PPAP – Production Part Approval Process Training Course

OSHKOSH™

Welcome

OSHKOSH™

Eric Barker

Supply Chain Director

Purpose

- Oshkosh Corporation's mission is to provide our customers with defect-free products & services and to supply them globally at the lowest total cost
- The goal is simple – to be the benchmark in every market
- This goal can only be achieved with support and commitment between Oshkosh & our suppliers
- Clear Concise expectations & requirements make the supplier-customer relationship work

Training Objectives

- Drive consistency of the PPAP process
- Improve technical skills of compiling PPAP
- Improve customer satisfaction and part quality
- Avoid common mistakes and oversights
- Achieve PPAP First-Pass-Yield of 1

Agenda

- Introduction to Production Part Approval Process (PPAP)
- PPAP Overview
- PPAP Expectations
- PPAP Level One – Elements & Requirements
- PPAP Level Two – Elements & Requirements
- PPAP Level Three – Elements & Requirements
- Supplier Applications
- Summary and Conclusions

PPAP Overview

Andrea Krueger

Supply Chain Manager

PPAP Overview

- Production Part Approval Process (PPAP)

- The purpose of PPAP is to verify that all customer engineering design record and specification requirements are properly understood by the Suppliers

- Ensure that the manufacturing process has the capability to produce product consistently meeting these requirements during an actual production run at the quoted production rates.

Oshkosh PPAP Requirements

- The Oshkosh corporation PPAP requirements were established by utilizing the AIAG 4th edition PPAP manual and Appendix H

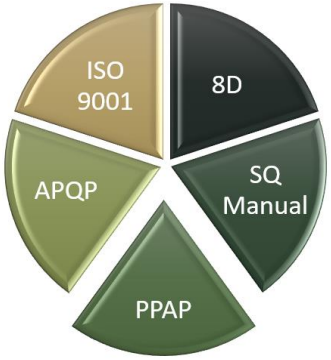
- As a Truck Industry OEM we have the liberty per AIAG to establish our own PPAP requirements and are not required to be strictly held to the Automotive PPAP requirements.

- OSK's submission Levels, and Interim Approval Processes are based off the Automotive (AIAG) requirements.

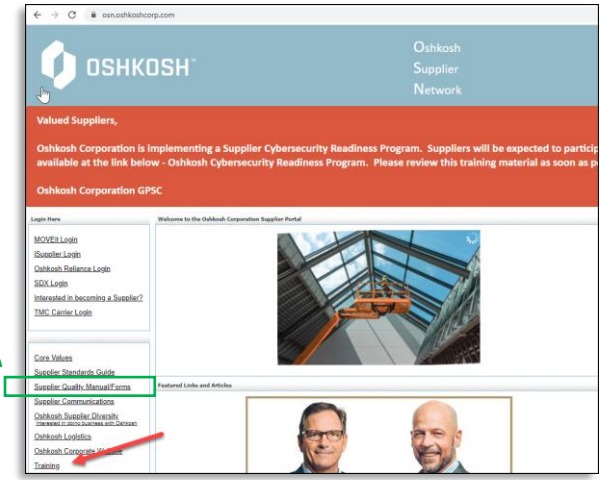
Training Resources

- Oshkosh Supplier Network (OSN)
- E Learning- 5 core tools
  - Production Part Approval Process (PPAP)
  - Failure Modes and Effects Analysis (FMEA)
  - Statistical Process Control (SPC)
  - Measurement Systems Analysis (MSA)
  - Advanced Product Quality Planning (APQP)
- Scholar Series
- AIAG

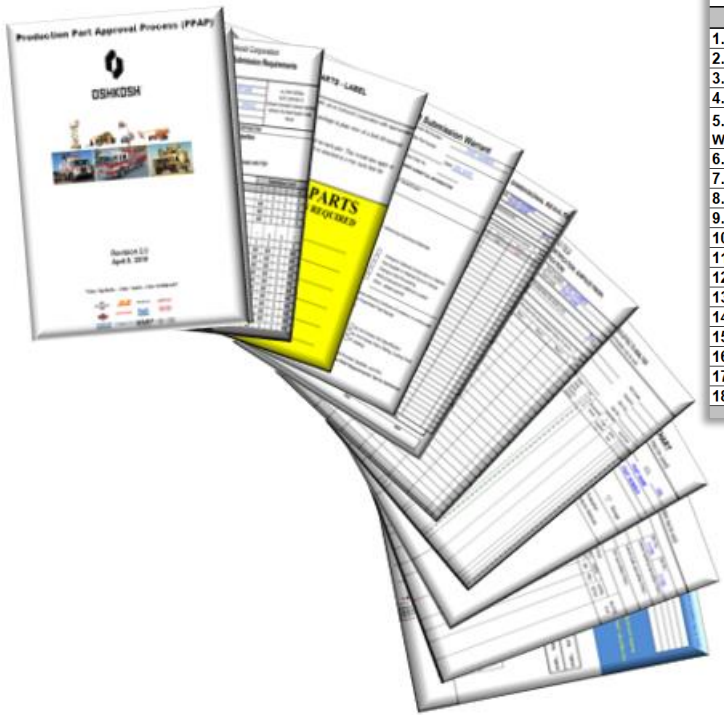
OSN



Scholar Series



PPAP Workbook

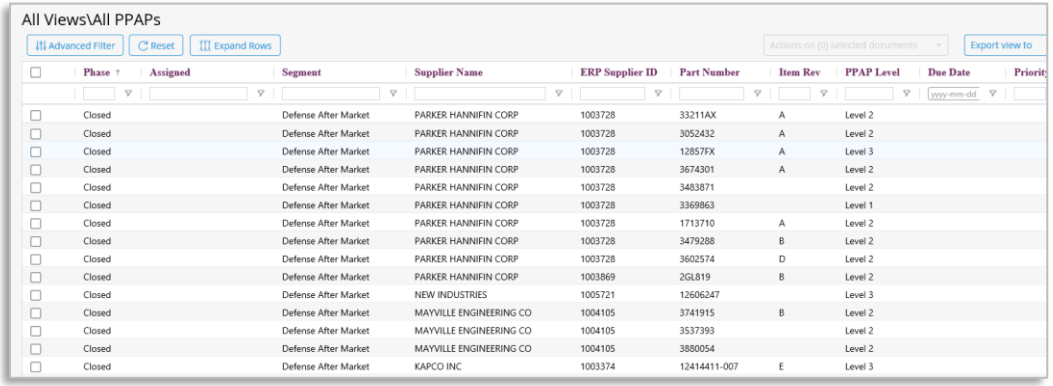


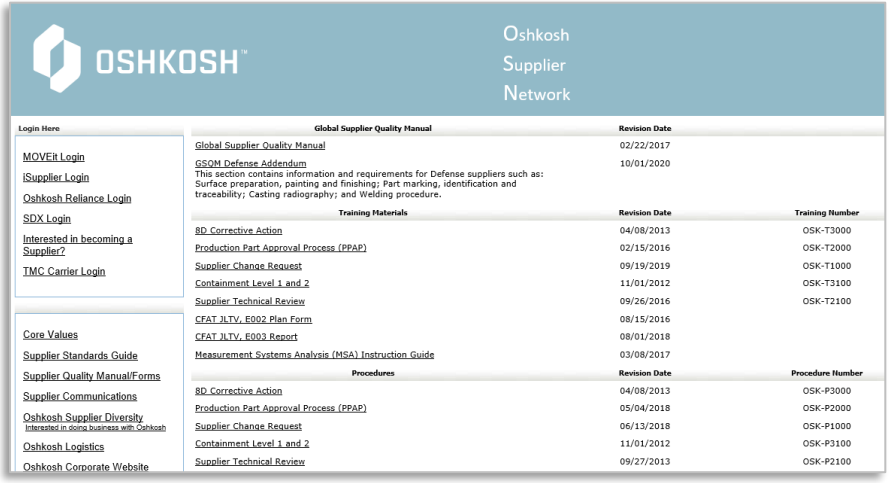
Default PPAP Submission Level 2 - Unless Otherwise Specified by Oshkosh Corporation
(Segment Specific Requirements may vary)
S = Supplier Must Send Items to Oshkosh Corporation for Approval
*** = Applicable material info required (material certification, Certificate of Compliance, or catalog page) with PSW**
N/R= Documents are not required for development or submission

	Submission Level			
PPAP Submission Requirements and Detail Description	**1**	**2**	**3**	**4**
1.) Part Submission Warrant (PSW)	S	S	S	S
2.) Dimensional Results	N/R	S	S	S
3.) Design Records (Bubble Print)	N/R	S	S	S
4.) PPAP Samples - *first production order / upon request prior to production order*	N/R	S	S	S
5.) Print Notes: (Attach copy of Raw Material Certification / Performance Test Report / Surface Finish, Paint Process, Welding Documentation such as WPS/PQRs/Welder Certs)	*	S	S	*
6.) Supplier Change Request (OSK-F1000) - *if applicable*	S	S	S	S
7.) Design Failure Modes effects Analysis (DFMEA) - *if supplier is design responsible*	N/R	N/R	S	N/R
8.) Process Flow Diagram (PFD)	N/R	N/R	S	N/R
9.) Process Failure Modes Effects Analysis (PFMEA)	N/R	N/R	S	N/R
10.) Initial Process Capability - *for major / critical characteristics - if applicable*	N/R	N/R	S	N/R
11.) Measurement System Analysis (MSA) - *for major / critical characteristics - if applicable*	N/R	N/R	S	N/R
12.) Process Control Plan	N/R	N/R	S	N/R
13.) Appearance Approval Report (AAR) - *if applicable*	N/R	N/R	S	N/R
14.) Checking Aids (Fixture, gage, template, etc) - *if applicable*	N/R	N/R	S	N/R
15.) Records of Compliance with Customer Specific Requirements - *if applicable*	N/R	N/R	S	N/R
16.) Photo Documentation (Master Sample of PPAP parts & Section J-Labeling)	S	S	S	N/R
17.) Tooling Photo Documentation - *if applicable*	N/R	S	S	N/R
18.) QC-112 PPAP Check List	N/R	N/R	S	N/R
Additional Submission Instructions below:				

PPAP Management

- PPAPs are managed through Oshkosh Reliance
- PPAP workbook is located on the Oshkosh Supplier Network (OSN)
  - Training, Procedures, Forms





What Oshkosh Expects of Suppliers

PPAP Submission

- Reasons for PPAP submission *(Also listed in the NGDV Addendum)*:
  - ❑ Initial Submission
  - ❑ Engineering Change(s) / Drawing revisions
  - ❑ Tooling: Transfer, Replacement, Refurbishment, or additional
  - ❑ Correction of Discrepancy
  - ❑ Production Break to Oshkosh Corporation > 1 year
  - ❑ Change to Construction or Material (optional material for example)
  - ❑ Sub-Supplier or Material Source Change
  - ❑ Change in Part Processing
  - ❑ Parts Produced at Additional Location or processes with new equipment
  - ❑ Ensuring proper drawing level is referenced and utilized
  - ❑ Other – Please specify

Submission Requirements

- A Level 2 PPAP submission is the default PPAP level for all products supplied to Oshkosh Corporation. Please follow segment specific guidelines for levels 1, 2 & 4; when not clearly defined, any questions should be directed to the applicable segment SQE. SQE can request additional PPAP samples and process documentation based on the part criticality. Levels 1, 2 and 4 PPAPs do not need to be pre-approved prior to the first order delivery.

- There may be instances when the specific Oshkosh Corporation Segment will require a PPAP submission level greater than or less than Level 2, depending on the specific component being supplied and contract requirements.

- Oshkosh Corporation provides approval of the PPAP package via notification within Reliance (no more signed PSWs).

Submission Requirements

- When a **Level 3** PPAP submission is required, Suppliers ***are not authorized to ship production material to Oshkosh Corporation without prior full or interim approval by an OSK Quality Engineer.***
  - On a rare occasion OSK may request PPAP parts be sent to Oshkosh for review along with the PPAP submission.
  - Interim PPAP approval may be used to permit the supplier to ship material on a limited time or quantity basis in accordance with the Interim Approval Worksheet and Part Submission Warrant
  - Oshkosh Corporation provides written approval of the PPAP package via Reliance (no longer do we sign a Part Submission Warrant (PSW).

- When a **Level 4** PPAP submission is required and utilized for non-production or New Product Development (NPD) submissions, it shall be sent to Oshkosh Corporation with the first order.
  - This level of PPAP also to be submitted through Reliance

What Oshkosh Expects of the Supplier

- Suppliers shall manage the completion and submittal of PPAP's 7 calendar days (minimum) prior to the Purchase Order due date

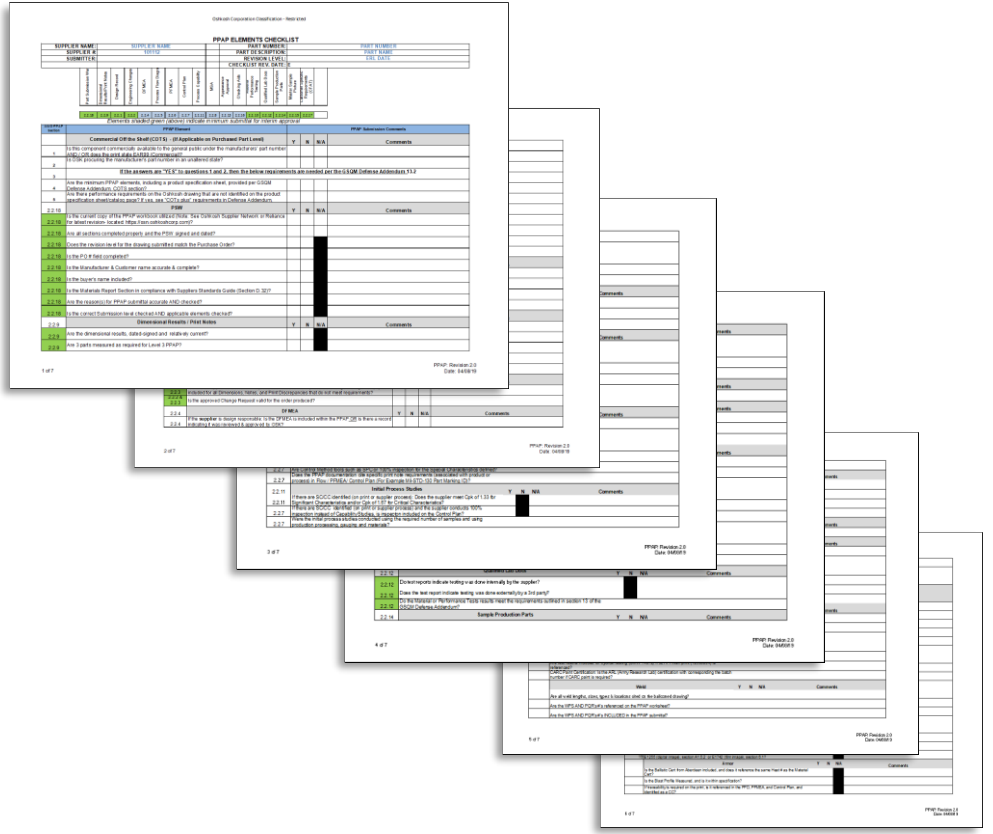
- PPAP's are considered **living documents** and are expected to be maintained to represent the current production process

- When the supplier encounters Corrective and Preventive Actions, updates to the PFMEA and Control Plans should be made promptly

- PPAP re-submittals are required when:
  - Part Drawing is revised (revision change)
  - Supplier process change is approved and made
  - Lapse in order fulfillment occurs for a period of > 1 years

QC-112 PPAP check list

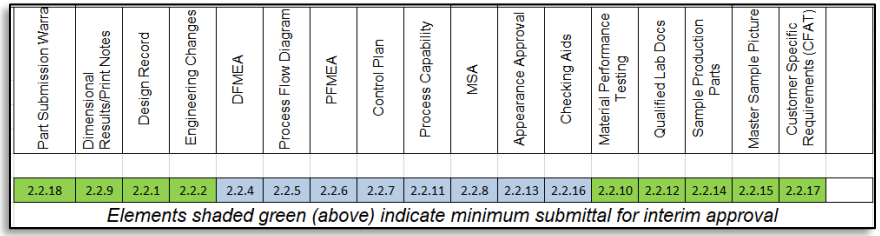
- Voice-of-the-Customer
- Assurance of understanding
- Assurance of completion
- Use the comments section for clarification
- Improves FPY



Interim Approval

- Interim Approval may be temporarily granted and **must be considered the exception**
- Interim Approval will not be granted if any of the following elements are missing or incomplete

- ❑ QC – 112 PPAP Checklist
- ❑ Design Record & Dimensional Results
- ❑ Engineering Change Documents – RCM (if applicable)
- ❑ Customer Engineering Approval (If applicable)
- ❑ Print Note Verification
- ❑ Material/Performance test results
- ❑ Qualified Lab Documents
- ❑ Sample Production Parts
- ❑ Master Sample Photos
- ❑ Part Submission Warrant (PSW)



Part Submission Warra	Dimensional Results/Print Notes	Design Record	Engineering Changes	DFMEA	Process Flow Diagram	PFMEA	Control Plan	Process Capability	MSA	Appearance Approval	Checking Aids	Material Performance Testing	Qualified Lab Docs	Sample Production Parts	Master Sample Picture	Customer Specific Requirements (CFAT)	
2.2.18	2.2.9	2.2.1	2.2.2	2.2.4	2.2.5	2.2.6	2.2.7	2.2.11	2.2.8	2.2.13	2.2.16	2.2.10	2.2.12	2.2.14	2.2.15	2.2.17	

Elements shaded green (above) indicate minimum submittal for interim approval

PPAP Reviewer/Approver Expectations

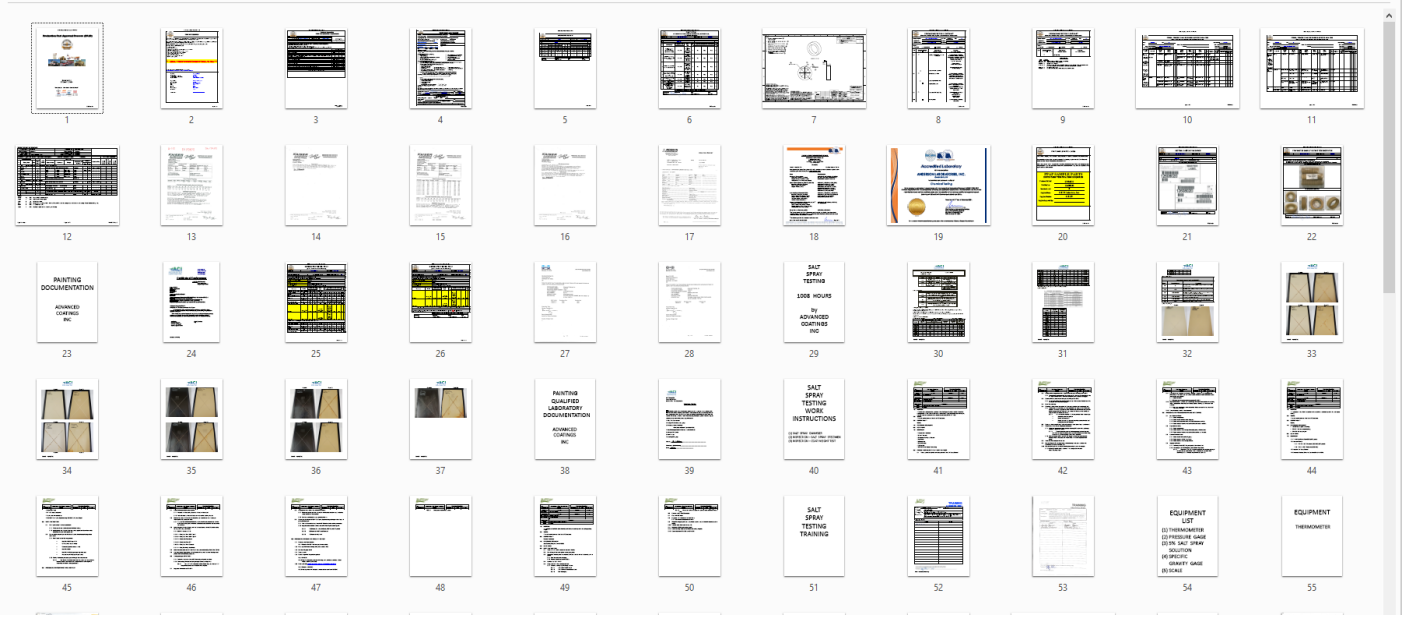
Expectations by the Reviewer

Sample parts and supporting documentation are submitted to show evidence that:

- The design records and specifications have been properly understood and met
- The manufacturing process has the capability to produce conforming parts in the actual production environment
- The PPAP submittal is organized
  - *PPAP workbook templates will be used for submission in one .pdf file in the order of the QC-112 Checklist*
  - *Please create an index to aide the reviewer*
  - Label documents to show relationships between specifications and evidence of compliance

PPAP Submission Format

- Example of PPAP submission as a .pdf file in the order of the QC-112 check list.



**PDF Software example is Adobe Pro*

Level 1 PPAP
Elements and Requirements

PPAP Part Submission - Level One Requirements

Default PPAP Submission Level 2 - Unless Otherwise Specified by Oshkosh Corporation
(Segment Specific Requirements may vary)
S = Supplier Must Send Items to Oshkosh Corporation for Approval
*** = Applicable material info required (material certification, Certificate of Compliance, or catalog page) with PSW**
N/R= Documents are not required for development or submission

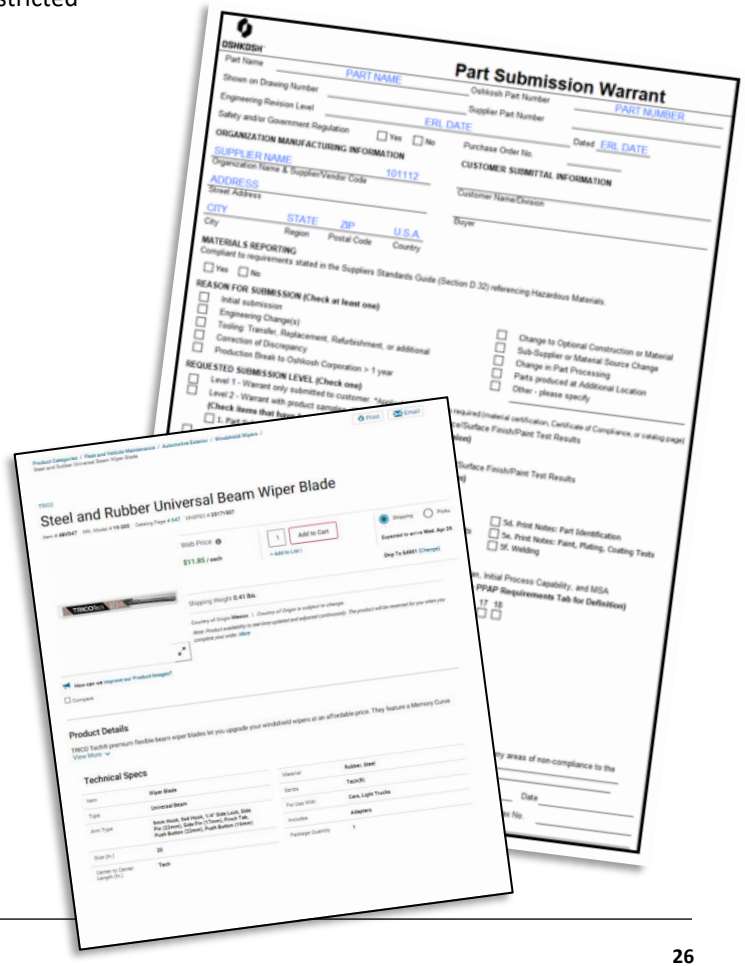
	Submission Level			
PPAP Submission Requirements and Detail Description	**1**	**2**	**3**	**4**
1.) Part Submission Warrant (PSW)	S	S	S	S
2.) Dimensional Results	N/R	S	S	S
3.) Design Records (Bubble Print)	N/R	S	S	S
4.) PPAP Samples - *first production order / upon request prior to production order*	N/R	S	S	S
5.) Print Notes: (Attach copy of Raw Material Certification / Performance Test Report / Surface Finish, Paint Process, Welding Documentation such as WPS/PQRs/Welder Certs)	*	S	S	*
6.) Supplier Change Request (OSK-F1000) - *if applicable*	S	S	S	S
7.) Design Failure Modes effects Analysis (DFMEA) - *if supplier is design responsible*	N/R	N/R	S	N/R
8.) Process Flow Diagram (PFD)	N/R	N/R	S	N/R
9.) Process Failure Modes Effects Analysis (PFMEA)	N/R	N/R	S	N/R
10.) Initial Process Capability - *for major / critical characteristics - if applicable*	N/R	N/R	S	N/R
11.) Measurement System Analysis (MSA) - *for major / critical characteristics - if applicable*	N/R	N/R	S	N/R
12.) Process Control Plan	N/R	N/R	S	N/R
13.) Appearance Approval Report (AAR) - *if applicable*	N/R	N/R	S	N/R
14.) Checking Aids (Fixture, gage, template, etc) - *if applicable*	N/R	N/R	S	N/R
15.) Records of Compliance with Customer Specific Requirements - *if applicable*	N/R	N/R	S	N/R
16.) Photo Documentation (Master Sample of PPAP parts & Section J-Labeling)	S	S	S	N/R
17.) Tooling Photo Documentation - *if applicable*	N/R	S	S	N/R
18.) QC-112 PPAP Check List	N/R	N/R	S	N/R
Additional Submission Instructions below:				

PPAP Level One Requirements

- PPAP Level one may be used for commercial parts
  - OSK MRP default if no drawing exists

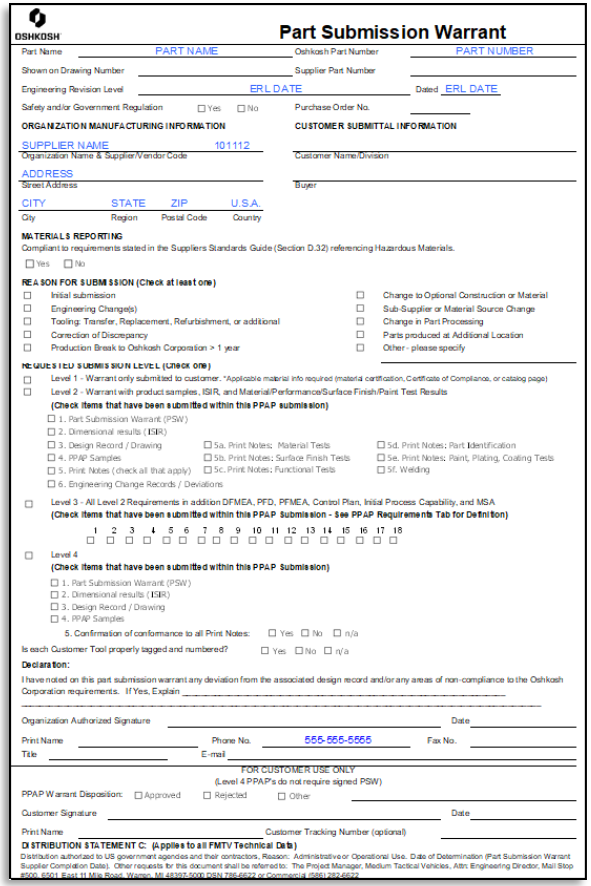
- PPAP Level one submission consists of:
  - Part Submission Warrant (PSW)
  - *Catalogue page with product information*

- Photo documentation – detailed in Level 2 PPAP section
  - Master Sample
  - Section J Label



Part Submission Warrant (PSW)

- PSW summarizes the PPAP and informs the customer why, what and by whom the PPAP is submitted
- This form shows the reason for submission (design change, annual revalidation, etc.) and the level of documents submitted to the customer
- Declaration of part compliance
- If there are any deviations the supplier should note on the warrant or inform that PPAP cannot be submitted
- Materials Reporting Per Suppliers Standards Guide Section D element 32 referencing Hazardous Materials



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Part Submission Warrant

Part Name: PART NAME — Oshkosh Part Number: PART NUMBER
Shown on Drawing Number: — Supplier Part Number:
Engineering Revision Level: ERL DATE — Dated: ERL DATE
Safety and/or Government Regulation: ☐ Yes ☐ No — Purchase Order No.:

ORGANIZATION MANUFACTURING INFORMATION

SUPPLIER NAME 101112
Organization Name & Supplier/Vendor Code
ADDRESS
Street Address
CITY STATE ZIP U.S.A.
City Region Postal Code Country

CUSTOMER SUBMITTAL INFORMATION

Customer Name/Division
Buyer

MATERIALS REPORTING
Compliant to requirements stated in the Suppliers Standards Guide (Section D.32) referencing Hazardous Materials.
☐ Yes ☐ No

REASON FOR SUBMISSION (Check at least one)
☐ Initial submission
☐ Engineering Change(s)
☐ Tooling: Transfer, Replacement, Refurbishment, or additional
☐ Correction of Discrepancy
☐ Production Break to Oshkosh Corporation > 1 year
☐ Change to Optional Construction or Material
☐ Sub-Supplier or Material Source Change
☐ Change in Part Processing
☐ Parts produced at Additional Location
☐ Other - please specify

REQUESTED SUBMISSION LEVEL (Check one)
☐ Level 1 - Warrant only submitted to customer. *Applicable material info required (material certification, Certificate of Compliance, or catalog page)
☐ Level 2 - Warrant with product samples, ISIR, and Material/Performance/Surface Finish/Paint Test Results
(Check items that have been submitted within this PPAP submission)
☐ 1. Part Submission Warrant (PSW)
☐ 2. Dimensional results (ISIR)
☐ 3. Design Record / Drawing ☐ 5a. Print Notes: Material Tests ☐ 5d. Print Notes: Part Identification
☐ 4. PPAP Samples ☐ 5b. Print Notes: Surface Finish Tests ☐ 5e. Print Notes: Paint, Plating, Coating Tests
☐ 5. Print Notes (check all that apply) ☐ 5c. Print Notes: Functional Tests ☐ 5f. Welding
☐ 6. Engineering Change Records / Deviations
☐ Level 3 - All Level 2 Requirements in addition DFMEA, PFD, PFMEA, Control Plan, Initial Process Capability, and MSA
(Check items that have been submitted within this PPAP Submission - See PPAP Requirements Tab for Definition)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐
☐ Level 4
(Check items that have been submitted within this PPAP Submission)
☐ 1. Part Submission Warrant (PSW)
☐ 2. Dimensional results (ISIR)
☐ 3. Design Record / Drawing
☐ 4. PPAP Samples
5. Confirmation of conformance to all Print Notes: ☐ Yes ☐ No ☐ n/a
Is each Customer Tool properly tagged and numbered? ☐ Yes ☐ No ☐ n/a

Declaration:
I have noted on this part submission warrant any deviation from the associated design record and/or any areas of non-compliance to the Oshkosh Corporation requirements. If Yes, Explain _____

Organization Authorized Signature _____ Date _____
Print Name _____ Phone No. 555-555-5555 Fax No. _____
Title _____ E-mail _____

FOR CUSTOMER USE ONLY
(Level 4 PPAP's do not require signed PSW)
PPAP Warrant Disposition: ☐ Approved ☐ Rejected ☐ Other _____
Customer Signature _____ Date _____
Print Name _____ Customer Tracking Number (optional) _____

DISTRIBUTION STATEMENT C: (Applies to all FMTV Technical Data)
Distribution authorized to US government agencies and their contractors, Reason: Administrative or Operational Use, Date of Determination (Part Submission Warrant Supplier Completion Date). Other requests for this document shall be referred to: The Project Manager, Medium Tactical Vehicles, Attn: Engineering Director, Mail Stop 8500, 6501 East 11 Mile Road, Warren, MI 48397-5000 DSN 786-6622 or Commercial (586) 282-6622

Supplier Standards Guide (SSG) Sec D, Elem 32 – Hazardous Materials

32. Obligations to Comply with Environmental and Hazardous Materials Regulations and Prohibitions on Use of Certain Hazardous Materials

(a) *Environmental Regulations.* Supplier shall manage the efforts described by this Purchase Order to ensure that all aspects of the contract execution, to include, but not be limited to, the following Supplier activities: design, manufacturing, testing, and storage activities, are in compliance with all applicable national, federal, state, provincial, municipal and local environmental laws, regulations and requirements. Supplier shall notify Buyer within 72 hours if any governmental authority gives any direction that could result in permit or other violations.

(b) *Hazardous Materials.* Supplier agrees that any order involving delivery of any hazardous material (including any material defined as a hazardous material under 49 CFR 171.8, any hazardous chemical as defined in 29 CFR 1910.1200(c), and any hazardous material and/or toxic substance as defined in any other applicable law) shall be packaged and shipped in accordance with the Federal Hazardous Materials Transportation Law, 49 U.S.C. § 5101, et seq., Hazardous Materials Regulations, Title 49 CFR Parts 100-185, Occupational Safety and Health Administration Regulations, Title 29 CFR Part 1910, and Material Safety Data, Transportation Data, And Disposal Data, For Hazardous Materials Furnished To Government Activities (FED-STD-313). The warning label required on hazardous material by 29 CFR 1910.1200 shall not be obscured by other stamps or labels. Supplier shall provide a Material Safety Data Sheet ("MSDS") to Buyer for each hazardous material as a condition of this Purchase Order. Supplier must submit the most current MSDS available (1) prior to the initial shipment, (2) with the first shipment of each year thereafter, and (3) upon any changes affecting the characteristics or composition of the hazardous material previously reported. An MSDS from the manufacturer may be used to satisfy one or more of the requirements of this Section; provided, however, in no event shall any MSDS bear an issue date earlier than 24 months before the date of submission.

(c) *Prohibition on Use of Certain Hazardous Materials.* Supplier shall not use asbestos, cadmium (used in electroplating processes), lead, mercury, hexavalent chromium (used in electroplating and coating processes), polychlorinated biphenyls, radioactive materials, or other highly toxic or carcinogenic materials without receiving prior written approval from Buyer. The use of pretreatment or painting/coating products containing any lead or hexavalent chromium is strictly prohibited.

Hazardous Materials Reference NGDV Addendum

As referenced in Section D.32 of the Oshkosh Supplier Standards Guide, the use of any pretreatment, plating, painting, or coating of any kind that contains Hexavalent Chrome is strictly prohibited. Any supplier to Oshkosh Corporation shall have systems in place to monitor and control the coating processes used by upstream suppliers when plating requirements are not strictly defined within the Oshkosh design record. Hexavalent Chrome can appear in several forms and can be known by many several nomenclatures. Regardless of the specific nomenclature referenced on the coating certification, usage is strictly prohibited.

Different ways of representing Hexavalent chromium are given below:

- Hexavalent chromium
- Hexavalent chrome
- Hex chrome

Different plating specifications that may contain Hex Chrome (the specifications below may be prohibited. Due diligence is required to verify conformance).

- ASTM B633 (Standard for Electro deposited coatings of Zinc on Iron and Steel)
- ASTM B633 (Coating thickness) Type II
- ASTM B633 (Coating thickness) Type III
- Zn/Fe SC (Coating thickness in micrometers) Type II
- Zn/Fe SC (Coating thickness in micrometers) Type III
- Zinc Yellow
- Zinc Clear
- Chromate
- Chromate conversion coating
- Zinc chromate
- Zinc Dichromate

In addition, Dacromet is not specifically a chromate coating, but a type of Zinc-Rich paint which contains Hex chrome.

PPAP Elements Checklist QC – 112 for PSW

2.2.18	PSW	Y	N	N/A	Comments
2.2.18	Is the current copy of the PPAP workbook utilized (Note: See Oshkosh Supplier Network or Reliance for latest revision- located: https://osn.oshkoshcorp.com)?				
2.2.18	Are all sections completed properly and the PSW signed and dated?				
2.2.18	Does the revision level for the drawing submitted match the Purchase Order?				
2.2.18	Is the PO # field completed?				
2.2.18	Is the Manufacturer & Customer name accurate & complete?				
2.2.18	Is the buyer's name included?				
2.2.18	Is the Materials Report Section in compliance with Suppliers Standards Guide (Section D.32)?				
2.2.18	Are the reason(s) for PPAP submittal accurate AND checked?				
2.2.18	Is the correct Submission level checked AND applicable elements checked?				

Level 2 PPAP
Elements and Requirements

Jake Bleazard

Supplier Performance Engineer

PPAP Part Submission Level Two Requirements

Default PPAP Submission Level 2 - Unless Otherwise Specified by Oshkosh Corporation
(Segment Specific Requirements may vary)
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2.) Dimensional Results	N/R	S	S	S
3.) Design Records (Bubble Print)	N/R	S	S	S
4.) PPAP Samples - *first production order / upon request prior to production order*	N/R	S	S	S
5.) Print Notes: (Attach copy of Raw Material Certification / Performance Test Report / Surface Finish, Paint Process, Welding Documentation such as WPS/PQRs/Welder Certs)	*	S	S	*
6.) Supplier Change Request (OSK-F1000) - *if applicable*	S	S	S	S
7.) Design Failure Modes effects Analysis (DFMEA) - *if supplier is design responsible*	N/R	N/R	S	N/R
8.) Process Flow Diagram (PFD)	N/R	N/R	S	N/R
9.) Process Failure Modes Effects Analysis (PFMEA)	N/R	N/R	S	N/R
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11.) Measurement System Analysis (MSA) - *for major / critical characteristics - if applicable*	N/R	N/R	S	N/R
12.) Process Control Plan	N/R	N/R	S	N/R
13.) Appearance Approval Report (AAR) - *if applicable*	N/R	N/R	S	N/R
14.) Checking Aids (Fixture, gage, template, etc) - *if applicable*	N/R	N/R	S	N/R
15.) Records of Compliance with Customer Specific Requirements - *if applicable*	N/R	N/R	S	N/R
16.) Photo Documentation (Master Sample of PPAP parts & Section J-Labeling)	S	S	S	N/R
17.) Tooling Photo Documentation - *if applicable*	N/R	S	S	N/R
18.) QC-112 PPAP Check List	N/R	N/R	S	N/R
Additional Submission Instructions below:				

PPAP Level Two

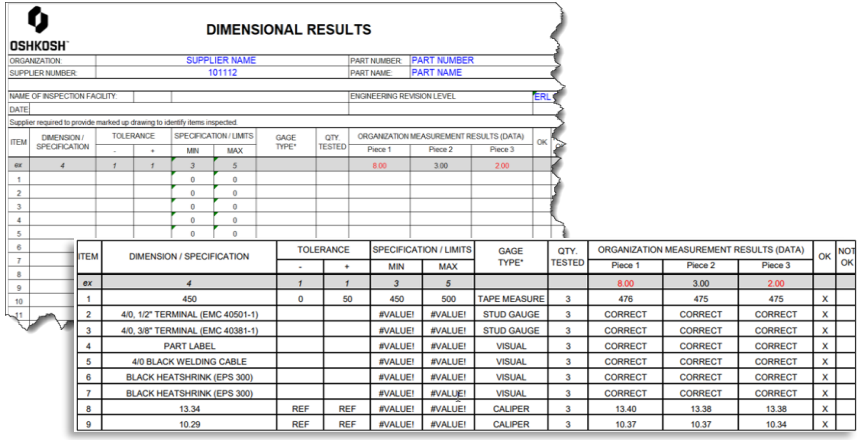
- Part Submission Warrant (PSW) ✓
- Dimensional Results & Design Record (Bubbled Print)
  - ❑ Welding standards
    - ➢ Weld Procedure Specification (WPS)
    - ➢ Procedure Qualification Record (PQR)
    - ➢ Welder Certifications
- Production Samples (First production order/upon request prior to production order)
- Photo Documentation (Master Sample, Section J Labeling, Label Scanning & Validation)
- Print Notes (attached copy where applicable)
  - ❑ Raw material certifications
  - ❑ Performance test reports & Qualified Lab Docs
  - ❑ Surface finish (Surface Preparation, Painting and Finishing)

Dimensional Results – PPAP Level 2

- Dimensional and Design Record consists of the Bubbled Print and Dimensional Results tab

- 100% dimensional inspection is required for one (1) production representative part for each PPAP Level 2 submittal

- One (1) piece dimensional results is also required for any **SUBCOMPONENT** outlined on the drawing, in addition to overall assembly.



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DIMENSIONAL RESULTS

ORGANIZATION	SUPPLIER NAME	PART NUMBER:	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME:	PART NAME
NAME OF INSPECTION FACILITY:		ENGINEERING REVISION LEVEL:	ERL
DATE:			

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

ITEM	DIMENSION / SPECIFICATION	TOLERANCE		SPECIFICATION / LIMITS		GAGE TYPE*	QTY. TESTED	ORGANIZATION MEASUREMENT RESULTS (DATA)			OK	NOT OK
		-	+	MIN	MAX			Piece 1	Piece 2	Piece 3		
ex	4	1	1	3	5			8.00	3.00	2.00		
1	450	0	50	450	500	TAPE MEASURE	3	476	475	475	X	
2	4/0, 1/2" TERMINAL (EMC 40501-1)			#VALUE!	#VALUE!	STUD GAUGE	3	CORRECT	CORRECT	CORRECT	X	
3	4/0, 3/8" TERMINAL (EMC 40381-1)			#VALUE!	#VALUE!	STUD GAUGE	3	CORRECT	CORRECT	CORRECT	X	
4	PART LABEL			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
5	4/0 BLACK WELDING CABLE			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
6	BLACK HEATSHRINK (EPS 300)			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
7	BLACK HEATSHRINK (EPS 300)			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
8	13.34	REF	REF	#VALUE!	#VALUE!	CALIPER	3	13.40	13.38	13.38	X	
9	10.29	REF	REF	#VALUE!	#VALUE!	CALIPER	3	10.37	10.37	10.34	X	

Dimensional results MUST be from production parts.

Production parts produced from more than one die, mold tooling, pattern, cavity or production process, a full dimensional layout from each is required

Dimensional Results – Best Practice

Measuring equipment should have a discrimination of at least one-tenth of the total tolerance being measured (AIAG MSA, chapter 1 sect. E)

A.) Best Practice: *it is permissible to add additional tabs to the Excel PPAP workbook to facilitate better organization of the PPAP submittal. Example- separate dimensions and print notes worksheets preceded by the applicable bubbled print for multiple components of an assembly / weldment. Be careful that the embedded formulas also are copied if you add worksheets.*

Dimensional Results – Best Practice for GD&T

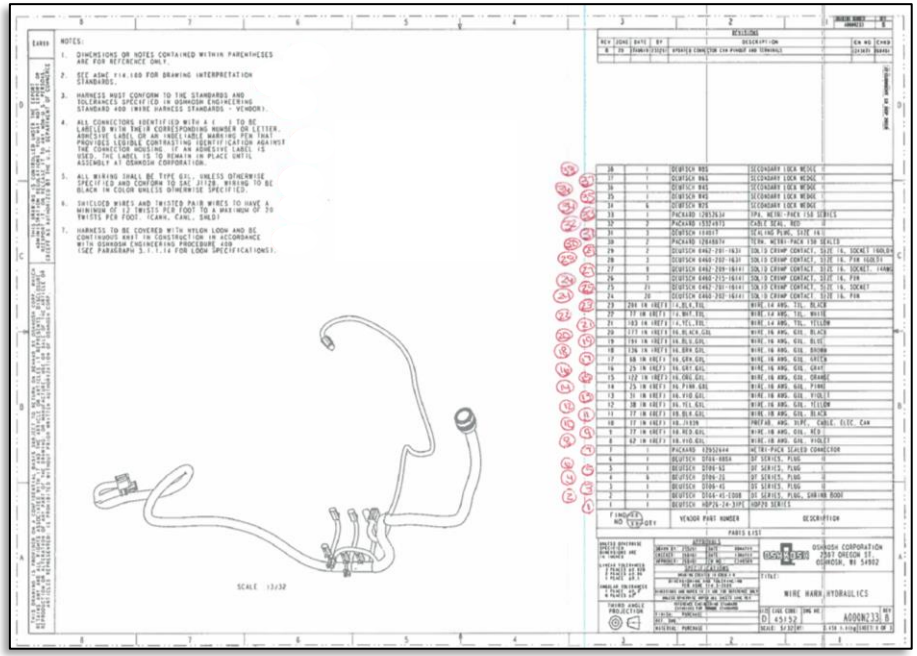
- **True Position specifications.** To facilitate better understanding, and standardize documentation, it is recommended to list both the “x” and “y” basic dimensions, the hole/feature size, and true position tolerance zone as shown below

- Also, express “Bonus Tolerances” as a separate line item within the dimensional PPAP worksheet. The example below expresses the allowable bonus tolerance that can be added to the True Position feature frame when a maximum material condition (MMC) exists.

ITEM	DIMENSION / SPECIFICATION	TOLERANCE		SPECIFICATION / LIMITS		GAGE TYPE*	QTY. TESTED	ORGANIZATION MEASUREMENT RESULTS (DATA)			OK	NOT OK
		-	+	MIN	MAX			Piece 1	Piece 2	Piece 3		
88	*60.33*	*Basic*	*Basic*	*Basic*	*Basic*	*CMM*	*1*	60.256			*X*	
89	22.23	*Basic*	*Basic*	*Basic*	*Basic*	*CMM*	1	22.220			X	
90	9.53	0.500	0.500	9.030	10.030	*CMM*	1	9.526			X	
91	⌖ Ø0.5Ⓜ A B C	GD&T	GD&T	0	0.500	*CMM*	1	0.130			X	
	"Bonus Tol"	GD&T	GD&T	GD&T	GD&T	*CMM*	1	0.496			X	

Design Record

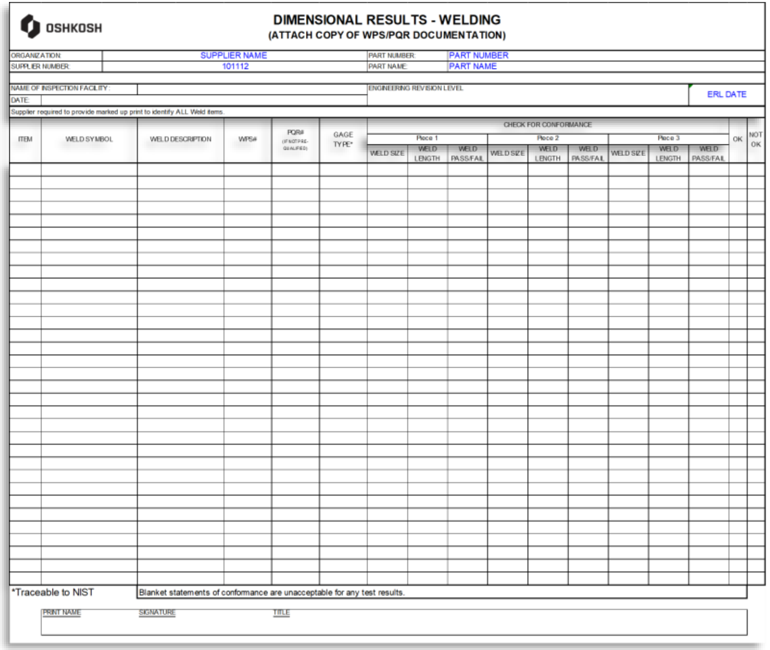
- Legible
  - Part Drawing, Notes & *ALL* Text
- Complete
  - All sub-component prints included
- Released
  - *Only approved drawings used for PPAP submittals*
- Bubbled
  - All Dimensions, Notes & Material (if noted separately from Notes section)
  - *Work with buyer or quality representative to confirm referenced drawings are current*



Dimensional Results – Welding

- Welding symbol & description documented
- WPS & PQR (if not prequalified) documented
- Weld size & Weld length documented for each part
- Supplier signoff required
- WPS & PQRs required to be submitted with PPAP
  - Stamped, dated as “approved” by a Certified Welding Inspector (CWI)

Reviewing possibility of changing to “Dimensional – Welding” instead of “Print Notes”



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DIMENSIONAL RESULTS - WELDING
(ATTACH COPY OF WPS/PQR DOCUMENTATION)

ORGANIZATION:	SUPPLIER NAME	PART NUMBER:	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME:	PART NAME
NAME OF INSPECTION FACILITY:		ENGINEERING REVISION LEVEL	ERL DATE
DATE:			

Supplier required to provide marked up print to identify ALL Weld items.

ITEM	WELD SYMBOL	WELD DESCRIPTION	WPS#	PQR# (IF NOT PRE-QUALIFIED)	GAGE TYPE*	CHECK FOR CONFORMANCE									OK	NOT OK
						Piece 1			Piece 2			Piece 3				
						WELD SIZE	WELD LENGTH	WELD PASS/FAIL	WELD SIZE	WELD LENGTH	WELD PASS/FAIL	WELD SIZE	WELD LENGTH	WELD PASS/FAIL		

*Traceable to NIST

Blanket statements of conformance are unacceptable for any test results.

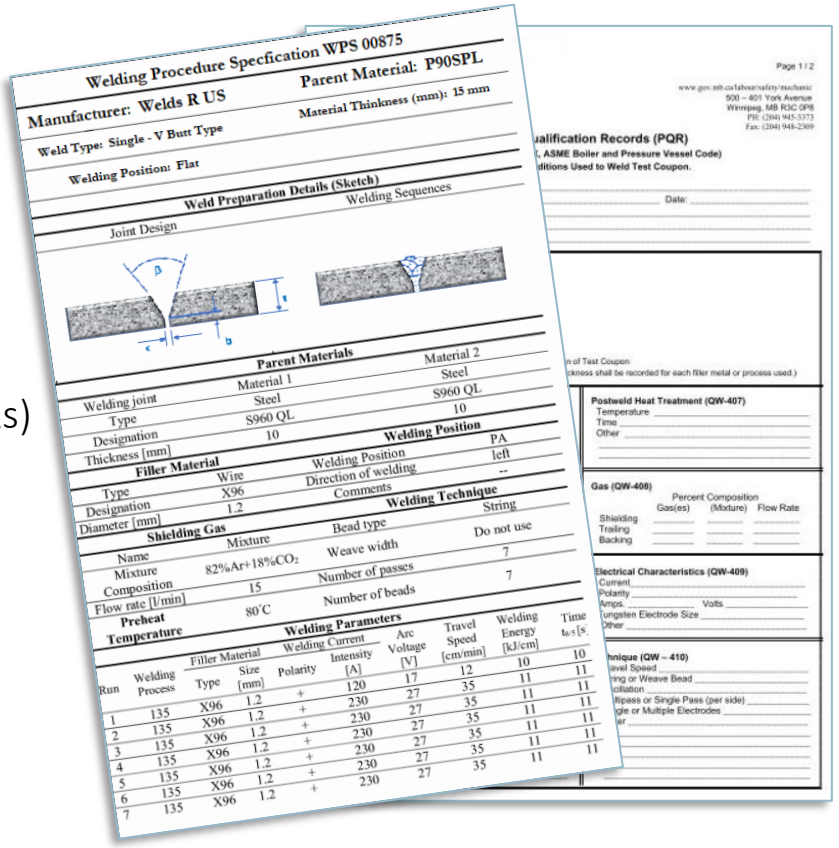
PRINT NAME | SIGNATURE | TITLE

Welding Standards – WPS & PQR

- The supplier shall develop and deliver Welding Procedure Specifications (WPS), Procedure Qualification Records(PQRs) and Weld Repair Procedures

- Welder Performance Qualification Records (WPQRs) shall be available on request

- The use of pre-qualified weld joints as specified in American Welding Society (AWS) D1.1 does not preclude submittal of welding procedure specifications (WPS)



Welding Procedure Specfication WPS 00875

Manufacturer: Welds R US — **Parent Material: P90SPL**

Weld Type: Single - V Butt Type — **Material Thinkness (mm): 15 mm**

Welding Position: Flat

Weld Preparation Details (Sketch)

Joint Design — Welding Sequences

Parent Materials		
Welding joint	Material 1	Material 2
Type	Steel	Steel
Designation	S960 QL	S960 QL
Thickness [mm]	10	10

Filler Material		Welding Position	
Type	Wire	Welding Position	PA
Designation	X96	Direction of welding	left
Diameter [mm]	1.2	Comments	--

Shielding Gas		Welding Technique	
Name	Mixture	Bead type	String
Mixture		Weave width	Do not use
Composition	82%Ar+18%CO_2	Number of passes	7
Flow rate [l/min]	15	Number of beads	7
Preheat Temperature	80°C		

Welding Parameters

Run	Welding Process	Filler Material Type	Filler Material Size [mm]	Welding Current Polarity	Welding Current Intensity [A]	Arc Voltage [V]	Travel Speed [cm/min]	Welding Energy [kJ/cm]	Time $t_{8/5}$ [s]
1	135	X96	1.2	+	120	17	12	10	10
2	135	X96	1.2	+	230	27	35	11	11
3	135	X96	1.2	+	230	27	35	11	11
4	135	X96	1.2	+	230	27	35	11	11
5	135	X96	1.2	+	230	27	35	11	11
6	135	X96	1.2	+	230	27	35	11	11
7	135	X96	1.2	+					

Page 1 / 2

www.gov.mb.ca/labour/safety/mechanic
500 – 401 York Avenue
Winnipeg, MB R3C 0P8
PH: (204) 945-3373
Fax: (204) 948-2309

ualification Records (PQR)
(, ASME Boiler and Pressure Vessel Code)
ditions Used to Weld Test Coupon.

Date:

n of Test Coupon
ckness shall be recorded for each filler metal or process used.)

Postweld Heat Treatment (QW-407)
Temperature
Time
Other

Gas (QW-408)
Percent Composition
Gas(es) (Mixture) Flow Rate
Shielding
Trailing
Backing

Electrical Characteristics (QW-409)
Current
Polarity
Amps. Volts
ungsten Electrode Size
Other

hnique (QW – 410)
avel Speed
ing or Weave Bead
cillation
ltipass or Single Pass (per side)
gle or Multiple Electrodes
er

QC112 - Weld

Weld	Y	N	N/A	Comments
Are all weld lengths, sizes, types & locations cited on the ballooned drawing?				
Are the WPS AND PQR's #'s referenced on the PPAP worksheet?				
Are the WPS AND PQR's #'s INCLUDED in the PPAP submittal?				
Are the WPS and PQR authorized by a CWI (or equivalent authority)?				
Are 3 weld features measured as required for Level 3 PPAP?				
If WPS not required per AWS (for example), are appropriate weld documentation and verification methods included?				

QC – 112 – Dimensional Results / Print Notes

2.2.9	Dimensional Results / Print Notes	Y	N	N/A
2.2.9	Are the dimensional results, dated-signed and relatively current?			
2.2.9	Are 3 parts measured as required for Level 3 PPAP?			
2.2.9	Is 1 part measured for sub-tier level drawing?			
2.2.9	Are the TOLERANCES properly recorded?			
2.2.9	Are the MIN / MAX spec limits on the ISIR correct according to the TOLERANCE limits on the print?			
2.2.9	Are the dimensional results within specification?			
2.2.9	If dimensional results for each of the 3 pieces are *identical,* is there justification for the exact values recorded (it otherwise appears to be pencil-whipped)?			
2.2.9	Are Standard or Metric units properly recorded according to the print ?			
2.2.9	Are proper GAGE TYPES used for the specified tolerance (adequate discrimination)?			
2.2.9	Are proper GAGE TYPES used for the application (calipers / tape measures have limited use)?			
2.2.9	Are multiple dimensions ALL listed and ALL verified (example 2x's, 6x's, etc.)?			
2.2.9	Are MSA / GRR / Capability Studies provided for Critical Characteristics?			
2.2.9	For multi-cavity tooling, at least 1 piece per cavity must have a complete layout			

PPAP Level Two

- Part Submission Warrant (PSW) ✓
- Dimensional Results & Design Record (Bubbled Print) ✓
  - ❑ Welding standards
    - ➢ Weld Procedure Specification (WPS)
    - ➢ Procedure Qualification Record (PQR)
    - ➢ Welder Certifications
- Production Samples (First production order/upon request prior to production order)
- Photo Documentation (Master Sample, Section J Labeling, Label Scanning & Validation)
- Print Notes (attached copy where applicable)
  - ❑ Raw material certifications
  - ❑ Performance test reports & Qualified Lab Docs
  - ❑ Surface finish (Surface Preparation, Painting and Finishing)

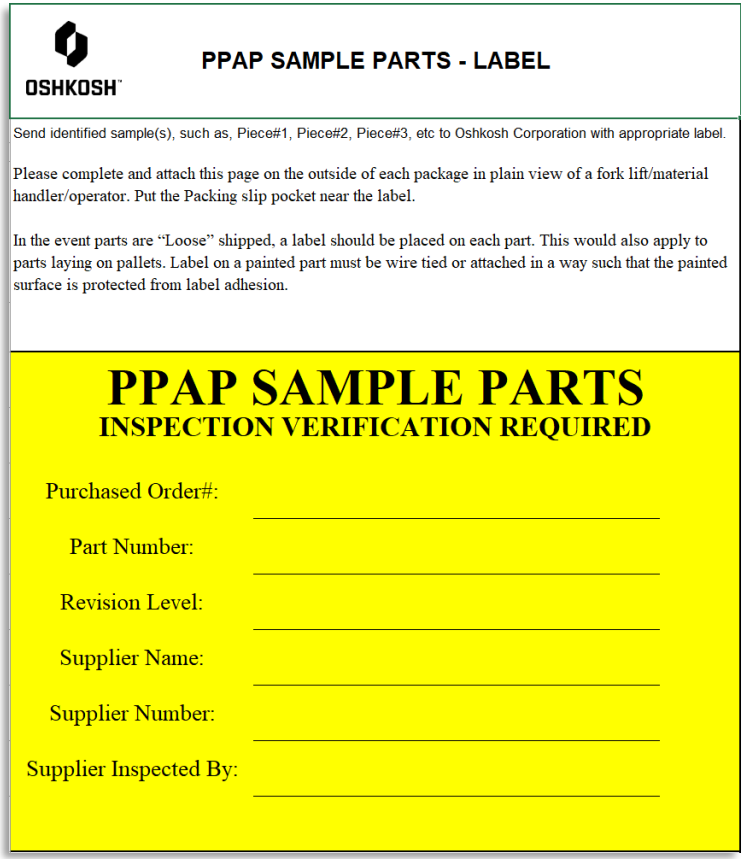
Matt Dankers

Supplier Performance Engineer

Production Samples

- Sample Production Parts (AIAG PPAP 2.2.14)

- The supplier shall ensure that the “PPAP Parts Label” is filled out and attached appropriately to the outside of each package



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PPAP SAMPLE PARTS - LABEL

Send identified sample(s), such as, Piece#1, Piece#2, Piece#3, etc to Oshkosh Corporation with appropriate label.

Please complete and attach this page on the outside of each package in plain view of a fork lift/material handler/operator. Put the Packing slip pocket near the label.

In the event parts are “Loose” shipped, a label should be placed on each part. This would also apply to parts laying on pallets. Label on a painted part must be wire tied or attached in a way such that the painted surface is protected from label adhesion.

PPAP SAMPLE PARTS

INSPECTION VERIFICATION REQUIRED

Purchased Order#: _____

Part Number: _____

Revision Level: _____

Supplier Name: _____

Supplier Number: _____

Supplier Inspected By: _____

PPAP Level Two

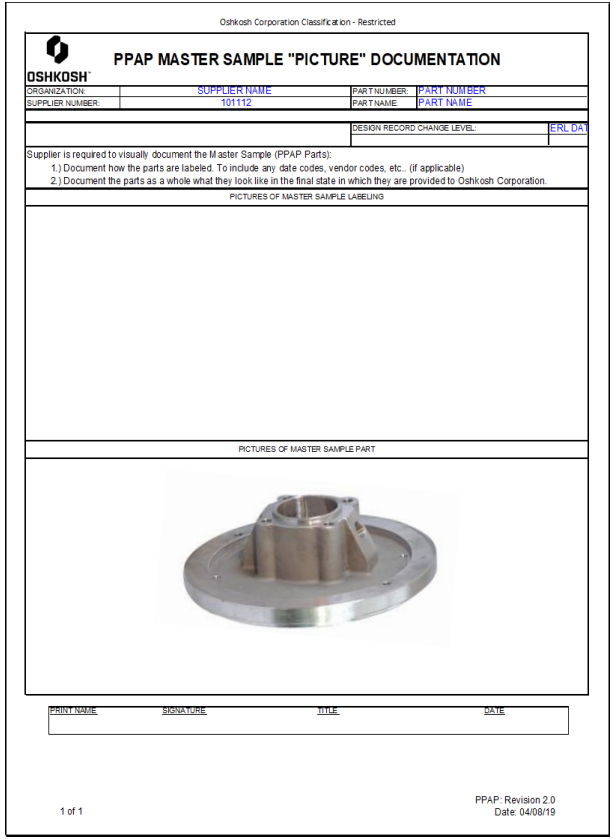
- Part Submission Warrant (PSW) ✓
- Dimensional Results & Design Record (Bubbled Print) ✓
  - ❑ Welding standards
    - ➢ Weld Procedure Specification (WPS)
    - ➢ Procedure Qualification Record (PQR)
    - ➢ Welder Certifications
- Production Samples (First production order/upon request prior to production order) ✓
- Photo Documentation (Master Sample, Section J Labeling, Label Scanning & Validation)
- Print Notes (attached copy where applicable)
  - ❑ Raw material certifications
  - ❑ Performance test reports & Qualified Lab Docs
  - ❑ Surface finish (Surface Preparation, Painting and Finishing)

Photo documentation – Master Sample

- A Master Sample is not required to be retained by the supplier unless specifically requested by Oshkosh, however the supplier is required to provide a photo of a Master Sample for all PPAP submittals, other than a Level 4

- Photo documentation should illustrate what the parts will look like in the final state in which they are provided to Oshkosh.

- ***Photo documentation should include part labeling*** (to include any date codes, vendor codes, cage codes, etc. if applicable), and no paint zones if applicable.
  - *Use this form to submit photo to meet Technical Spec 5082115 (Scannable Labels) per AIAG B4*



Oshkosh Corporation Classification - Restricted

OSHKOSH

PPAP MASTER SAMPLE "PICTURE" DOCUMENTATION

ORGANIZATION:	SUPPLIER NAME	PART NUMBER:	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME:	PART NAME

	DESIGN RECORD CHANGE LEVEL:	ERL DAT

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 Oshkosh Corporation.

PICTURES OF MASTER SAMPLE LABELING

PICTURES OF MASTER SAMPLE PART

PRINT NAME	SIGNATURE	TITLE	DATE

1 of 1

PPAP: Revision 2.0
Date: 04/08/19

QC – 112 Master Sample (photo)

2.2.15	Master Sample (photo)	Y	N	N/A	Comments
2.2.15	Do they capture paint / no paint zones?				
2.2.15	Do they capture the part marking ID and it is correct per print requirements?				
2.2.15	Do they capture significant view angles of the part?				
2.2.15	**(UID-Specific requirements)** Is the sample label photo taken directly perpendicular to the label, at approximately 1 foot away, with no glare on the label?				

Packaging & Shipping

- The Supplier shall provide for adequate facilities and instructions for handling, packaging and shipping to protect the products and prevent damage during storage and transit

- The Supplier shall conform to the requirements of the Oshkosh Supplier Standards Guide Section J
  - Located at http://osn.oshkoshcorp.com

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SECTION J LABELING VALIDATION

ORGANIZATION:	SUPPLIER NAME	PART NUMBER:	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME:	PART NAME
TOOL / FIXTURE NUMBER:		DESIGN RECORD CHANGE LEVEL:	ERL D
DATE:			

Supplier is required to provide sample of SSG Section J compliant label(s) and document with Photo in PPAP workbook

PICTURE OF SECTION J COMPLIANT LABELING

Part Number (P)
123456

Country Origin: USA
Revision: A
Container Code: C0001

Quantity (Q)
12

Purchase Order(K)
246810

Kanban ID (I)
AA10000

Location (L)
711

Please Save This Space On The Labels For a Future Oshkosh Initiative

Supplier Name City/State/Zip

OSK Location Name City/State/Zip

PPAP Level Two

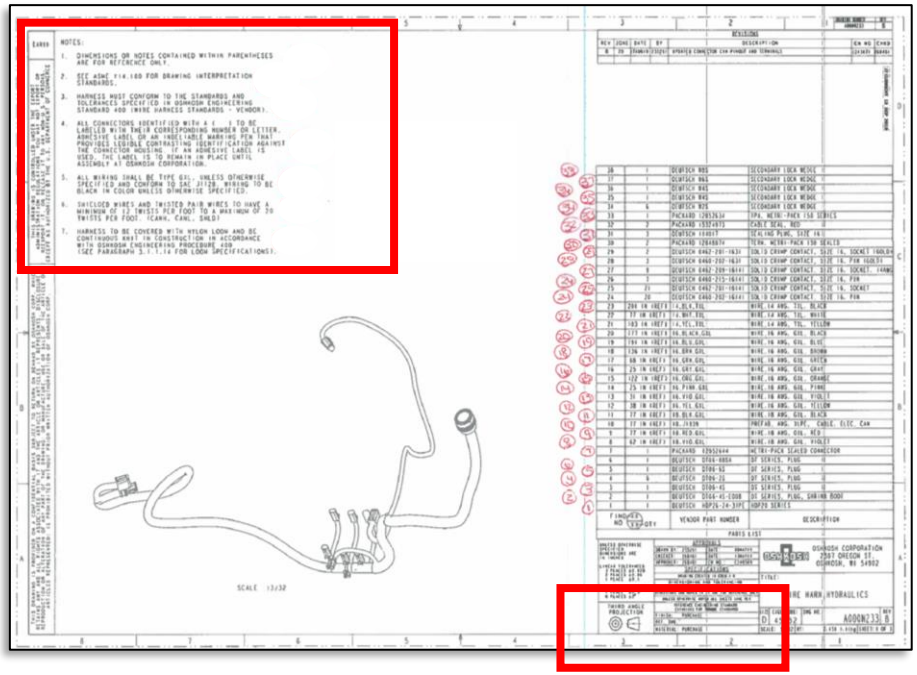
- Part Submission Warrant (PSW) ✓
- Dimensional Results & Design Record (Bubbled Print) ✓
  - ❑ Welding standards
    - ➢ Weld Procedure Specification (WPS)
    - ➢ Procedure Qualification Record (PQR)
    - ➢ Welder Certifications
- Production Samples (First production order/upon request prior to production order) ✓
- Photo Documentation (Master Sample, Section J Labeling, Label Scanning & Validation) ✓
- Print Notes (attached copy where applicable)
  - ❑ Raw material certifications
  - ❑ Performance test reports & Qualified Lab Docs
  - ❑ Surface finish (Surface Preparation, Painting and Finishing)

Jake Bleazard

Supplier Performance Engineer

Print Notes

- Usually describes material, performance & finish requirements
- Write out entire print note in the PPAP workbook verbatim
  - Please don't write "Print Note #1"
- 5082115 Technical specification is usually called out in this section
- *Title block Note - Material callout is sometimes found in the title block*



Print Notes – Raw Material Certifications

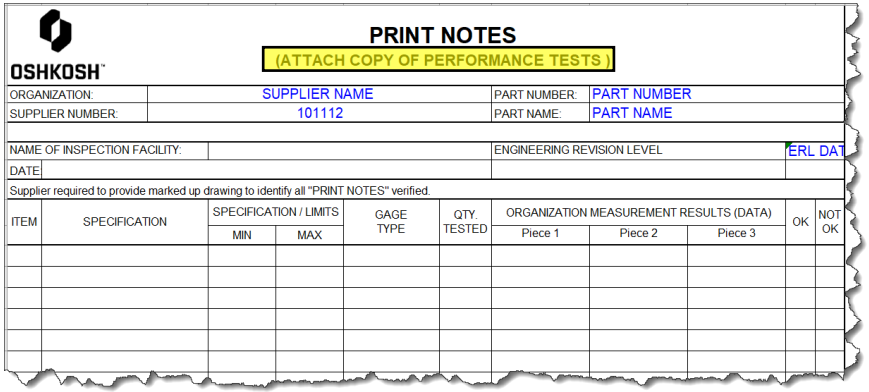
- It is the supplier's responsibility to confirm the material conformance to applicable standards
- The supplier shall perform all chemical, physical, metallurgical or mechanical property tests as specified by the Design Record or Control Plan
- When the supplier maintains "design record authority" for the part or it's subcomponents and material details are not documented on the design record, Oshkosh requires all material tests results be maintained by the supplier and made available upon request
- Raw material composition is presented in a Certificate of Analysis (COA)

PPAP Level Two

- Part Submission Warrant (PSW) ✓
- Dimensional Results & Design Record (Bubbled Print) ✓
  - ❑ Welding standards
    - ➢ Weld Procedure Specification (WPS)
    - ➢ Procedure Qualification Record (PQR)
    - ➢ Welder Certifications
- Production Samples (First production order/upon request prior to production order) ✓
- Photo Documentation (Master Sample, Section J Labeling, Label Scanning & Validation) ✓
- Print Notes (attached copy where applicable)
  - ❑ Raw material certifications ✓
  - ❑ Performance test reports & Qualified Lab Docs
  - ❑ Surface finish (Surface Preparation, Painting and Finishing)

Print Notes - Performance Test

- The Supplier shall perform tests for all part(s) or product material(s) when performance of functional requirements are specified by the Design Record or Control Plan.
  - Performance testing is the process of verifying the functionality of the product when exposed to conditions that they will be used in.
  - Qualified Lab Documentation must accompany each performance test result form.
  - Performance Tests Results Shall include:
    - Design Record change level of parts tested
    - Authorized engineering changes
    - Number, date & change level of specifications used for test
    - Date testing took place
    - Quantity tested
    - Specific parameters and actual results



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PRINT NOTES

(ATTACH COPY OF PERFORMANCE TESTS)

ORGANIZATION:	SUPPLIER NAME	PART NUMBER:	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME:	PART NAME
NAME OF INSPECTION FACILITY:		ENGINEERING REVISION LEVEL	ERL DAT
DATE:			

Supplier required to provide marked up drawing to identify all "PRINT NOTES" verified.

ITEM	SPECIFICATION	SPECIFICATION / LIMITS		GAGE TYPE	QTY. TESTED	ORGANIZATION MEASUREMENT RESULTS (DATA)			OK	NOT OK
		MIN	MAX			Piece 1	Piece 2	Piece 3		

Print Notes - Performance Test

- Performance Tests Results Shall indicate the following:
  - ❑ Design Record change level of parts tested
  - ❑ Authorized engineering changes
  - ❑ Number, date and change level of specifications to which part was tested
  - ❑ Date testing took place
  - ❑ Quantity tested
  - ❑ Specific parameters and actual results

- It is the supplier's responsibility to plan for ongoing material and performance testing which should be identified as separate line items on the control plan

QC – 112 Material/Performance Testing

2.2.10	Material / Performance Testing	Y	N	N/A	Comments
2.2.10	Are material certifications included for all requirements specified on the print?				
2.2.10	Are material certification(s) provided (where no specification is given) to establish a base-line of product acceptability?				
2.2.10	Are material certification(s) dated relatively recent (within 12 months)?				
2.2.10	Are material certification(s) signed and dated?				
2.2.10	Are foreign Certification(s) translated into English?				
2.2.10	Are material certification(s) provided for sub components?				
2.2.10	Are material certification(s) included for hardware called-out on the print?				
2.2.10	Do certification(s) included explicitly reference standards cited (example: SAE/MIL/ASTM)?				
2.2.10	Do material certification(s) show adherence to specified temperature requirements?				
2.2.10	Are test results included for product material(s) when performance or functional requirements are specified by the design record AND/OR the supplier's Control Plan?				

Qualified Lab Documentation

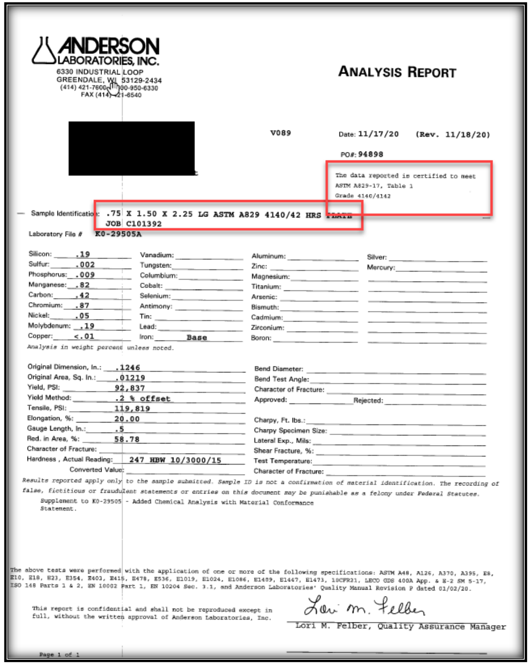
Accredited ISO 17025 Laboratory

- ❑ The name of the laboratory performing the test
- ❑ The laboratory's accreditation standard (accreditation number and/or name of the 3rd Party organization that provided accreditation)
- ❑ List of standards used for testing
- ❑ The date on which the testing took place

Non – Accredited Laboratory

- ❑ The name of the laboratory performing the test
- ❑ Documentation (work instructions) for each type of tests conducted
- ❑ Training records / certifications of personnel who performed the testing
- ❑ List of all test equipment used to perform testing
- ❑ Calibration records of all test equipment used

Qualified Lab Documentation – Example Documents



ANDERSON LABORATORIES, INC.
6330 INDUSTRIAL LOOP
GREENDALE, WI 53129-2434
(414) 421-7600 00-950-6330
FAX (414) 21-6540

ANALYSIS REPORT

[redacted]

V089 Date: 11/17/20 (Rev. 11/18/20)

PO#: 94898

The data reported is certified to meet
ASTM A829-17, Table 1
Grade 4140/4142

Sample Identification: .75 X 1.50 X 2.25 LG ASTM A829 4140/42 HRS PLATE
JOB C101392

Laboratory File # K0-29505A

Silicon:	.19	Vanadium:		Aluminum:		Silver:	
Sulfur:	.002	Tungsten:		Zinc:		Mercury:	
Phosphorus:	.009	Columbium:		Magnesium:			
Manganese:	.82	Cobalt:		Titanium:			
Carbon:	.42	Selenium:		Arsenic:			
Chromium:	.87	Antimony:		Bismuth:			
Nickel:	.05	Tin:		Cadmium:			
Molybdenum:	.19	Lead:		Zirconium:			
Copper:	<.01	Iron:	Base	Boron:			

Analysis in weight percent unless noted.

Original Dimension, In.:	.1246	Bend Diameter:	
Original Area, Sq. In.:	.01219	Bend Test Angle:	
Yield, PSI:	92,837	Character of Fracture:	
Yield Method:	.2 % offset	Approved:	Rejected:
Tensile, PSI:	119,819		
Elongation, %:	20.00	Charpy, Ft. lbs.:	
Gauge Length, In.:	.5	Charpy Specimen Size:	
Red. in Area, %:	58.78	Lateral Exp., Mils:	
Character of Fracture:		Shear Fracture, %:	
Hardness , Actual Reading:	247 HBW 10/3000/15	Test Temperature:	
Converted Value:		Character of Fracture:	

Results reported apply only to the sample submitted. Sample ID is not a confirmation of material identification. The recording of false, fictitious or fraudulent statements or entries on this document may be punishable as a felony under Federal Statutes.

Supplement to K0-29505 - Added Chemical Analysis with Material Conformance Statement.

The above tests were performed with the application of one or more of the following specifications: ASTM A48, A126, A370, A395, E8, E10, E18, E23, E354, E403, E415, E478, E536, E1019, E1024, E1086, E1409, E1447, E1473, 10CFR21, LECO GDS 400A App. & E-2 SM 5-17, ISO 148 Parts 1 & 2, EN 10002 Part 1, EN 10204 Sec. 3.1, and Anderson Laboratories' Quality Manual Revision P dated 01/02/20.

This report is confidential and shall not be reproduced except in full, without the written approval of Anderson Laboratories, Inc.

Lori M. Felber

Lori M. Felber, Quality Assurance Manager

Page 1 of 1

ilac-MRA A2LA

Accredited Laboratory

A2LA has accredited

ANDERSON LABORATORIES, INC.
Greendale, WI

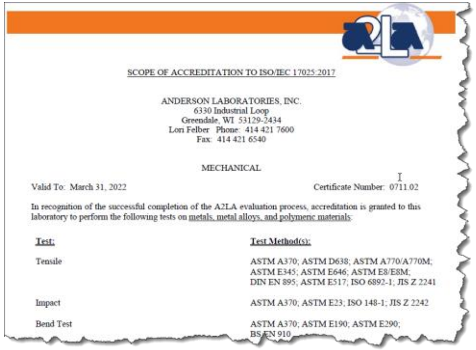
for technical competence in the field of

Mechanical Testing

This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2005 General requirements for the competence of testing and calibration laboratories. This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

Presented this 24th day of February 2020.

Vice President, Accreditation Services
For the Accreditation Council
Certificate Number 0711.02
Valid to March 31, 2022



SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017

ANDERSON LABORATORIES, INC.
6330 Industrial Loop
Greendale, WI 53129-2434
Lori Felber Phone: 414 421 7600
Fax: 414 421 6540

MECHANICAL

Valid To: March 31, 2022 Certificate Number: 0711.02

In recognition of the successful completion of the A2LA evaluation process, accreditation is granted to this laboratory to perform the following tests on metals, metal alloys, and polymeric materials:

Test:	Test Method(s):
Tensile	ASTM A370; ASTM D638; ASTM A770/A770M; ASTM E345; ASTM E646; ASTM E8/E8M; DIN EN 895; ASTM E517; ISO 6892-1; JIS Z 2241
Impact	ASTM A370; ASTM E23; ISO 148-1; JIS Z 2242
Bend Test	ASTM A370; ASTM E190; ASTM E290; BS EN 910

QC – 112 Qualified Lab Docs

2.2.12	Qualified Lab Docs	Y	N	N/A	Comments
2.2.12	Do test reports indicate testing was done internally by the supplier?				
2.2.12	Does the test report indicate testing was done externally by a 3rd party?				
2.2.12	Do the Material or Performance Tests results meet the requirements outlined in section 13 of the GSQM Defense Addendum?				

PPAP Level Two

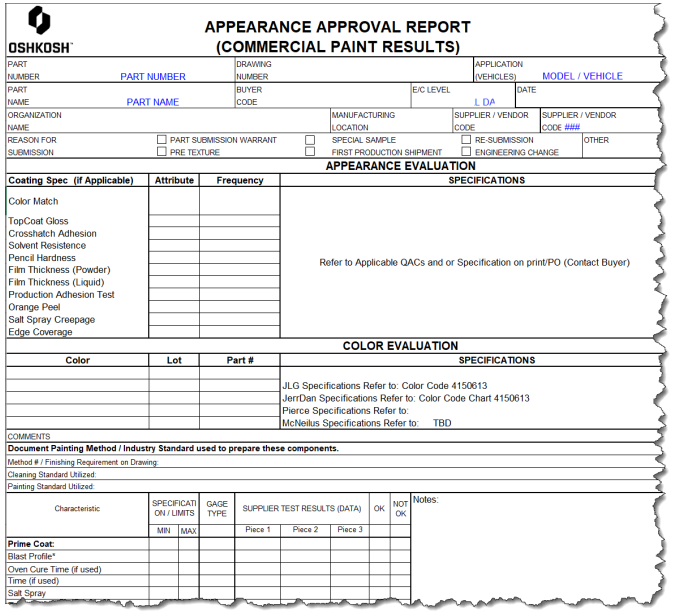
- Part Submission Warrant (PSW) ✓
- Dimensional Results & Design Record (Bubbled Print) ✓
  - ❑ Welding standards
    - ➢ Weld Procedure Specification (WPS)
    - ➢ Procedure Qualification Record (PQR)
    - ➢ Welder Certifications
- Production Samples (First production order/upon request prior to production order) ✓
- Photo Documentation (Master Sample, Section J Labeling, Label Scanning & Validation) ✓
- Print Notes (attached copy where applicable)
  - ❑ Raw material certifications ✓
  - ❑ Performance test reports & Qualified Lab Docs ✓
  - ❑ Surface finish (Surface Preparation, Painting and Finishing)

Andrea Krueger

Supply Chain Manager

Print Notes – Surface Preparation, Painting and Finishing

- Supplier must comply with Oshkosh finish requirement
- When finish requirement is “silent”, supplier shall reference Oshkosh PS-100 Paint Standard and/or FM100 Finish Methods
  - *If no finish method called out, supplier needs to submit documentation that shows Oshkosh finish request*
- Tier 1 suppliers are responsible to ensure finish requirements are upheld by sub-tier finish suppliers.
  - *It is highly recommended that tier 1 suppliers mitigate risks by requiring sub-tier suppliers to document process flows, FMEA and Process Control Plans in accordance with OSK PPAP format*
- As referenced in Section D.32 of the Oshkosh Supplier Standards Guide, the use of any pretreatment, plating, painting or coating of any kind that contains Hexavalent Chrome is strictly prohibited



OSHKOSH

APPEARANCE APPROVAL REPORT
(COMMERCIAL PAINT RESULTS)

PART NUMBER: PART NUMBER	DRAWING NUMBER:	APPLICATION (VEHICLES): MODEL / VEHICLE	
PART NAME: PART NAME	BUYER CODE:	E/C LEVEL: L DA	DATE:
ORGANIZATION NAME:	MANUFACTURING LOCATION:	SUPPLIER / VENDOR CODE:	SUPPLIER / VENDOR CODE: ###

REASON FOR SUBMISSION: ☐ PART SUBMISSION WARRANT ☐ PRE TEXTURE ☐ SPECIAL SAMPLE ☐ FIRST PRODUCTION SHIPMENT ☐ RE-SUBMISSION ☐ ENGINEERING CHANGE ☐ OTHER

APPEARANCE EVALUATION

Coating Spec (if Applicable)	Attribute	Frequency	SPECIFICATIONS
Color Match			Refer to Applicable QACs and or Specification on print/PO (Contact Buyer)
TopCoat Gloss			
Crosshatch Adhesion			
Solvent Resistence			
Pencil Hardness			
Film Thickness (Powder)			
Film Thickness (Liquid)			
Production Adhesion Test			
Orange Peel			
Salt Spray Creepage			
Edge Coverage			

COLOR EVALUATION

Color	Lot	Part #	SPECIFICATIONS
			JLG Specifications Refer to: Color Code 4150613
			JerrDan Specifications Refer to: Color Code Chart 4150613
			Pierce Specifications Refer to:
			McNeilus Specifications Refer to: TBD

COMMENTS

Document Painting Method / Industry Standard used to prepare these components.

Method # / Finishing Requirement on Drawing:
Cleaning Standard Utilized:
Painting Standard Utilized:

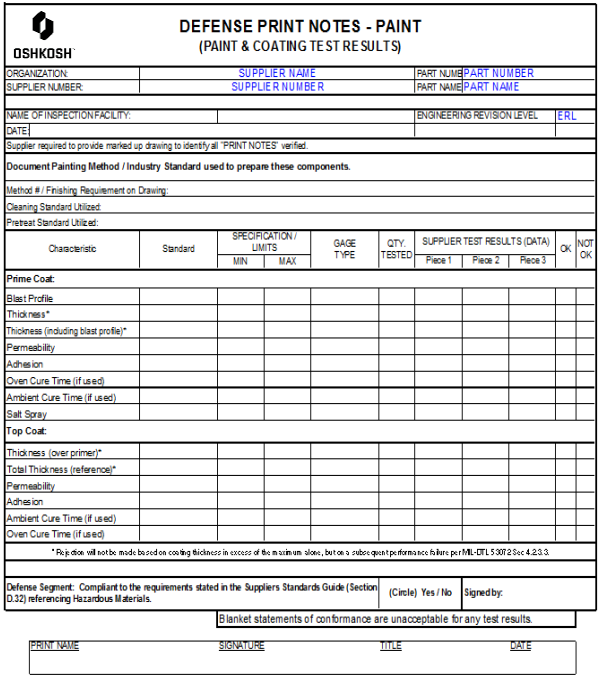
Characteristic	SPECIFICATION / LIMITS MIN	SPECIFICATION / LIMITS MAX	GAGE TYPE	SUPPLIER TEST RESULTS (DATA) Piece 1	Piece 2	Piece 3	OK	NOT OK
Prime Coat:								
Blast Profile*								
Oven Cure Time (if used)								
Time (if used)								
Salt Spray								

Notes:

Print Notes – Defense Paint tab

This is the document where the supplier shows what print standard, Industry standard, & process steps were used to coat the part

- The following tests & results are completed for both prime & topcoat:
  - Solvent permeability, cross hatch adhesion, dry film thickness test, along with salt spray results, ambient & oven cure times
- The supplier should note they aren't using any hazardous material not allowed per the Supplier's Standard Guide (Yes or No should be circled & signed)
- Confirm name, signature, title and date are all included



OSHKOSH

DEFENSE PRINT NOTES - PAINT
(PAINT & COATING TEST RESULTS)

ORGANIZATION:	SUPPLIER NAME	PART NUMB	PART NUMBER
SUPPLIER NUMBER:	SUPPLIER NUMBER	PART NAME	PART NAME
NAME OF INSPECTION FACILITY:		ENGINEERING REVISION LEVEL	ERL
DATE:			

Supplier required to provide marked up drawing to identify all "PRINT NOTES" verified.

Document Painting Method / Industry Standard used to prepare these components.

Method # / Finishing Requirement on Drawing:
Cleaning Standard Utilized:
Pretreat Standard Utilized:

Characteristic	Standard	SPECIFICATION / LIMITS MIN	SPECIFICATION / LIMITS MAX	GAGE TYPE	QTY. TESTED	SUPPLIER TEST RESULTS (DATA) Piece 1	Piece 2	Piece 3	OK	NOT OK
Prime Coat:										
Blast Profile										
Thickness*										
Thickness (including blast profile)*										
Permeability										
Adhesion										
Oven Cure Time (if used)										
Ambient Cure Time (if used)										
Salt Spray										
Top Coat:										
Thickness (over primer)*										
Total Thickness (reference)*										
Permeability										
Adhesion										
Ambient Cure Time (if used)										
Oven Cure Time (if used)										

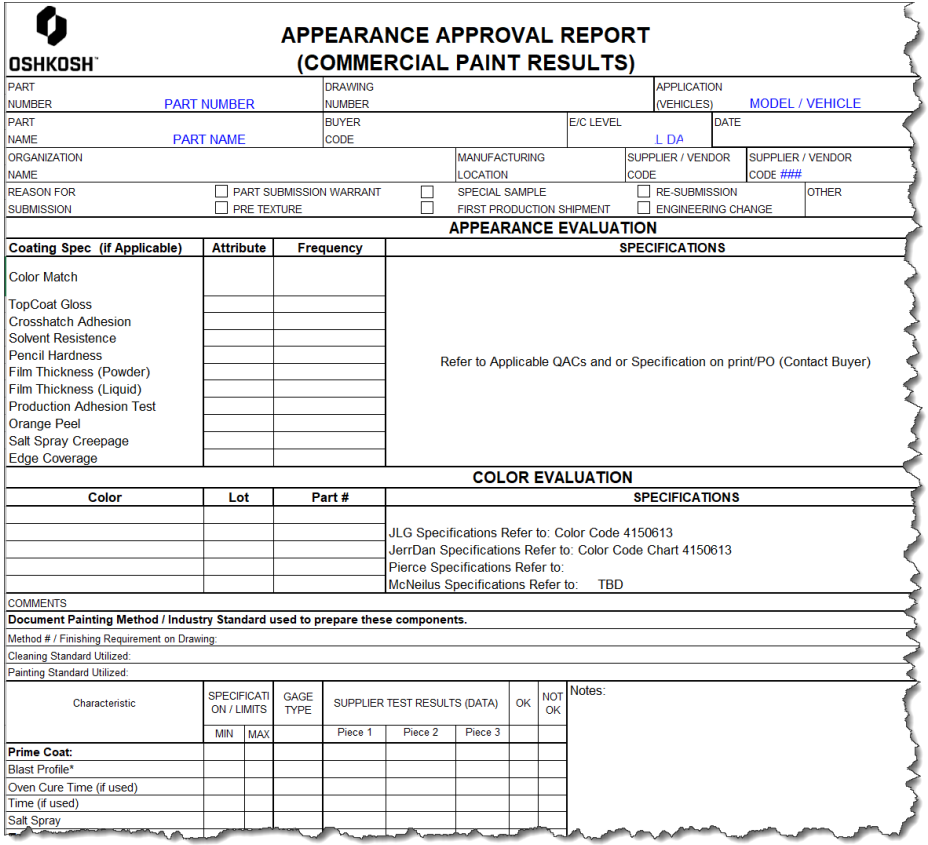
* Rejection will not be made based on coating thickness in excess of the maximum alone, but on a subsequent performance failure per MIL-DTL 53072 Sec 4.2.3.3.

Defense Segment: Compliant to the requirements stated in the Suppliers Standards Guide (Section D.32) referencing Hazardous Materials. (Circle) Yes / No **Signed by:**

Blanket statements of conformance are unacceptable for any test results.

PRINT NAME | SIGNATURE | TITLE | DATE

Appearance Approval Report (Commercial Paint Results)



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APPEARANCE APPROVAL REPORT (COMMERCIAL PAINT RESULTS)

PART NUMBER	DRAWING NUMBER	APPLICATION (VEHICLES)
PART NUMBER		MODEL / VEHICLE

PART NAME	BUYER CODE	E/C LEVEL	DATE
PART NAME		L DA	

ORGANIZATION NAME	MANUFACTURING LOCATION	SUPPLIER / VENDOR CODE	SUPPLIER / VENDOR CODE
			CODE ###

REASON FOR SUBMISSION: ☐ PART SUBMISSION WARRANT ☐ PRE TEXTURE ☐ SPECIAL SAMPLE ☐ FIRST PRODUCTION SHIPMENT ☐ RE-SUBMISSION ☐ ENGINEERING CHANGE ☐ OTHER

APPEARANCE EVALUATION

Coating Spec (if Applicable)	Attribute	Frequency	SPECIFICATIONS
Color Match			Refer to Applicable QACs and or Specification on print/PO (Contact Buyer)
TopCoat Gloss			
Crosshatch Adhesion			
Solvent Resistence			
Pencil Hardness			
Film Thickness (Powder)			
Film Thickness (Liquid)			
Production Adhesion Test			
Orange Peel			
Salt Spray Creepage			
Edge Coverage			

COLOR EVALUATION

Color	Lot	Part #	SPECIFICATIONS
			JLG Specifications Refer to: Color Code 4150613
			JerrDan Specifications Refer to: Color Code Chart 4150613
			Pierce Specifications Refer to:
			McNeilus Specifications Refer to: TBD

COMMENTS

Document Painting Method / Industry Standard used to prepare these components.

Method # / Finishing Requirement on Drawing:

Cleaning Standard Utilized:

Painting Standard Utilized:

Characteristic	SPECIFICATION / LIMITS MIN	SPECIFICATION / LIMITS MAX	GAGE TYPE	SUPPLIER TEST RESULTS (DATA) Piece 1	Piece 2	Piece 3	OK	NOT OK	Notes:
Prime Coat:									
Blast Profile*									
Oven Cure Time (if used)									
Time (if used)									
Salt Spray									

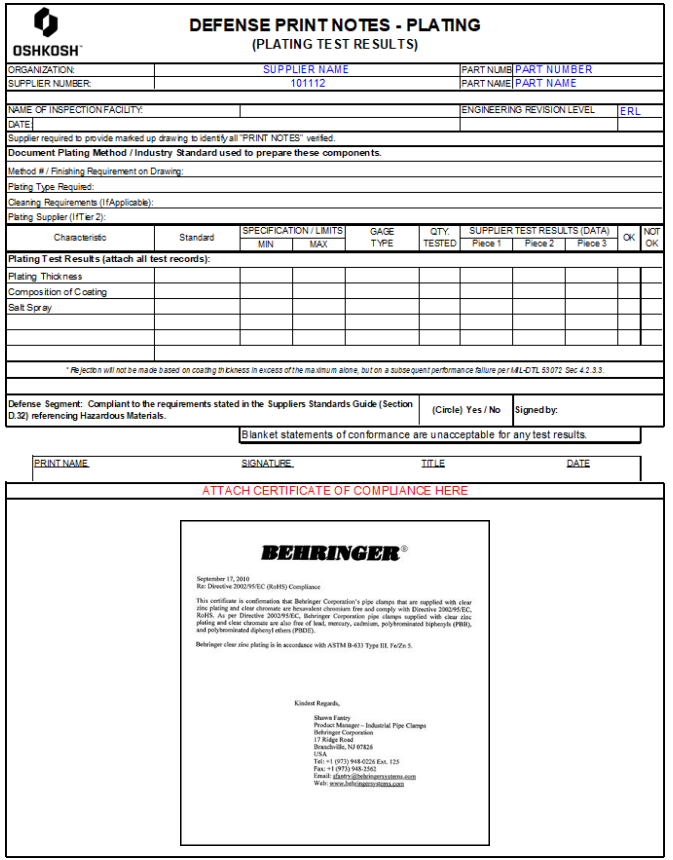
QC-112 Appearance Approval

2.2.13	Appearance Approval	Y	N	N/A	Comments
2.2.13	Was an Appearance Approval Report submitted?				

Print Notes – Plating (Plating test results)

This is the document where the supplier shows what print standard, Industry standard, & process steps were used to plate the part

- The following tests & results are completed:
  - Plating thickness, composition of coating and salt spray testing
- The supplier should note they aren't using any hazardous material not allowed per the Supplier's Standard Guide (Yes or No should be circled & signed)
- Confirm name, signature, title and date are all included
- Confirm Plating Certificate of Compliance is also included



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DEFENSE PRINT NOTES - PLATING
(PLATING TEST RESULTS)

ORGANIZATION:	SUPPLIER NAME	PART NUMB	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME	PART NAME
NAME OF INSPECTION FACILITY:		ENGINEERING REVISION LEVEL	ERL
DATE:			

Supplier required to provide marked up drawing to identify all "PRINT NOTES" verified.

Document Plating Method / Industry Standard used to prepare these components.

Method # / Finishing Requirement on Drawing:

Plating Type Required:

Cleaning Requirements (If Applicable):

Plating Supplier (If Tier 2):

Characteristic	Standard	SPECIFICATION / LIMITS MIN	SPECIFICATION / LIMITS MAX	GAGE TYPE	QTY. TESTED	SUPPLIER TEST RESULTS (DATA) Piece 1	Piece 2	Piece 3	OK	NOT OK
Plating Test Results (attach all test records):										
Plating Thickness										
Composition of Coating										
Salt Spray										

* Rejection will not be made based on coating thickness in excess of the maximum alone, but on a subsequent performance failure per MIL-DTL 53072 Sec 4.2.3.3.

Defense Segment: Compliant to the requirements stated in the Suppliers Standards Guide (Section D.32) referencing Hazardous Materials. (Circle) Yes / No Signed by:

Blanket statements of conformance are unacceptable for any test results.

PRINT NAME SIGNATURE TITLE DATE

ATTACH CERTIFICATE OF COMPLIANCE HERE

BEHRINGER®

September 17, 2010
Re: Directive 2002/95/EC (RoHS) Compliance

This certificate is confirmation that Behringer Corporation's pipe clamps that are supplied with clear zinc plating and clear chromate are hexavalent chromium free and comply with Directive 2002/95/EC, RoHS. As per Directive 2002/95/EC, Behringer Corporation pipe clamps supplied with clear zinc plating and clear chromate are also free of lead, mercury, cadmium, polybrominated biphenyls (PBB), and polybrominated diphenyl ethers (PBDE).

Behringer clear zinc plating is in accordance with ASTM B-633 Type III, Fe/Zn 5.

Kindest Regards,

Shawn Fantry
Product Manager – Industrial Pipe Clamps
Behringer Corporation
17 Ridge Road
Branchville, NJ 07826
USA
Tel: +1 (973) 948-0226 Ext. 125
Fax: +1 (973) 948-2562
Email: sfantry@behringersystems.com
Web: www.behringersystems.com

PPAP Level Two

- Part Submission Warrant (PSW) ✓
- Dimensional Results & Design Record (Bubbled Print) ✓
  - ❑ Welding standards
    - ➢ Weld Procedure Specification (WPS)
    - ➢ Procedure Qualification Record (PQR)
    - ➢ Welder Certifications
- Production Samples (First production order/upon request prior to production order) ✓
- Photo Documentation (Master Sample, Section J Labeling, Label Scanning & Validation) ✓
- Print Notes (attached copy where applicable)
  - ❑ Raw material certifications ✓
  - ❑ Performance test reports & Qualified Lab Docs ✓
  - ❑ Surface finish (Surface Preparation, Painting and Finishing) ✓

15 MIN BREAK

OSHKOSH™

Level 3 PPAP
Elements and Requirements

Theresa Zitzelsberger

Supplier Performance Engineer

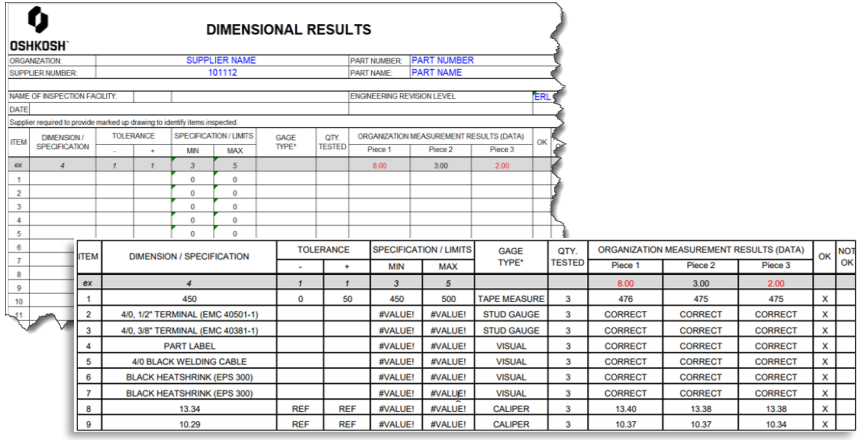
PPAP Part Submission Level Three Requirements

Default PPAP Submission Level 2 - Unless Otherwise Specified by Oshkosh Corporation
(Segment Specific Requirements may vary)
S = Supplier Must Send Items to Oshkosh Corporation for Approval
*** = Applicable material info required (material certification, Certificate of Compliance, or catalog page) with PSW**
N/R= Documents are not required for development or submission

	Submission Level			
PPAP Submission Requirements and Detail Description	**1**	**2**	**3**	**4**
1.) Part Submission Warrant (PSW)	S	S	S	S
2.) Dimensional Results	N/R	S	S	S
3.) Design Records (Bubble Print)	N/R	S	S	S
4.) PPAP Samples - *first production order / upon request prior to production order*	N/R	S	S	S
5.) Print Notes: (Attach copy of Raw Material Certification / Performance Test Report / Surface Finish, Paint Process, Welding Documentation such as WPS/PQRs/Welder Certs)	*	S	S	*
6.) Supplier Change Request (OSK-F1000) - *if applicable*	S	S	S	S
7.) Design Failure Modes effects Analysis (DFMEA) - *if supplier is design responsible*	N/R	N/R	S	N/R
8.) Process Flow Diagram (PFD)	N/R	N/R	S	N/R
9.) Process Failure Modes Effects Analysis (PFMEA)	N/R	N/R	S	N/R
10.) Initial Process Capability - *for major / critical characteristics - if applicable*	N/R	N/R	S	N/R
11.) Measurement System Analysis (MSA) - *for major / critical characteristics - if applicable*	N/R	N/R	S	N/R
12.) Process Control Plan	N/R	N/R	S	N/R
13.) Appearance Approval Report (AAR) - *if applicable*	N/R	N/R	S	N/R
14.) Checking Aids (Fixture, gage, template, etc) - *if applicable*	N/R	N/R	S	N/R
15.) Records of Compliance with Customer Specific Requirements - *if applicable*	N/R	N/R	S	N/R
16.) Photo Documentation (Master Sample of PPAP parts & Section J-Labeling)	S	S	S	N/R
17.) Tooling Photo Documentation - *if applicable*	N/R	S	S	N/R
18.) QC-112 PPAP Check List	N/R	N/R	S	N/R
Additional Submission Instructions below:				

Dimensional Results – PPAP Level 3

- Dimensional and Design Record consists of the Bubbled Print and Dimensional Results tab
- 100% dimensional inspection is required for three (3) production representative parts for each PPAP Level 3 submittal
- One (1) piece dimensional results is also required for any **SUBCOMPONENT** outlined on the drawing, in addition to overall assembly.



OSHKOSH

DIMENSIONAL RESULTS

ORGANIZATION	SUPPLIER NAME	PART NUMBER:	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME:	PART NAME
NAME OF INSPECTION FACILITY:		ENGINEERING REVISION LEVEL:	ERL
DATE:			

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

ITEM	DIMENSION / SPECIFICATION	TOLERANCE		SPECIFICATION / LIMITS		GAGE TYPE*	QTY. TESTED	ORGANIZATION MEASUREMENT RESULTS (DATA)			OK	NOT OK
		-	+	MIN	MAX			Piece 1	Piece 2	Piece 3		
ex	4	1	1	3	5			8.00	3.00	2.00		
1	450	0	50	450	500	TAPE MEASURE	3	476	475	475	X	
2	4/0, 1/2" TERMINAL (EMC 40501-1)			#VALUE!	#VALUE!	STUD GAUGE	3	CORRECT	CORRECT	CORRECT	X	
3	4/0, 3/8" TERMINAL (EMC 40381-1)			#VALUE!	#VALUE!	STUD GAUGE	3	CORRECT	CORRECT	CORRECT	X	
4	PART LABEL			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
5	4/0 BLACK WELDING CABLE			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
6	BLACK HEATSHRINK (EPS 300)			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
7	BLACK HEATSHRINK (EPS 300)			#VALUE!	#VALUE!	VISUAL	3	CORRECT	CORRECT	CORRECT	X	
8	13.34	REF	REF	#VALUE!	#VALUE!	CALIPER	3	13.40	13.38	13.38	X	
9	10.29	REF	REF	#VALUE!	#VALUE!	CALIPER	3	10.37	10.37	10.34	X	

Dimensional results MUST be from production parts.

Production parts produced from more than one die, mold tooling, pattern, cavity or production process, a full dimensional layout from each is required

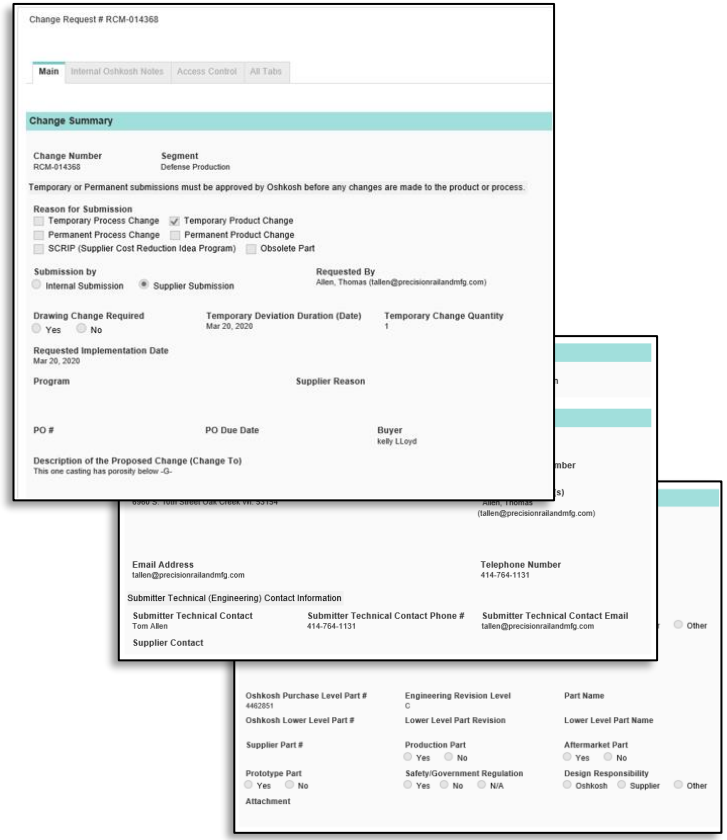
PPAP Level Three

- All elements of PPAP Level 2 
- Supplier Change Request (OSK-RCM) – if applicable
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible
- Process Failure Modes Effects Analysis (PFMEA)
- Process Flow Diagram (PFD)
- Measurement System Analysis (MSA)
- Initial process Capability
- Process Control Plan
- Checking Aids
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Supplier Change Request Form

- Suppliers are responsible to ensure that all products supplied to Oshkosh Corporation meet the requirements of the current released drawing, to the current revision on the purchase order, and as documented in the Oshkosh PPAP (if required).

- This change request shall occur via the **Change Management** module within the Oshkosh Reliance Software.



Authorized Engineering Change Documents (AIAG PPAP 2.2.2)

- The Supplier shall maintain copies of any authorized engineering change documents for those changes not yet recorded in the Design Record but incorporated in the product, part or tooling

- Marked Drawings are acceptable for PPAP submission when a released drawing is not available due to timeline constraints

- Any Marked drawings from Oshkosh Defense must be signed approved by Oshkosh Design Engineering and a copy of the approved OSK Supplier Change Request (RCM) must accompany the PPAP Submittal

QC-112, Authorized Engineering Change Docs

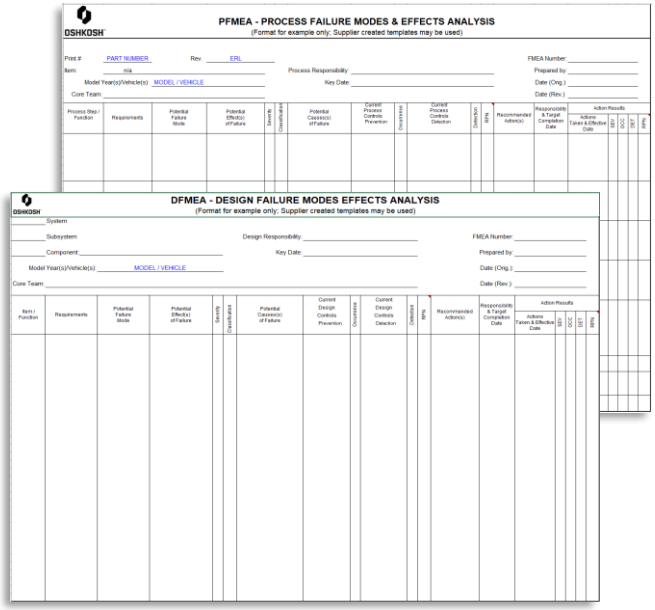
2.2.2 & 2.2.3	Authorized Engineering Change Docs (RCM (Reliance Change Management)/Customer Engineering approval	Y	N	N/A	Comments
2.2.3	Is there an approved Deviation Request, submitted to RCM (Reliance Change Management) system, included for all Dimensions, Notes, and Print Discrepancies that do not meet requirements?				
2.2.2 & 2.2.3	Is the approved Change Request valid for the order produced?				

PPAP Level Three

- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible
- Process Failure Modes Effects Analysis (PFMEA)
- Process Flow Diagram (PFD)
- Measurement System Analysis (MSA)
- Initial process Capability
- Process Control Plan
- Checking Aids
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Failure Modes Effects Analysis - FMEA

- FMEA is an analytical methodology used to ensure that potential problems have been considered and addressed throughout the product & process development process
- Failure mode is way or manner which a product or process could fail to meet design intent or process requirement
- Used both in the Design & Process Phase of production
  - DFMEA required when supplier is considered design responsible
- Each item/function has a Severity, Occurrence & Detection #
- Risk Priority Number (RPN) calculated by multiplying together



FMEA Severity Ranking Assignment

- FMEA Severity rank values shall be in accordance with Severity Rating Scale Table

- If there is any disagreement between criteria for assignment of Severity Rank in the table while performing the FMEA analysis, the more severe (higher) rank shall always be utilized

SEVERITY RATING SCALE				
CUSTOMER EFFECT	**SEVERITY OF EFFECT ON PRODUCT**	**RANK**	**SEVERITY OF EFFECT ON PROCESS**	**ASSY EFFECT**
Failure to Meet Safety and/or Regulatory Requirements	Potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulation without warning.	**10**	May endanger operator (machine or assembly) without warning.	**Hazardous without warning**
	Potential failure mode affects safe vehicle operation and/or involves noncompliance with government regulation with warning	**9**	May endanger operator (machine or assembly) with warning.	**Hazardous with warning**
Loss or Degradation of Primary Function	Loss of primary function (vehicle / item inoperable, but does not affect safe operation).	**8**	100% of production run may have to be scrapped, line shutdown, or stop ship.	**Major Disruption**
	Degradation of primary function (vehicle / item operable but at a reduced level of performance)	**7**	A portion of the production run may have to be scrapped, deviation from primary process including decreased line speed or added manpower.	**Significant Disruption**
Loss or Degradation of Secondary Function	Loss of secondary function (vehicle / item operable, but does not affect safe operation, but secondary functions inoperable)	**6**	100% of production run may have to be reworked off line and accepted.	**Moderate Disruption**
	Degradation of secondary function (vehicle / item operable, but secondary functions operate at reduced level of performance)	**5**	A portion of the production run may have to be reworked off line and accepted.	
Loss or Degradation of Tertiary Function	Condition impacting a tertiary function but vehicle remains operable, appearance or audible noise, or item does not conform and noticed by >75% of customers	**4**	100% of production run may have to be reworked in station before it is processed.	**Minor Disruption**
	Condition impacting a tertiary function but vehicle remains operable, appearance or audible noise, or item does not conform and noticed by ~50% of customers	**3**	A portion of the production run may have to be reworked in station before it is processed.	
	Condition impacting a tertiary function but vehicle remains operable, appearance or audible noise, or item does not conform and noticed by <25% of customers	**2**	Slight inconvenience to process, operation, or operator.	**Annoyance**
No effect	No discernible effect	**1**	No discernible effect.	**None**

FMEA Occurrence Ranking Assignment

- FMEA Severity rank values shall be in accordance with Occurrence Rating Scale Table

- If there is any disagreement between criteria for assignment of Severity Rank in the table while performing the FMEA analysis, the more severe (higher) rank shall always be utilized

OCCURRENCE RATING SCALE				
LIKELIHOOD OF FAILURE	**OCCURRENCE OF CAUSE FROM TESTING**	**OCCURRENCE OF CAUSE FOR DFMEA**	**OCCURRENCE OF CAUSE FOR PFMEA**	**RANK**
Very High	Observed on over 50% of test assets.	New technology/new design with no history.	One occurrence per part/machine	**10**
High	Observed on >25-50% of test assets.	Failure is inevitable with new design, new application, or change in duty cycle/operating conditions.	One occurrence per shift *(>1 in 5)	**9**
		Failure is likely with new design, new application, or change in duty cycle/operating conditions.	One occurrence per day *(1 in 5)	**8**
		Failure is uncertain with new design, new application, or change in duty cycle/operating conditions.	One occurrence per week *(1 in 25)	**7**
Moderate	Observed on >12.5-25% of test assets.	Frequent failures associated with similar designs or in design simulation and testing.	One occurrence every 2 weeks *(1 in 50)	**6**
		Occasional failures associated with similar designs or in design simulation and testing.	One occurrence per month *(1 in 100)	**5**
		Isolated Failures associated with similar design or in design simulation and testing.	One occurrence per 3 months *(1 in 300)	**4**
Low	Observed on up to 12.5% of test assets.	Only isolated failures associated with almost identical design or in design simulation and testing.	One occurrence per 6 months *(1 in 600)	**3**
Very Low	No occurrences observed during testing.	No observed failures associated with almost identical design or in design simulation and testing.	One occurrence per year *(1 in 1200)	**2**
		Failure is eliminated through preventive control.	Less than one occurrence per year *(<1 in 1200)	**1**
Occurrence frequency for PFMEA should be calculated based upon yearly production volumes (for example, if 1200 units are produced each year, one occurrence per month equals 1 in 100 units produced)				

FMEA Detection Ranking Assignment

- FMEA Severity rank values shall be in accordance with Detection Rating Scale Table

- To determine the Risk Priority Number (RPN) values, the OSK standard table within the PPAP workbook shall be utilized

Detection Rating Scale

Rank	DETECTION PROBABILITY	CRITERIA
10	No detection opportunity	No current process control; Cannot detect or is not analyzed.
9	Not likely to detect at any stage	Failure Mode and/or Error (Cause) is not easily detected (e.g. random audits)
8	Problem Detection Post Processing	Failure Mode detection post-processing by operator through visual/tactile/audible means.
7	Problem Detection at Source	Failure Mode detection in-station by operator through visual/tactile/audible means or post-processing through use of attribute gauging (go/no go, manual torque check/clicker wrench, etc.)
6	Problem Detection Post Processing	Failure Mode detection post-processing by operator through use of variable gauging or in-station by operator through use of attribute gauging (go/no go, manual torque check/clicker wrench, etc.)
5	Problem Detection at Source	Failure Mode or Error (Cause) detection in-station by operator through use of variable gauging or by automated controls in-station that will detect discrepant part and notify operator (light, buzzer, etc.). Gauging performed on setup and first-piece check (for set-up causes only).
4	Problem Detection Post Processing	Failure Mode detection post-processing by automated controls that will detect discrepant part and lock part to prevent further processing.
3	Problem Detection at Source	Failure Mode detection in-station by automated controls that will detect discrepant part and prevent automatically lock part in station to prevent further processing.
2	Error Detection and/or Problem Prevention	Error (Cause) detection in-station by automated controls that will detect error and prevent discrepant part from being made.
1	Detection not applicable; Failure Prevention	Error (Cause) prevention as a result of fixture design, machine design or part design. Discrepant parts cannot be made because item has been error-proofed by process/product design.

This scale was adapted from the AIAG FMEA Manual (4th Edition)

FMEA Special Characteristics

- Special Characteristics are defined as product characteristics or manufacturing process parameters which can affect safety or compliance with regulations, fit, function, performance or subsequent process of product.

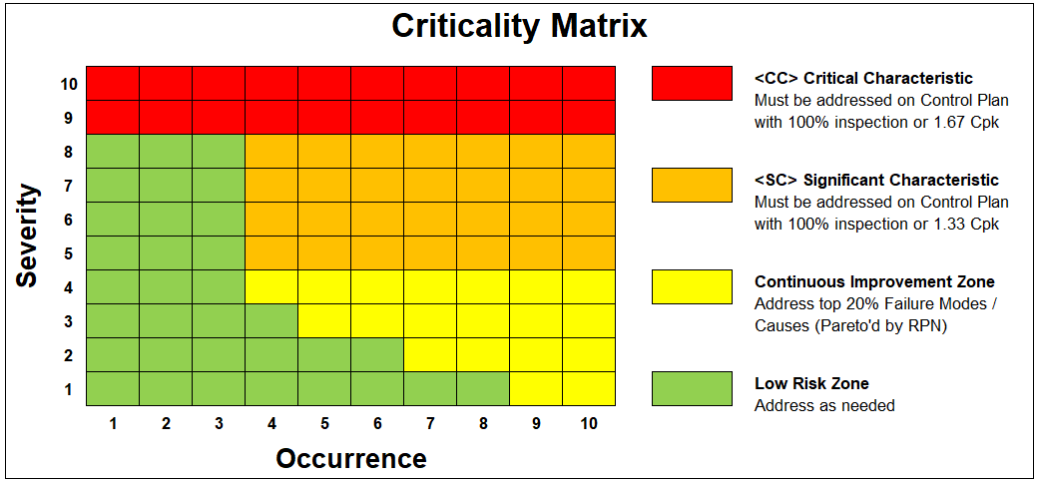
- Two types of Special Characteristics
  - Critical Characteristics (CC) – A Critical Characteristic is defined as a product characteristic or manufacturing process parameter that can potentially affect compliance with government regulations, safe vehicle operation or safe equipment function.
  - Significant Characteristic (SC) – A Significant Characteristic is defined as a product characteristic or manufacturing process parameter which can affect fit, function, performance or impact subsequent process of a product.

- Critical and Significant Characteristics shall be assigned based on the Severity, Occurrence and Detection

Critical Characteristics

- Critical Characteristics shall be identified, recorded, and implemented when a DFMEA PFMEA Severity rank of 9 or 10 regardless of the corresponding Occurrence Rank

- All items identified as a Critical Characteristics shall demonstrate a minimum Cpk of 1.67 or be subject to 100% inspection

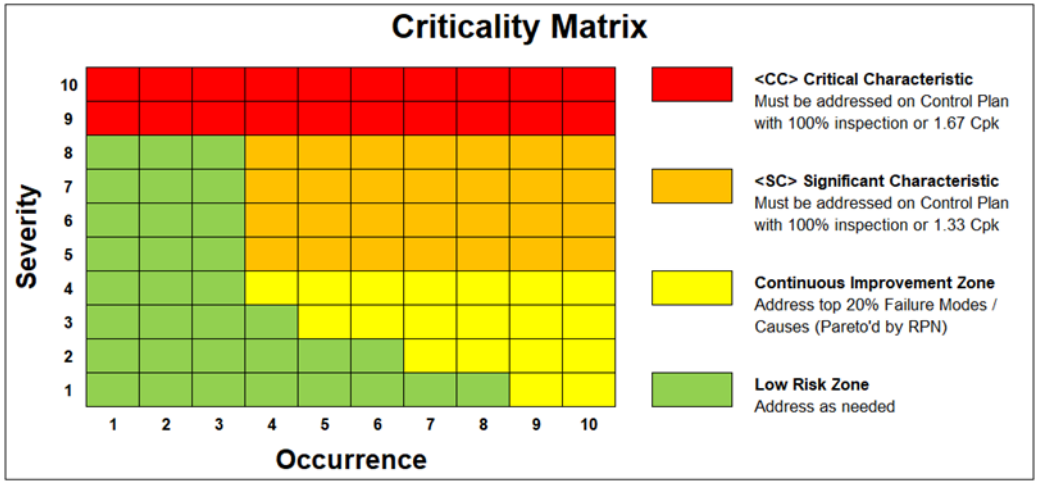


FMEA Characteristic Assignment Process

- Critical and Significant Characteristics shall be assigned based on the Severity and Occurrence data derived from the Design and/or Process Failure Mode and Effects Analyses (DFMEA and PFMEA)

- Criteria for assignment of special characteristics shall be in accordance with the Criticality Matrix

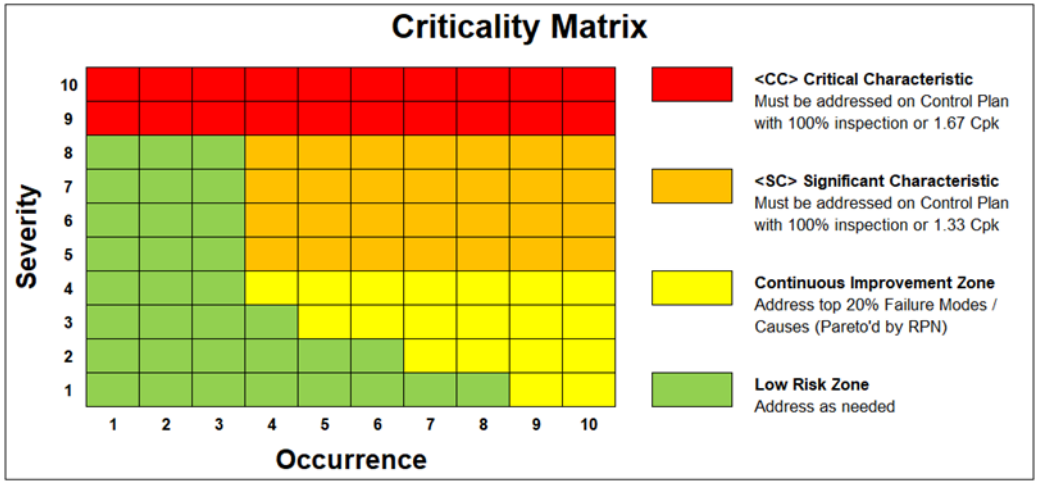
- All Special Characteristics shall be documented on the control plan



Significant Characteristics

- Significant Characteristics shall be identified, recorded, and implemented when a DFMEA PFMEA Severity rank of 5-8 is identified with corresponding Occurrence rank of 4-10

- All items identified as a Significant Characteristics shall demonstrate a minimum Cpk fo 1.33 or be subject to 100% inspection



QC 112 - FMEA

2.2.4	DFMEA	Y	N	N/A	Comments
2.2.4	If the **supplier** is design responsible: Is the DFMEA is included within the PPAP OR is there a record indicating it was reviewed & approved by OSK?				
2.2.4	Does the print indicate that the component is *"Source Control"* or *"Vendor Item Control"*? (no = NA)				
2.2.4	Is the DFMEA prepared using current AIAG guidelines?				
2.2.4	Are Significant Characteristics (Special/ Critical) identified and captured within the DFMEA (no= NA)?				
2.2.4	If **Oshkosh** is design responsible: Are there SC / CC's present on the print (no = NA)?				
2.2.4	If **Oshkosh** is design responsible and the part is manufactured by OSK: Are the sub-component level PPAP's present with submittal (no = NA)?				

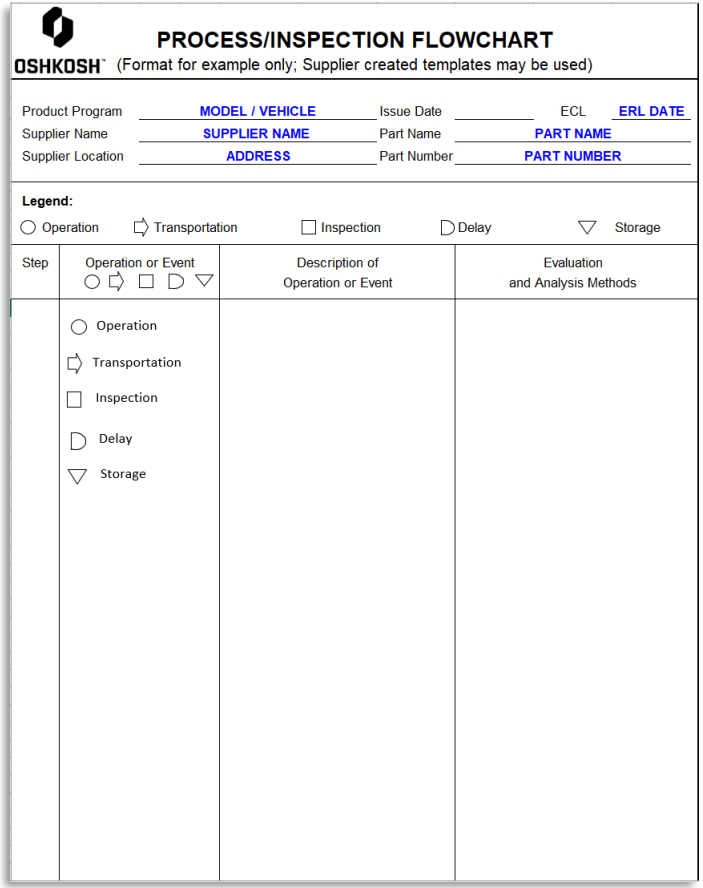
2.2.6	PFMEA	Y	N	N/A	Comments
2.2.6	Has the PFMEA been constructed utilizing the OSK ranking worksheet for Severity and Occurrences?				
2.2.6	Are there SC / CC identified by the Supplier? "NO" = N/A (refer to Criticality Matrix in Global Supplier Quality Manual)				
2.2.6	In cases where SC/CC have been identified, does the supplier have SPC or 100% inspection for them noted in the "Control Method" column?				
2.2.6	Are Detection values correct for Visual Inspection per AIAG (Minimum 7 or 8)?				
2.2.6	Are Recommended Actions cited for the highest RPN?				
2.2.6	Does the PPAP documentation cite specific print note requirements (associated with product or process) in Flow / PFMEA/ Control Plan (For Example Mil-STD-130 Part Marking ID)?				

PPAP Level Three

- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible ✓
- Process Failure Modes Effects Analysis (PFMEA) ✓
- Process Flow Diagram (PFD)
- Measurement System Analysis (MSA)
- Initial process Capability
- Process Control Plan
- Checking Aids
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Process Flow Diagram

- Process Flow Diagrams are required for all Level 3 Submittals



PROCESS/INSPECTION FLOWCHART

OSHKOSH (Format for example only; Supplier created templates may be used)

Product Program	MODEL / VEHICLE	Issue Date	ECL ERL DATE
Supplier Name	SUPPLIER NAME	Part Name	PART NAME
Supplier Location	ADDRESS	Part Number	PART NUMBER

Legend:

Operation | Transportation | Inspection | Delay | Storage

Step	Operation or Event	Description of Operation or Event	Evaluation and Analysis Methods
	Operation Transportation Inspection Delay Storage		

QC – 112, Process Flow Diagram

2.2.5	Process Flow Diagram(s)	Y	N	N/A	Comments
2.2.5	Does the PPAP documentation cite specific print note requirements (associated with product or process) in Flow / PFMEA/ Control Plan (For Example Mil-STD-130 Part Marking ID)?				
2.2.5	Does the Flow Diagram reflect the entire process e.g. Receiving, outside processing?				
2.2.5	Are the process steps for the Process Flow, PFMEA and Control Plan aligned?				

PPAP Level Three

- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible ✓
- Process Failure Modes Effects Analysis (PFMEA) ✓
- Process Flow Diagram (PFD) ✓
- Measurement System Analysis (MSA)
- Initial process Capability
- Process Control Plan
- Checking Aids
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Matt Dankers

Supplier Performance Engineer

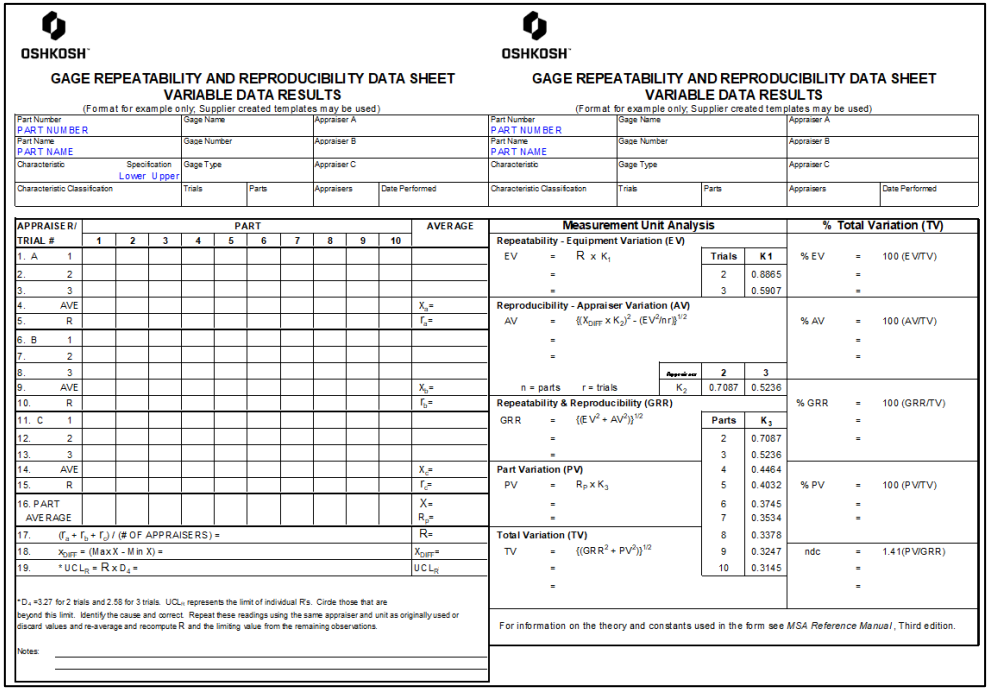
Measurement Systems Analysis (MSA)

- For all Level 3 PPAP submittals, Oshkosh requires separate GR&R's be submitted for each measurement gage or device family gage that is used to validate Critical, Significant, Major or CSI (Critical Safety Item) identified on the Design Record or listed on the Control Plan

- Oshkosh requires suppliers to perform MSA in accordance with the AIAG MSA manual 4th edition

Gage Repeatability and Reproducibility (GR&R)

- Gage R&R is used to ensure that measurements used in the manufacturing process are reasonably consistent regardless of how many times they are performed or by who performs them.



OSHKOSH

GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS
(Format for example only; Supplier created templates may be used)

Part Number: PART NUMBER	Gage Name	Appraiser A	
Part Name: PART NAME	Gage Number	Appraiser B	
Characteristic / Specification: Lower Upper	Gage Type	Appraiser C	
Characteristic Classification	Trials / Parts	Appraisers	Date Performed

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1											
2.	2											
3.	3											
4.	AVE											$\bar{X}_A$=
5.	R											$\bar{r}_A$=
6. B	1											
7.	2											
8.	3											
9.	AVE											$\bar{X}_B$=
10.	R											$\bar{r}_B$=
11. C	1											
12.	2											
13.	3											
14.	AVE											$\bar{X}_C$=
15.	R											$\bar{r}_C$=
16. PART AVERAGE												$\bar{X}$= $\bar{R}_P$=
17.	$(\bar{r}_A + \bar{r}_B + \bar{r}_C)$ / (# OF APPRAISERS) =											$\bar{R}$=
18.	X_{DIFF} = (Max X - Min X) =											X_{DIFF}=
19.	* $UCL_R = \bar{R} \times D_4$ =											UCL_R

*D_4 =3.27 for 2 trials and 2.58 for 3 trials. UCL_R represents the limit of individual Rs. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute R and the limiting value from the remaining observations.

Notes:

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)
EV = $\bar{R} \times K_1$

Trials	K_1
2	0.8865
3	0.5907

Reproducibility - Appraiser Variation (AV)
AV = $\{(X_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$

n = parts r = trials

Appraisers	K_2
2	0.7087
3	0.5236

Repeatability & Reproducibility (GRR)
GRR = $\{(EV^2 + AV^2)\}^{1/2}$

Parts	K_3
2	0.7087
3	0.5236
4	0.4464
5	0.4032
6	0.3745
7	0.3534
8	0.3378
9	0.3247
10	0.3145

Part Variation (PV)
PV = $R_P \times K_3$

Total Variation (TV)
TV = $\{(GRR^2 + PV^2)\}^{1/2}$

% Total Variation (TV)

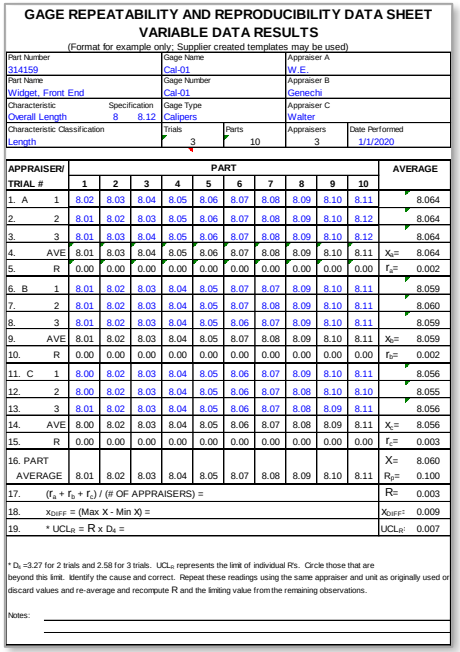
% EV	=	100 (EV/TV)
% AV	=	100 (AV/TV)
% GRR	=	100 (GRR/TV)
% PV	=	100 (PV/TV)
ndc	=	1.41(PV/GRR)

For information on the theory and constants used in the form see *MSA Reference Manual*, Third edition.

Gage Repeatability and Reproducibility (GR&R) Results

- The Gage R&R process uses statistical methods to determine the variation due to the measurement system

- Results are given as a few key values:
- %GRR (TV)
- %GRR (Tol)
- Number of Distinct Categories (NDC)



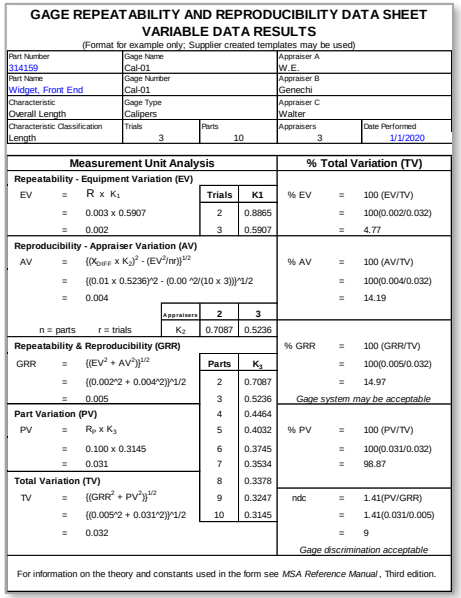
GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS
(Format for example only; Supplier created templates may be used)

Part Number: 314159	Gage Name: Cal-01	Appraiser A: W. E.	
Part Name: Widget, Front End	Gage Number: Cal-01	Appraiser B: Genechi	
Characteristic: Overall Length — Specification: 8 8.12	Gage Type: Calipers	Appraiser C: Walter	
Characteristic Classification: Length	Trials: 3	Parts: 10	Appraisers: 3 — Date Performed: 1/1/2020

APPRAISER/ TRIAL #		PART 1	2	3	4	5	6	7	8	9	10	AVERAGE
1. A	1	8.02	8.03	8.04	8.05	8.06	8.07	8.08	8.09	8.10	8.11	8.064
2.	2	8.01	8.02	8.03	8.05	8.06	8.07	8.08	8.09	8.10	8.12	8.064
3.	3	8.01	8.03	8.04	8.05	8.06	8.07	8.08	8.09	8.10	8.12	8.064
4.	AVE	8.01	8.03	8.04	8.05	8.06	8.07	8.08	8.09	8.10	8.11	$\bar{X}_A$= 8.064
5.	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$\bar{r}_A$= 0.002
6. B	1	8.01	8.02	8.03	8.04	8.05	8.07	8.07	8.09	8.10	8.11	8.059
7.	2	8.01	8.02	8.03	8.04	8.05	8.07	8.08	8.09	8.10	8.11	8.060
8.	3	8.01	8.02	8.03	8.04	8.05	8.06	8.07	8.09	8.10	8.11	8.059
9.	AVE	8.01	8.02	8.03	8.04	8.05	8.07	8.08	8.09	8.10	8.11	$\bar{X}_B$= 8.059
10.	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$\bar{r}_B$= 0.002
11. C	1	8.00	8.02	8.03	8.04	8.05	8.06	8.07	8.09	8.10	8.11	8.056
12.	2	8.00	8.02	8.03	8.04	8.05	8.06	8.07	8.08	8.10	8.10	8.055
13.	3	8.01	8.02	8.03	8.04	8.05	8.06	8.07	8.08	8.09	8.11	8.056
14.	AVE	8.00	8.02	8.03	8.04	8.05	8.06	8.07	8.08	8.09	8.11	$\bar{X}_C$= 8.056
15.	R	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	$\bar{r}_C$= 0.003
16. PART AVERAGE		8.01	8.02	8.03	8.04	8.05	8.07	8.08	8.09	8.10	8.11	$\bar{\bar{X}}$= 8.060
17.		$(\bar{r}_A + \bar{r}_B + \bar{r}_C)$ / (# OF APPRAISERS) =										$\bar{R}$= 0.003
18.		x_{DIFF} = (Max X - Min X) =										x_{DIFF}: 0.009
19.		* $UCL_R = \bar{R} \times D_4$ =										UCL_R: 0.007

* D_4 =3.27 for 2 trials and 2.58 for 3 trials. UCL_R represents the limit of individual R's. Circle those that are beyond this limit. Identify the cause and correct. Repeat these readings using the same appraiser and unit as originally used or discard values and re-average and recompute $\bar{R}$ and the limiting value from the remaining observations.

Notes:



GAGE REPEATABILITY AND REPRODUCIBILITY DATA SHEET
VARIABLE DATA RESULTS
(Format for example only; Supplier created templates may be used)

Part Number: 314159	Gage Name: Cal-01	Appraiser A: W.E.	
Part Name: Widget, Front End	Gage Number: Cal-01	Appraiser B: Genechi	
Characteristic: Overall Length	Gage Type: Calipers	Appraiser C: Walter	
Characteristic Classification: Length	Trials: 3	Parts: 10	Appraisers: 3 — Date Performed: 1/1/2020

Measurement Unit Analysis

Repeatability - Equipment Variation (EV)

EV = $\bar{R} \times K_1$
= 0.003 x 0.5907
= 0.002

Trials	K_1
2	0.8865
3	0.5907

Reproducibility - Appraiser Variation (AV)

AV = $\{(\bar{X}_{DIFF} \times K_2)^2 - (EV^2/nr)\}^{1/2}$
= {(0.01 x 0.5236)^2 - (0.00 ^2/(10 x 3))}^1/2
= 0.004

n = parts r = trials

Appraisers	2	3
K_2	0.7087	0.5236

Repeatability & Reproducibility (GRR)

GRR = $\{(EV^2 + AV^2)\}^{1/2}$
= {(0.002^2 + 0.004^2)}^1/2
= 0.005

Parts	K_3
2	0.7087
3	0.5236
4	0.4464
5	0.4032
6	0.3745
7	0.3534
8	0.3378
9	0.3247
10	0.3145

Gage system may be acceptable

Part Variation (PV)

PV = $R_P \times K_3$
= 0.100 x 0.3145
= 0.031

Total Variation (TV)

TV = $\{(GRR^2 + PV^2)\}^{1/2}$
= {(0.005^2 + 0.031^2)}^1/2
= 0.032

Gage discrimination acceptable

% Total Variation (TV)

% EV = 100 (EV/TV)
= 100(0.002/0.032)
= 4.77

% AV = 100 (AV/TV)
= 100(0.004/0.032)
= 14.19

% GRR = 100 (GRR/TV)
= 100(0.005/0.032)
= 14.97

% PV = 100 (PV/TV)
= 100(0.031/0.032)
= 98.87

ndc = 1.41(PV/GRR)
= 1.41(0.031/0.005)
= 9

For information on the theory and constants used in the form see *MSA Reference Manual*, Third edition.

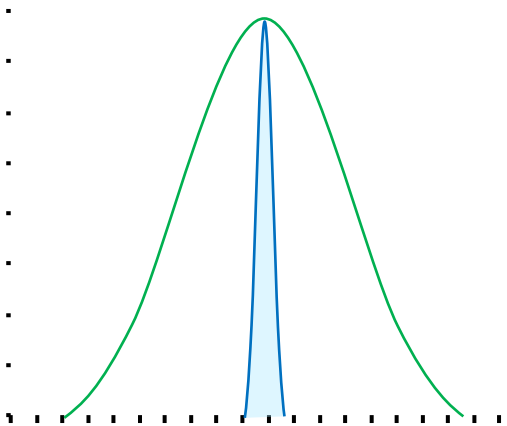
Gage Repeatability and Reproducibility (GR&R)

GRR	Decision
Less than 10 percent	Gage considered to be acceptable for application
10 percent to 30 percent	Gage may be acceptable for some applications. Use of gage must be approved by OSK
Over 30 percent	Gage considered to be unacceptable for application

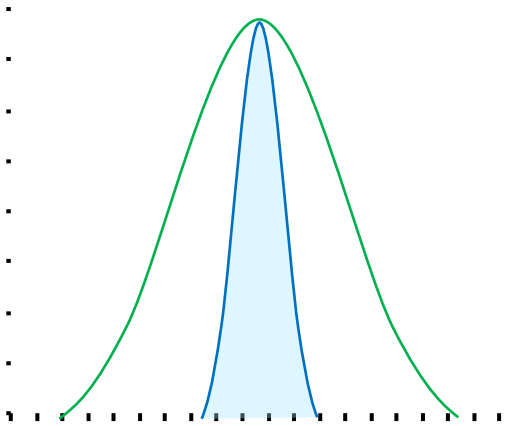
Table VIII-A: GR&R Criteria

MSA Results

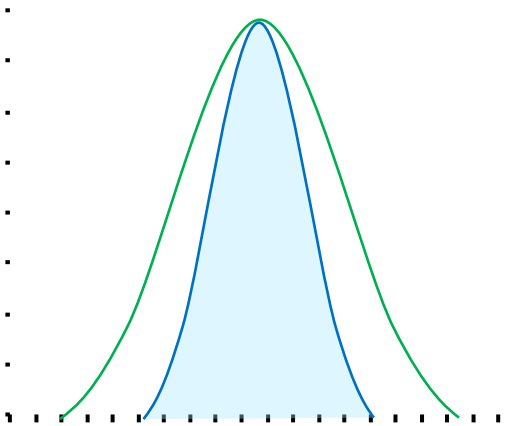
Examples



%GRR (TV) = 10%
Acceptable



%GRR (TV) = 30%
Marginal



%GRR (TV) = 60%
Unacceptable

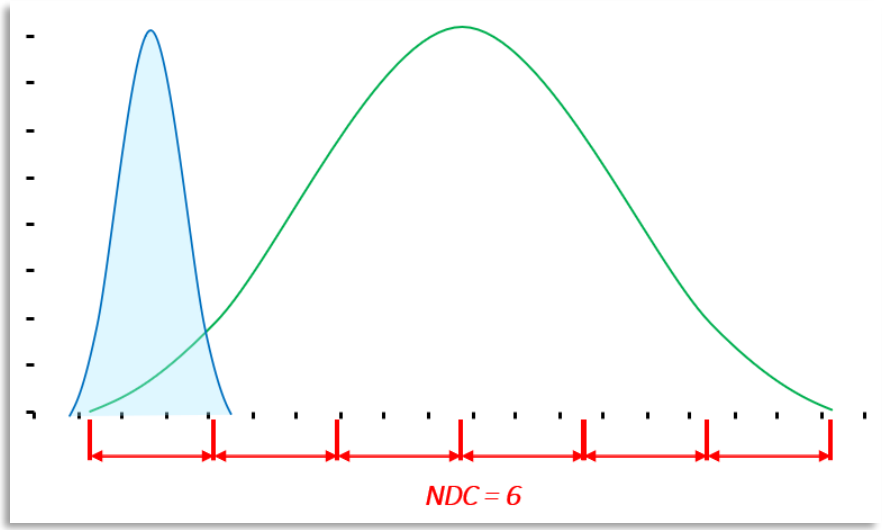
MSA Results

Number of Distinct Categories (NDC)

Very similar to Gage Resolution

Roughly tells you how many different values you will be able to detect

You need a NDC of 5 or greater



QC – 112 MSA

2.2.8	MSA	Y	N	N/A	Comments
2.2.8	Are there SC/CC's identified (on print or supplier process) and MSA is included in PPAP?				
2.2.8	Has the MSA been constructed using the *Defense Segment MSA Instruction Guide* (located: https://osn.oshkoshcorp.com)?				
2.2.8	Was the MSA Report / Checklist used to ensure completeness (included within the *Defense Segment MSA Instruction Guide*)?				
2.2.8	Does the PPAP package contain a photo of the measurement tool?				

PPAP Level Three

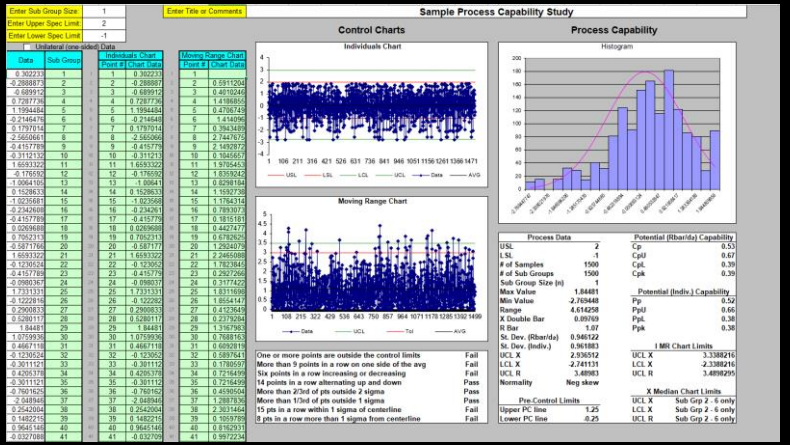
- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible ✓
- Process Failure Modes Effects Analysis (PFMEA) ✓
- Process Flow Diagram (PFD) ✓
- Measurement System Analysis (MSA) ✓
- Initial process Capability
- Process Control Plan
- Checking Aids
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Initial Process Capability

- Initial Process Studies are required for all Level 3 PPAP submissions where Critical, Significant, Major or CSI Characteristics are identified

- Cp and Cpk are used to measure how likely a process is to provide parts within the print specifications

- 100% Inspection is required until Cpk minimums are achieved
  - ❑ Inspections to be reflected within Control Plan
  - ❑ Evidence of 100% inspection should be available upon request



QC – 112 Initial Process Studies

2.2.11	Initial Process Studies	Y	N	N/A	Comments
2.2.11	If there are SC/CC identified (on print or supplier process): Does the supplier meet Cpk of 1.33 for Significant Characteristics and/or Cpk of 1.67 for Critical Characteristics?				
2.2.7	If there are SC/CC identified (on print or supplier process) and the supplier conducts 100% inspection instead of Capability Studies, is inspecton included on the Control Plan?				
2.2.7	Were the initial process studies conducted using the required number of samples and using production processing, gauging and materials?				

PPAP Level Three

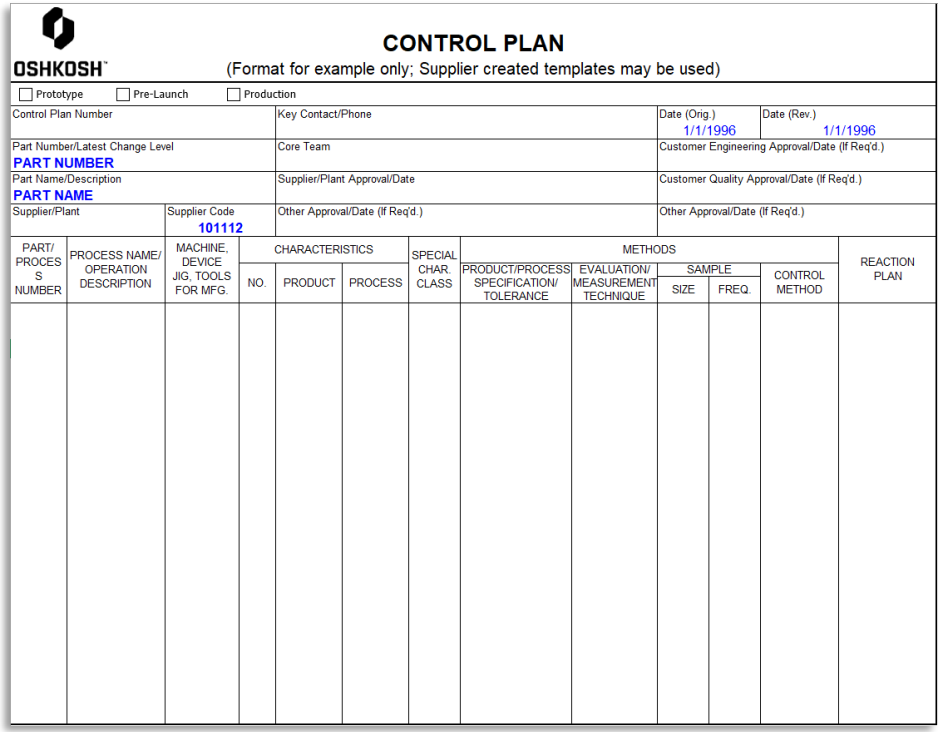
- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible ✓
- Process Failure Modes Effects Analysis (PFMEA) ✓
- Process Flow Diagram (PFD) ✓
- Measurement System Analysis (MSA) ✓
- Initial process Capability ✓
- Process Control Plan
- Checking Aids
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Allison Vandenberg

Supplier Performance Engineer

Process Control Plan

- Process Control Plans are required for all PPAP Level 3 submittals



OSHKOSH

CONTROL PLAN

(Format for example only; Supplier created templates may be used)

☐ Prototype ☐ Pre-Launch ☐ Production

Control Plan Number	Key Contact/Phone	Date (Orig.) 1/1/1996	Date (Rev.) 1/1/1996
Part Number/Latest Change Level **PART NUMBER**	Core Team	Customer Engineering Approval/Date (If Req'd.)	
Part Name/Description **PART NAME**	Supplier/Plant Approval/Date	Customer Quality Approval/Date (If Req'd.)	
Supplier/Plant / Supplier Code **101112**	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	

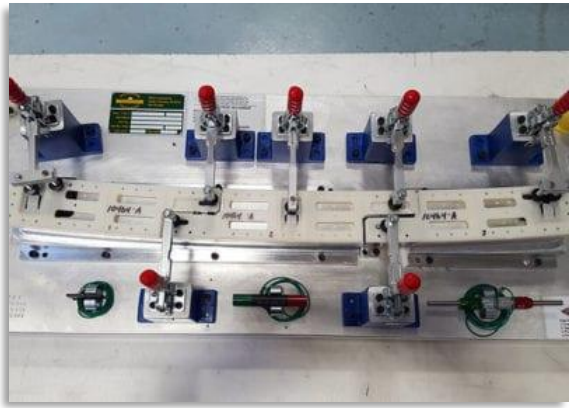
QC – 112 Process Control Plan

Control Plan	Y	N	N/A	Comments
Has the supplier indicated the Control Plan type? e.g. Prototype / Production				
Are Product and Process Characteristics properly identified (in the correct columns) per the AIAG definitions?				
Does the Control Plan cover all activities from receiving inspection to shipment?				
Are all Special Product/Process Characteristics included in the Control Plan?				
Are Control Method tools such as SPC or 100% inspection for the Special Characteristics defined?				
Does the PPAP documentation cite specific print note requirements (associated with product or process) in Flow / PFMEA/ Control Plan (For Example Mil-STD-130 Part Marking ID)?				

PPAP Level Three

- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible ✓
- Process Failure Modes Effects Analysis (PFMEA) ✓
- Process Flow Diagram (PFD) ✓
- Measurement System Analysis (MSA) ✓
- Initial process Capability ✓
- Process Control Plan ✓
- Checking Aids
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Checking Aids



- Checking aids include all dedicated instruments, templates, attribute and variable gages, fixtures, or jigs that are used to determine acceptance/rejection of product characteristics
- If a device is specially made for the part being verified, and is not available as a catalog item, it is a “checking aid.”
- The supplier shall certify that all aspects of the checking aid agree with the part dimensional requirements
- The supplier shall provide for preventative maintenance of any checking aids for the life of the part
- If a checking aid is used to verify a Special Characteristic, the Supplier shall conduct the appropriate MSA activities including Gage R&R

QC-112, Checking Aids

2.2.16	Checking Aids	Y	N	N/A	Comments
2.2.16	Are all product specific checking aids, fixtures, test stands and Mylar listed on the Control Plan?				

PPAP Level Three

- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible ✓
- Process Failure Modes Effects Analysis (PFMEA) ✓
- Process Flow Diagram (PFD) ✓
- Measurement System Analysis (MSA) ✓
- Initial process Capability ✓
- Process Control Plan ✓
- Checking Aids ✓
- Tooling Photo Documentation
- Commercial Off the Shelf (COTS) +

Tooling Photo Documentation

OSHKOSH

TOOLING & FIXTURES - PROPERTY OF OSHKOSH CORP.

ORGANIZATION	SUPPLIER NAME	PART NUMBER	PART NUMBER
SUPPLIER NUMBER	101112	PART NAME	PART NAME
TOOL / FIXTURE NUMBER		DESIGN RECORD CHANGE LEVEL:	ERL DAT
DATE			

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

PHOTO OF OSHKOSH OWNED TOOLING AND FIXTURES

PRINT NAME	SIGNATURE	TITLE	DATE

PPAP Level Three

- All elements of PPAP Level 2 ✓
- Supplier Change Request (OSK-RCM) – if applicable ✓
- Design Failure Modes Effects Analysis (DFMEA) – if supplier is design responsible ✓
- Process Failure Modes Effects Analysis (PFMEA) ✓
- Process Flow Diagram (PFD) ✓
- Measurement System Analysis (MSA) ✓
- Initial process Capability ✓
- Process Control Plan ✓
- Checking Aids ✓
- Tooling Photo Documentation ✓
- Commercial Off the Shelf (COTS) +

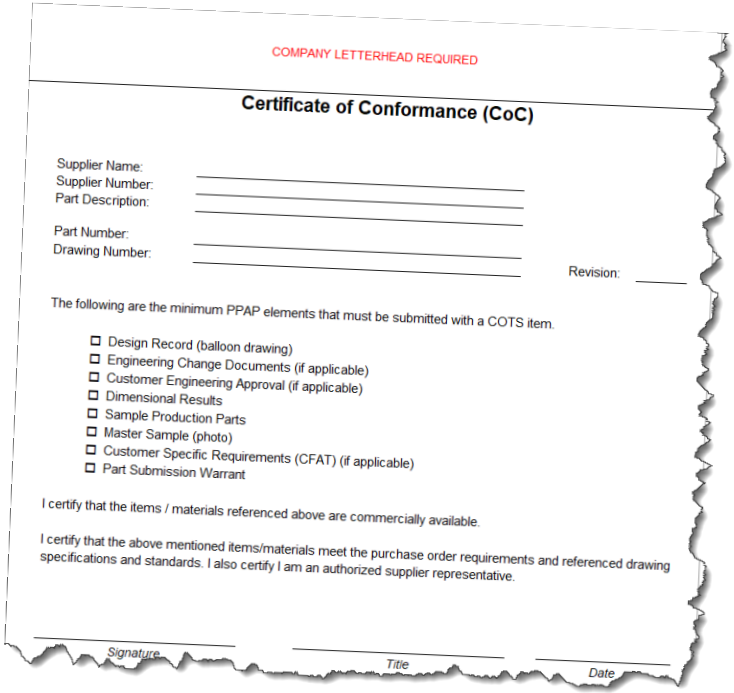
Commercial Off the Shelf (COTS) +

- COTS components are items that are commercially available, unaltered and may be procured through distributors
- For COTS+ parts, these are commercially available with some alterations required.
  - The supplier is expected to create all 18 elements of PPAP & submit to requested Level of PPAP
- In some cases, suppliers may be unable to obtain all data for all 18 elements. In these cases, the supplier is expected to demonstrate/affirm conformance with supporting documents or Certificates of Conformance by supplying the following minimum PPAP elements:

- ❑ Design Record & Dimensional Results
- ❑ Engineering Change Documents – RCM (if applicable)
- ❑ Customer Engineering Approval (If applicable)
- ❑ Print Note Verification
- ❑ Sample Production Parts
- ❑ Master Sample Photos
- ❑ Part Submission Warrant (PSW)
- ❑ Catalog Page or equivalent from Original Equipment Manufacturer (OEM) to demonstrate commerciality (if available)

Commercial Off the Shelf (COTS) +

- When the supplier cannot attain all PPAP elements, a Certificate of Conformance (C of C) will be submitted in addition to above elements
- The C of C shall:
  - ❑ Confirm the article is commercially available
  - ❑ Be on the supplier's company letterhead
  - ❑ Include the Oshkosh part number
  - ❑ Include the part revision level
  - ❑ Be signed by a representative within the contractor's organization that has decision making authority
  - ❑ Positively affirm that the part meets the requirements of the print



COMPANY LETTERHEAD REQUIRED

Certificate of Conformance (CoC)

Supplier Name:
Supplier Number:
Part Description:

Part Number:
Drawing Number:

Revision:

The following are the minimum PPAP elements that must be submitted with a COTS item.

- ☐ Design Record (balloon drawing)
- ☐ Engineering Change Documents (if applicable)
- ☐ Customer Engineering Approval (if applicable)
- ☐ Dimensional Results
- ☐ Sample Production Parts
- ☐ Master Sample (photo)
- ☐ Customer Specific Requirements (CFAT) (if applicable)
- ☐ Part Submission Warrant

I certify that the items / materials referenced above are commercially available.

I certify that the above mentioned items/materials meet the purchase order requirements and referenced drawing specifications and standards. I also certify I am an authorized supplier representative.

Signature *Title* *Date*

Commercial Off the Shelf (COTS) +

18.2.1. "COTS PLUS"

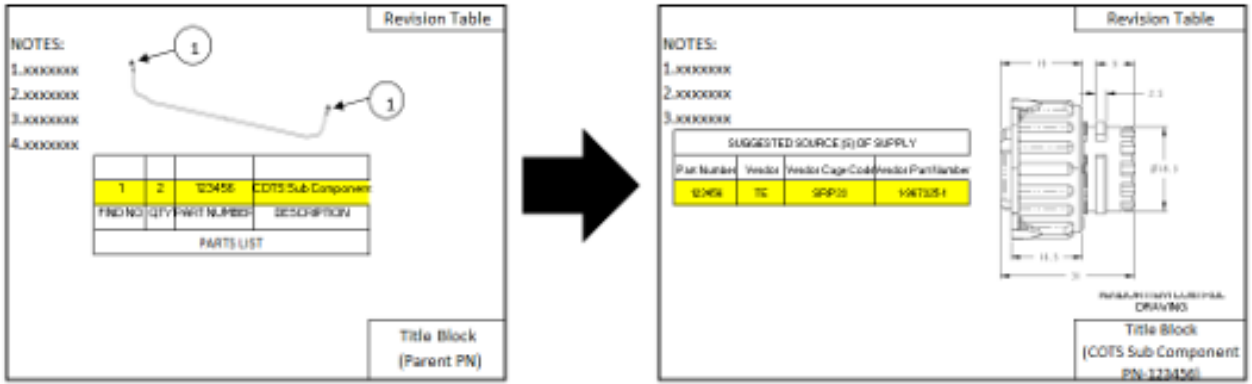
Parts that are Commercial Off the Shelf (as defined above) but have additional print or performance requirements that Oshkosh has deemed important (because of the part's application). If the OEM catalog page or product data sheet that does not include all Oshkosh NGDV print specifications, the supplier is responsible to provide objective evidence that the part meets the requirement within the Oshkosh NGDV print and a L3 PPAP is required.

NOTE: Caution is needed when a COTS component is "modified" with additional specifications. Modifications to COTS parts re-classify it as a COTS Plus part. If a modification alters the original specifications, re-testing the part in its entirety is required to demonstrate that no unintended performance shortcoming will occur because of the modification.

Commercial Off the Shelf (COTS) +

18.2.2. COTS SUBCOMPONENTS

For COTS subcomponents within the Purchased Part Level (Parent), only the certificate of conformance and design record are required if COTS Vendor Part Number specified by subcomponent drawing is used. If no Vendor Part Number is specified, a one-piece dimensional result, print note verification, design record, and Supplier Change Request (if applicable) are required.



PPAP Elements Checklist QC – 112 for COTS +

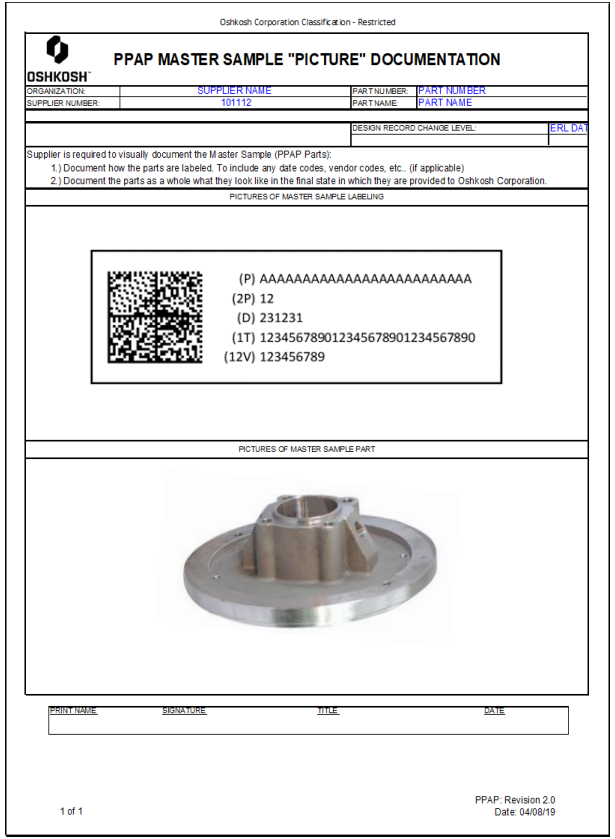
AIAG-PPAP Section	PPAP Element	PPAP Submission Comments			
	***Commercial Off the Shelf (COTS) - (If Applicable on Purchased Part Level)**	**Y**	**N**	**N/A**	**Comments**
Commercial off the Shelf (COTS) Components are items sold in the commercial marketplace. These parts are commercially available (and at times procured through distributors). They cannot be modified, combined, evolved, or "of-a-type" commercial items. They must truly be "as-is". For further definition, refer to FAR 2.101					
1	Is this component **Commercial Off the Shelf** (commercially available to the general public, unaltered, and under the manufacturers' EXACT part number) as defined in the *Defense Segment Addendum, Section 14?*				
1A	If the answer to question 1 is yes, are the minimum PPAP elements for a COTS part (including a catalog page or equivalent, verbatim to address all OSK specifications) provided in accordance to the COTS section in the *Defense Segment Addendum, Section 14*, and in accordance to the *OSK Certificate of Conformance form*?				
2	Is this component **COTS plus** (commercially available **but** with additional performance / print requirements) as defined in the *Defense Segment Addendum, Section 14*				
2A	If the answer to question 2 is yes, have you provided objective evidence that the part meets all of the OSK print requirement? (see *Defense Segment Addendum, Section 14)*				

Randy Jahnke

Project Manager

Label Scanning & Validation

- Scanning requirements of print 5082115
- Data structure elements
- Validation App
- Understand and be able to validate bar code “structure”
  - Capture scannable label on Master Sample tab of PPAP workbook



Oshkosh Corporation Classification - Restricted

OSHKOSH

PPAP MASTER SAMPLE "PICTURE" DOCUMENTATION

ORGANIZATION:	SUPPLIER NAME	PART NUMBER:	PART NUMBER
SUPPLIER NUMBER:	101112	PART NAME:	PART NAME

	DESIGN RECORD CHANGE LEVEL:	ERL DAT

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 Oshkosh Corporation.

PICTURES OF MASTER SAMPLE LABELING

(P) AAAAAAAAAAAAAAAAAAAAAAAA
(2P) 12
(D) 231231
(1T) 1234567890123456789012345678 90
(12V) 123456789

PICTURES OF MASTER SAMPLE PART

PRINT NAME	SIGNATURE	TITLE	DATE

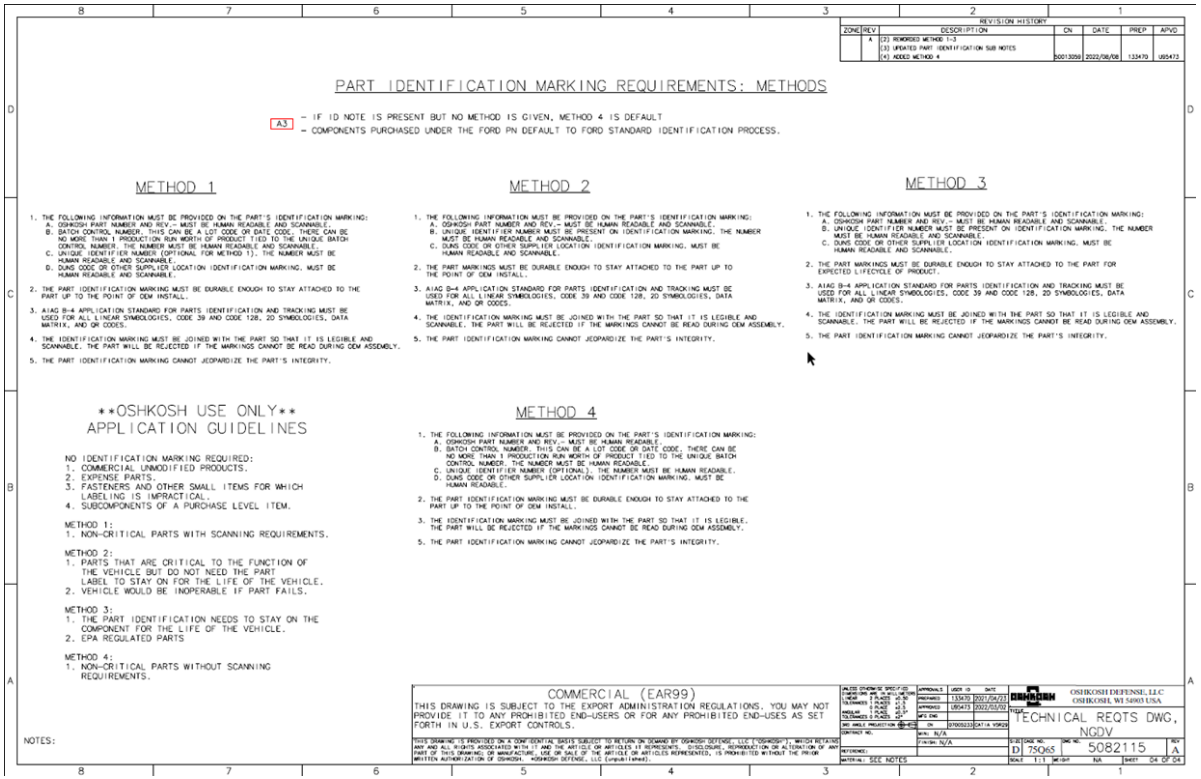
1 of 1

PPAP: Revision 2.0
Date: 04/08/19

Scanning Requirements

- Print 5082115 Rev A
  - Applies to purchased components, parts & accessories
- Finish requirements: General, Application, Gloss, Touch up
- Finish requirements: Coating Methods
  - E-Coat Prime
  - Non E-Coat Prime
  - Additional Coatings
- Part Identification Marking Requirements: Methods 1-4 & Guidelines

Scanning Requirements – Print 5082115 Rev A



REVISION HISTORY

ZONE	REV	DESCRIPTION	CN	DATE	PREP	APVD
	A	(2) REWORDED METHOD 1-3 (3) UPDATED PART IDENTIFICATION SUB NOTES (4) ADDED METHOD 4	00013058	2022/08/08	133470	U05473

PART IDENTIFICATION MARKING REQUIREMENTS: METHODS

A3 – IF ID NOTE IS PRESENT BUT NO METHOD IS GIVEN, METHOD 4 IS DEFAULT
– COMPONENTS PURCHASED UNDER THE FORD PN DEFAULT TO FORD STANDARD IDENTIFICATION PROCESS.

METHOD 1

1. THE FOLLOWING INFORMATION MUST BE PROVIDED ON THE PART'S IDENTIFICATION MARKING:
   A. OSHKOSH PART NUMBER AND REV.– MUST BE HUMAN READABLE AND SCANNABLE.
   B. BATCH CONTROL NUMBER. THIS CAN BE A LOT CODE OR DATE CODE. THERE CAN BE NO MORE THAN 1 PRODUCTION RUN WORTH OF PRODUCT TIED TO THE UNIQUE BATCH CONTROL NUMBER. THE NUMBER MUST BE HUMAN READABLE AND SCANNABLE.
   C. UNIQUE IDENTIFIER NUMBER (OPTIONAL FOR METHOD 1). THE NUMBER MUST BE HUMAN READABLE AND SCANNABLE.
   D. DUNS CODE OR OTHER SUPPLIER LOCATION IDENTIFICATION MARKING. MUST BE HUMAN READABLE AND SCANNABLE.
2. THE PART IDENTIFICATION MARKING MUST BE DURABLE ENOUGH TO STAY ATTACHED TO THE PART UP TO THE POINT OF OEM INSTALL.
3. AIAG B-4 APPLICATION STANDARD FOR PARTS IDENTIFICATION AND TRACKING MUST BE USED FOR ALL LINEAR SYMBOLOGIES, CODE 39 AND CODE 128, 2D SYMBOLOGIES, DATA MATRIX, AND QR CODES.
4. THE IDENTIFICATION MARKING MUST BE JOINED WITH THE PART SO THAT IT IS LEGIBLE AND SCANNABLE. THE PART WILL BE REJECTED IF THE MARKINGS CANNOT BE READ DURING OEM ASSEMBLY.
5. THE PART IDENTIFICATION MARKING CANNOT JEOPARDIZE THE PART'S INTEGRITY.

METHOD 2

1. THE FOLLOWING INFORMATION MUST BE PROVIDED ON THE PART'S IDENTIFICATION MARKING:
   A. OSHKOSH PART NUMBER AND REV.– MUST BE HUMAN READABLE AND SCANNABLE.
   B. UNIQUE IDENTIFIER NUMBER MUST BE PRESENT ON IDENTIFICATION MARKING. THE NUMBER MUST BE HUMAN READABLE AND SCANNABLE.
   C. DUNS CODE OR OTHER SUPPLIER LOCATION IDENTIFICATION MARKING. MUST BE HUMAN READABLE AND SCANNABLE.
2. THE PART MARKINGS MUST BE DURABLE ENOUGH TO STAY ATTACHED TO THE PART UP TO THE POINT OF OEM INSTALL.
3. AIAG B-4 APPLICATION STANDARD FOR PARTS IDENTIFICATION AND TRACKING MUST BE USED FOR ALL LINEAR SYMBOLOGIES, CODE 39 AND CODE 128, 2D SYMBOLOGIES, DATA MATRIX, AND QR CODES.
4. THE IDENTIFICATION MARKING MUST BE JOINED WITH THE PART SO THAT IT IS LEGIBLE AND SCANNABLE. THE PART WILL BE REJECTED IF THE MARKINGS CANNOT BE READ DURING OEM ASSEMBLY.
5. THE PART IDENTIFICATION MARKING CANNOT JEOPARDIZE THE PART'S INTEGRITY.

METHOD 3

1. THE FOLLOWING INFORMATION MUST BE PROVIDED ON THE PART'S IDENTIFICATION MARKING:
   A. OSHKOSH PART NUMBER AND REV.– MUST BE HUMAN READABLE AND SCANNABLE.
   B. UNIQUE IDENTIFIER NUMBER MUST BE PRESENT ON IDENTIFICATION MARKING. THE NUMBER MUST BE HUMAN READABLE AND SCANNABLE.
   C. DUNS CODE OR OTHER SUPPLIER LOCATION IDENTIFICATION MARKING. MUST BE HUMAN READABLE AND SCANNABLE.
2. THE PART MARKINGS MUST BE DURABLE ENOUGH TO STAY ATTACHED TO THE PART FOR EXPECTED LIFECYCLE OF PRODUCT.
3. AIAG B-4 APPLICATION STANDARD FOR PARTS IDENTIFICATION AND TRACKING MUST BE USED FOR ALL LINEAR SYMBOLOGIES, CODE 39 AND CODE 128, 2D SYMBOLOGIES, DATA MATRIX, AND QR CODES.
4. THE IDENTIFICATION MARKING MUST BE JOINED WITH THE PART SO THAT IT IS LEGIBLE AND SCANNABLE. THE PART WILL BE REJECTED IF THE MARKINGS CANNOT BE READ DURING OEM ASSEMBLY.
5. THE PART IDENTIFICATION MARKING CANNOT JEOPARDIZE THE PART'S INTEGRITY.

OSHKOSH USE ONLY
APPLICATION GUIDELINES

NO IDENTIFICATION MARKING REQUIRED:
1. COMMERCIAL UNMODIFIED PRODUCTS.
2. EXPENSE PARTS.
3. FASTENERS AND OTHER SMALL ITEMS FOR WHICH LABELING IS IMPRACTICAL.
4. SUBCOMPONENTS OF A PURCHASE LEVEL ITEM.

METHOD 1:
1. NON-CRITICAL PARTS WITH SCANNING REQUIREMENTS.

METHOD 2:
1. PARTS THAT ARE CRITICAL TO THE FUNCTION OF THE VEHICLE BUT DO NOT NEED THE PART LABEL TO STAY ON FOR THE LIFE OF THE VEHICLE.
2. VEHICLE WOULD BE INOPERABLE IF PART FAILS.

METHOD 3:
1. THE PART IDENTIFICATION NEEDS TO STAY ON THE COMPONENT FOR THE LIFE OF THE VEHICLE.
2. EPA REGULATED PARTS

METHOD 4:
1. NON-CRITICAL PARTS WITHOUT SCANNING REQUIREMENTS.

METHOD 4

1. THE FOLLOWING INFORMATION MUST BE PROVIDED ON THE PART'S IDENTIFICATION MARKING:
   A. OSHKOSH PART NUMBER AND REV.– MUST BE HUMAN READABLE.
   B. BATCH CONTROL NUMBER. THIS CAN BE A LOT CODE OR DATE CODE. THERE CAN BE NO MORE THAN 1 PRODUCTION RUN WORTH OF PRODUCT TIED TO THE UNIQUE BATCH CONTROL NUMBER. THE NUMBER MUST BE HUMAN READABLE.
   C. UNIQUE IDENTIFIER NUMBER (OPTIONAL). THE NUMBER MUST BE HUMAN READABLE.
   D. DUNS CODE OR OTHER SUPPLIER LOCATION IDENTIFICATION MARKING. MUST BE HUMAN READABLE.
2. THE PART IDENTIFICATION MARKING MUST BE DURABLE ENOUGH TO STAY ATTACHED TO THE PART UP TO THE POINT OF OEM INSTALL.
3. THE IDENTIFICATION MARKING MUST BE JOINED WITH THE PART SO THAT IT IS LEGIBLE. THE PART WILL BE REJECTED IF THE MARKINGS CANNOT BE READ DURING OEM ASSEMBLY.
5. THE PART IDENTIFICATION MARKING CANNOT JEOPARDIZE THE PART'S INTEGRITY.

NOTES:

COMMERCIAL (EAR99)
THIS DRAWING IS SUBJECT TO THE EXPORT ADMINISTRATION REGULATIONS. YOU MAY NOT PROVIDE IT TO ANY PROHIBITED END-USERS OR FOR ANY PROHIBITED END-USES AS SET FORTH IN U.S. EXPORT CONTROLS.

OSHKOSH DEFENSE, LLC
OSHKOSH, WI 54903 USA

TECHNICAL REQTS DWG, NGDV

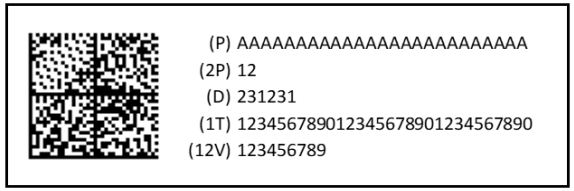
D 75065 5082115 A

Scanning Requirements – Methods 1 through 4

Method	Data	Elements	Capture	Additional Information
1	Part number and rev		Human readable and scanable	durable enough to install, AIAG B-4 standard, linear symbologies, code 39 and code 128, 2D symbologies, data matrix, and QR codes
1	Batch control number	lot code	Human readable and scanable	there can only be no more than 1 production run worth of product tied to the unique batch control number
1	Batch control number	date	Human readable and scanable	
1	Unique identifier		Human readable and scanable	optional
1	Duns code		Human readable and scanable	or other supplier location identification markings
2	Part number and rev		Human readable and scanable	durable enough to install, AIAG B-4 standard, linear symbologies, code 39 and code 128, 2D symbologies, data matrix, and QR codes, will be rejected is not legible in assembly
2	Unique identifier		Human readable and scanable	required
2	Duns code		Human readable and scanable	suplier location identification marking
3	Part number and rev		Human readable and scanable	durable enough for life cycle of product, AIAG B-4 standard, linear symbologies, code 39 and code 128, 2D symbologies, data matrix, and QR codes
3	Unique identifier		Human readable and scanable	required
3	Duns code		Human readable and scanable	suplier location identification marking
4	Part number and rev		Human readable	durable enough to install, AIAG B-4 standard, linear symbologies, code 39 and code 128, 2D symbologies, data matrix, and QR codes
4	Batch control number	lot code	Human readable	there can only be no more than 1 production run worth of product tied to the unique batch control number
4	Batch control number	date	Human readable	
4	Unique identifier		Human readable	optional
4	Duns code		Human readable	or other supplier location identification markings

Scanning Requirements – Data Structure

- P = Oshkosh Part Number
- 2P = Revision Number
- D = Date in YYMMDD format
- 1T = Traceability number – Lot # / Serial #
- 12V = DUNS Number



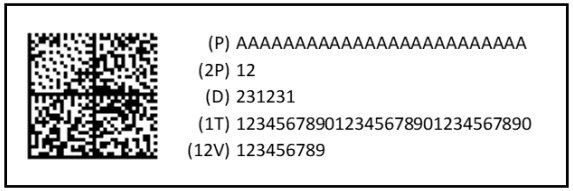
- Note: These fields can be variable in length. What is important is that the data identifiers (DI) are present.

Scanning Requirements – Data Structure

The AIAG B-4 Standard specifies that the data format to be used within the Data Matrix shall be format 06 as defined under ISO 15434. This indicates that data identifiers (DI) from ASC MH 10 are to be used for every data field. These DIs are published in the American National Standard ANSI MH10.8.2. Here is a list of typical DIs used in the automotive industry.

B	Container Type (internally assigned or mutually defined)
1B	Returnable container identification code assigned by the container owner or the appropriate regulatory agency (e.g., a metal tub, basket, reel, unit load device (ULD), trailer, tank, or intermodal container) (excludes gas cylinders) (See "2B.")
2B	Gas Cylinder Container Identification Code assigned by the manufacturer in conformance with U.S. Department of Transportation (DoT) standards
D	Date, in the format YYMMDD
1D	Date in the format DDMMYY
2D	Date in the format MMDDYY
I	U.S. Vehicle Identification Number
K	Order number assigned by Customer to identify a Purchasing Transaction (e.g., purchase order number)
1L	Location (generic)
4L	Country of Origin — two-character code from the ISO 3166 standard country code list
20L — 24L	Additional location numbers. The exact meaning of each DI is assigned internally. This set of DIs could be used for a hierarchy of locations; for example: BUILDING (20L); BAY (21L); SHELF (23L); BIN (24L).
P	Item Identification Code assigned by Customer
1P	Item Identification Code assigned by Supplier
2P	Code assigned to specify the revision level of the part (e.g., Engineering Change Level, revision or edition)
25P	Identification of a party to a transaction as identified in 18V, followed by the supplier assigned part number
Q	Quantity, Number of Pieces, or Amount (numeric only) (unit of measure and significance mutually defined. Quantity typically assumed pieces unless otherwise specified.
1Q	Theoretical Length / Weight (numeric only) (historically used in the shipment of primary metals)
2Q	Actual Weight (numeric only)
7Q	Quantity and unit of measure in the format: Quantity followed by the two-character Unit of Measure code as defined in Data Element number 355 of the ANSI X12.3 Data Element Dictionary standard
S	Serial Number assigned by Supplier to an entity for its lifetime
3S	Unique Package Identification assigned by Supplier (lowest level of packaging which has a package ID code; SHALL contain like items)
4S	Package Identification assigned by Supplier to master packaging containing like items on a single customer order. (Container Serial Number assigned by Supplier to a Master pack) (Master label serial number)
5S	Package Identification assigned by Supplier to master packaging containing unlike items on a single customer order. (Container Serial Number assigned by Supplier to a Mixed pack) (Mixed Load label serial number)
9S	Generic Package Identification, significance mutually agreed to by Customer and Supplier
10S	Machine, work cell or tool ID code
11S	Fixed Asset ID Code
15S	Serial Number assigned by Supplier Entity that can only be used in conjunction with "13V"
19S	Combined Dun & Bradstreet company identification of the supplier followed by a unique package identification assigned by the supplier, in the format nn...nn+nn...n where a plus symbol (+) is used as a delimiter between the DUNS Number and unique package identification.
25S	Identification of a party to a transaction as identified in 18V, followed by the supplier assigned serial number.
T	Traceability number assigned to a unique batch or group of items (lot, heat, batch) by the Customer
1T	Traceability number assigned to a unique batch or group of items (lot, heat, batch) by the Supplier / Manufacturer
V	Supplier Code assigned by the Customer
12V	DUNS number identifying Manufacturer
14V	DUNS ® number of the Customer

Scanning Requirements – Data Structure



[)>[RS]06[GS]PAAAAAAAAAAAAAAAAAAAAAAAA[GS]2P12[GS]D231231[GS]1T12345678901234567890123456789O[GS]12V123456789[RS][EOT]

The barcode data is broken down as follows:

1. **[)>** = Start of the bar code data.
2. **[RS]** = Record Separator (ASCII 30). The Record Separator is followed by a code that indicates the ISO/IEC 15434 Format used.
3. **06** = Defines that this record set *[RS]* uses the ISO/IEC 15434 Format 06 which uses the Data Identifiers found in ASC MH 10 (AIAG MH10.8.2)
   a. The above three pieces of information together ([)>[RS]06) are the header.
4. **[GS]** = Group Separator (ASCII 29) which separates each piece of Information Content.
   a. Each [GS] is followed by a Data Identifier that defines the data to follow. For example, [GS]P indicates that the numbers following up to the next separator are the Part Number.
5. **[RS]** = Record Separator (ASCII 30). When at the end, this defines the end of a Record.
6. **[EOT]** = End of Transmission (ASCII 4).

Scanning Requirements – Data Structure

(P) AAAAAAAAAAAAAAAAAAAAAAAA
(2P) 12
(D) 231231
(1T) 12345678901234567890123456789O
(12V) 123456789

Note: The characters in brackets ([RS], [GS], [EOT]) are non-printable ASCII Functions so if you were to scan this into Notepad or Word you would see:

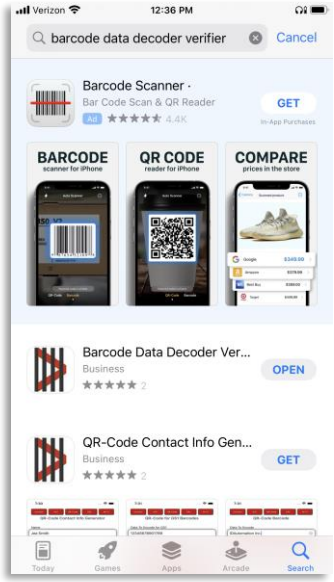
Without non-printable ASCII Functions:
[)>06PAAAAAAAAAAAAAAAAAAAAAAAA2P12D2312311T12345678901234567890123456789012V123456789

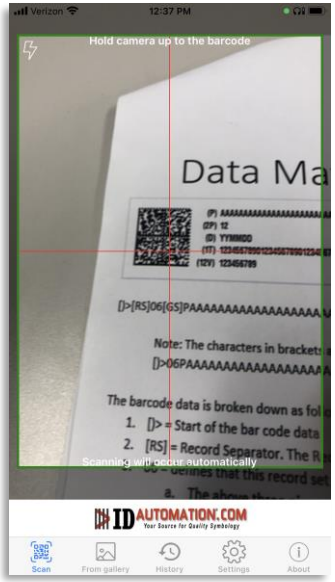
With non-printable ASCII Functions:
[)>[RS]06[GS]PAAAAAAAAAAAAAAAAAAAAAAAA[GS]2P12[GS]D231231[GS]1T12345678901234567890123456789O[GS]12V123456789[RS][EOT]

These characters are essential for the script to determine the data and storage location within the system and MUST be validated with the data elements of the barcode data.

Scanning App – Data Decoder Verification

- Download the “Barcode Scanner” application onto smart device
  - It is a free app
- Will display the non-printable characters
- Open the app from the home screen of your mobile device
  - Point and shoot
- The application will automatically scan the barcode with the red cross hairs, or the user can press the scan button.





Scanning App – Data Decoder Verification

- Once the application has scanned the bar code, it will automatically display the data of the scan.
- This is where validation of the data will occur.
- The barcode data is broken down as follows:

1. **[)>** = Start of the bar code data.
2. **[RS]** = Record Separator (ASCII 30). The Record Separator is followed by a code that indicates the ISO/IEC 15434 Format used.
3. **06** = Defines that this record set [RS] uses the ISO/IEC 15434 Format 06 which uses the Data Identifiers found in ASC MH 10 (AIAG MH10.8.2)
   a) The above three pieces of information together ([)>[RS]06) are the header.
4. **[GS]** = Group Separator (ASCII 29) which separates each piece of Information Content.
   a) Each [GS] is followed by a Data Identifier that defines the data to follow. For example, [GS]P indicates that the numbers following up to the next separator are the Part Number.
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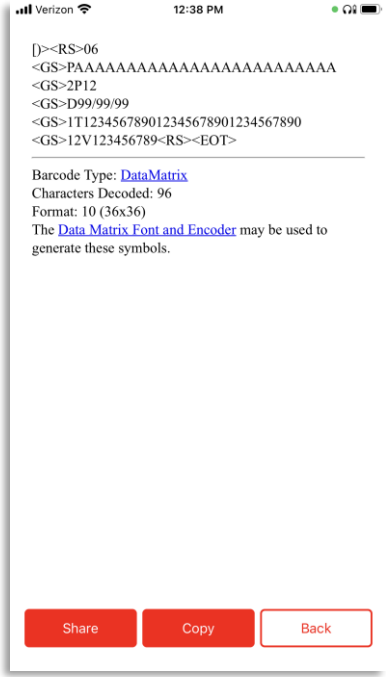

Darrell Williams

Sr. Supply Chain Manager

Supplier Applications

General Overview

- MOVEit – Secure file transfer
- Reliance – Supplier quality
- Oshkosh Supplier Network (OSN)
- Polices & Procedures (SSG)
- Jaggaer – PO/RFQ/KPI's
- Q&A

Eric Barker

Supply Chain Director

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