample	
JLTV Requirements	**Inadmissible**
Photo documentation of conforming part shall be included.	Photos missing date codes or vendor codes.

Of the initial 6 Sample Parts, 1 must be held for the Master Sample Part, and the remaining 5 must be submitted for PTR per Element 14.

16. Checking Aids

Definition: A list of Checking Fixtures for checking parts that shows a picture of the tool and calibration records, including the dimensional report of the tool.

Purpose: Providing documentation that all aspects of the checking aid agree with the part's dimensional requirements.



AM GENERAL
MISSION READY ★ FUTURE DRIVEN

Checking Aids

SUPPLIER NAME	RGBSI Aerospace & Defense	PART NUMBER:	2584771
SUPPLIER CODE	8CGW6	PART NAME:	Base, Mounting
TOOL / FIXTURE NUMBER:		ENGINEERING CHANGE LEVEL	
DATE:			

Supplier is required to identifyand document checking aids with photo in PPAP workbook

PHOTO OF CHECKING AIDS

Ensure information is filled out correctly. Pictures need to be clear and all pictured wording legible. Place pictures of Checking Aids here.

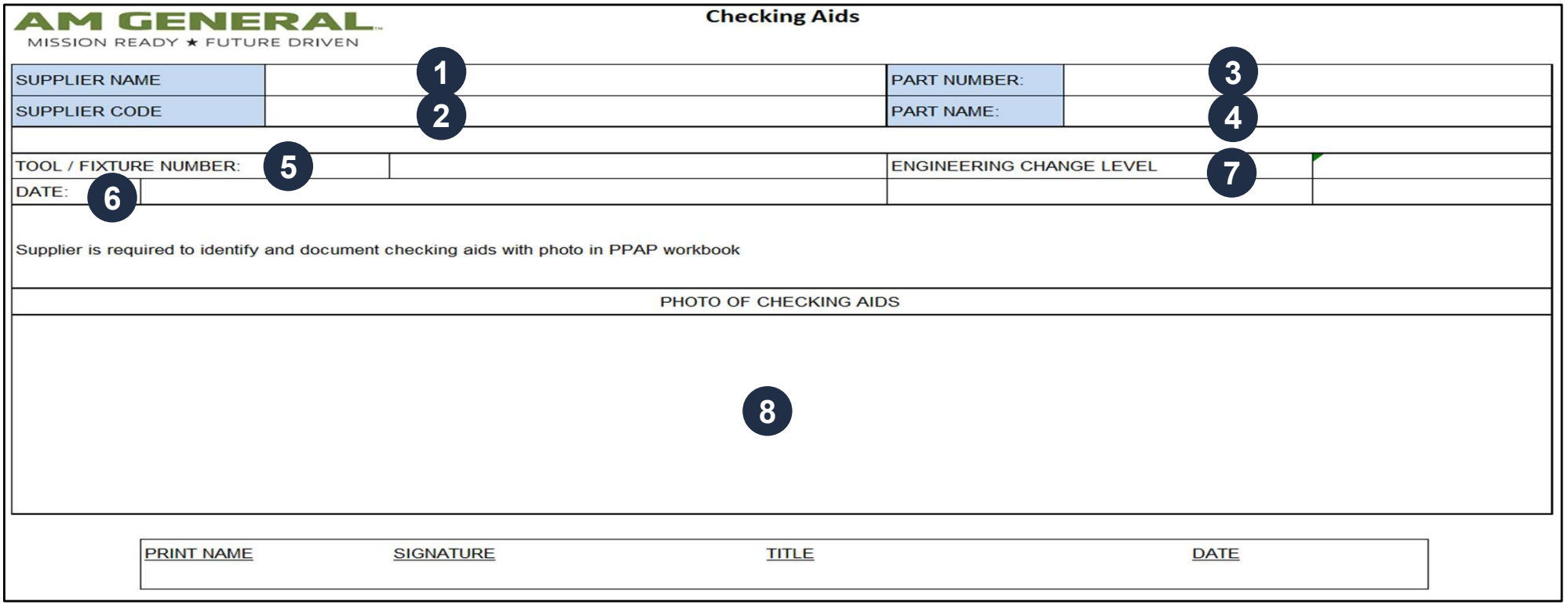
PRINT NAME	SIGNATURE	TITLE	DATE

Example

Printed Copy Uncontrolled.
1AF0003 16. Checking Aids — Latest Edition on AMG Intranet Site (http://ride.amgeneralintranet.com) — Rev 9/1/2023

16. Checking Aids

How to: Fill out the relevant information for the supplier, part number, and tooling/fixture details. Add a picture of all AM General owned tooling and fixtures.



AM GENERAL
MISSION READY ★ FUTURE DRIVEN

Checking Aids

SUPPLIER NAME	1	PART NUMBER:	3
SUPPLIER CODE	2	PART NAME:	4
TOOL / FIXTURE NUMBER:	5	ENGINEERING CHANGE LEVEL	7
DATE:	6		

Supplier is required to identify and document checking aids with photo in PPAP workbook

PHOTO OF CHECKING AIDS

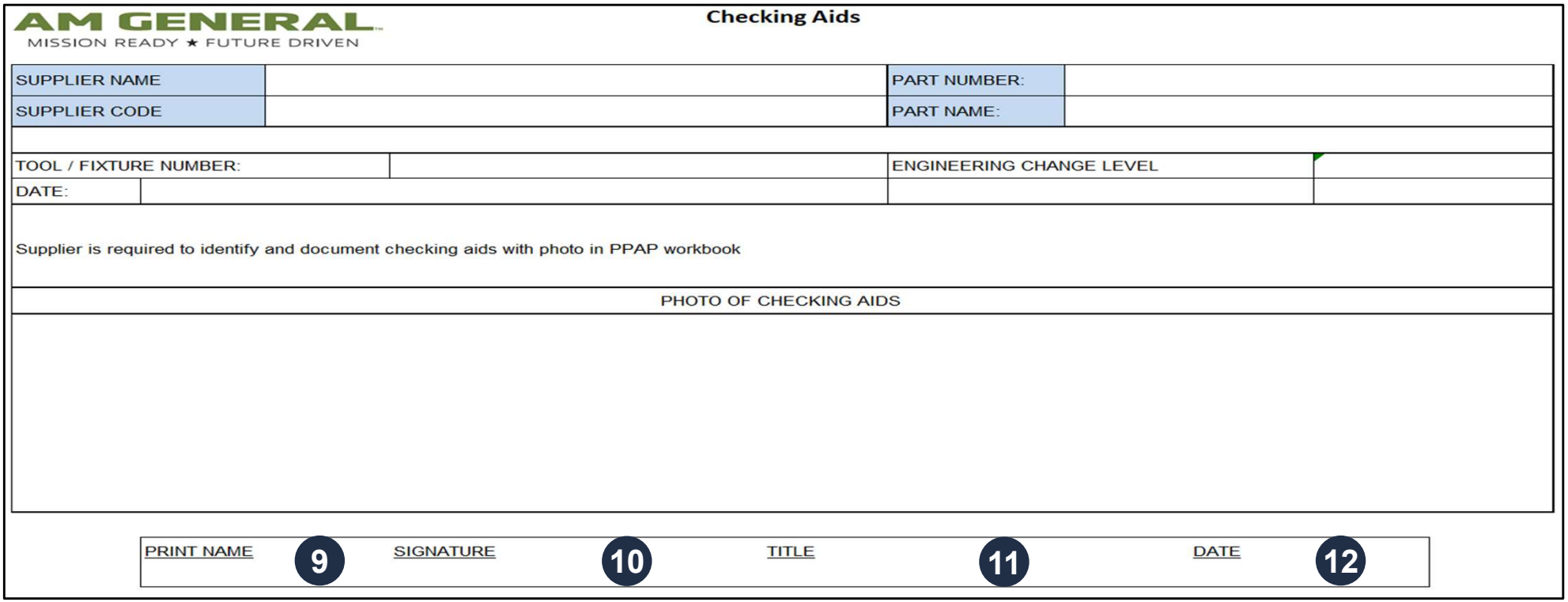
8

PRINT NAME	SIGNATURE	TITLE	DATE

1. **Supplier Name**: Name of supplier that produced sample part.
2. **Supplier Code**: Unique code (typically a Cage Code) identifying the supplier.
3. **Part Number**: Unique identifier and revision letter assigned to a part.
4. **Part Name**: Name given to a part or product.
5. **Tool / Fixture Number**: Unique identifier for tool / fixture in this form.
6. **Date**: Date of tool / fixture being documented.
7. **Engineering Change Level**: What level is the part's design record currently on.
8. **Photo of Checking Aids**: Attached image of tool / fixture in this form.

16. Checking Aids

How to: Fill out the information at the bottom in reference to the prints related to the tooling or fixtures pictured above them.



AM GENERAL
MISSION READY ★ FUTURE DRIVEN

Checking Aids

SUPPLIER NAME		PART NUMBER:	
SUPPLIER CODE		PART NAME:	
TOOL / FIXTURE NUMBER:		ENGINEERING CHANGE LEVEL	
DATE:			

Supplier is required to identify and document checking aids with photo in PPAP workbook

PHOTO OF CHECKING AIDS

PRINT NAME	9	SIGNATURE	10	TITLE	11	DATE	12

9 **Print Name**: Printed name of personnel who completed this form.

10 **Signature**: Signature of personnel who completed this form.

11 **Title**: Title of personnel who completed this form.

12 **Date**: Date of when this form is completed by personnel.

16. Checking Aids

SUPPLIER NAME	RGBSI Aerospace & Defense	PART NUMBER:	2584771
SUPPLIER CODE	8CGW6	PART NAME:	Base, Mounting
TOOL / FIXTURE NUMBER:		ENGINEERING CHANGE LEVEL	E
DATE:			

Supplier is required to identify all AM General Owned Tools & Fixtures and document with Photo in PPAP workbook

PHOTO OF AM GENERAL OWNED TOOLING AND FIXTURES

Ensure information is filled out correctly. Pictures need to be clear, all pictured wording legible, and must contain a tag or identification that clearly shows fixtures are AMG owned. Place pictures of Tooling and Fixtures here.

Example

PRINT NAME	SIGNATURE	TITLE	DATE

Element 16 Checking Aids	
JLTV Requirements	**Inadmissible**
If requested by the customer, the organization shall submit with the PPAP submission any part-specific assembly or component checking aid.	Failure to provide evidence of preventive maintenance.
Measurement system analysis studies, e.g., Gage R&R, accuracy, bias, linearity, stability studies, shall be conducted in compliance with customer requirements.	
The organization shall certify that all aspects of the checking aid agree with part dimensional requirements.	
The organization shall document all released engineering design changes that have been incorporated in the checking aid at the time of submission.	
The organization shall provide for preventive maintenance of any checking aids for the life of the part.	

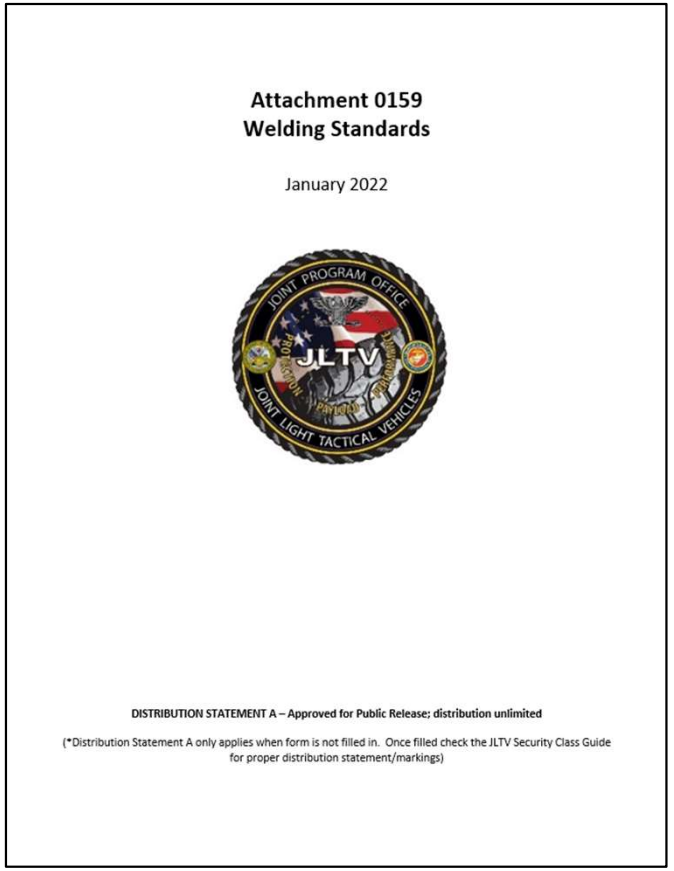
17. Records of Compliance for Customer-Specific Requirements

Definition: All documentation or records, including all test reports and test documentation, which satisfy fulfillment of customer-specified requirements.

Purpose: Ensures that all JLTV and commodity-specific requirements are met prior to part shipment.

How to: As approved by AM General Supplier Quality, ensure all commodity / process – specific JLTV requirements are met, including:

- AM General Supplier Quality Manual
  - AM General Fastener Requirements
  - AM General Weld Requirements
  - AM General Paint/Coating Requirements
  - AM General Armor Material Requirements
  - AM General Radiographic Inspection Requirements



Attachment 0159
Welding Standards

January 2022

DISTRIBUTION STATEMENT A – Approved for Public Release; distribution unlimited

(*Distribution Statement A only applies when form is not filled in. Once filled check the JLTV Security Class Guide for proper distribution statement/markings)

17. Records of Compliance for Customer-Specific Requirements

AM GENERAL
MISSION READY ★ FUTURE DRIVEN

17 Records of Compliance

USG PPAP # 2584771

REV E

Ensure information is auto filled correctly (PPAP Submittal Date will autofill from PSW). If Records of Compliance is necessary, please attach instead of the Not Applicable sheet.

(SUB-CONTRACTOR) PART NUMBER: 2584771

REV E

NOT APPLICABLE AT THIS TIME

(SUB-CONTRACTOR) TO COMPLY IF APPLICABLE PER PPAP FOURTH EDITION 2.2.17

Date: YYYY-MM-DD

(SUB-CONTRACTOR) AUTHORIZED REP: Jane Doe

(SUB-CONTRACTOR) AUTHORIZED REP. SIGNATURE: Jane Doe

Excerpt from AMG Supplier Quality Manual
Required Records of Compliance

3.3.10.3. Compliance to the following is required to be documented, as applicable:
- **3.3.10.3.1.** Raw Material Certification
- **3.3.10.3.2.** Performance Test Reports which identify that all specified performance requirements on the Design Record have been demonstrated
- **3.3.10.3.3.** Surface Finish Requirements
- **3.3.10.3.4.** Marking/Labeling Requirements
- **3.3.10.3.5.** Welding documentation necessary to demonstrate conformance to specified weld requirements. (Welding Procedures Specifications, Welder Certifications, Weld Procedure Qualification Requirements, etc.)

Example

Element 17 Records of Compliance	
JLTV Requirements	**Inadmissible**
The organization shall have records of compliance to all applicable customer-specific requirements. For bulk materials, applicable customer-specific requirements shall be documented on the Bulk Material Requirements Checklist.	Missing or incomplete documentation for customer-specific requirements.
Component First Article Test (CFAT) Documentation shall be included. CFAT documentation shall include a matrix summary of the results of each test (to include raw data), and any applicable calibration or certification documentation.	

17. Records of Compliance for Customer-Specific Requirements

CFAT requirements (Section 1.5 AM General SQM):

- CFAT requirements noted on part prints must be tested and met prior to PPAP approval.
- CFAT testing required on a minimum of 2 component samples for each test.
- CFAT units taken from 1st 10 component units produced.

Interim PPAP approval:

- Supplier must submit both PSW and Interim Recovery Worksheet for materials in need of Interim approval.
- CFAT interim approval must be received prior to part point of assembly.
- JLTV Specific: Interim approval only granted for 120 days max.

COTS (Commercial Off The Shelf):

- Supplier is expected to demonstrate / affirm part conformance with supporting PPAP documents or Certificates of Conformance (CoC).
- If all 18 PPAP elements are not available, the supplier shall provide the minimum PPAP elements (1, 2, 3, 9, 14, 15, 17, and 18).

17. Records of Compliance for Customer-Specific Requirements

JLTV Welding Requirements – Attachment 1059: Welding Standards

- All welds shall be free of debris and defects in accordance with the documents listed in the tables below.
- A supplier may utilize alternate standards with AM General approval if equivalent or better quality and performance can be demonstrated and verified.
- Materials covered under MIL- DTL-46100, Armor Plate, Steel, Wrought, and High-Hardness (HH) or MIL-DTL-12560.
    - On any ballistic surface 5/8 inch (15.9mm) from the toe of the weld, at any location of weldment, the Brinell hardness shall not be lower than that permitted minimum hardness requirements if the materials are qualified under MIL-DTL-46100 or MIL-DTL-12560.

STRUCTURAL WELDING STANDARDS	
Structural Steel, Fusion Welding	American Welding Society (AWS) D1.1/D1.1M
Structural Aluminum, Fusion Welding and Friction Stir Welding	American Welding Society (AWS) D1.2/D1.2M
Structural Sheet Metal, Fusion Welding	American Welding Society (AWS) D1.3/D1.3M
Stainless Steel, Fusion Welding	American Welding Society (AWS) D1.6/D1.6M
Titanium, Fusion Welding	American Welding Society (AWS) D1.9/D1.9M
AUTOMOTIVE WELDING STANDARDS	
Steel, Resistance Spot Welding	American Welding Society (AWS) D8.1M
Steel, Arc Welding	American Welding Society (AWS D8.8M
Steel, Laser Beam Welding	American Welding Society (AWS) D8.10M
Aluminum, Arc Welding	American Welding Society (AWS D8.14M
Steel, Resistance Spot Welding	American Welding Society (AWS) D8.1M
ROBOTIC WELDING STANDARDS	
Specification for Robotic Arc Welding Safety	American Welding Society (AWS) D16.1M/D16.1
Guide for Components of Robotic Arc Welding Installations	American Welding Society (AWS) D16.2M/D16.2
Risk Assessment Guide for Robotic Arc Welding	American Welding Society (AWS) D16.3M/D16.3
Specification for the Qualification of Robotic Arc Welding Personnel	American Welding Society (AWS) D16.4M/D16.4
Robotic Arc Welding Personnel, Certification	American Welding Society (AWS) QC19

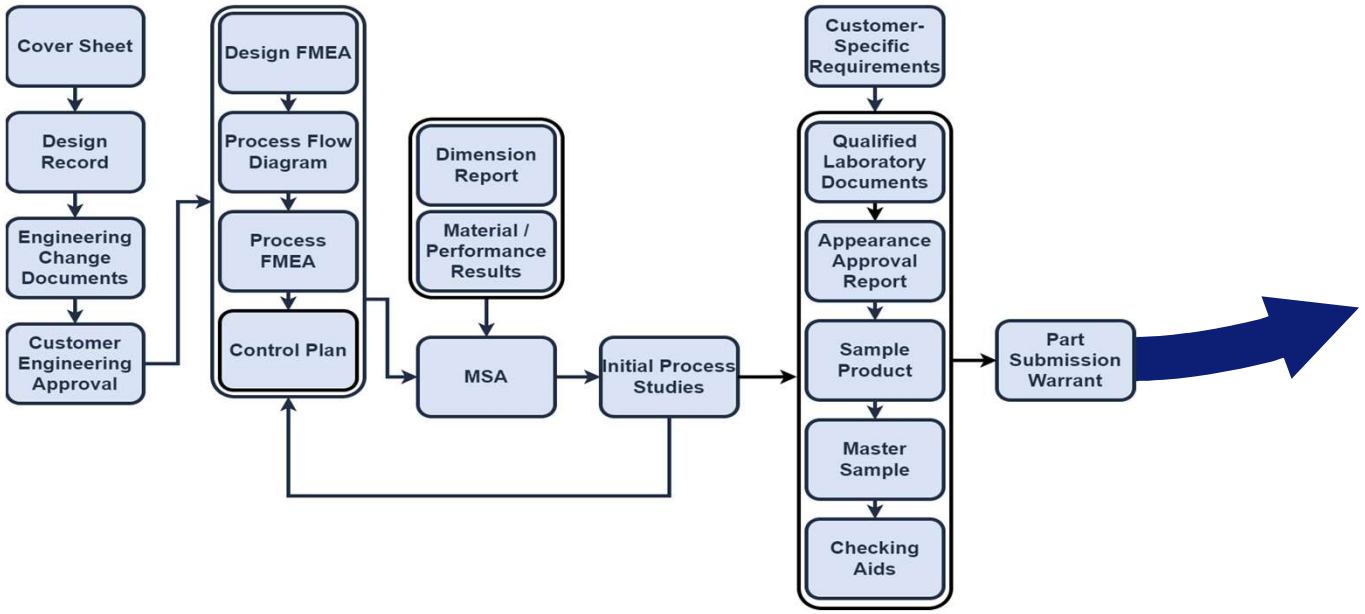
WELDING STANDARDS FOR OTHER APPLICATIONS	
Specification for Welding Procedure and Performance Qualification	American Welding Society (AWS) B2.1/B2.1M
Sheet Metal Welding Code	American Welding Society (AWS) D9.1/D9.1M
Specification for Welding Earthmoving, Construction, Agricultural, and Ground-Based Material Handling Equipment	American Welding Society (AWS) D14.3/D14.3M
Specification for Fusion Welding for Aerospace Applications	American Welding Society (AWS) D17.1/D17.1M
Specification for Resistance Welding for Aerospace Applications	American Welding Society (AWS) D17.2/D17.2M
Specification for Friction Stir Welding of Aluminum Alloys for Aerospace Applications	American Welding Society (AWS) D17.3/D17.3M
Recommended Practices for Resistance Welding	American Welding Society (AWS) C1.1M/C1.1
Carbon and Low-Alloy Steels, Resistance Welding	American Welding Society (AWS) C1.4M/C1.4
Friction Welding of Metals	American Welding Society (AWS) C6.2/C6.2M
MILITARY WELDING STANDARDS	
Armor and High Strength Steel, Fusion Welding	JLTV MIL-STD-3040A Interim (Attachment 0182)
Armor Grade Aluminum, Fusion Welding	MIL-STD-3057
BOILER AND PRESSURE VESSEL CODE	
Section IX qualification standard for welding and brazing procedures, welders, braziers, and welding and brazing operators	ASME Section IX

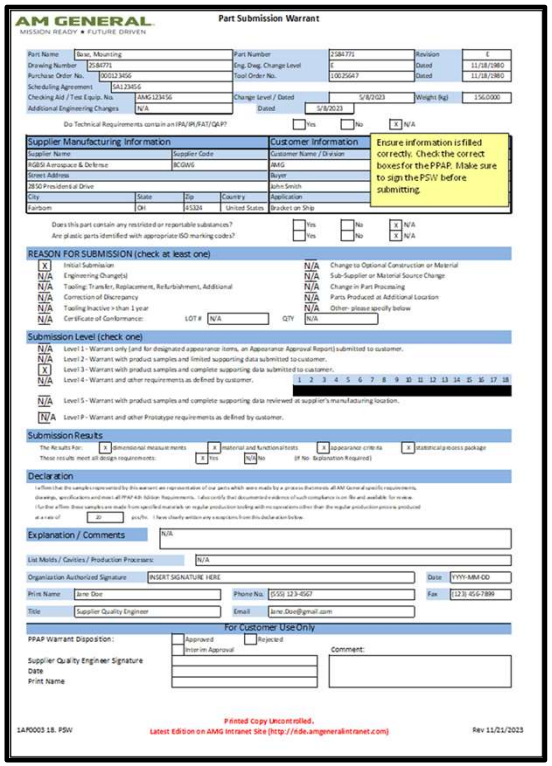
18a. Part Submission Warrant

Definition: Supplier completes the Part Submission Warrant (PSW) to verify fulfillment of all AIAG/ AMG / JLTV production and shipment requirements.

Purpose: To show conformance with all guidance, requirements, standards, and specifications.

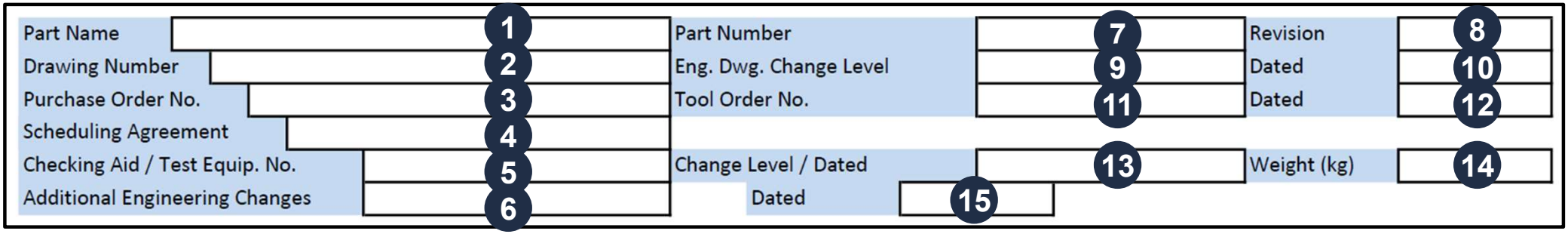
How to: Supplier provides details for all required fields in the PSW and signs, verifying that all JLTV submission requirements are met for the PPAP part / assembly.





18a. Part Submission Warrant

How to: Check that the following information has been auto-filled correctly from the Information tab of the workbook. It is important that this information is accurate.



1	**Part Name (Nomenclature)**: Descriptive title or label for a part.
2	**Drawing Number**: Unique identifier and revision letter assigned to a drawing.
3	**Purchase Order No.**: Unique identifying number assigned to the sample part's P.O.
4	**Scheduling Agreement**: Timing agreement between customer and supplier.
5	**Checking Aid / Test Equip. No.**: Apply If one is used for dimensional inspection.
6	**Additional Engineering Changes**: Engineering changes not yet incorporated.
7	**Part Number**: Unique number assigned to identify the sample part.
8	**Revision**: Latest iteration of the design record that part must comply to.
9	**Eng. Dwg. Change Level**: Approved level (revision) of addendums to the drawing.
10	**Dated**: Date that Eng. Dwg. Change Level was approved and established.
11	**Tool Order No.**: Identifier of any orders placed for tools involved with part.
12	**Dated**: Date of Tool Order No.
13	**Change Level / Dated**: Dated approved change of part.
14	**Weight (kg)**: Weight of part individually, per kilogram.
15	**Dated**: Date of part change level.

18a. Part Submission Warrant

How to: Check that the following information has been auto-filled correctly from the Information tab of the workbook. It is important that this information is accurate. Also, check the correct boxes below the information.

Supplier Manufacturing Information				Customer Information
Supplier Name (16)	Supplier Code (17)			Customer Name / Division (23)
Street Address (18)				Buyer (24)
City (19)	State (20)	Zip (21)	Country (22)	Application (25)

26 Does this part contain any restricted or reportable substances?	☐ Yes	☐ No	☒ N/A	Unless otherwise stated, all JLTV parts will be marked N/A
27 Are plastic parts identified with appropriate ISO marking codes?	☐ Yes	☐ No	☒ N/A	

16	**Supplier Name**: Name of supplier that produced sample part.	21	**Zip**: Zip code of supplier's location.	26	**Reportable Substances**: Does this part or contain, restricted materials.
17	**Supplier Code**: Unique code (typically a Cage Code) identifying the supplier.	22	**Country**: Country of supplier's location.	27	**ISO Marking Codes**: Are there ISO marking codes for the plastic parts.
18	**Street Address**: Location of supplier.	23	**Customer Name / Division**: Name / division of supplier of the submitted sample part.		
19	**City**: City of supplier's location.	24	**Buyer**: Personnel / firm who contractually solidified customer / supplier relations.		
20	**State**: State of supplier's location.	25	**Application**: Enter the model year, vehicle name, or engine, transmission, etc.		

18a. Part Submission Warrant

How to: Check all the relevant boxes that explain the reason for the submission. Also, fill out the information for lot number and quantity.

REASON FOR SUBMISSION (check at least one)

- ☐ 28 Initial Submission
- ☐ 29 Engineering Change(s)
- ☐ 30 Tooling: Transfer, Replacement, Refurbishment, Additional
- ☐ 31 Correction of Discrepancy
- ☐ 32 Tooling Inactive > than 1 year
- ☐ 33 Certificate of Conformance:

LOT # [39]

- ☐ 34 Change to Optional Construction or Material
- ☐ 35 Sub-Supplier or Material Source Change
- ☐ 36 Change in Part Processing
- ☐ 37 Parts Produced at Additional Location
- ☐ 38 Other- please specify below

QTY [40]

28	**Initial Submission**: PPAP is initiated due to an initial submission.
29	**Engineering Change(s)**: PPAP is initiated due to an engineering change
30	**Tooling**: PPAP is initiated due to new / refurbished tooling.
31	**Correction of Discrepancy**: PPAP is initiated due to a corrective action.
32	**Tooling Inactive > than 1 year**: PPAP is initiated due to tooling inactivity > 1 year.
33	**CoC**: PPAP is initiated due to the need of a Certificate of Conformance.
34	**Change to Construction or Material**: PPAP is initiated due to change of material.
35	**Sub-Supplier or Material Source Change**: PPAP is initiated due to supplier change.
36	**Change in Part Processing**: PPAP is initiated due to a process change.
37	**Parts Produced at Additional Location**: PPAP is initiated due to location change.
38	**Other**: PPAP is initiated due to a reason not listed here.
39	**Lot #**: Designated unique code identifying the lot produced under this PPAP.
40	**Qty**: Quantity of parts under this PPAP.

18a. Part Submission Warrant

How to: Check all the relevant boxes that explain the submission level and the submission results.

Submission Level (check one)

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

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

43 ☐ Level 3 - Warrant with product samples and complete supporting data submitted to customer.

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

45

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

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

47 ☐ Level P - Warrant and other Prototype requirements as defined by customer.

Submission Results

The Results For: 48 ☐ dimensional measurements 49 ☐ material and functional tests 50 ☐ appearance criteria 51 ☐ statistical process package

These results meet all design requirements: 52 ☐ Yes 53 ☐ No (if No- Explanation Required)

41	**Level 1**: Checkbox for Submission of PPAP package.
42	**Level 2**: Checkbox for Submission of PPAP package.
43	**Level 3**: Checkbox for Submission of PPAP package.
44	**Level 4**: Checkbox for Submission of PPAP package.
45	**Checkboxes**: For customer to check for which elements are requested for submittal.
46	**Level 5**: Checkbox for Submission of PPAP package.
47	**Level P**: Checkbox for Submission of PPAP package used for prototypes.
48	**Dimensional Measurements**: All measurements meet design requirements.
49	**Material and Functional Tests**: All measurements meet design requirements.
50	**Appearance Criteria**: All appearance criteria meet design requirements.
51	**Statistical Process Package**: All statistical process package meet design requirements.
52	**Yes**: Confirms that all results meet all design requirements.
53	**No**: Confirms that all results do not meet all design requirements.

18a. Part Submission Warrant

How to: Make sure to read the declaration before filling out the rest of the information. Fill the rest out with accurate information and sign.

Declaration

I affirm that the samples represented by this warrant are representative of our parts which were made by a process that meets all AM General specific requirements, drawings, specifications and meet all PPAP 4th Edition Requirements. I also certify that documented evidence of such compliance is on file and available for review. I further affirm these samples are made from specified materials on regular production tooling with no operations other than the regular production process produced at a rate of (54) pcs/hr. I have clearly written any exceptions from this declaration below.

Explanation / Comments (55)

List Molds / Cavities / Production Processes: (56)

Organization Authorized Signature (57) Date (58)

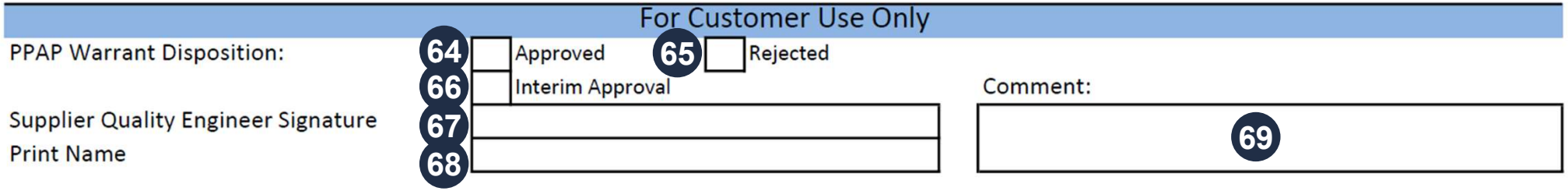
Print Name (59) Phone No. (61) Fax (63)

Title (60) Email (62)

54	**Rate**: Affirms the rate of production in parts per hour.	58	**Date**: Date of organization Authorized Signature.	62	**Email**: Email of organization authorized personnel.
55	**Comments**: Allows supplier to provide a brief explanation or comment.	59	**Print Name**: Printed name of organization authorized personnel.	63	**Fax**: Fax number of organization authorized personnel.
56	**List**: A list of molds, cavities, and production processes used for submitted part.	60	**Title**: Title of organization authorized personnel.		
57	**Signature**: Signature of authorized personnel from supplier's organization.	61	**Phone No.**: Phone number of organization authorized personnel.		

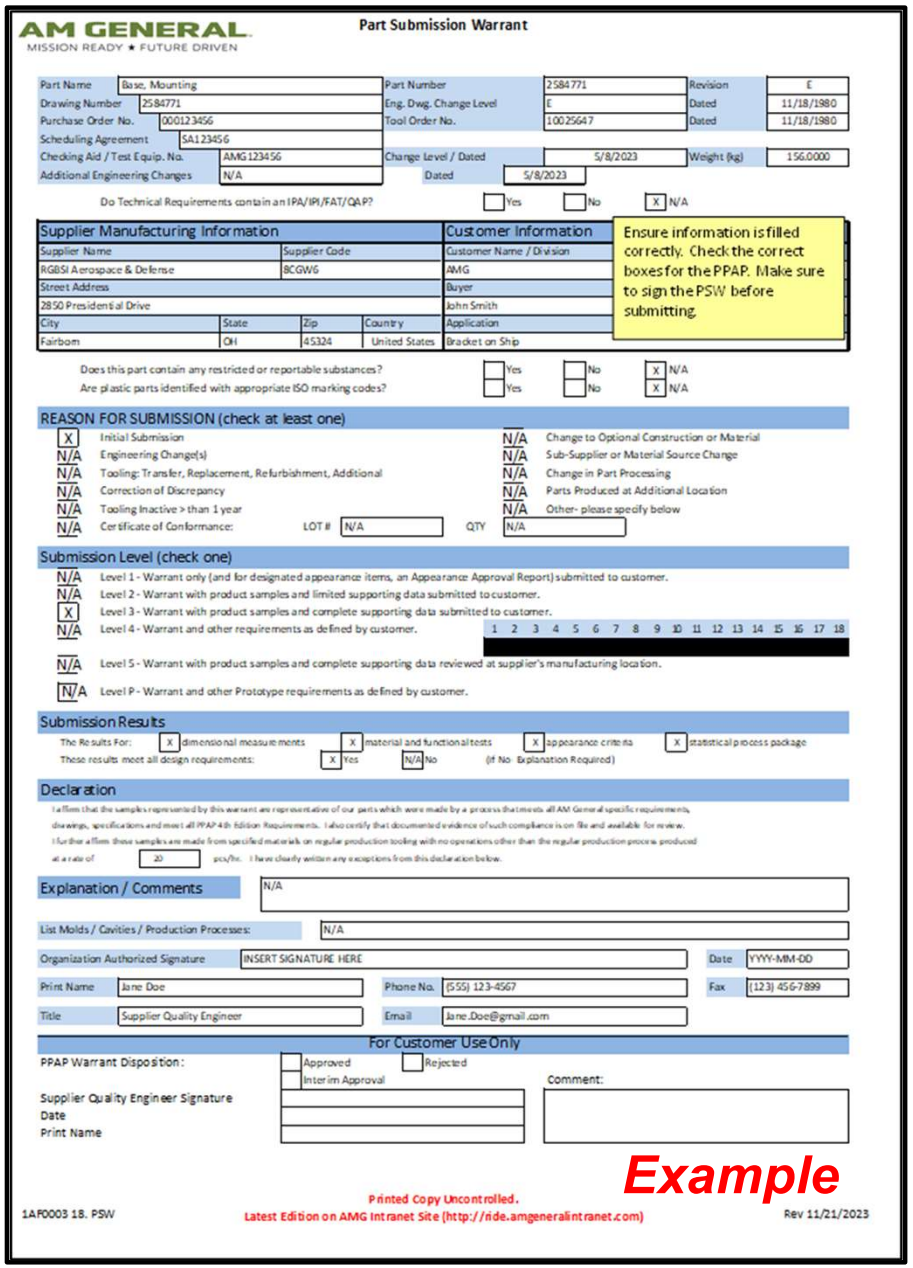
18a. Part Submission Warrant

How to: The last part of the form is only for the customer to fill out. It will record the PPAP approval type and will be signed by the customer's Supplier Quality Engineer. Ensure the information is filled out accurately.



64	**Approved**: Checkbox to identify customer approves PPAP package.
65	**Rejected**: Checkbox to identify customer rejects PPAP package.
66	**Interim Approval**: Checkbox to identify customer approves PPAP package for part's process for current run of production only.
67	**Signature**: Signature from Supplier Q.E. personnel.
68	**Printed Name**: Printed name of Supplier Q.E. personnel.
69	**Comment**: Supplier Q.E. may include comments in this cell.

18a. Part Submission Warrant



AM GENERAL
MISSION READY ★ FUTURE DRIVEN

Part Submission Warrant

Part Name	Base, Mounting	Part Number	2584771	Revision	E
Drawing Number	2584771	Eng. Dwg. Change Level	E	Dated	11/18/1980
Purchase Order No.	000123456	Tool Order No.	10025647	Dated	11/18/1980
Scheduling Agreement	SA123456				
Checking Aid / Test Equip. No.	AMG123456	Change Level / Dated	5/8/2023	Weight (kg)	156.0000
Additional Engineering Changes	N/A	Dated	5/8/2023		

Do Technical Requirements contain an IPA/IPI/FAT/QAP? ☐ Yes ☐ No ☒ N/A

Supplier Manufacturing Information				Customer Information
Supplier Name	Supplier Code			Customer Name / Division
RGBSI Aerospace & Defense	BCGW6			AMG
Street Address				Buyer
2850 Presidential Drive				John Smith
City	State	Zip	Country	Application
Fairborn	OH	45324	United States	Bracket on Ship

Ensure information is filled correctly. Check the correct boxes for the PPAP. Make sure to sign the PSW before submitting.

Does this part contain any restricted or reportable substances? ☐ Yes ☐ No ☒ N/A
Are plastic parts identified with appropriate ISO marking codes? ☐ Yes ☐ No ☒ N/A

REASON FOR SUBMISSION (check at least one)

- ☒ Initial Submission
- N/A Engineering Change(s)
- N/A Tooling: Transfer, Replacement, Refurbishment, Additional
- N/A Correction of Discrepancy
- N/A Tooling Inactive > than 1 year
- N/A Certificate of Conformance: LOT # N/A QTY N/A
- N/A Change to Optional Construction or Material
- N/A Sub-Supplier or Material Source Change
- N/A Change in Part Processing
- N/A Parts Produced at Additional Location
- N/A Other- please specify below

Submission Level (check one)

- N/A Level 1 - Warrant only (and for designated appearance items, an Appearance Approval Report) submitted to customer.
- N/A 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.
- N/A Level 4 - Warrant and other requirements as defined by customer. 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
- N/A Level 5 - Warrant with product samples and complete supporting data reviewed at supplier's manufacturing location.
- N/A Level P - Warrant and other Prototype requirements as defined by customer.

Submission Results

The Results For: ☒ dimensional measurements ☒ material and functional tests ☒ appearance criteria ☒ statistical process package
These results meet all design requirements: ☒ Yes N/A No (If No Explanation Required)

Declaration

I affirm that the samples represented by this warrant are representative of our parts which were made by a process that meets all AM General specific requirements, drawings, specifications and meet all PPAP 4th Edition Requirements. I also certify that documented evidence of such compliance is on file and available for review. I further affirm these samples are made from specified materials on regular production tooling with no operations other than the regular production process produced at a rate of 20 pcs/hr. I have clearly written any exceptions from this declaration below.

Explanation / Comments	N/A				
List Molds / Cavities / Production Processes:	N/A				
Organization Authorized Signature	INSERT SIGNATURE HERE			Date	YYYY-MM-DD
Print Name	Jane Doe	Phone No.	(555) 123-4567	Fax	(123) 456-7899
Title	Supplier Quality Engineer	Email	Jane.Doe@gmail.com		

For Customer Use Only

PPAP Warrant Disposition: ☐ Approved ☐ Rejected ☐ Interim Approval
Comment:
Supplier Quality Engineer Signature
Date
Print Name

Example

Printed Copy Uncontrolled.
Latest Edition on AMG Intranet Site (http://ride.amgeneralintranet.com)
1AF0003 18. PSW Rev 11/21/2023

All boxes must have a response. If a response is not applicable, write N/A.

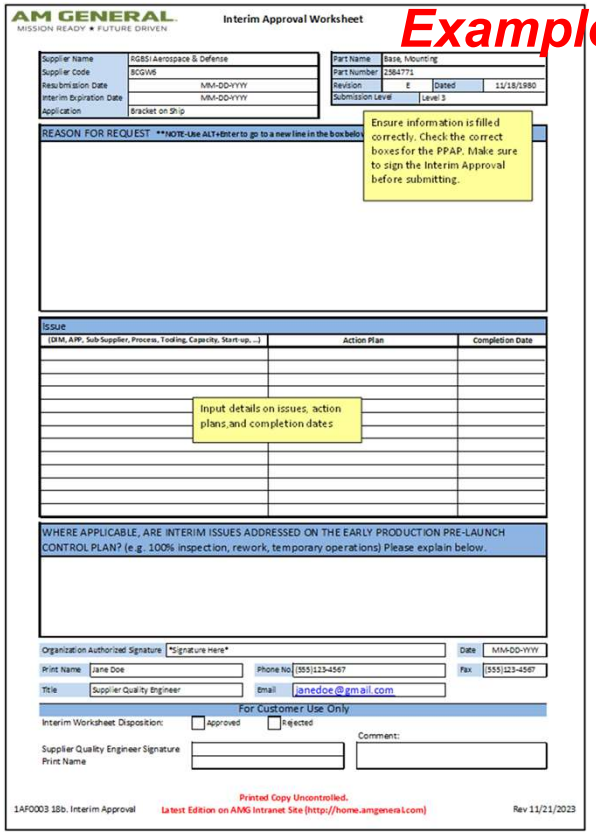
Element 18 Part Submission Warrant (PSW)	
JLTV Requirements	**Inadmissible**
Approved Warrant with both Supplier/Producer Management Approval signature and AM General signature.	Warrant missing supplier/producer signature.
Evidence of all elements of PPAP completed (for Submission Level 3).	For the Submission Level3 - no evidence of complete elements.
For Interim Approvals: Warrant should include an Action Plan to achieve full approval with target dates and owners for each action.	No action plan for interim approval levels.
PSW must have all fields completed, any areas not applicable should be indicated as such.	Warrant has missing or incomplete information fields.

18b. Interim Approval

Definition: Supplier completes the Interim Approval Worksheet to verify fulfillment of all AIAG/ AMG / JLTV production and shipment requirements for Interim PPAP Approvals.

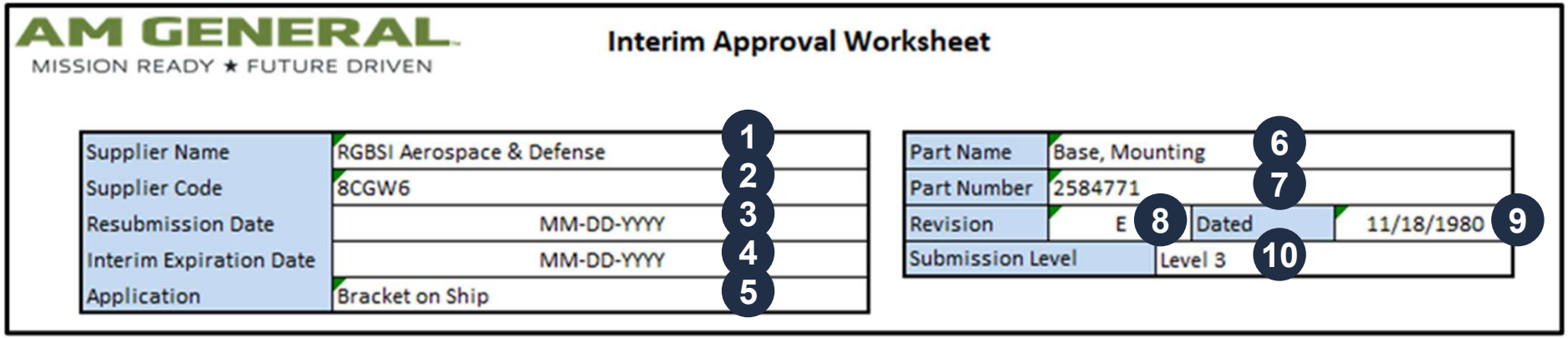
Purpose: To show conformance with all guidance, requirements, standards, and specifications laid out in AM General's Interim Approval requirements for PPAP.

How to: Supplier provides details for all required fields in the worksheet and signs, verifying that all JLTV Interim Approval submission requirements are met for the PPAP part / assembly.



18b. Interim Approval

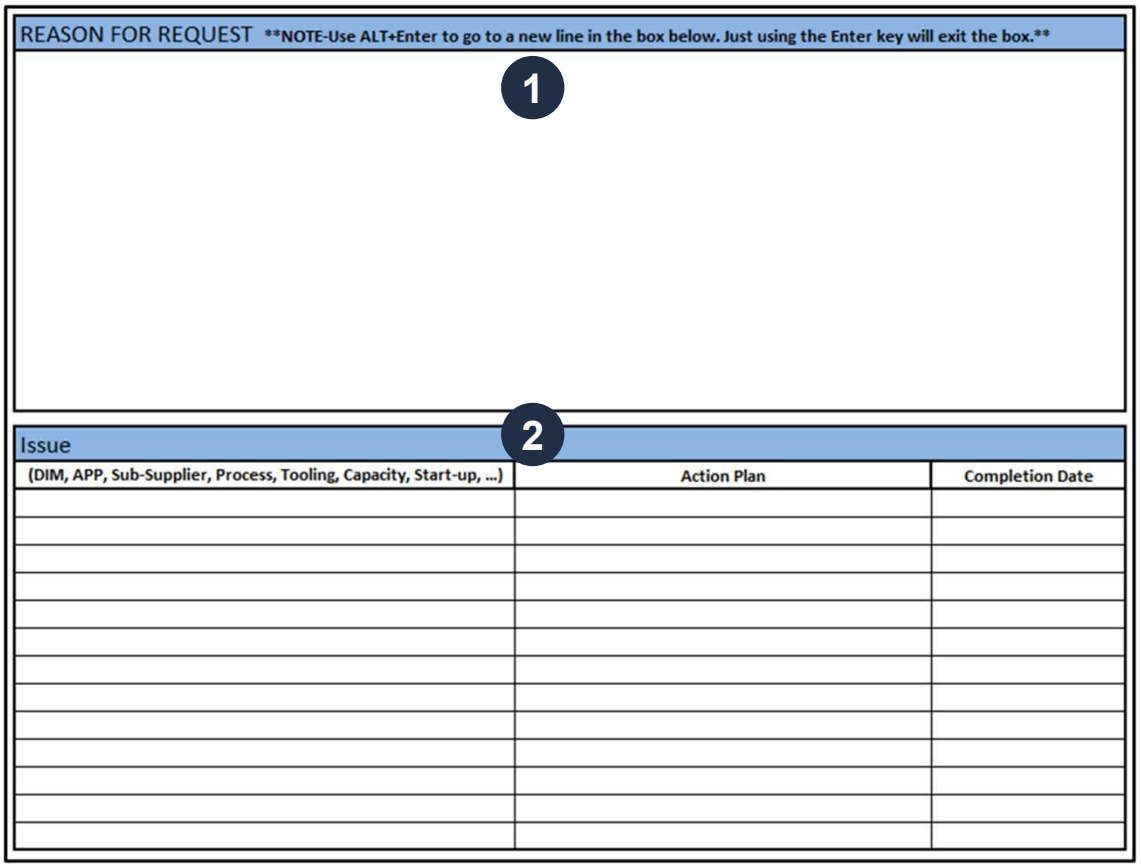
How to: Check that the following information has been auto-filled correctly from the Information tab of the workbook. It is important that this information is accurate. Any boxes that do not auto-fill must be filled out manually.



1. **Supplier Name**: Name of the supplier that produced the part.
2. **Supplier Code**: Unique code (typically a Cage Code) identifying the supplier.
3. **Resubmission Date**: Date of resubmission after Interim Approval.
4. **Interim Expiration Date**: Expiration Date for Interim Approval.
5. **Application**: Enter the model year, vehicle name, or engine, transmission, etc.
6. **Part Name (Nomenclature)**: Descriptive title or label for a part.
7. **Part Number**: Unique number assigned to identify the sample part.
8. **Revision**: Latest iteration of the design record that part must comply to.
9. **Dated**: Date that Eng. Dwg. Revision Level was approved and established.
10. **Submission Level**: PPAP Level being submitted after Interim.

18b. Interim Approval

How to: Provide detailed reasoning for Interim Approval Request, what issues are being faced causing the interim request, and what actions are being take to achieve full Level 3 PPAP Approval.

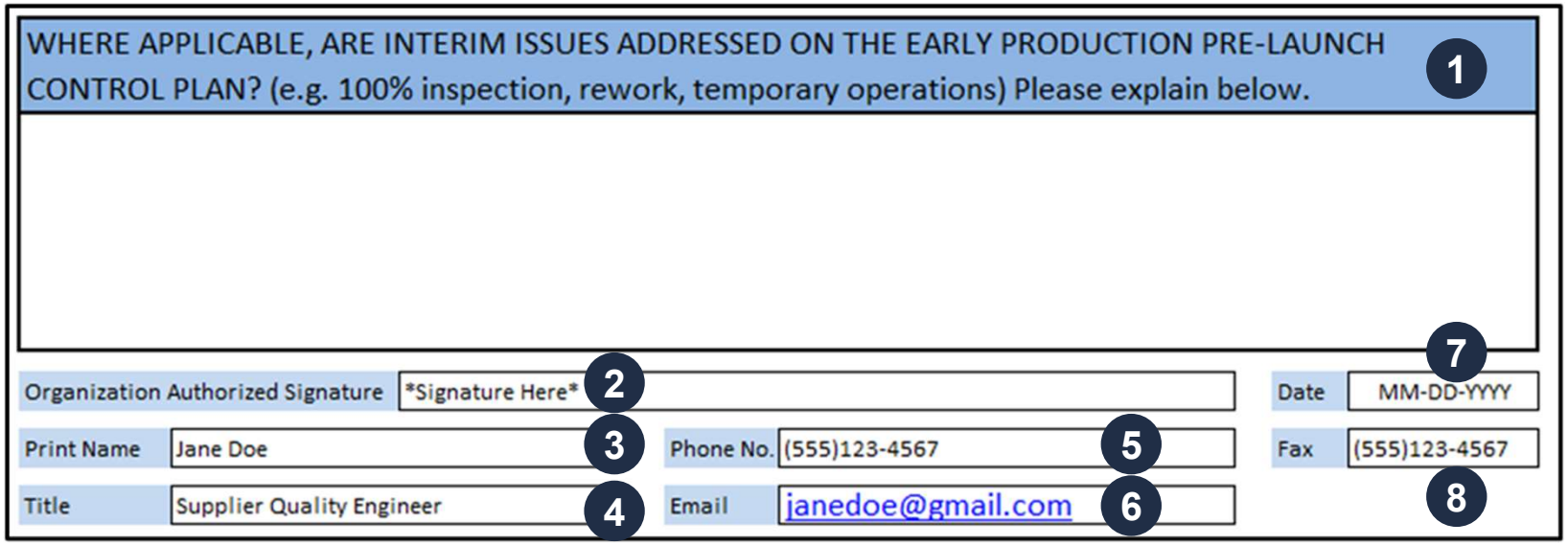


1 **Reason For Request**: Detailed reason explaining the cause of an Interim Approval Request

2 **Issue**: Table used to identify issues, Action Plans, and Completion Date

18b. Interim Approval

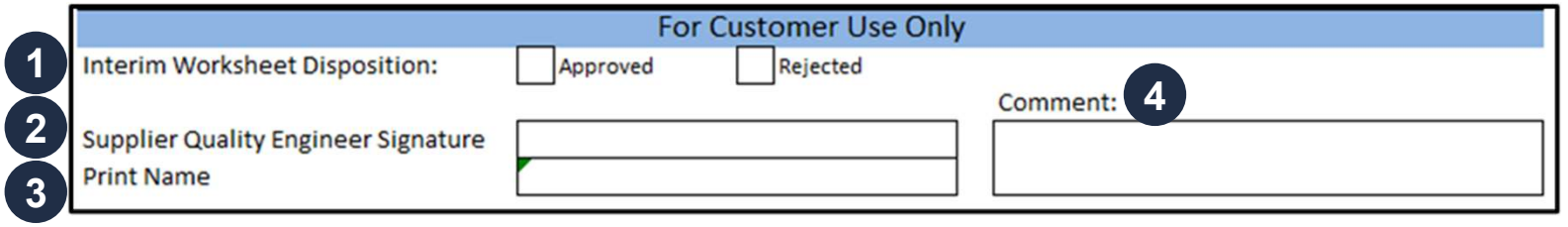
How to: Provide details on how the interim issues are being addressed on the Pre-Launch Control Plan. Then fill in contact information for the authorized personnel submitting the Interim Approval Request.



1	**Issues Addressed**: Detailed description of how issues are addressed.
2	**Organization Authorized Signature**: Signature of authorized personnel from supplier's organization.
3	**Print Name**: Printed name of organization authorized personnel.
4	**Title**: Title of organization authorized personnel.
5	**Phone No.**: Phone number of organization authorized personnel.
6	**Email**: Email of organization authorized personnel.
7	**Date**: Date of organization Authorized Signature.
8	**Fax**: Fax number of organization authorized personnel.

18b. Interim Approval

How to: The last part of the form is only for the customer to fill out. It will record the PPAP approval type and will be signed by the customer's Supplier Quality Engineer. Ensure the information is filled out accurately.



1	**Interim Worksheet Disposition**: Check boxes for "Approved" or "Rejected" Interim Status.
2	**Supplier Quality Engineer Signature**: Signature of authorized personnel from customer's organization.
3	**Print Name**: Printed name of organization authorized personnel.
4	**Comment**: Supplier Q.E. may include comments in this cell.

PPAP Is A Living Process

PPAP is NOT a "Check the Box" Process; It is the Way We Do Business.

The various PPAP Elements, especially the FMEAs, are a data base of lessons learned that apply to all similar products, both current and new. (UPI & Transfer)

Per SAE J 1739 the supplier must have a risk priority number reduction (RPN) process. Every RPN change drives a change to the PPAP documentation.

Every corrective action, either internal or external, is accompanied by a change to the PFMEA & Control Plan and in many cases the DFMEA, Flow Plan, and Process Readiness Documentation.

AM GENERAL™
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UNITED STATES ARMY

AIAG
Automotive Industry Action Group

Thank You

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