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OSHKOSH DEFENSE SUPPLIER SYMPOSIUM 2023

04/04/2023

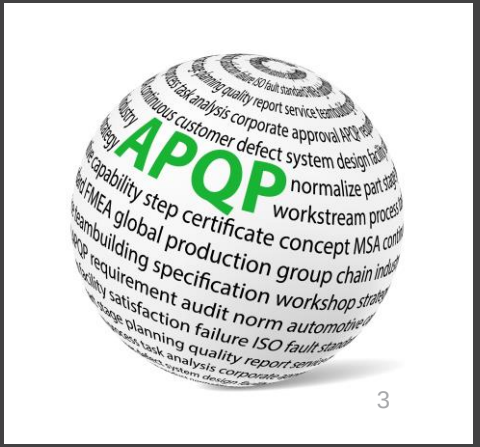
ADVANCED PRODUCT QUALITY PLANNING (APQP)

Josh Hardel

Principal Engineer Advanced Supplier Quality

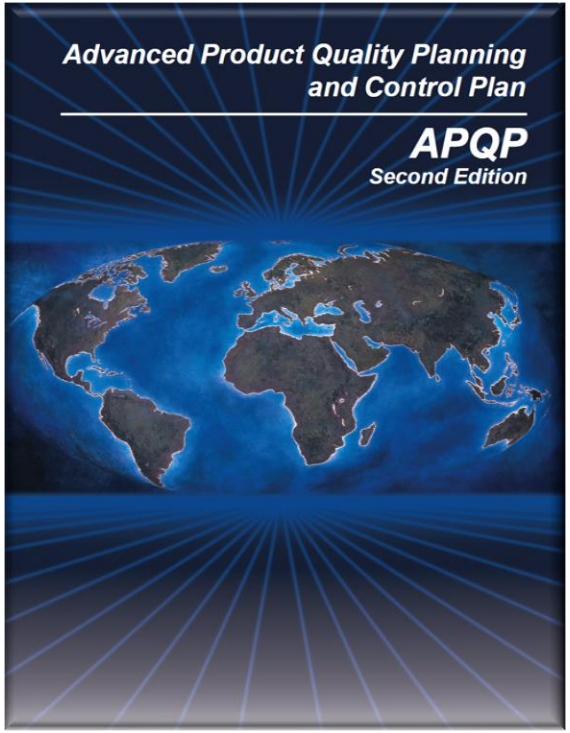
LEARNING OUTLINE

- What is APQP?
- APQP Deliverables during Product Development
- APQP Supplier Expectations from Oshkosh
- Summary

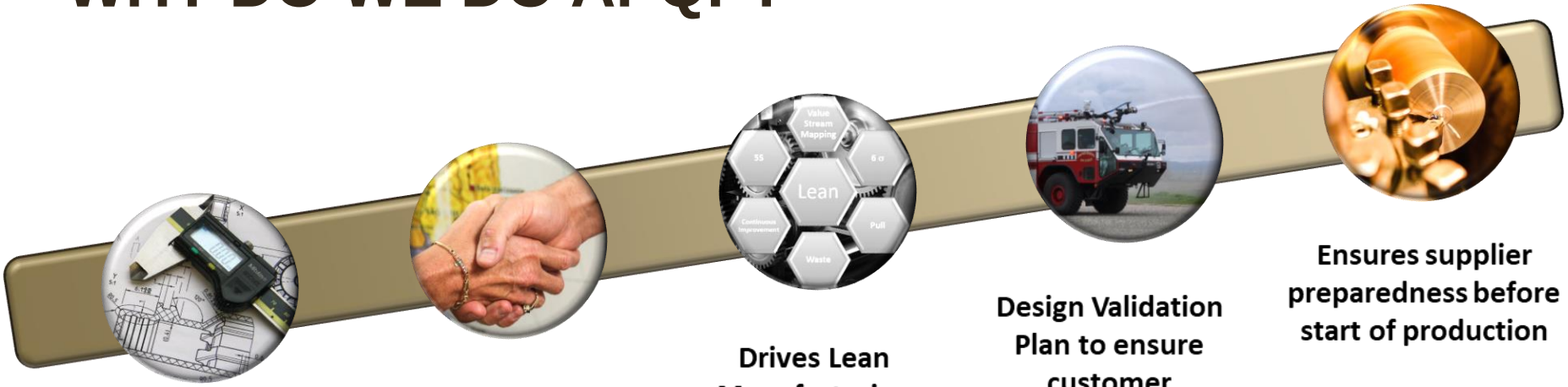


WHAT IS APQP?

- Created by Automotive Industry Action Group (AIAG)
- Structured method of defining and establishing the steps necessary to assure that a product meets customer specification and expectation
- Identifies Critical to Quality sub-systems from the Voice of Customer
- Details the implementation of appropriate quality tools at various phases in the product development cycle



WHY DO WE DO APQP?



Fosters robust product design

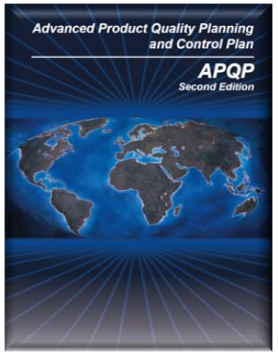
Establishes clear lines of communication between customers and suppliers to define product/ project specifications

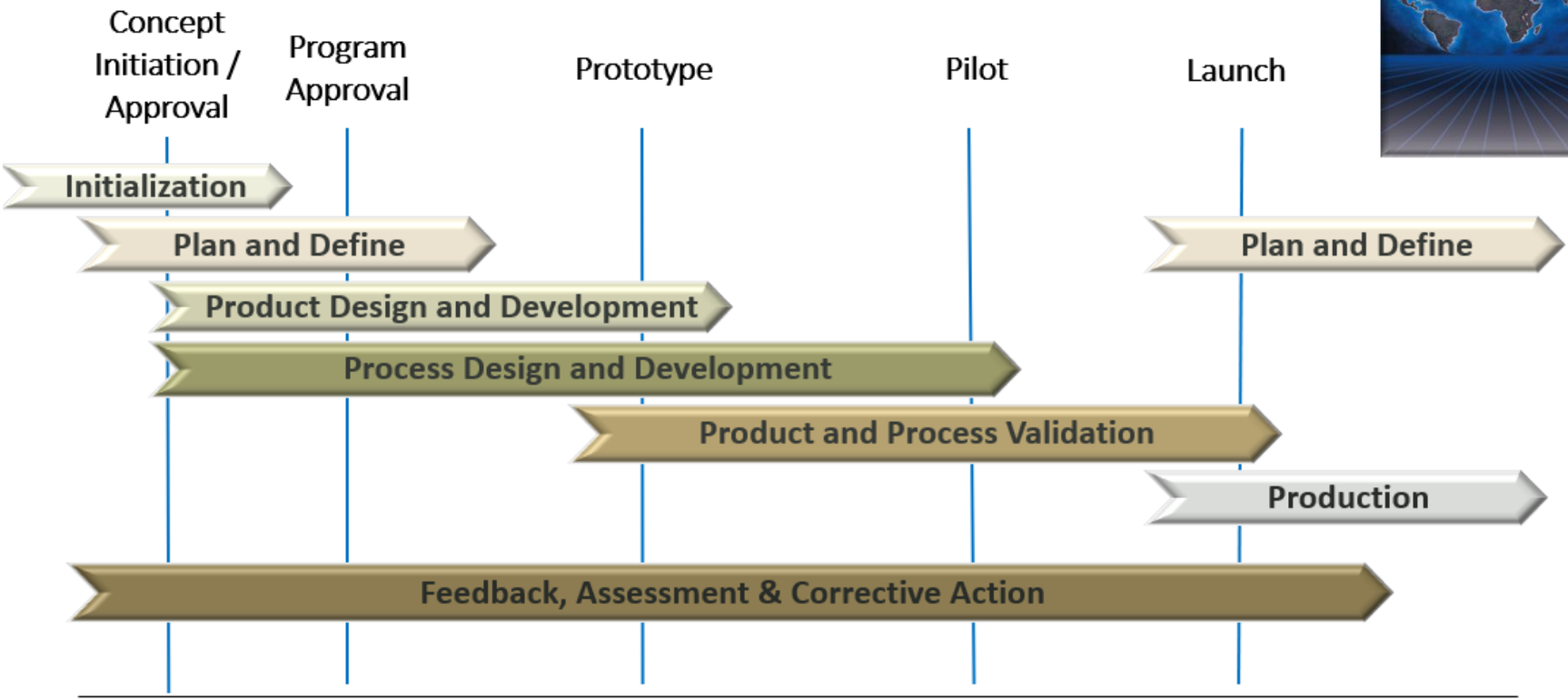
Drives Lean Manufacturing processes to produce part within cost and on-time

Design Validation Plan to ensure customer satisfaction using product testing

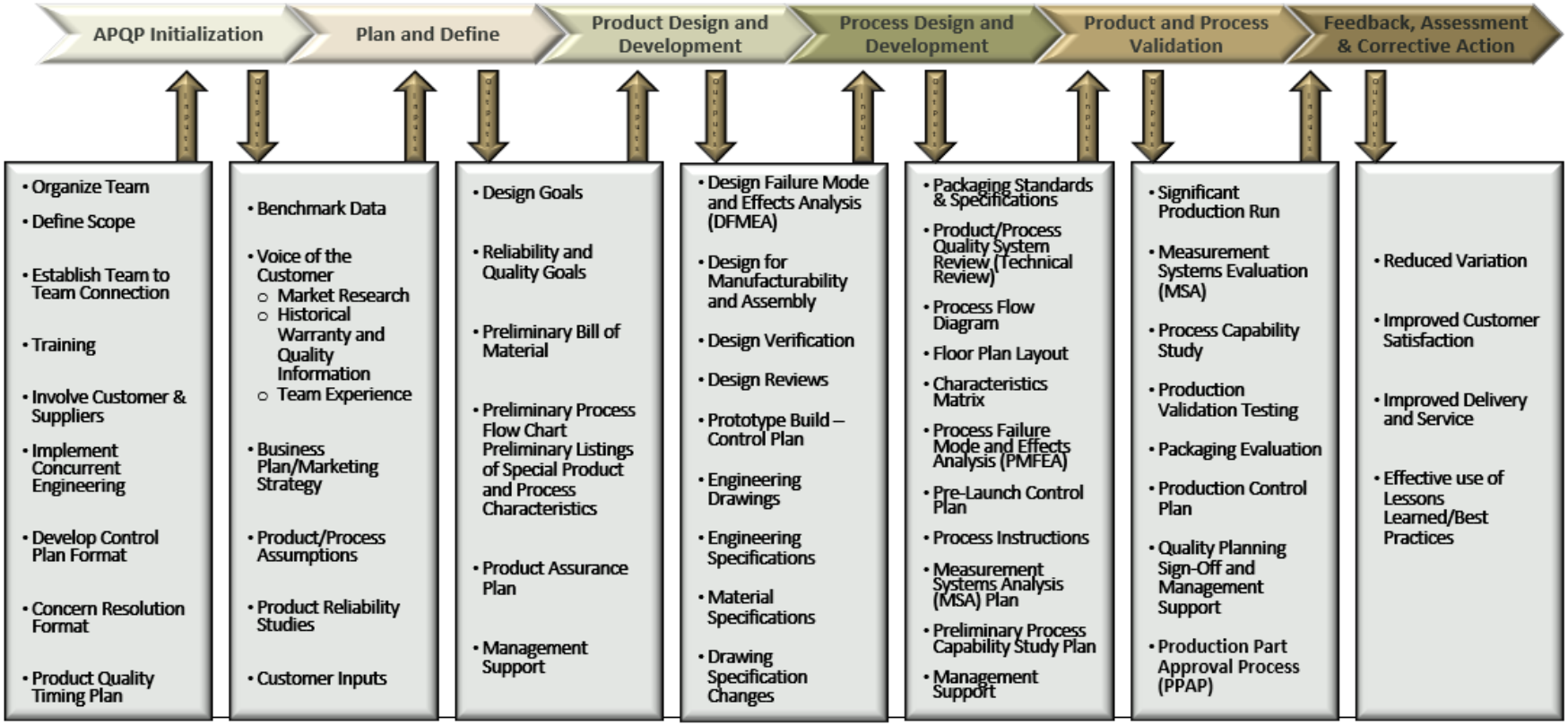
Ensures supplier preparedness before start of production

PRODUCT QUALITY PLANNING ELEMENT TIMING CHART





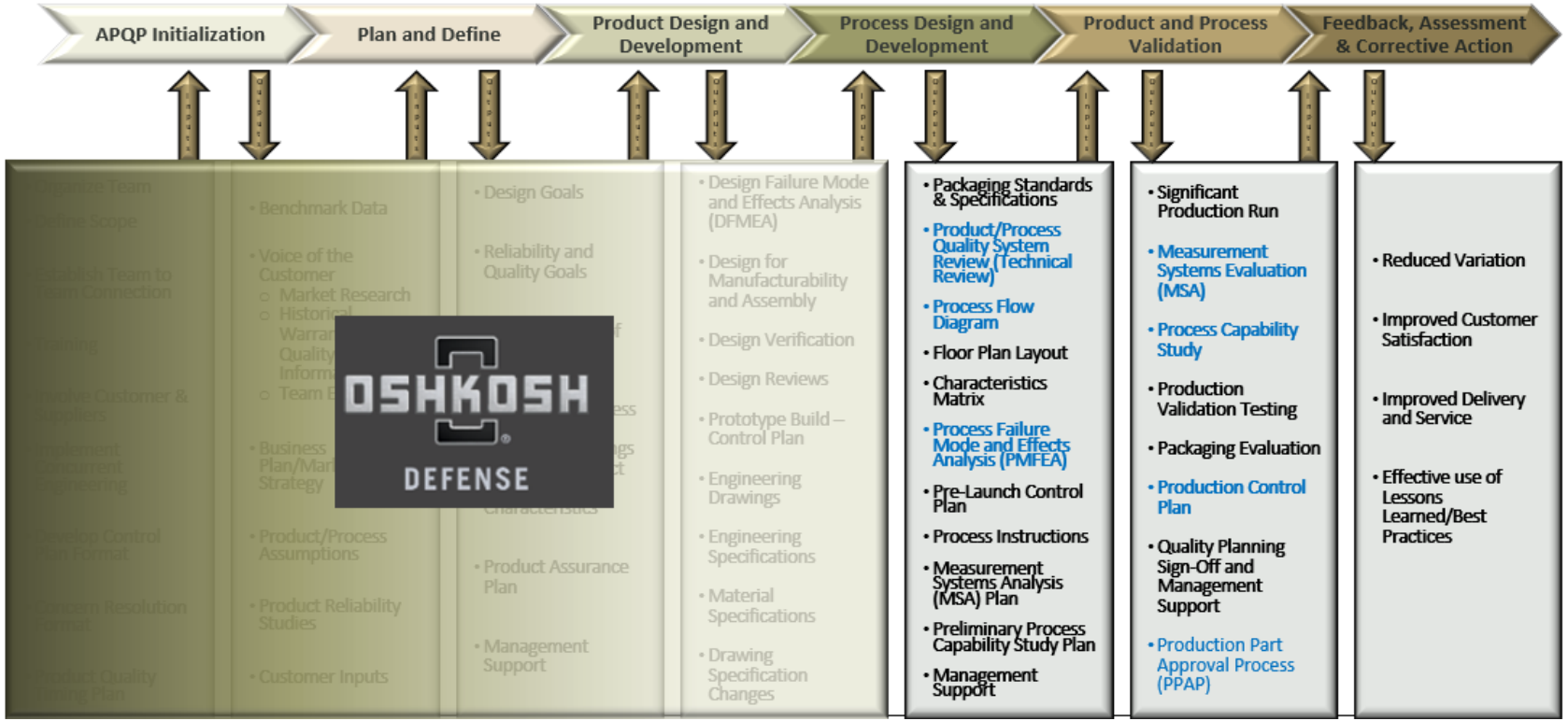
PRODUCT QUALITY PLANNING AS DEFINED BY APQP



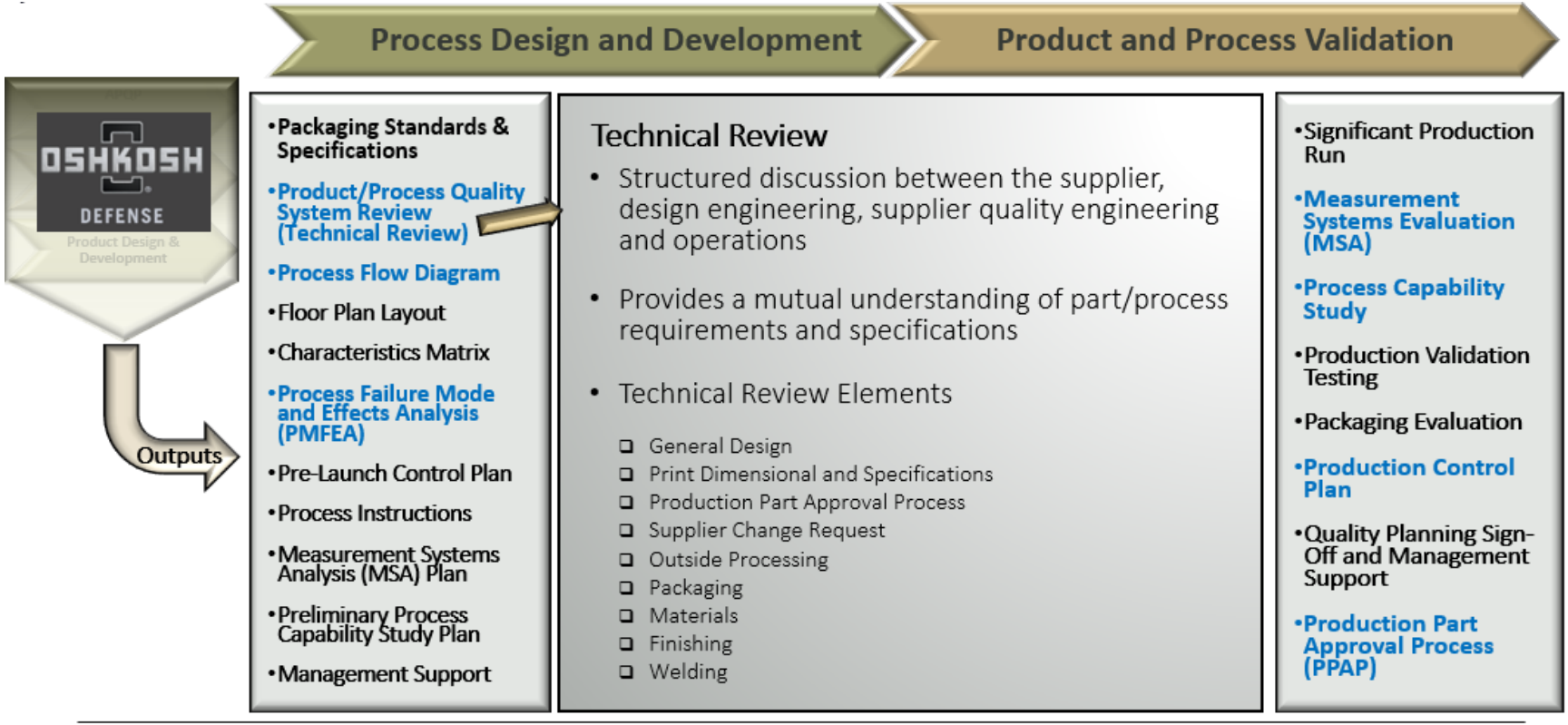
APQP – CONTRACT PROVIDER

Deliverable

Action



APQP – DELIVERABLES



APQP – DELIVERABLES

Process Design and Development → **Product and Process Validation**

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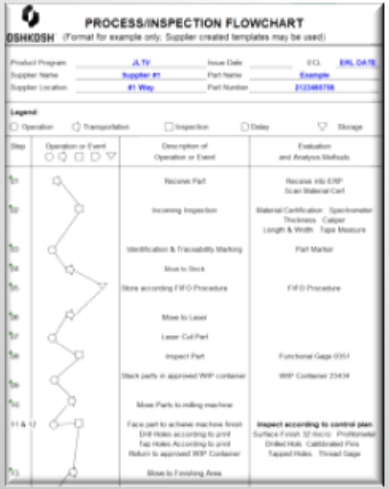
Product Design & Development

Outputs

- Packaging Standards & Specifications
- **Product/Process Quality System Review (Technical Review)**
- **Process Flow Diagram**
- Floor Plan Layout
- Characteristics Matrix
- **Process Failure Mode and Effects Analysis (PMFEA)**
- Pre-Launch Control Plan
- Process Instructions
- Measurement Systems Analysis (MSA) Plan
- Preliminary Process Capability Study Plan
- Management Support

Process Flow Diagram

- Visual tool that maps the processing steps for a product
- Diagram provides the scope for Process Failure Mode and Effects Analysis (PFMEA)
- Identifies where potential issues might arise



- Significant Production Run
- **Measurement Systems Evaluation (MSA)**
- **Process Capability Study**
- Production Validation Testing
- Packaging Evaluation
- **Production Control Plan**
- Quality Planning Sign-Off and Management Support
- **Production Part Approval Process (PPAP)**

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Process Failure Mode and Effects Analysis (PFMEA)

- Analytical method to ensure potential problems are considered, prioritized and addressed throughout the product and process development
- Integral part of risk management and supporting continual improvement
- Helps guide teams in developing product and process designs that meet expectations
- Not a single event or to be done by one individual
- Retention of past learning should be included in FMEA for continual improvement

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APQP – DELIVERABLES

Product and Process Validation → **Feedback, Assessment & Corrective Action**

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Measurement System Analysis (MSA)

- Thorough assessment of the test method, measuring instruments, and process of obtaining measurements to ensure the integrity of data used for analysis
- MSA considers the following:
  - ❑ Selecting the correct measurement and approach
  - ❑ Assessing the measuring device
  - ❑ Assessing procedures and operators
  - ❑ Assessing any measurement interactions
  - ❑ Calculating the measurement uncertainty of individual measurement devices and/or measurement systems
- Required for all Critical and Significant Characteristics

- Reduced Variation
- Improved Customer Satisfaction
- Improved Delivery and Service
- Effective use of Lessons Learned/Best Practices

APQP – DELIVERABLES

Product and Process Validation → **Feedback, Assessment & Corrective Action**

OSHKOSH DEFENSE

Product Design & Development

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Process Capability Study

- Focuses on prevention rather than detection
- Used to understand variation in a process and then works to control it
- Some tools include
  - ❑ Statistical Process Control (SPC)
  - ❑ Control Charts
  - ❑ Process Capability
    - Cp
    - Cpk

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OSHKOSH DEFENSE
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Production Control Plan

- Identify process characteristics and identifies control methods for the sources of variation
- Reduces waste and improves the quality of products during design, manufacturing and assembly

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OSHKOSH DEFENSE

Product Design & Development

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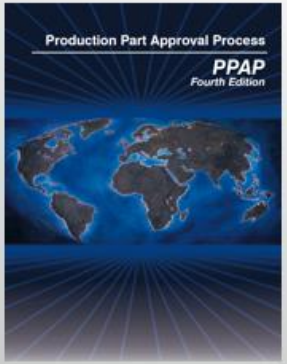
Production Part Approval Process (PPAP)

- The PPAP process is designed to demonstrate that a supplier has developed their design and production process to meet the customer's requirements, minimizing the risk of failure by effective use of APQP
- "All customer engineering design record and specification requirements are properly understood by the supplier and that the process has the potential to produce product consistently meeting these requirements during an actual production run at the quoted production rate."

  - Fourth Edition



- Reduced Variation
- Improved Customer Satisfaction
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APQP – DELIVERABLES

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Oshkosh Corporation
PPAP Part Submission Requirements

Part Number:	PART NUMBER	Purchase Order No.	
Revision Level:	ERL DATE	Part Description:	PART NAME
Supplier Name:	SUPPLIER NAME	Reason for Request:	
Supplier Number:	101112	OSK Program:	MODEL / VEHICLE
Date Issued:		Submission Due Date:	

ALL PPAP CRITERIA MUST CONFORM TO Oshkosh Corporation Customer Specifics defined in the Global Supplier Quality Manual

UNLESS OTHERWISE SPECIFIED IN WRITING BY OSHKOSH CORPORATION:

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

PPAP Submission Requirements and Detail Description	Submission Level 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:				

EXPECTATIONS OF OSHKOSH SUPPLIERS REGARDING APQP

Oshkosh Global Supplier Quality Audit - APQP Section						Supplier:	Audit Date:
Element 1 - Pre-quote Feasibility Review	ISO 9001:2015 Clause 8.2.3.1					**Supplier Comments**	**Auditor Comments**
	List Document Numbers, Names and Revisions						
	Objective Evidence	**Review a completed feasibility review. Record the PART NUMBER (or other identifying number).**					
	Review	(CR) A) Is there evidence that pre-quote feasibility reviews are conducted?	B) Is there a signoff / approval for the feasibility review?	C) Is there a documented checklist or equivalent?	(CR) D) Is there evidence of a review of customer requirements?	E) Is there evidence of a review of quality requirements?	
		F) Is there evidence of a review for manufacturability?	G) Is there evidence of a cross functional drawing review process?	H) Is there evidence of a supplier source review?			
	Interview	I) Is there a cross functional review meeting?	J) Is the outcome of reviews communicated back to customer?	(CR) K) Do the feasibility reviews include a manufacturing capacity review?			
	MAX POINTS:	***11***	***POINTS SCORED:***	***0***	***FAILED CRITICAL:***	***3***	

EXPECTATIONS OF OSHKOSH SUPPLIERS REGARDING APQP

Oshkosh Global Supplier Quality Audit - APQP Section

Element 2 - APQP/Product Realization	ISO 9001:2015 Clause 8.6 & IATF 16949:2015 Clauses 8.6.1 & 8.6.4					Supplier Comments	Auditor Comments
	List Document Numbers, Names and Revisions						
	Objective Evidence	**Review a completed project (for the Audit Sample Part Number, if possible). Record the PART NUMBER (or other identifying number).**					
	Interview	(CR) A) Does the supplier have a product realization/APQP process to launch new parts?	(CR) B) Does the supplier use the process for all major projects? I	C) Does the supplier use the process for all new parts? II	D) Does the supplier have regular meetings to manage the project schedule?	E) Does the supplier track action items from the project meeting?	
		F) Does the process include creation of packaging plans?					
	Review	G) Is the APQP/Product Realization process documented?	H) Does the product realization/APQP documented process contain all critical steps for the supplier?	I) Does the process have a checklist or equivalent that includes multiple phases?	J) Is there evidence that the product realization/APQP process is being followed correctly?	K) Is there evidence of project planning (i.e. Gantt charts, electronic checklist, etc)?	
	MAX POINTS:	***11***	***POINTS SCORED:***	***0***	***FAILED CRITICAL:***	***2***	

EXPECTATIONS OF OSHKOSH SUPPLIERS REGARDING APQP

Oshkosh Global Supplier Quality Audit - APQP Section

Element 3 - Customer Engineering Specifications	IATF 16949:2015 Clause 8.5.6.1					Supplier Comments	Auditor Comments
	List Document Numbers, Names and Revisions						
	Objective Evidence	**Review a part number that has recently changed. Record the PART NUMBER and REVISION.**					
	Review	(CR) A) Is there a documented process to review customer document changes? (i.e., drawing changes, etc.)	(CR) B) Is a document (Change Notice, etc.) used to track and implement the changes?	C) Does the process include verification of changes (PPAP, etc.)?	(CR) D) Did you see evidence that the process is being followed?		
	Interview	E) Is there a cross-functional review process for changes?	G) Does the supplier have a process to purge obsolete	G) Does the supplier have a process to acknowledge changes?			
	MAX POINTS:	*7*	***POINTS SCORED:***	*0*	***FAILED CRITICAL:***	*3*	

EXPECTATIONS OF OSHKOSH SUPPLIERS REGARDING APQP

Oshkosh Global Supplier Quality Audit - APQP Section

Element 5 - Process Failure Modes and Effects Analysis (PFMEA)	IATF 16949:2015 Clause 8.3.2.1					Supplier Comments	Auditor Comments
	Objective Evidence	**Review a Process Failure Modes and Analysis (PFMEA) for the Audit Sample Key Process. Record the PART NUMBER (or other identifying number) and REVISION DATE.**					
	Review	(CR) A) Does the supplier have Process Failure Mode and Effects Analysis (PFMEA)?	(CR) B) Do the PFMEA process steps match the PFD steps?	C) Is there evidence that actions are taken to reduce high RPN on PFMEAs?	D) Are there overdue items in the action plan for PFMEA? (No=1, Yes=0)	E) Is there evidence that the PFMEAs are updated when changes to the process occur?	
		F) Is there evidence that PFMEAs are updated based on nonconformance data and/or Corrective Actions?	G) Did the PFMEA include any Significant or Critical Characteristics (SC/CC)?	H) Is there evidence that PFMEAs are regularly reviewed and updated?			
	Interview	I) Does the supplier create a PFMEA for all key product families and/or key processes? (i.e., not only at customer request)	J) Is the PFMEA reviewed for high RPN?				
	MAX POINTS:	***10***	***POINTS SCORED:***	***0***	***FAILED CRITICAL:***	***2***	

EXPECTATIONS OF OSHKOSH SUPPLIERS REGARDING APQP

Oshkosh Global Supplier Quality Audit - APQP Section

	IATF 16949:2015 Clause 8.5.1.1					Supplier Comments	Auditor Comments
Element 6 - Control Plans	***Objective Evidence***	**Review a Control Plan for the Audit Sample Key Process. Record the PART NUMBER (or other identifying number) and REVISION DATE.**					
	Review	(CR) A) Does the supplier have Control Plans?	(CR) B) Does the Control Plan match the process controls in the PFMEA?	(CR) C) Does the Control Plan match the production documents you viewed on the production floor (i.e., traveler, inspection plan, etc.)?	D) Does the Control Plan provide specific inspection requirements (feature, method, frequency)?	E) Is there evidence that the Control Plans are updated when changes to the process occur?	
		F) Did the Control Plan include any Significant or Critical Characteristics (SC/CC)?					
	Interview	G) Does the supplier create general Control Plans for all key product families and/or key processes? (i.e., not only at customer request) I	H) Does the supplier create Control Plans for all high volume part numbers? II	(CR) I) Does the supplier use SPC, process capability studies, or 100% inspection for all Significant and Critical Characteristics?			
	MAX POINTS:	***9***	***POINTS SCORED:***	***0***	***FAILED CRITICAL:***	***4***	

EXPECTATIONS OF OSHKOSH SUPPLIERS REGARDING APQP

Oshkosh Global Supplier Quality Audit - APQP Section

Element 7 - Production Part Approval Process (PPAP)	IATF 16949:2015 Clause 8.3.4.4						Supplier Comments	Auditor Comments
	Objective Evidence	**Review a submitted PPAP. Record the PART NUMBER and SUBMISSION DATE.**						
	Interview	A) Does the supplier have experience with PPAP?	B) Does the supplier have experience with Oshkosh PPAP (for any segment)?					
	Review	C) Is there evidence of a customer approved L2 PPAP? I	D) Is there evidence of a customer approved L3 PPAP? II					
	MAX POINTS:	***4***	***POINTS SCORED:***	***0***	***FAILED CRITICAL:***	***0***		

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10 MINUTE BREAK

PROCESS FLOW DIAGRAM

PROCESS/INSPECTION FLOWCHART

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

Product Program	JLTV	Issue Date		ECL	ERL DATE
Supplier Name	Supplier #1	Part Name	Example		
Supplier Location	#1 Way	Part Number	2123465756		

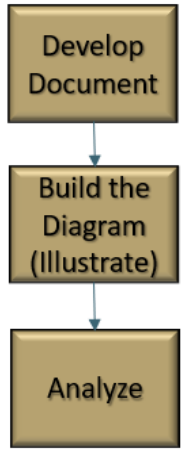
Legend: ○ Operation ⇨ Transportation □ Inspection D Delay ▽ Storage

Step	Operation or Event	Description of Operation or Event	Evaluation and Analysis Methods
01		Receive Part	Receive into ERP Scan Material Cert
02		Incoming Inspection	Material Certification: Spectrometer Thickness: Caliper Length & Width: Tape Measure
03		Identification & Traceability Marking	Part Marker
04		Move to Stock	
05		Store according FIFO Procedure	FIFO Procedure
06		Move to Laser	
07		Laser Cut Part	
08		Inspect Part	Functional Gage 0351
09		Stack parts in approved WIP container	WIP Container 23434
10		Move Parts to milling machine	
11 & 12		Face part to achieve machine finish Drill Holes according to print Tap Holes According to print Return to approved WIP Container	**Inspect according to control plan** Surface Finish 32 micro: Profilometer Drilled Hols: Calibbrated Pins Tapped Holes: Thread Gage
13		Move to Finishing Area	

WHAT IS A PROCESS FLOW DIAGRAM

"The process flow chart is a schematic representation of the current or proposed process flow. It can be used to analyze sources of variation of machines, materials, methods, and manpower from the beginning to end of a manufacturing or assembly process. It is used to emphasize the impact of sources of variation on the process."
- Per AIAG – APQP Manual (Second Edition)

- Clearly describes production process steps and sequence in order to meet customer requirements
  - Documents the process, activities, connections and flows
  - Through the eyes of the product
  - Visual Map
- Illustrates a product's transformation
  - Beginning to end



BUILD PROCESS FLOW DIAGRAM

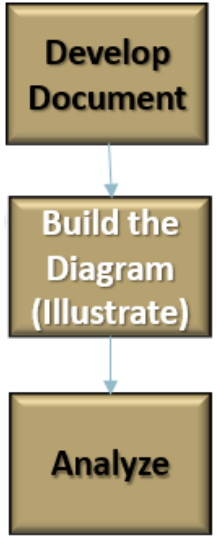
- Identify ALL process steps (Non-Value and Value added)
- Attain full understanding of all the steps in the process

- Use symbol most closely related to the action

⬭ Operation
⇨ Transportation
□ Inspection
D Delay
▽ Storage

- Describe
- Standard Operating Procedures (SOP)
- Procedures and Work Instructions
- Specifications

- Measurements
- Inspections
- Descriptions of Product



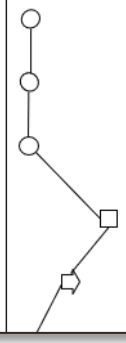
BUILD PROCESS FLOW DIAGRAM

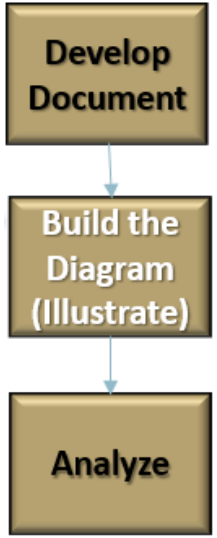
PROCESS/INSPECTION FLOWCHART

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

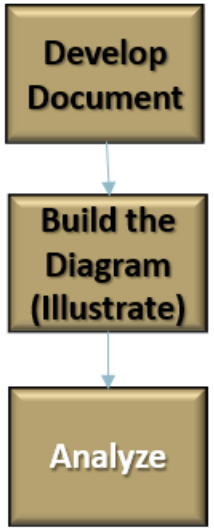
Product Program	CUSTOMER ORDER	Issue Date	
ECL	YESTERDAY		
Supplier Name	ON TIME R US	Part Name	WIDGET, ORANGE
Supplier Location	GLOBAL	Part Number	12345678

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

Step	Operation or Event	Description of Operation or Event	Evaluation and Analysis Methods
		Submitted PO	Customer Order Received
		Schedule WO	In ERP, Printable WO
		Manufacture Product	In-Process Checks, 1st Piece
		Inspect Product	Final Inspection, SPC
		Move Product to Inventory	



ANALYZE PROCESS FLOW DIAGRAM



When do you update a Process Flow Diagram?

- New Customer Requirements are agreed upon
- New Technology that changes a process
- Customer Issues where corrective actions change the process
- Design Changes
- Any changes where final product to customer is impacted

The Process Flow Diagram directs future tool usage & analysis:

- Failure Mode and Effects Analysis (FMEA)
- Data Collection & Control Charting (SPC)
- Control plans

Rule #1 Update Process Flow Diagrams with new knowledge & change in process

PROCESS FAILURE MODE & EFFECTS ANALYSIS (PFMEA)

PFMEA - PROCESS FAILURE MODES & EFFECTS ANALYSIS
(Format for example only; Supplier created templates may be used)

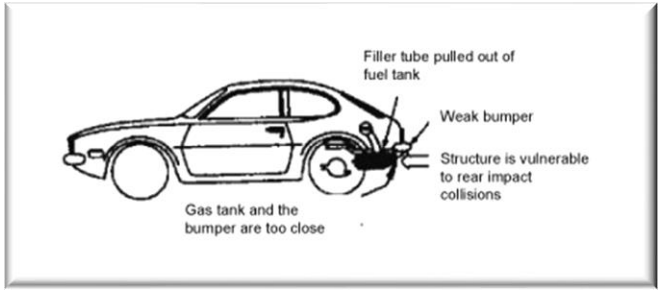
Print # PART NUMBER Rev. ERL
Item: n/a
Model Year(s)/Vehicle(s): MODEL / VEHICLE
Core Team:
Process Responsibility:
Key Date:
FMEA Rankings
FMEA Number:
Prepared by:
Date (Orig.)
Date (Rev.)

Process Step / Function	Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Causes(s)/ Mechanism(s) of Failure	Occur	Current Process Controls -Prevention -Detection	Detec	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Sev	Occ	Det	R.P.N.

WHAT IS FAILURE MODE AND EFFECTS ANALYSIS (FMEA)

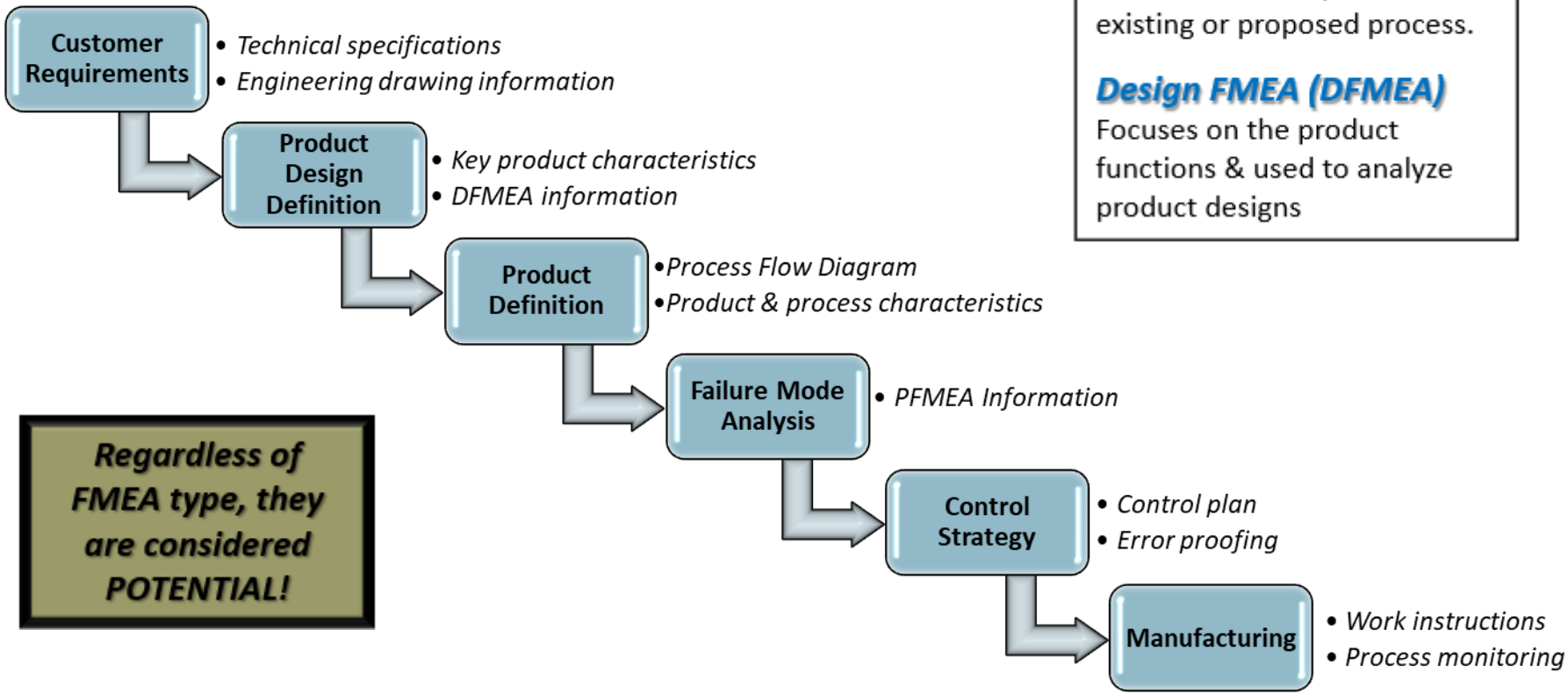
- An analytical tool using a disciplined technique
- Used to identify where problems in products / processes are likely to occur
- Identifies potential solutions to minimize risks of problems
- Can focus on potential process related failures and their causes (PFMEA)
- Targeted at eliminating the Root Cause
- Allows prioritization of corrective actions

Initially developed for the military, now used in a variety of industries



Automotive: Ford (Pinto mid-1970's)

INFORMATION FLOW



Process FMEA (PFMEA)
Focuses on the inputs of an existing or proposed process.

Design FMEA (DFMEA)
Focuses on the product functions & used to analyze product designs

Regardless of FMEA type, they are considered POTENTIAL!

WHEN IS FMEA USED & WHAT ARE THE BENEFITS

When ***NEW*** systems, products and processes are being designed

When ***EXISTING*** designs or processes are being changed or improved

Aids in improving design for products and processes

- Identify potential failure modes and rate the severity of their effects
- Increases customer satisfaction through improved quality
- Improves product reliability

Contributes to product cost savings

- Reduces warranty costs
- Decreases waste
- Reduces no-value added operations

WHEN IS THE FMEA UPDATED

When a change is being considered to a product or process related to:

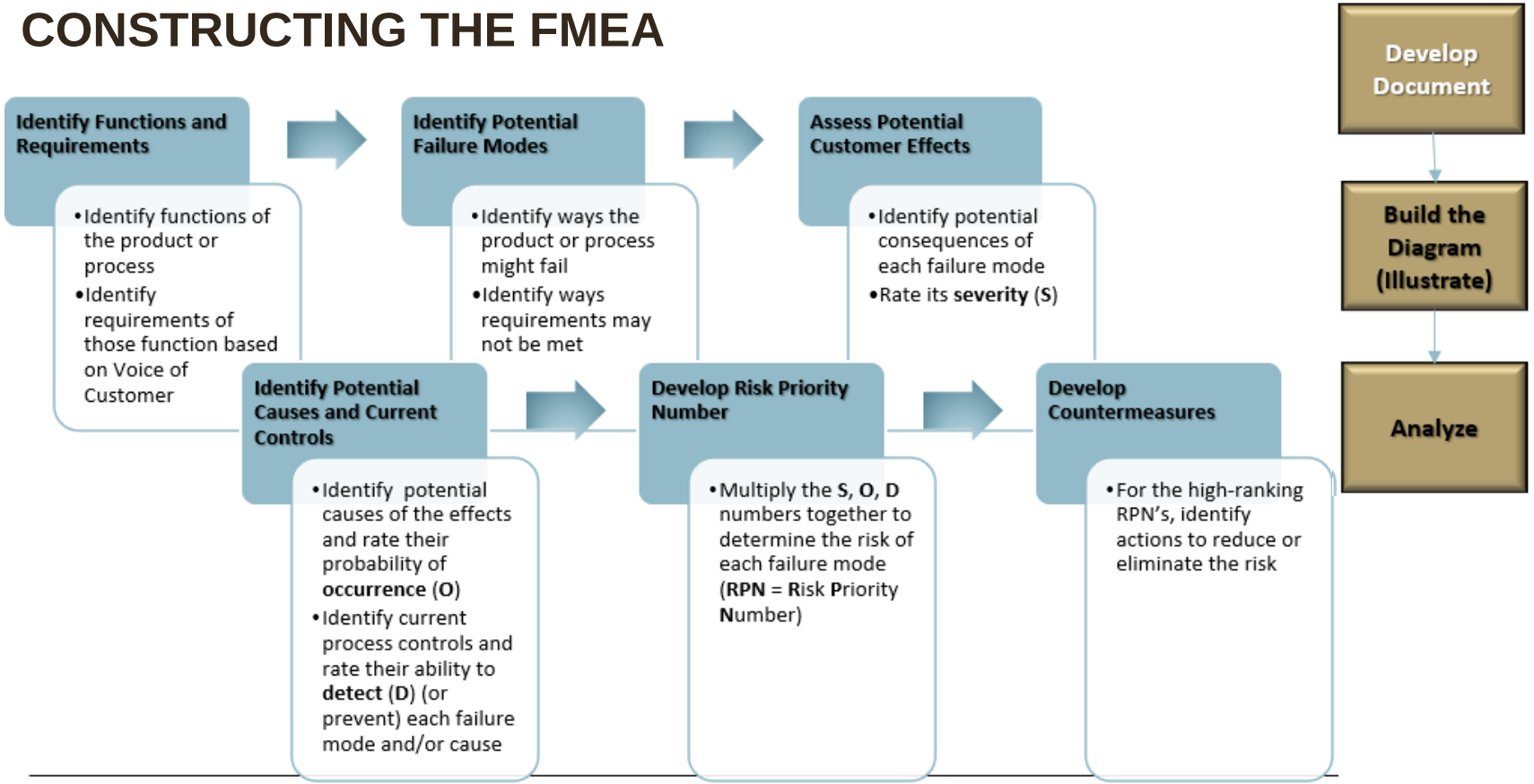
- Design
- Application
- Material
- Environment
- Manufacturing / Assembly Processes

Actions are taken to:

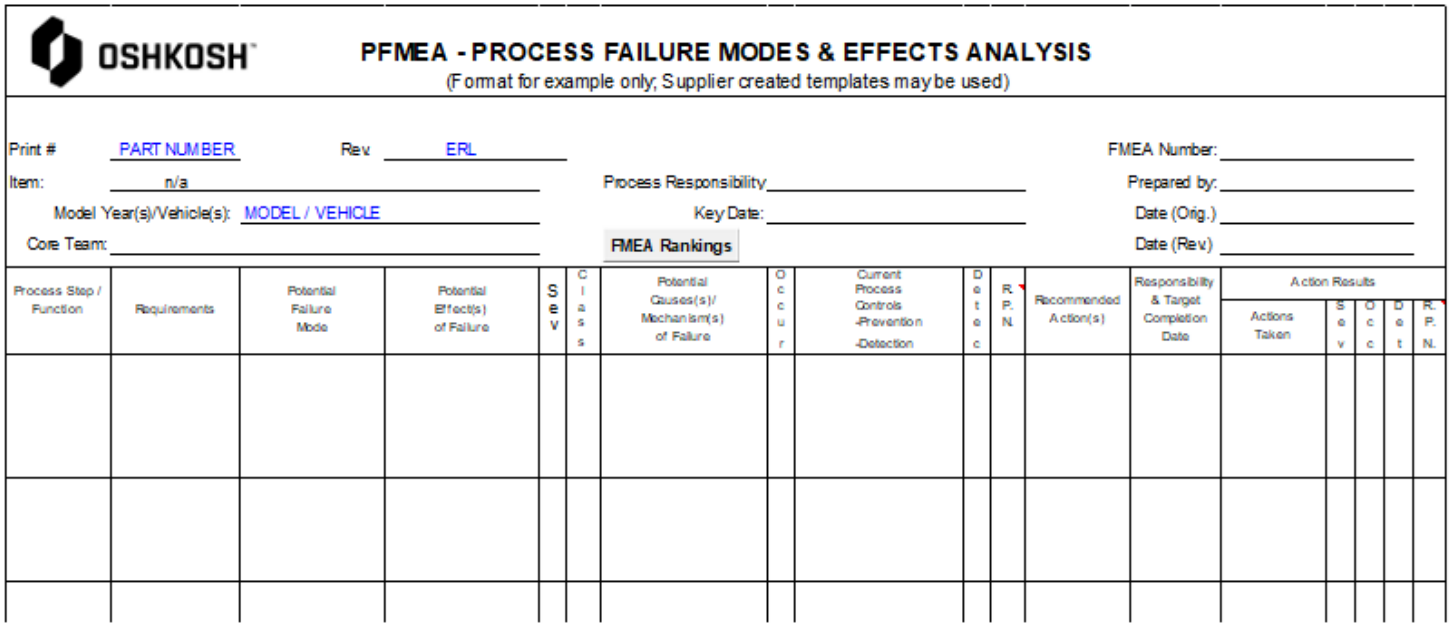
- Reduce the occurrence of the causes/failure modes
- Increase the ability to prevent a failure mode from occurring

PFMEAs can be updated as needed and applied to similar processes

CONSTRUCTING THE FMEA



BUILD PFMEA – BLANK TEMPLATE EXAMPLE



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PFMEA - PROCESS FAILURE MODES & EFFECTS ANALYSIS

(Format for example only; Supplier created templates maybe used)

Print # PART NUMBER Rev ERL FMEA Number:

Item: n/a Process Responsibility: Prepared by:

Model Year(s)/Vehicle(s): MODEL / VEHICLE Key Date: Date (Orig.)

Core Team: FMEA Rankings Date (Rev)

Process Step / Function	Requirements	Potential Failure Mode	Potential Effect(s) of Failure	Sev	Class	Potential Cause(s)/ Mechanism(s) of Failure	Occur	Current Process Controls -Prevention -Detection	Det	R.P.N.	Recommended Action(s)	Responsibility & Target Completion Date	Action Results				
													Actions Taken	Sev	Occ	Det	R.P.N.

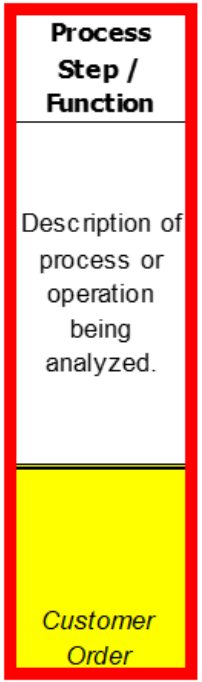
Develop Document

Build the Diagram (Illustrate)

Analyze

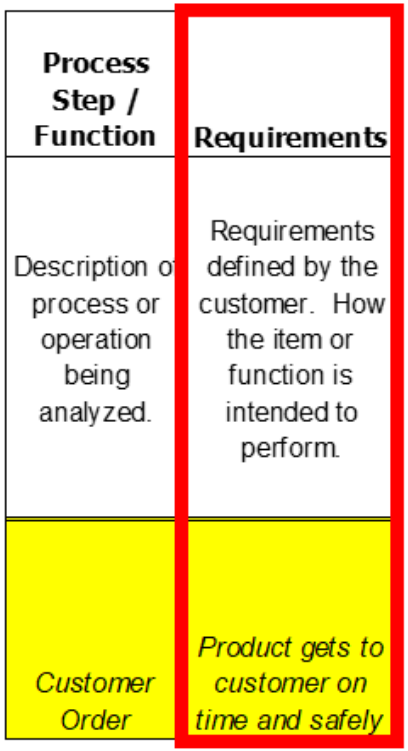
1. IDENTIFY PROCESS STEP / FUNCTION

- Derived from Process Steps in the Process Flow Diagram



2. IDENTIFY REQUIREMENTS

- The requirements are defined by the customer
- Defines how the item or function is intended to perform



"Customer Order" Process

3. IDENTIFY POTENTIAL FAILURE MODES

- Ways in which the process step could fail to perform its intended function
- Consider how the process could potentially fail to meet process requirements
- A failure mode describes the non-conformance (defect) at that specific operation or process step

Fatigue	Wear
Fracture	Excessive Material
Leakage	Improper Temp
Fails to Open	Calls not Answered

Process Step / Function	**Requirements**	Potential **Failure Mode**
Description of process or operation being analyzed.	Requirements defined by the customer. How the item or function is intended to perform.	Manner in which the process could potentially fail to meet process requirements.
Customer Order	*Products gets to customer on time and safely*	*Late Delivery*

"Customer Order" Process

"What could happen to cause the process to fail to meet customer requirements?"

4. ASSESS POTENTIAL CUSTOMER EFFECTS

If the FAILURE MODE is not detected and either corrected or removed, it will cause an EFFECT to occur

- The EFFECT of a failure mode is the outcome on the **customer** when a failure mode occurs

The customer can be:

- ***External*** (end-user) – the effects should be stated in terms of product (or system) performance.
- ***Internal*** (next step in the process) – the effects should be stated in terms of process performance.

Requirements	Potential **Failure Mode**	Potential **Effects** of Failure
Requirements defined by the customer. How the item or function is intended to perform.	Manner in which the process could potentially fail to meet process requirements.	Effects of the failure mode on the customer.
Products gets to customer on time and safely	*Late Delivery*	*Critical Short to Customer Production*

"Customer Order" Process

5. IDENTIFY SEVERITY OF EFFECTS

SEV (S) Rates the impact of the *EFFECT* of the potential failure mode on the customer

- Internal
- External

Severity Rating Scale

Rating	Description	Definition (Severity of Effect)
10	Dangerously high	Failure could injure the customer or an employee.
9	Extremely high	Failure would create noncompliance with federal regulations.
8	Very high	Failure renders the unit inoperable or unfit for use.
7	High	Failure causes a high degree of customer dissatisfaction.
6	Moderate	Failure results in a subsystem or partial malfunction of the product.
5	Low	Failure creates enough of a performance loss to cause the customer to complain.
4	Very Low	Failure can be overcome with modifications to the customer's process or product, but there is minor performance loss.
3	Minor	Failure would create a minor nuisance to the customer, but the customer can overcome it without performance loss.
2	Very Minor	Failure may not be readily apparent to the customer, but would have minor effects on the customer's process or product.
1	None	Failure would not be noticeable to the customer and would not affect the customer's process or product.

Potential **Failure Mode**	Potential **Effects** of Failure	**S E V**
Manner in which the process could potentially fail to meet process requirements.	Effects of the failure mode on the customer.	Severity of the effect (S)
Late Delivery	*Critical Short to Customer Production*	*8*

"Customer Order" Process

Severity is the likely impact of the failure

6. IDENTIFY POTENTIAL CAUSES OF FAILURE

The cause of the failure mode is how the failure mode could occur; there may be several causes

Experimentation may be required to determine the ROOT causes

- Use problem solving techniques to determine the root causes
- 5 Why, Is/Is Not, Fishbone

This will lead the team toward preventive actions

Must be specific

- Avoid ambiguity such as “operator error”

Potential **Effects** of Failure	**S E V**	Potential **Causes** of Failure
Effects of the failure mode on the customer.	Severity of the effect (S)	How the failure could occur.
Critical Short to Customer Production	*8*	*Quality Issues*

“Customer Order” Process

7. IDENTIFY OCCURRENCE FOR POTENTIAL CAUSES OF FAILURE

OCC (O) is the probability that the failure mode (or the cause of the failure) will happen

Occurrence Rating Scale

Rating	Description	Potential Failure Rate
10	Very High: Failure is almost inevitable.	More than one occurrence per day or a probability of more than three occurrences in 10 events (C_{pk} < 0.33).
9	High: Failures occur almost as often as not.	One occurrence every three to four days or a probability of three occurrences in 10 events (Cpk ≈ 0.33).
8	High: Repeated failures.	One occurrence per week or a probability of 5 occurrences in 100 events (C_{pk} ≈ 0.67).
7	High: Failures occur often.	One occurrence every month or one occurrence in 100 events (C_{pk} ≈ 0.83).
6	Moderately High: Frequent failures.	One occurrence every three months or three occurrences in 1,000 events (C_{pk} ≈ 1.00).
5	Moderate: Occasional failures.	One occurrence every six months to one year or five occurrences in 10,000 events (C_{pk} ≈ 1.17).
4	Moderately Low: Infrequent failures.	One occurrence per year or six occurrences in 100,000 events (C_{pk} ≈ 1.33).
3	Low: Relatively few failures.	One occurrence every one to three years or six occurrences in ten million events (C_{pk} ≈ 1.67).
2	Low: Failures are few and far between.	One occurrence every three to five years or 2 occurrences in one billion events (C_{pk} ≈ 2.00).
1	Remote: Failure is unlikely.	One occurrence in greater than five years or less than two occurrences in one billion events (C_{pk} > 2.00).

Potential **Effects** of Failure	**S E V**	Potential **Causes** of Failure	**O C C**
Effects of the failure mode on the customer.	Severity of the effect (S)	How the failure could occur.	Frequency of failure occurrence (O)
Critical Short to Customer Production	8	*Quality Issues*	4
	8	*Missing Customer Supplied par*	2
	8	*Order not entered for production*	1
	8	*Sub-components didn't arrive on time*	4

Note: Copy the SEV rating to the rows beneath so that each cause will be associated with the same SEV rating.

"Customer Order" Process

8. IDENTIFY CURRENT PROCESS CONTROLS

"Customer Order" Process

Descriptions of controls that either:

- *PREVENT* the failure mode/cause from occurring
- *DETECT* the failure mode/cause should it occur

There are three types of process controls:

- GOOD - Detect the failure mode
- BETTER - Detect the cause/mechanism and lead to corrective actions
- BEST - Prevent the cause or failure mode/effect from occurring or reduce their rate of occurrence

Potential **Causes** of Failure	**O C C**	Current Process **Controls**
How the failure could occur.	Frequenc of failure occurrenc (O)	Descriptions of the controls that prevent or detect the failure mode.
Quality Issues	*4*	*Weekly meeting of the Material Review Board to review all non-conformances*
Missing Customer Supplied part	*2*	*Review Supplier Critical Short Report*
Order not entered for production	*1*	*Daily Review of manual customer orders*
components didn't arrive on time	*4*	*Review Supplier Critical Short Report*

9. IDENTIFY DETECTION

DET (D) is the extent to which a failure (or cause) can be identified prior to reaching the customer.

Detection Rating Scale

Rating	Description	Definition
10	Absolute Uncertainty	The product is not inspected or the defect caused by failure is not detectable.
9	Very Remote	Product is sampled, inspected, and released based on Acceptable Quality Level (AQL) sampling plans.
8	Remote	Product is accepted based on no defectives in a sample.
7	Very Low	Product is 100% manually inspected in the process.
6	Low	Product is 100% manually inspected using go/no-go or other mistake-proofing gages.
5	Moderate	Some Statistical Process Control (SPC) is used in process and product is final inspected off-line.
4	Moderately High	SPC is used and there is immediate reaction to out-of-control conditions.
3	High	An effective SPC program is in place with process capabilities (C_{pk}) greater than 1.33.
2	Very High	All product is 100% automatically inspected.
1	Almost Certain	The defect is obvious or there is 100% automatic inspection with regular calibration and preventive maintenance of the inspection equipment.

O C C	Current Process **Controls**	D E T
Frequency of failure occurrence (O)	Descriptions of the controls that prevent or detect the failure mode.	Extent to which failure (or cause) can be identified prior to reaching customer (D)
4	*Weekly meeting of the Material Review Board to review all non-conformances*	2
2	*Review Supplier Critical Short Report*	3
1	*Daily Review of manual customer orders*	1
4	*Review Supplier Critical Short Report*	3

"Customer Order" Process

10. CALCULATE RISK PRIORITY NUMBER (RPN)

"Customer Order" Process

RPN

The product of (S) * (O) * (D) = RPN

Higher RPN's should have specific corrective actions assigned

- The actions will most likely require data collection and/or experimentation

Current Process **Controls**	D E T	R P N
Descriptions of the controls that prevent or detect the failure mode.	Extent to which failure (or cause) can be identified prior to reaching customer (D)	Product of (S)*(O)*(D)
Weekly meeting of the Material Review Board to review all non-conformances	2	32
Review Supplier Critical Short Report	3	48
Daily Review of manual customer orders	1	8
Review Supplier Critical Short Report	3	96

11. DETERMINE RECOMMENDED ACTIONS

Identify actions to mitigate potential failures

May reduce the frequency of occurrence

May increase the ability to PREVENT causes and/or failure modes

- Usually improving detection controls is costly and ineffective for quality improvements.
- Increasing inspection should only be utilized as a temporary measure for containment

Reassess RPN to see if actions eliminate major issues

Focus on DEFECT PREVENTION!

D E T	R P N	Actions Recommended
Extent to which failure (or cause) can be identified prior to reaching customer (D)	Product o (S)*(O)*(D	Actions to be taken on the highest ranked concerns and critical items.
2	32	*Collect data to determine how often quality issues affect shipments*
3	48	*Collect data to determine how often supplier is missing customer supplied part*
1	8	*Cross training customer service reps*
3	96	*Collect data to determine how often late sub-components affect shipments*

"Customer Order" Process

12. DETERMINE RESPONSIBILITY, DATES & ACTIONS TAKEN

Process Step / Function	Requirements	Potential Failure Mode	Potential Effects of Failure	SEV	Potential Causes of Failure	OCC	Current Process Controls	DET	RPN	Actions Recommended	Responsibility and Dates	Actions Taken
Description of process or operation being analyzed.	Requirements defined by the customer. How the item or function is intended to perform.	Manner in which the process could potentially fail to meet process requirements.	Effects of the failure mode on the customer.	Severity of the effect (S)	How the failure could occur.	Frequency of failure occurrence (O)	Descriptions of the controls that prevent or detect the failure mode.	Extent to which failure (or cause) can be identified prior to reaching customer (D)	Product of (S)*(O)*(D)	Actions to be taken on the highest ranked concerns and critical items	The individual(s) responsible for the actions and the target dates for completion.	Brief description of the action and effective date after the action has been implemented.
Customer Order	*Products gets to customer on time and safely*	*Late Delivery*	*Critical Short to Customer Production*	*8*	*Quality Issues*	*4*	*Weekly meeting of the Material Review Board to review all non-conformances*	*2*	*32*	*Collect data to determine how often quality issues affect shipments*		
				8	*Missing Customer Supplied part*	*2*	*Review Supplier Critical Short Report*	*3*	*48*	*Collect data to determine how often supplier is missing customer supplied part*		
				8	*Order not entered for production*	*1*	*Daily Review of manual customer orders*	*1*	*8*	*Cross training customer service reps*		
				8	*Sub-components didn't arrive on time*	*4*	*Review Supplier Critical Short Report*	*3*	*96*	*Collect data to determine how often late sub components affect shipments*		

13. ASSESS ACTION TAKEN & RESULTING RPNS

"Customer Order" Process

Original RPN Values

Resulting RPN Values

RPN	Actions Recommended	Responsibility and Dates	Actions Taken	SEV	OCC	DET	RPN
Product of (S)*(O)*(D)	Actions to be taken on the highest ranked concerns and critical items.	The individual(s) responsible for the actions and the target dates for completion.	Brief description of the action and effective date after the action has been implemented.				
32	*Collect data to determine how often quality issues affect shipments*	*S. Smith (Sept 1)*	*Accounts for 40% of late arrivals; implement daily MRB process*	*8*	*2*	*1*	16
48	*Collect data to determine how often supplier is missing customer supplied part*	*S. Smith (Oct 15)*	*Accounts for 20% of late arrivals; implement daily review of critical shorts*	*8*	*2*	*1*	16
8	*Cross training customer service reps*			*8*	*1*	*1*	8
96	*Collect data to determine how often late sub-components affect shipments*	*S. Smith (Feb 15)*	*Accounts for 30% of late arrivals; implement daily review of critical shorts*	*8*	*4*	*1*	32

FMEA SUMMARY

- Used to improve process before failure occurs; focus on prevention of product and process issues
- Used to prioritize corrective actions & ensure alignment with customer needs
- Useful during design for new systems, products and processes
- Useful when existing designs or processes are being changed
- Updated after change is implemented or action items completed
- A tool to document actions taken & leads to future tool usage:
  - Data collection plans and experimentation
  - Control plans

OSHKOSH DEFENSE

YOUR MISSION. OUR HONOR

10 MINUTE BREAK

CONTROL PLANS

☐ Prototype ☐ Pre-Launch ☑ Production

CONTROL PLAN

Control Plan No:

Part Number/Latest Change Level	Key Contact/Phone	Date (Orig.)	Date (Rev.)
Customer Part Number	Core Team	Customer Engineering Approval/Date (If Req'd.)	
Part Name/Description	Supplier/Plant Approval/Date	Customer Quality Approval/Date (If Req'd.)	
Supplier/Plant Supplier Code	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 Frequency	Control Method	
300	Initiate weld sequence / Perform TIG weld of frame parts.	Robotic Arm controller. TIG welders.		Weld beads per design specification.			Tube welds meet pull test with failure in parent material.	Pull test using test fixture 20-1.	1 pc.	Per shift.	Hydraulic pull test instruction TI21-01 Process monitoring form PMF-20-01	Quarantine material since last good pull test.
				Good welds, no visible defects.		yes	Weld appearance meets visual standard.	Operator evaluation to Visual Std TB20-VS1	100%	Each piece.	Visual inspection OWI #20-01.	Remove pa and send to repair.
					Weld voltage	yes	24 Volts AC +/- 2.0 volts	Machine Control	100%	Each weld cycle.	Closed-loop machine control.	Scrap part Re-start welder.
					Weld voltage	yes	24 Volts AC +/- 2.0 volts	**Visual**	Once each	Shift start or change-over or maint. event.	**Set-up OWI #20-02 & Form PMF-20-02 Periodic maintenance per PM-WI #20.**	Scrap current part Shut down. Notify maintenanc
					Inert gas flow rate	yes	5 cubic feet / min. +/- 0.5 cfm	**Visual**	twice	Per shift.	**Operator cleans gas cup twice per shift PM-WI-20.** Process monitoring form PMF-20-01	Notify maintenanc
					Inert gas flow rate	yes	5 cubic feet / min. +/- 0.5 cfm	**Visual of verification of Flow Meter**	Once each	Shift start or change-over or maint. event	**Set-up OWI #20-02 & Form PMF-20-02. Equipment Calibration Procedure #368**	Quarantine material since last good pull test. Notify maintenanc

CONTROL PLAN – THE BASICS

What is it?

- Monitoring, controlling and inspection needs
- Reaction plan to be followed for suspected non-conforming product

Why create it?

- Reduces variation due to both input & output variables

When to create it?

- *AFTER* PFD & PFMEA have been created
- *BEFORE* pilot/production builds are conducted

CONTROL PLAN – THE BENEFITS

Quality

- Reduces waste
- Improves the quality of products
- Control sources of variation (input variables) which cause variation in product characteristics (output variables).
- Quality improvement tool.

Customer Satisfaction

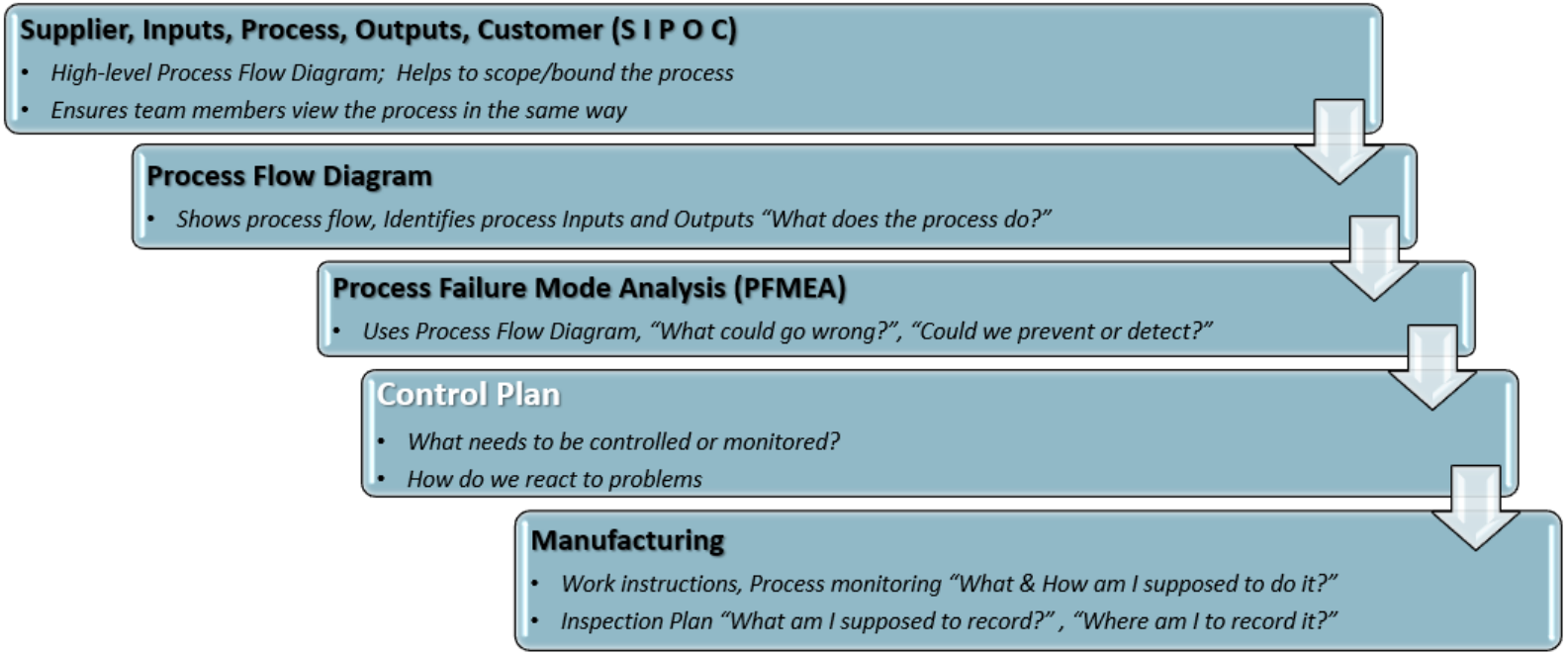
- Focus resources on characteristics that are important to the customer.
- Proper allocation of resources to reduce costs without sacrificing quality.

Communication

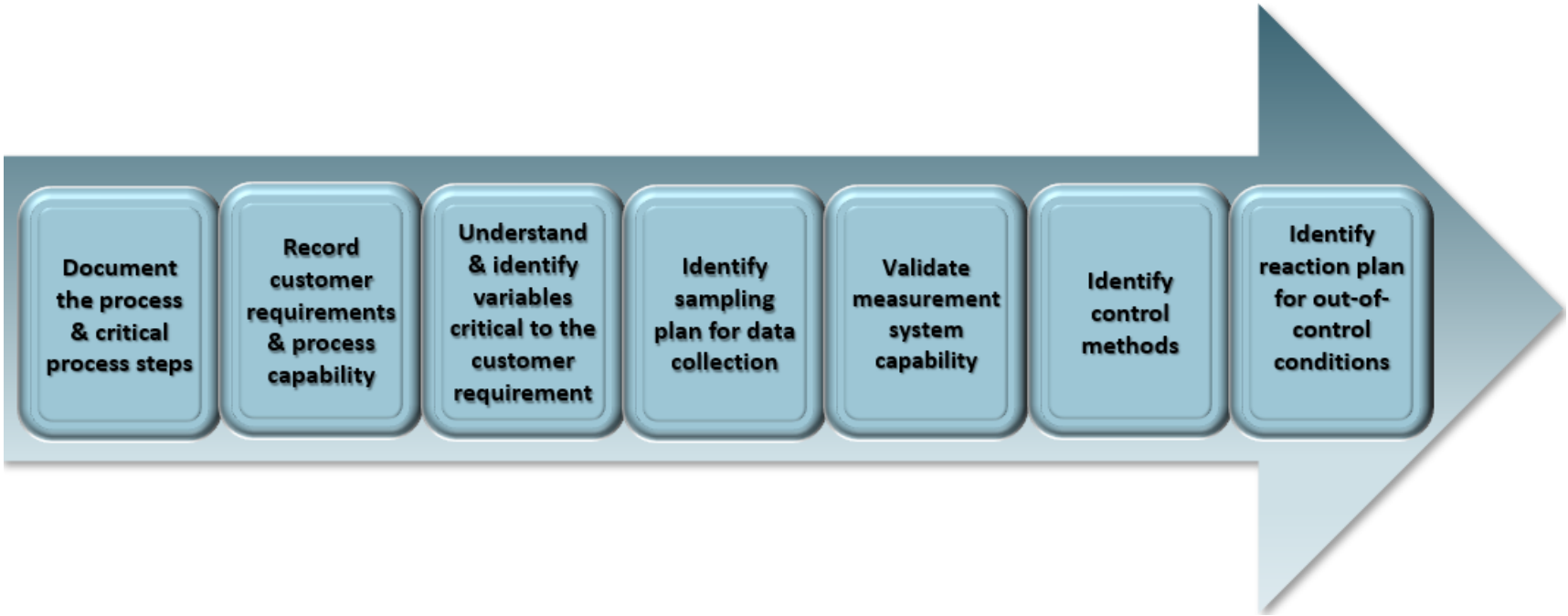
- A living document, that identifies and communicates changes in the product/process characteristics, control methods, and characteristic measurement methods

CONTROL PLAN DEVELOPMENT

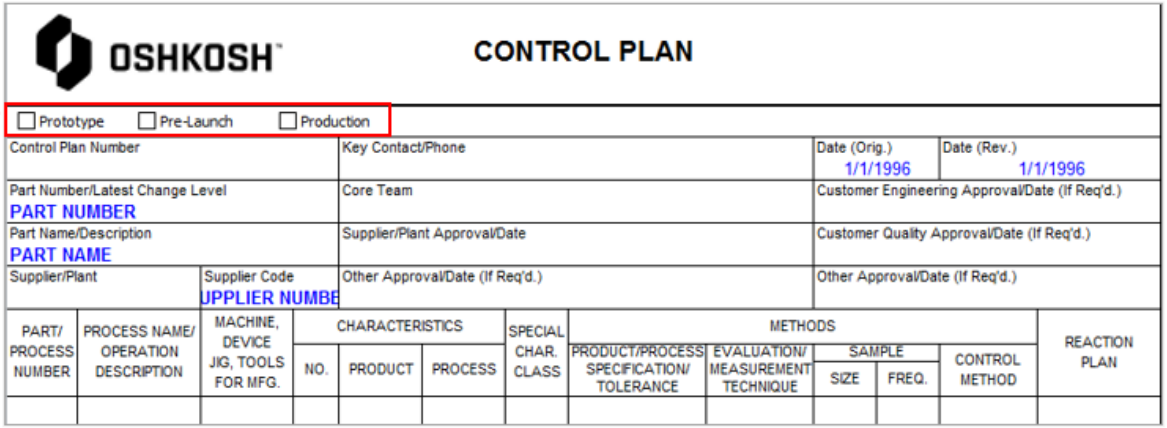
- *Must be built from the PFMEA*



CONTROL PLAN DEVELOPMENT



STEP-BY-STEP CONTROL PLAN CREATION



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CONTROL PLAN

1

☐ 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 UPPLIER NUMBE	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	

Control Plan Form Review

1

Prototype

A description of the dimensional measurements, material and performance tests occurring during Prototype build

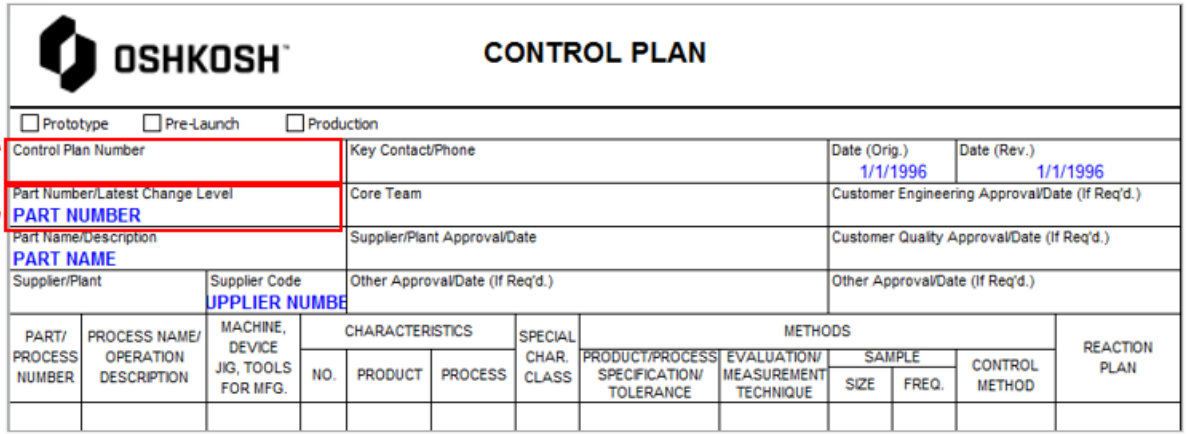
Pre-Launch

A description of the dimensional measurements, material and performance tests that will occur after Prototype and before normal

Production

A comprehensive documentation of product and process characteristics, process controls, tests, and measurement during normal production.

STEP-BY-STEP CONTROL PLAN CREATION



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CONTROL PLAN

☐ Prototype ☐ Pre-Launch ☐ Production

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			NO.	PRODUCT	PROCESS		PRODUCT/PROCESS SPECIFICATION/ TOLERANCE	EVALUATION/ MEASUREMENT TECHNIQUE	SAMPLE SIZE	SAMPLE FREQ.	CONTROL METHOD	

Control Plan Form Review

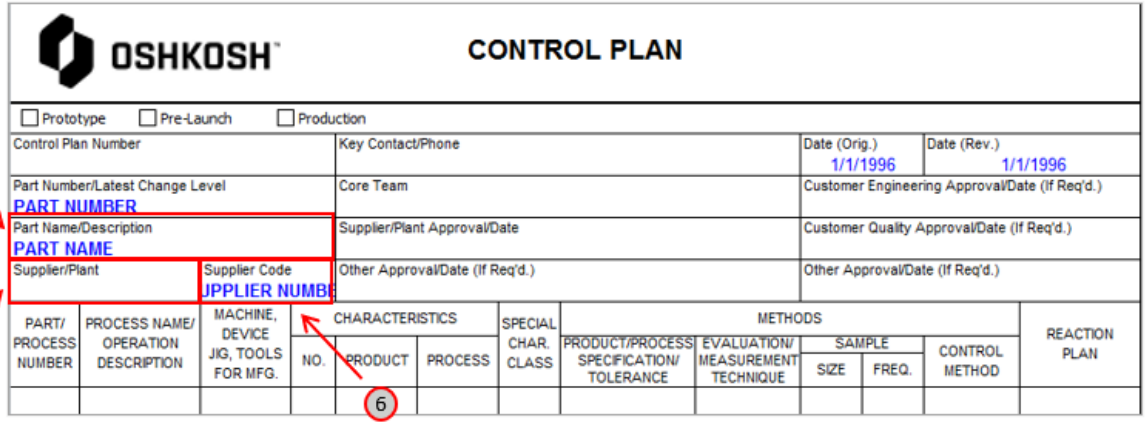
2 Control Plan Number

- Enter the control plan document number used for tracking, if applicable.
- For multiple control pages, enter page number (page ___ of ___).

3 Part Number & Latest Change Level

- Enter the number of the system, subsystem or component being controlled.
- When applicable, enter the latest engineering change level and/or issue date from the drawing specification.

STEP-BY-STEP CONTROL PLAN CREATION



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CONTROL PLAN

☐ Prototype ☐ Pre-Launch ☐ Production

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4 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: UPPLIER NUMB	Other Approval/Date (If Req'd.)	Other Approval/Date (If Req'd.)

5 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	
				6								

Control Plan Form Review

4 **Part Description**

- Enter the name and description of the product/process being controlled

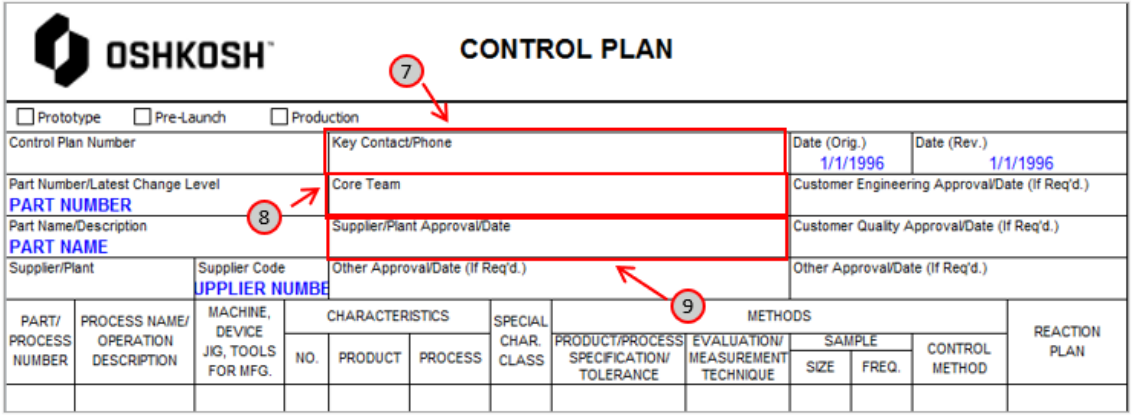
5 **Supplier/Plant**

- Enter the name of the company and the appropriate division, plant or department preparing the Quality Control Plan

6 **Supplier Code**

- Enter any specific supplier or work center identification number necessary for tracking purposes.

STEP-BY-STEP CONTROL PLAN CREATION



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CONTROL PLAN

☐ Prototype ☐ Pre-Launch ☐ Production

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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	

7 8 9

Control Plan Form Review

7 **Key Contact & Phone Number**

- Enter the name and telephone number of the primary contact responsible for the control plan

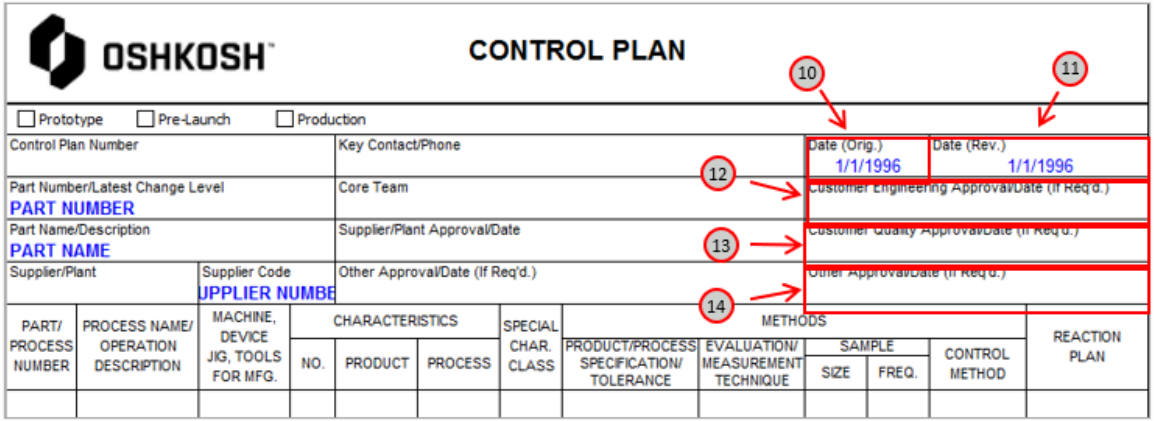
8 **Core Team**

- Enter the name(s) and telephone number(s) of the individual(s) responsible for preparing the Quality Control Plan to the latest revision
- It is recommended that all of the team members' names, phone numbers, and locations be included on an attached distribution list

9 **Supplier/Plant - Approval/Date**

- If required obtain approval

STEP-BY-STEP CONTROL PLAN CREATION



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CONTROL PLAN

10 11

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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	12 Customer Engineering Approval/Date (If Req'd.)	
Part Name/Description PART NAME	Supplier/Plant Approval/Date	13 Customer Quality Approval/Date (If Req'd.)	
Supplier/Plant	Supplier Code UPPLIER NUMBE	Other Approval/Date (If Req'd.)	14 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	

Control Plan Form Review

10 **Origination Date**
- Enter the date that the original QC Plan was created

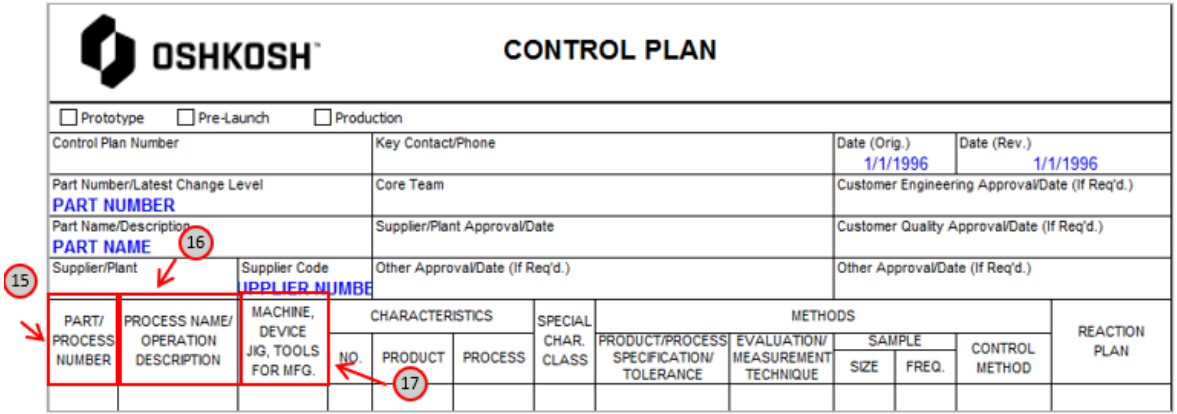
11 **Revision Date**
- Enter the date that the plan was last updated

12 **Engineering Approval Date**
- If required obtain engineering authority approval

13 **Quality Approval Date**
- If required obtain quality authority approval

14 **Other/Additional Approvals**
- If required obtain additional authority approvals

STEP-BY-STEP CONTROL PLAN CREATION



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Part Number/Latest Change Level PART NUMBER	Core Team	Customer Engineering Approval/Date (If Req'd.)	
Part Name/Description PART NAME (16)	Supplier/Plant Approval/Date	Customer Quality Approval/Date (If Req'd.)	
Supplier/Plant (15)	Supplier Code UPPLIER NUMBE	Other Approval/Date (If Req'd.)	Other Approval/Date (If Req'd.)

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(17)

Control Plan Form Review

(15) **Part / Process Number**

- The item number, usually from the engineering specification. If multiple part numbers are used, they should all be listed

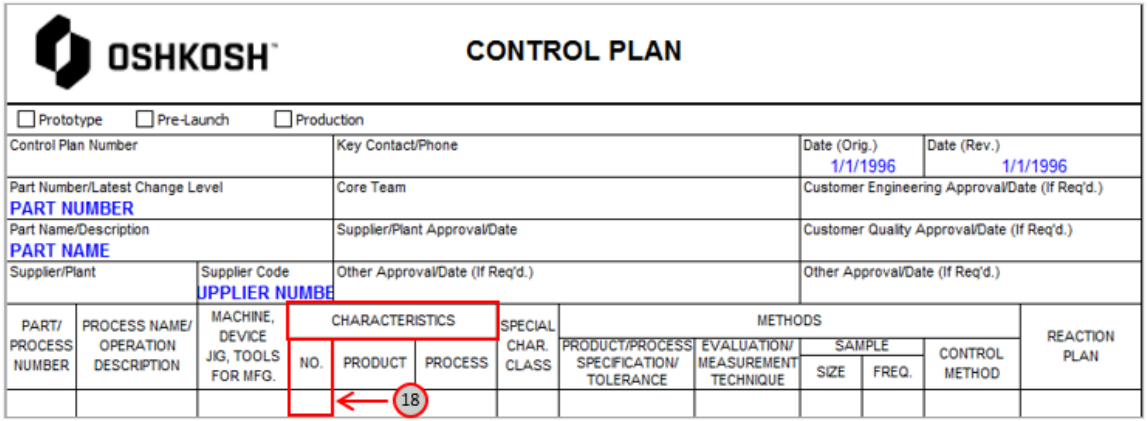
(16) **Process Name / Operation Description**

- Where possible, all of the steps in the production of the system, subsystem, or component should be described. These steps can be identified from a process flow chart or traveler or router.

(17) **Machine, Device, Tools For Manufacturing**

- For each operation that is described, identify the processing equipment, e.g., machine, device, jig, or other tools for manufacturing, as appropriate.

STEP-BY-STEP CONTROL PLAN CREATION



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				18								

Control Plan Form Review

Characteristics

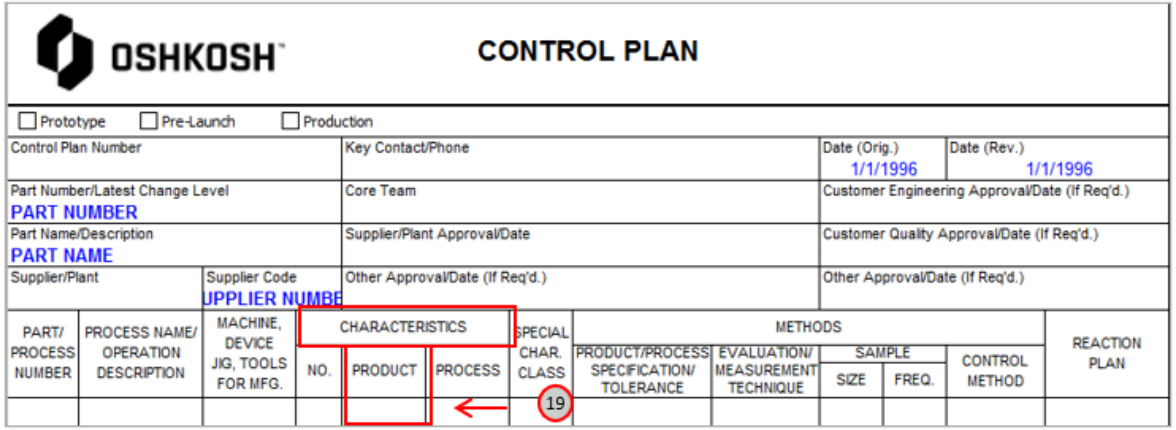
- The distinguishing feature, dimension or property of a process or product on which variable or attribute data can be collected.
- Use visual aids where applicable

18

Number

- Enter a sequential tracking number (Simple Use)
- Enter a cross reference number from other applicable documents such as a Process Flow Diagram or FMEA etc. (Advanced Use)

STEP-BY-STEP CONTROL PLAN CREATION



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PART/ PROCESS NUMBER	PROCESS NAME/ OPERATION DESCRIPTION	MACHINE, DEVICE JIG, TOOLS FOR MFG.	CHARACTERISTICS: NO.	CHARACTERISTICS: PRODUCT	CHARACTERISTICS: PROCESS	SPECIAL CHAR. CLASS	METHODS: PRODUCT/PROCESS SPECIFICATION/ TOLERANCE	METHODS: EVALUATION/ MEASUREMENT TECHNIQUE	METHODS: SAMPLE SIZE	METHODS: SAMPLE FREQ.	METHODS: CONTROL METHOD	REACTION PLAN
						19						

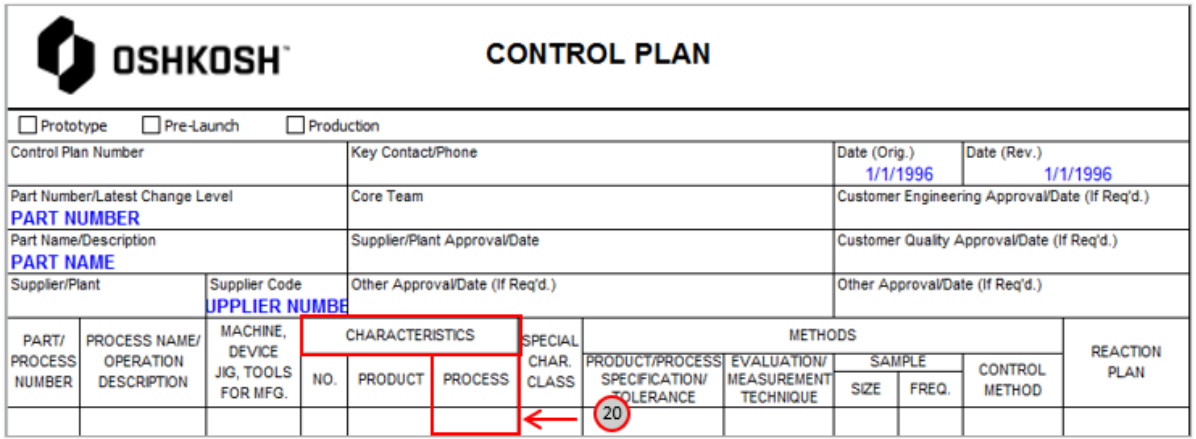
Control Plan Form Review

19 **Product**

- Features or properties of the part, component or assembly that are described on engineering drawings or other primary engineering information.
- The Quality Control Plan Team should identify the Special Product Characteristics which are a compilation of important Product Characteristics from all sources.

All Special Characteristics must be accounted for in Control Plans - they must be listed. Other product characteristics and features for which process controls are required during normal operations should also be listed. Wherever possible use visual aids for appearance related features.

STEP-BY-STEP CONTROL PLAN CREATION



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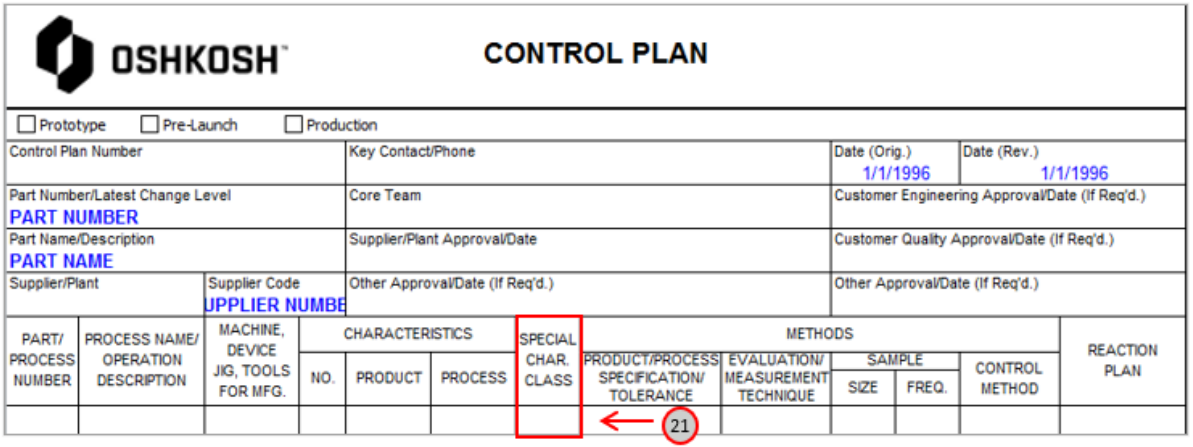
PART/ PROCESS NUMBER	PROCESS NAME/ OPERATION DESCRIPTION	MACHINE, DEVICE JIG, TOOLS FOR MFG.	CHARACTERISTICS NO.	CHARACTERISTICS PRODUCT	CHARACTERISTICS PROCESS	SPECIAL CHAR. CLASS	METHODS PRODUCT/PROCESS SPECIFICATION/ TOLERANCE	METHODS EVALUATION/ MEASUREMENT TECHNIQUE	METHODS SAMPLE SIZE	METHODS SAMPLE FREQ.	METHODS CONTROL METHOD	REACTION PLAN
							20					

Control Plan Form Review

20 **Process Characteristics**

- The process variables (input variables) that have a cause and effect relationship with the identified Product Characteristic.
- Can only be measured at the time it occurs.
- The team should identify Process Characteristics for which variation must be controlled to minimize product variation.
- There could be one or more Process Characteristics listed for each product characteristic.
- In some processes one Process Characteristic may affect several Product Characteristics.

STEP-BY-STEP CONTROL PLAN CREATION



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							← 21					

Control Plan Form Review

21 **Special Characteristic Classification**

- Where and when required apply any special characteristic designation.
- Example designations include "safety", "critical", "key", "major", etc.

STEP-BY-STEP CONTROL PLAN CREATION

OSHKOSH **CONTROL PLAN**

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					22							

23 24

METHODS

22 **Product / Process / Specification Tolerance**
- Specifications and tolerances from various engineering specifications and documents.

23 **Evaluation / Measurement Technique**
- The measurement system to be used.
- This could include gages, fixtures, tools, and/or test equipment required to measure the part, process or manufacturing equipment.

24 **Sample Size & Frequency**
- When sampling will be used, list the sample size and frequency of sampling.

Control Plan Form Review

STEP-BY-STEP CONTROL PLAN CREATION

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25

Control Method

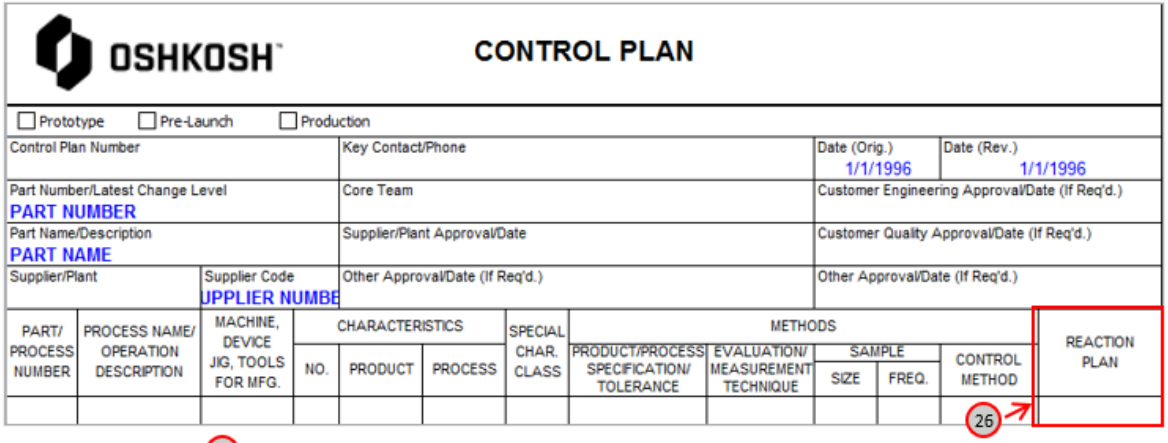
- Brief description of how the operation will be controlled
- Include procedure numbers where applicable
- The control method is determined by the type of process that exists
- The control method utilized should be based on knowledge and analysis of the process

Example control methods include:

- Inspection, Variable or Attribute Data
- Mistake-Proofing (automated/non-automated)
- Statistical Process Control
- Sampling Plans

Control Plan Form Review

STEP-BY-STEP CONTROL PLAN CREATION



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											26	

Control Plan Form Review

26 **REACTION PLAN**

- Specifies the corrective actions necessary to avoid producing nonconforming products or operating out of control
- May refer to a specific reaction plan number
- May identify the person responsible for the reaction plan
- The actions should normally be the responsibility of the people closest to the process, the operator or supervisor, and be clearly designated in the plan
- In all cases, suspect and nonconforming products must be clearly identified and quarantined, and disposition made by the responsible person designated.

APQP RESOURCES

Oshkosh Supplier Network | Oshkosh Corporation

Additional supplier training

CLICK THE LINKS BELOW FOR STEP-BY-STEP GUIDES:

Defense Counterfeit Parts Awareness and Avoidance

Enroll In Advanced Product Quality Planning (APQP)

OSHKOSH DEFENSE

YOUR MISSION. OUR HONOR

"*Distinguished Men and Women of Oshkosh:*

My son, (2/5 Marines currently deployed to Afghanistan) and all of the Marines in their vehicle recently survived an IED explosion directly underneath their MRAP. He asked me to send along his thanks for the protection afforded by your quality vehicles. As a father, I am so grateful for what you are doing and wish to thank you from the bottom of my heart. God bless you and God bless America."

- Marine Father