DS-IMS

APQP

Changed manual, 3. issue, methodology, practical application

Danijel Suhanji, 02.2025, v1.0

Content

1 Updated APQP manual – 02.2025, v1.0

2 APQP Methodology – 02.2025, v1.0

3 APQP Steps – 02.2025, v1.0

4 Chapter 1 – Program planning and definition – 02.2025, v1.0

5 Chapter 2 – Product design and development– 02.2025, v1.0

6 Chapter 3 – Process design and development – 02.2025, v1.0

7 Chapter 4 – Product and process validation – 02.2025, v1.0

8 Chapter 5 – Feedback, Assesment, Corrective action – 02.2025, v1.0

9 Gated Management– 02.2025, v1.0

10 Analitical tehniques – 02.2025, v1.0

11 Change description in tables – 02.2025, v1.0

1. Updated APQP manual

Danijel Suhanji, 02.2025, v1.0

New APQP Manual

Previously, this topic **was covered in the AIAG APQP Manual 2nd Edition**. It was presented **together with the Control Plan as part of the APQP**.

Now, AIAG has released **two new and updated manuals in March 2024.**, but still the control plan is an integral part of the APQP:

- APQP 3rd edition and
- Control Plan 1st Edition.

The changes are the result of general continuous improvement, the advancement of the technology itself in general, as well as advanced technological improvements in the automotive industry.



Sustaining Winnings

It is very important to meet the requirements of customers and users and make improvements that affect them. APQP monitors improvements and performance.

Manual content

- Chapter 1: Planning and define program;
- Chapter 2: Product design and development;
- Section 3: Process design and development;
- Section 4: Product and process validation;
- Section 5: Feedback, assessment and corrective action;
- Appendix A: Product quality planning checklist;
- Appendix B: Gated management;
- Appendix C: Analytical techniques;
- Appendix D: Team feasibility commitment;
- Appendix E: Quality planning summary and approval;
- Appendix F: Reference material;
- Appendix G: Sector specific guidance;
- Appendix H: Glossaries;
- Appendix I: Index.

Reference manuals

AIAG & VDA Failure Mode and Effects Analysis (FMEA) Handbook

Control Plan Reference Manual

Measurement Systems Analysis (MSA) Reference Manual

Production Part Approval Process (PPAP)

Statistical Process Control (SPC) Reference Manual

CQI-8 Layered Process Audit Guideline

CQI-14 Automotive Warranty Management: A Guideline for Industry Best Practices

CQI-19 Sub-Tier Supplier Management Process Guideline

CQI-28 AIAG Traceability Guideline

How will be applied

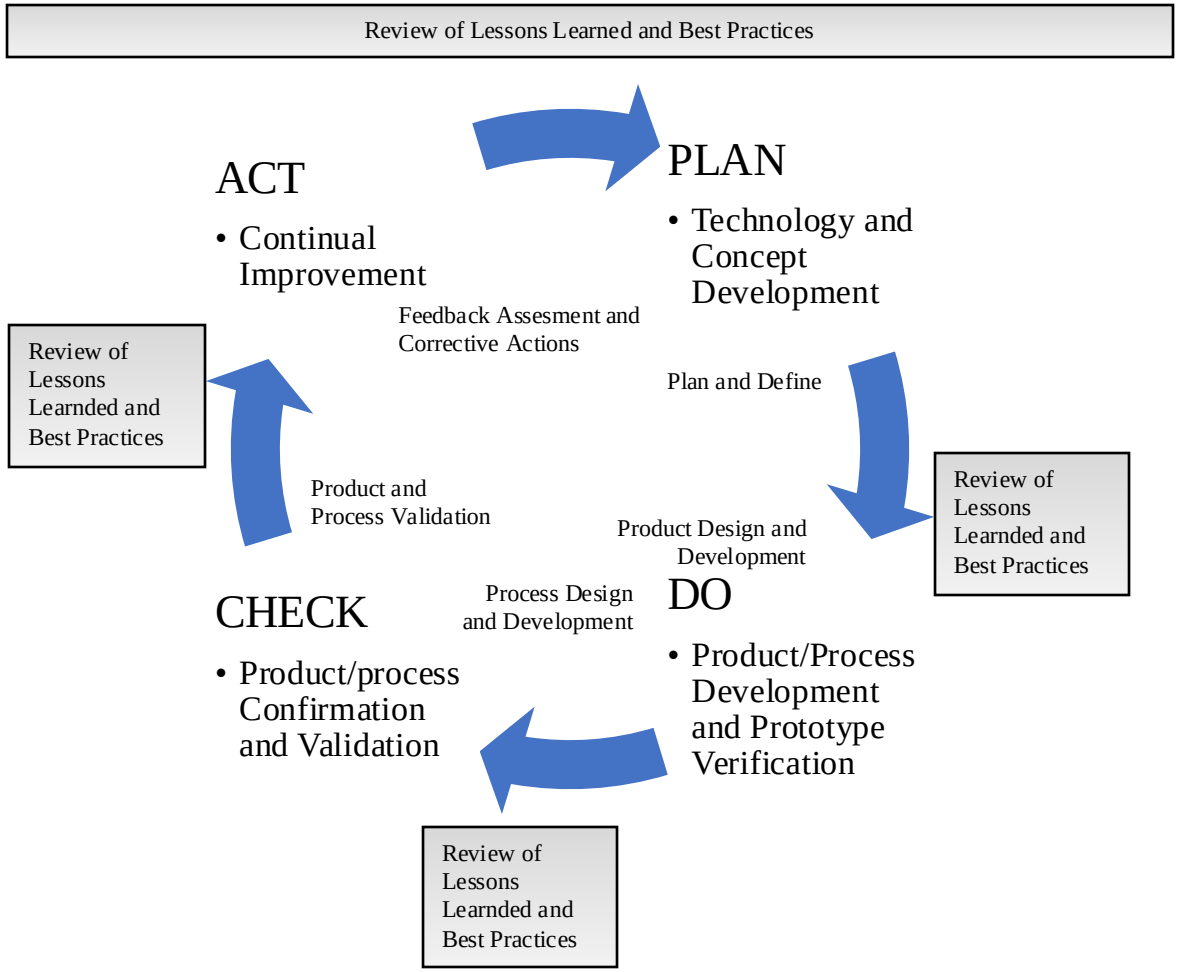
Ford, General Motors, and Stellantis have agreed that a new manual will be available after publication. The official start date is:

- Ford: 12/31/2024;
- GM: 09/01/2024;
- Stellantis: 01.09.2024.

Manual AIAG APQP 3. issue – what is new

- Emphasis on the importance of constant review and application of lessons learned and best practices;
- Removed the contents of the control plan to a standalone manual;
- Added Surcing and Sourcing Verification List, requires a high-risk supplier assessment method;
- A new assessment, planning and evaluation of capacities (contracted volume) has been added;
- Added a section for change management and a checklist for change management;
- Added a section for APQP program metrics, i.e. It is required to manage the effective completion of program tasks and phases through appropriate metrics;
- Added a section for the Risk Assessment Mitigation Plan, with the aim of analysing and addressing risks on an ongoing basis to identify opportunities for improvement and mitigation measures;
- Added clarification of traceability;
- Improved checklists for completing tasks;
- A new appendix has been added to manage the gates

Product Quality Planning Circle



SIPOC Diagram Ilustrating the „Organization“

Supplier	Input	Process	Output	Customer
Your Supplier External or Internal		You are here You are the „Organization“ You are the „APQP Process Owner“		Your Customer External or Internal

Supply Chain Depiction

Tier of the Organization	Supplier	Organization	Customer
0	Tier 1	OEM	Kupac
1	Tier 2	Tier 1	OEM
2	Tier 3	Tier 2	Tier 1
N	Tier N+1	Tier 3	Tier N-1

Detailed changes

Control Plan

One of major changes is to separate out control plan from APQP manual. Before there was one common manual for APQP and Control plan method, but now AIAG separate it out to two new manuals:

- APQP 3rd Edition;
- Control Plan 1st Edition.

Change Management

New change management section added. Manual says the change is any modification impacting the form, fit and function of the part or material during ongoing APQP phases up-to PPAP approval, must gone through this change management process.

Change management checklist added in manual Appendix A-8.

Ongoing Review

It is important to have an ongoing reviews and use of lesson learned in the program throughout phases.

New edition mentioned Gated review system with step-by-step review and verification.

Detailed changes - continued

APQP Program Metrics

New APQP Program Metrics section added in manual. Using this document project manager is responsible to used this metrics to monitor and track down all APQP activities, phase, wise, and update

It is like a dashboard or deliverables tracking system for the management and team. Also part of each gate review meeting to have an overview.

Risk Assessment Mitigation Plan

Added new section of risk assessment and mitigation plan to addressed and mitigate the risk on our ongoing project. It is done by project team manager and done as Risk Evaluation and Mitigation Strategy (REMS).

Detailed changes - continued

Traceability

Part Traceability content added and give importance to it.

Added new section of traceability into APQP 3rd edition manual. Get agreement with customer on detailed traceability topic. The purpose is to have identification and track the component or system for non-conformity/failure. Which means "How product traceability are maintain in an organization?"

Traceability includes many methods, but the common are that some organization follows unique serial or identification number, some organization follows lot traceability system.

It is also applicable for the EV industry considering the framework and suitable conditions.

Sourcing

Supply chain is the priority for good development process. Therefore, the new edition incorporate this new addition of sourcing requirement. This includes the high risk supplier evaluation method according to manual.

A detailed sourcing section along with high risk supplier evaluation checklist added in new manual.

Detailed changes - continued

Gated Management

New gated management method added into new edition. Leadership and management support is necessary for a successful product development. It is done through interest commitment and support of leadership.

Therefore, the purpose of Gated management system is to have a gate review, which is done through the leadership sign-off.

There are 6 gates identified as per APQP phases.

The gated management framework of this new APQP edition are holistic approach of leadership involvement and support at every product development planning phase.

Emphasis on Continuous Improvement

To begin, the updated APQP guidelines strongly emphasize continuous improvement. This involves ongoing reviews and a systematic appreciation of lessons learned. Leadership reviews are now integral to ensuring organizations document their continuous improvement efforts and track results effectively.

Detailed changes - continued

Capacity Assessment

Assessment Planning and Evaluation of Suppliers and Manufacturing Plant Capacity:

- Over the years, many variances and conflicts have arisen due to manufacturing not having sufficient capacity to meet OEM requirements. Conversely, there have been instances of overengineering for larger capacity than really needed during production;
- The new guidelines address this by requiring a thorough review and approval of realistic capacity for manufacturing, assembling, service, packaging, and shipping of products. This ensures alignment with actual production capabilities.

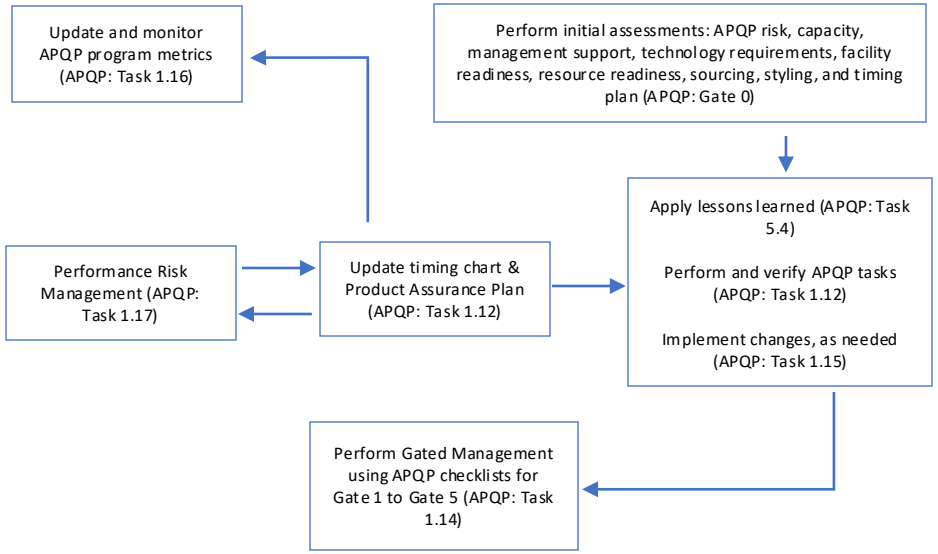
Enhanced Task Completion Review Checklist (Milestone)

Introduces an updated task completion review checklist. Traditionally, development projects have been managed primarily at the OEM or manufacturer level. However, recognizing the significance of metrics in APQP activities, the new guidelines emphasize milestone management. Clear, delegated tasks and responsibilities are essential for effective project management.

Key benefits

- **APQP's rigorous risk assessments**, FMEA design and process assessments, control plans, and manufacturing tests prevent a host of quality issues before parts are mass-produced;
- **Improved Customer Satisfaction** - Higher quality products result in higher customer satisfaction. When customers are satisfied, their relationships with manufacturers and suppliers improve;
- **Increased efficiency** - Quality problems in the development and production process hinder efficiency and time to market. APQP provides a reliable framework for early capture and resolution of these problems to reduce the need for rework;
- **Reduced costs** Quality issues, interruptions in the development and production process, rework, product returns, warranty claims, and more result in higher costs for the manufacturer. APQP drastically reduces these problems to save significant costs;
- **Improved Supplier Relationships** - Taking into account a detailed understanding of customer requirements and expectations, APQP enables suppliers to better understand their customers leading to improved customer supplier relationships and cooperation in the employment relationship;
- **APQP's risk assessment processes** enable suppliers and manufacturers to identify, resolve, and develop measures early to mitigate potential quality issues.
- **Enhanced Process Control** - The combined methodologies listed above in combination with APQP's Statistical Process Control (SPC) processes allow suppliers and manufacturers to monitor/control the production process in even more detail.

APQP as a governance framework of the product development



2. APQP Methodology

Danijel Suhanji, 02.2025, v1.0

What is APQP – definition

Advanced Product Quality Planning (APQP) is a methodology that originated in the automotive industry to ensure that the development and production of high-quality products meet customer requirements and expectations.

APQP includes a number of steps and tools to ensure that all necessary planning and preparations are done prior to mass (series) production. The goal of APQP is to prevent quality problems, improve overall customer satisfaction, and lead continuous improvement.

APQP is an essential tool for the automotive industry and is applied during the product and process development phases. Therefore, it is a systematic way of monitoring, defining and planning development steps.

These steps are present in the product and process development phase to satisfy the customer (internal and external). That is why this process records the voice of the customer (VoC) to satisfy the customer.

Why is APQP important

There are many challenges in the automotive industry

- Innovation;
- More complex products and assemblies;
- Reduced development time for new products;
- Complicated supply chain activity;
- Increase customer requirements and quality.

To overcome these challenges, the automotive industry has adopted the Advanced Product Quality Planning (APQP) process.

The APQP method is used to achieve:

- Avoiding late changes in the product and process;
- First time quality of the product;
- Low price;
- Risk reduction at an early stage.

APQP and PDCA

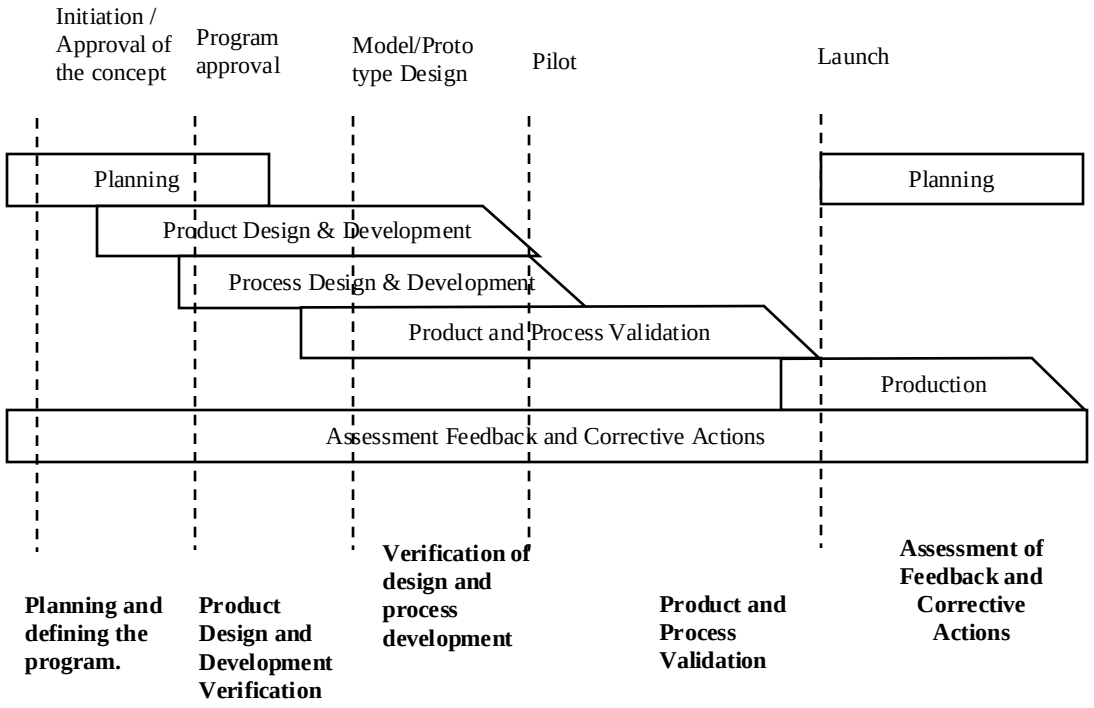
In particular, the Advance Product Quality Planning (APQP) cycle works according to the PDCA methods – Plan, Do, Check, Act. That is why the APQP process consists of five phases and four main activities.

APQP Phases

- Planning and define program;
- Product design and development;
- Process design and development;
- Product and process validation;
- (Production);
- Feedback, assesment and corrective action.

It also has a large number of auxiliary tools used, such as: DFMEA, PFMEA, CTQ, special features, control plan, SPC, etc...

APQP diagram



Inputs and outputs per phases

Output from	Activity	Input to
"Suppliers" of the APQP process	Voice of the customer ➢ Market research (including OEM timing for vehicle production, and OEM timing for quantity); ➢ Historical information about warranty and quality; ➢ Team Experience	Planning and defining the program.
	Business Plan and Marketing Strategy	
	Comparative (benchmark) product/process data	
	Product/Process Assumptions	
	Product Reliability Studies	
	Customer inputs ➢ Quality and reliability objectives; ➢ Cost targets; ➢ Other expected KPI objectives	
	Initial quality, JD powers, Consumers reports	

Inputs and outputs per phases - continued

Output from	Activity	Input for
Planning and defining the program	Design Goals	Product design and development
	Reliability and Quality Goals	
	Preliminary BOM (Bill of Materials)	
	Preliminary process flow chart	
	Preliminary identification of production and process special characteristics	
	Product Assurance Plan	
	Leadership Support	
	Capacity planning	
	Change Management Implementation	
	APQP Program Metrics	
	Risk Assesment Mitigation Plan	

Inputs and outputs per phases - continued

Output from	Activity	Input for
Product design and development	DFMEA	Process design and development
	Design for manufacturability, assembly and service	
	Design Verification	
	Design review	
	Prototype Control Plan	
	Engineering drawings (including mathematical data)	
	Engineering Specifications	
	Material Specifications	
	Changes to drawings and specifications	
	New equipment, tools and process requirements	
	Special production and process characteristics	
	Gage/Testing Equipment Requirements	
	Team Feasibility Commitment and Leadership Support	

Inputs and outputs per phases - continued

Output from	Activity	Input for
Process design and development	Packaging Standards and Specifications	Product and Process Validation
	Product/ Process Quality System Review	
	Process flow Chart	
	Plant Layout Plan	
	PFMEA	
	Control Plan – Pre-Launch	
	Process Instructions	
	MSA Plan	
	Preliminary Process Capability Study Plan	
	Leadership Support	

Inputs and outputs per phases - continued

Output from	Activity	Input for
Product and Process Validation	Significant production run	Assessment of Feedback and Corrective Actions
	MSA	
	Preliminary Process Capability Study	
	Production Part Approval	
	Product Validation Testing	
	Packaging Evaluation	
	Production Control Plan	
	Quality Planning Sign-Off and Leadership Support	

Inputs and outputs per phases - continued

Output from	Activity	Input for
Assessment of Feedback and Corrective Actions	Reduced Variation	"Customer" of the APQP process
	Improved Customer Satisfaction	
	Improved Customer Service and Delivery	
	Effective use of Lessons Learned/Best Practices	

3. APQP Steps

Danijel Suhanji, 02.2025, v1.0

Organize a team

->First step - assign a process owner to the APQP project: involve leadership representatives from multiple functions such as engineering, manufacturing, software support, material control, purchasing, quality, human resources, sales, field service, suppliers, and customers, as appropriate.

->The high-risk analysis should be completed as a minimum of the elements of Appendix A-0.

->Establish an initial APQP meeting with team leadership representatives, including selected vendors.

A-0

A-0 APQP Risk Factors Checklist

Customer or Internal Part No _____ Revision Level _____

	General Risk Criteria	Yes	No	Comment / Action Required	Person Responsible	Due Date
A. Commitment						
1	Customer product requirements understood					
2	Additional customer requirements understood and complied with					
3	Management oversight confirmed					
B. Part Criticality						
4	Safety item					
5	Historical problems					
6	Pass through potential					
C. Workload						
7	Simultaneous launches					
8	Adequate resources					
9	Bottlenecks and constraints					
D. Management						
10	Significant management changes					
11	Engaged					
12	Adequate resources					
13	Appropriate priority set					
14	KPI's set and monitored					
15	Contingency plans are adequate					
E. Leadership						
16	Knowledgeable					
17	Engaged					
18	Checklists being used and reviewed					
F. Process Owners						
19	All functions represented					
20	Knowledgeable					
21	If applicable, the organization is familiar with the requirements of special process audits (AIAG CQI's) and auditors qualifications for CQI audits					
G. Knowledge						
22	Retention and storage method adequate					
23	Transfer method adequate					
24	"Read across" adequate					
H. Performance						
25	Past launch issues/lessons learned					
26	Containment actions					
I. Certification						
27	IATF certification current					
28	Certified APQP experts on staff					
J. Sub-tier Management						
29	Evidence APQP used					
30	If applicable, the supplier is familiar with the requirements of special process audits (AIAG COI's) and auditors qualifications for COI audits					
Risk criteria by phase						
	Plan and Define					
	Checklist completed					
	Actions reviewed					
	Actions completed					
	Product Design and Development					
	Checklist completed					
	Actions reviewed					
	Actions completed					
	Process Design and Development					
	Checklist completed					
	Actions reviewed					
	Actions completed					
	Product and Process Validation					
	Checklist completed					
	Actions reviewed					
	Actions completed					
	Feedback, Assessment and Corrective Action					
	Checklist completed					
	Actions reviewed					
	Actions completed					

* Every "No" item must have approved action plan

Revision date: _____

Prepared By: _____

DS-IMS

Define the scope

Identify the needs, expectations and requirements of customers.

Leadership should appoint a project/program team manager responsible for overseeing the planning process

Minimum scope of team meetings - elements:

- Define the roles and responsibilities of each area represented;
- Identify customers - internal and external;
- Define the customer's requirements. Require detailed requirements for each customer. Strive to fully understand all requirements, clarify all ambiguous needs directly with the customer. Reference Appendix C for tools;
- Choose disciplines, individuals and/or suppliers who should be added to the team and those that are not needed;
- Understand all customer program expectations and develop a specific customer requirement statement;
- Evaluate the feasibility of the proposed design, performance requirements, and manufacturing process;
- Identify the costs, time, and constraints that need to be taken into account;
- Determine the assistance required from the customer;
- Identify the required documentation and process for maintaining or updating documents.

Team to Team

Establish lines of communication with appropriate customer teams, organizations and suppliers.

This may include regular meetings with other teams.

The amount of contact between the teams depends on the number of issues that need to be addressed.

Training

The success of APQP depends on an effective training program.

The customer may have additional specific requirements for APQP training.

Sourcing

Existing and especially new suppliers require a thorough review to ensure the sustainability of the design and the ability to consistently produce and deliver a particular product on time and in full, and the scope of procurement ends with an acceptable result of the verification process.

The activities of the APQP should be cascaded to the supplier.

A checklist in Appendix A-9 or equivalent should be used and/or there is an action plan in place to mitigate the identified risks

A-9 Sourcing checklist

A-9

Customer or Internal Part No _____ Revision Level _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Does the supplier facility capacity plan meet organization quality and delivery requirements, including service parts?					
2	Have your supply chain lead times been considered within the capacity plan?					
3	Has the supplier reviewed lessons learned from previous or similar projects?					
4	Has the supplier reviewed the DFMEA and PFMEA, if appliable?					
5	Is the supplier aligned with severities, special and pass-through characteristics listed in PFMEAs?					
6	Does the supplier have an acceptable recovery plan?					
7	Does the supplier have a process and resource plan for evaluation and management of tiered suppliers?					
8	Does the supplier have evidence of prior product experience or technical expertise relevant to new product?					
9	Can the supplier meet manpower resource commitments to ensure successful completion of program; proper skills and training to perform the necessary tasks?					
10	Can the supplier verify any special assembly techniques, test methods or containment procedures used?					
11	Has the supplier met all sourcing requirements and provides all documentation required by customer?					
	ENGINEERING FUNCTION					
12	Does the supplier currently supply to the automotive industry?					
13	Are customer and organization specification subscriptions up to date?					
14	Does the supplier have experience with this commodity? If so, list how long in Comments.					
15	Is the supplier experienced with the material grade/type as defined on drawing? (e.g., plastic, steel, rubber)					
16	Does the supplier have acceptable design capability for the specific component (s)?					
17	Are the supplier's drawing and engineering software systems compatible with customer requirements?					
18	Is the supplier capable of exchanging engineering data electronically?					
19	Does the supplier have an effective change management process with all appropriate functions represented?					
20	If timing is compressed does the supplier have the resources to manage?					
21	Are there any open concerns from the technical review, e.g., feasibility, timing?					
22	Does the supplier have a system and resources to manage all regulatory requirements, such as safety, IMDS, REACH?					
23	Does the supplier use error-proofing for special characteristics as described in section 2.11 APQP?					
24	Does the supplier have any exceptions to the requirements?					
	MANUFACTURING SYSTEMS					
25	Does the supplier site have experience manufacturing this commodity or similar product?					
26	Is the supplier's manufacturing site in the same region/country as ours?					
27	Will the supplier use existing production equipment for the program?					
28	Are specialized tooling or fixtures required for this program?					
29	Does the supplier have in-house tooling/pattern-making capability?					
30	Does the part require special handling or shipping care?					
31	Are there specified labeling requirements?					
	he supplier have a traceability process capability?					
	he supplier have a well-defined and implemented process for preventive maintenance?					
	he supplier have a process for predictive maintenance?					
34	Is usage of statistical process controls evident on the shop floor, using both variable and attribute data as applicable?					
35	Does the supplier have experience with pass-through characteristics?					
36	Does the supplier understand the pass-through characteristics from the supplier to the end customer?					
37	Does the supplier use mistake-proofing for special characteristics?					
38	Does the supplier validate detection systems (e.g., rabbit, reject master)?					
39	Does the supplier have experience in high volume production?					
40	Does the supplier have experience with the required tolerance ranges?					
41	Are the inspection areas well lit and are visual aids present?					
42	Do all work stations have work instructions and reaction plans clearly documented and accessible?					
43	Are all major concerns found during the manufacturing process review/audit resolved?					
44	Is the manufacturing facility clean and well organized?					
45	Does the manufacturing facility fulfill requirements for water services, air, floor space, storage, power outages, etc.?					
46	Does the supplier evaluate equipment efficiencies and through-put as a performance indicator, such as OEE?					
47	Are any risks due to new building construction or expansion at the site mitigated?					
48	As applicable, does the supplier meet minimum CTPAT criteria? This includes applicable foreign regulatory requirements, e.g., product certification.					
	QUALITY SYSTEM					
49	Is the supplier third-party certified? If so, list any major nonconformances in their most recent third-party surveillance audit in Comments.					
50	Does the supplier's recent Parts Per Million (PPM) performance meet the organization's PPM requirement? If available, note the previous year's average in Comments.					
51	Does the supplier track internal PPM? If so, list the average for the past year.					
52	Does the supplier's recent Parts Per Billion (PPB) performance meet the organization's PPB requirement, if applicable? If available, note the previous year's average in Comments,					
53	Does the supplier track internal PPB? If so, list the average for the past year.					
54	Does the supplier have an effective and documented corrective action process?					
55	Does the supplier have an effective and documented product and process continuous improvement process?					
	MANUFACTURING SYSTEMS					
56	Does the supplier have an effective and documented system for managina its sub- suppliers?					
57	Are predictive tools used for preventive maintenance?					
58	Does the supplier have an effective and documented gage calibration capability?					
59	Does the supplier have a documented layered process audit (LPA) process? (Reference AIAG CQI-8 Layered Process Audit Guideline)					
60	Does the supplier conduct effective layered process audits (LPA)?					
61	Does the supplier have regular management review meetings?					
62	Does the supplier have clearly defined and appropriate metrics for monitoring quality performance?					
63	Does the supplier have an effective and documented lessons learned process?					
64	Does lessons learned include launch issues?					
65	Does lessons learned include read-across?					
66	Does the supplier have an effective and documented process for managing pass-through characteristics (PTCs)?					
	COMMERCIAL					
67	Does the supplier have a well-defined program management process in place?					
68	Does the supplier have adequate management resources (e.g., engineers, qualified staff)?					
69	Does the supplier have an inventory control system that ensures adequate supply and FIFO of current product?					
70	Is the supplier's financial rating acceptable?					
71	Did or will the supplier accept the organization's quality requirements?					
72	Did or will the supplier accept the organization's P.O. terms and conditions?					
73	Did the supplier request any exceptions during team feasibility assessment?					
74	Did the supplier provide a capacity and investment plan?					

A-9 - continued

	TECHNOLOGY					
75	Does the supplier have all the necessary machinery, tooling and equipment for product realization?					
76	Does the supplier have experience manufacturing similar product with existing product and process technology?					
77	List any potential risk due to implementation of new product or process technology in Comments.					
78	Does the supplier have customer and/or organization portal capability and cyber security systems?					

*** Every "No" item must have approved action plan**

Revision date: _____

Prepared By: _____

High-Risk Supplier Assessment

There must be a method to identify "high-risk" suppliers

The minimum criteria used to define "high risk" are given in Table 0.1 – Criteria for the selection of critical suppliers, and give preference to suppliers that are not considered "high risk".

When necessity requires the use of a "high-risk" supplier:

- Hold an APQP meeting;
- Implement regular APQP meetings;
- Implement risk mitigation plans with vendors;
- Report on the supplier's "high-risk" status and risk mitigation plans during their own organizational APQP meetings with the customer.

Table 0.1 – Criteria for the selection of critical suppliers

Criteria as a minimum
➢ New supplier of the organization; ➢ New location or plant ("Greenfield" or "Brownfield"); ➢ A history of poor quality; ➢ Historical problems that have led to a "spill" of quality at the customer; ➢ Responsible for one or more cases of historical actions on the field; ➢ The supplied components have safety or regulatory requirements; ➢ Failure on components with an FMEA rated severity of 8+ (refer to the AIAG & VDA FMEA Manual); ➢ Historically poor launch performance; ➢ New technology; ➢ There is no certification according to ISO 9001 or IATF 16949.

Customers and Organizations Involvment

The primary customer can initiate the quality planning process with the organization.

The organization has an obligation to establish a multifunctional team.

The supplier must use an equivalent methodology.

In cases where a customer directs an organization to purchase from a specified supplier, it remains the responsibility of the organization to work with the supplier to complete all APQP activities related to the supplier

Simultaneous Engineering

A process in which cross-functional teams pursue a common goal with the goal of accelerating the introduction of quality products earlier

Control Plans

They provide a written summary of the descriptions of the systems used in minimizing processes and product variations:

- Prototype - A description of the dimensional measurements, material and functional tests that will occur during the construction of the prototype;
- Pre-launch - A description of the dimensional measurements, material and functional tests that will occur after the prototype and before the initial launch of production. Customers can request a safe launch or an enhanced retention period during pre-launch;
- Manufacturing Comprehensive documentation of product/process characteristics, process controls, tests, and measurement systems that will occur during mass production. The start of production must include a safe launch or Enhanced Containment Period

Concerns resolution

Concerns about product design and/or process concerns should be documented on a matrix with assigned responsibilities and timing.

Analytical techniques described in Appendix C.

Product Quality Timing Plan

It is one of the first tasks, and should list customers and internal milestones, tasks, assignments and review of gates, as well as other events where necessary.

The complexity and expectations of customers should be taken into account.

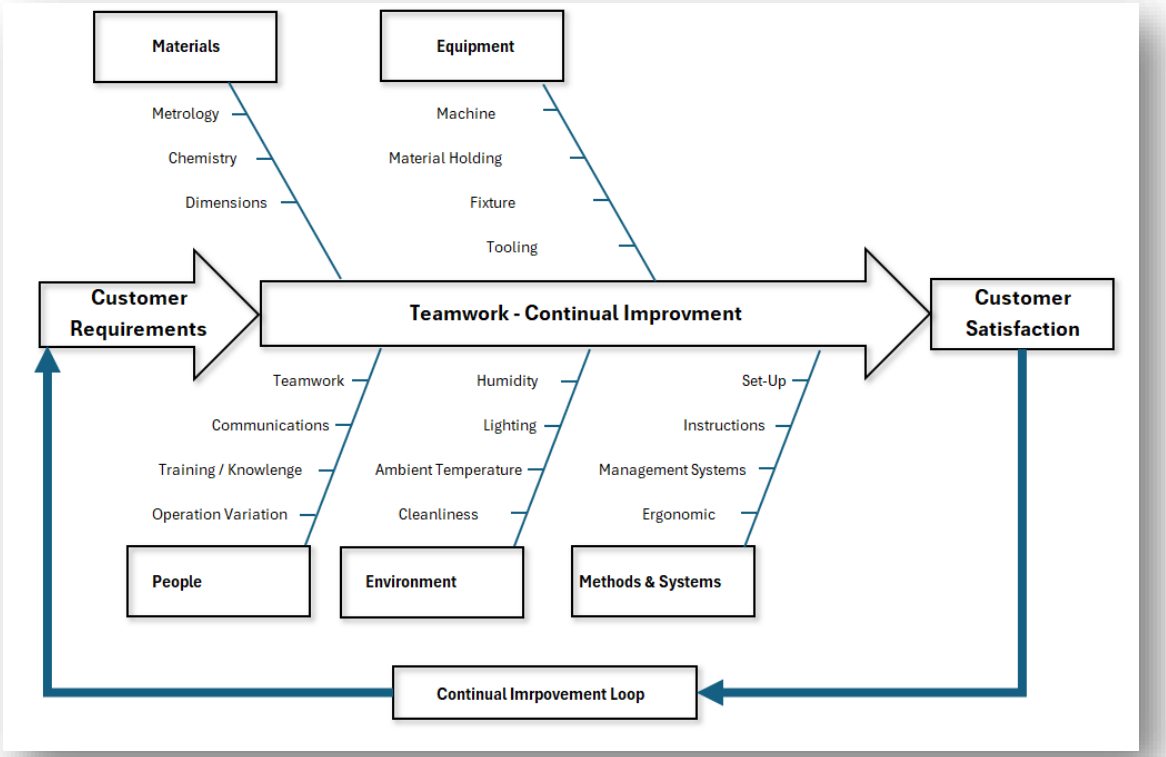
All members must agree with the timing chart.

Provides the scheduling team with a consistent format to track progress and set meeting agendas. Each event should have a "start" and "end" date with the actual point of progress recorded

Applicable analitical techniques – Cause and Effect diagram

Cause and Effect Diagram	->An analytical tool that indicates the relationship between an "effect" and all possible "causes" affecting it, organizing the types of process inputs into a cause-and-effect model, with the aim of identifying the sources of variation and the appropriate methods of control. ->Primary groups: people, materials, equipment, methods and systems, environment and customer requirements. ->See Figure C2 for an example.

Figure C2



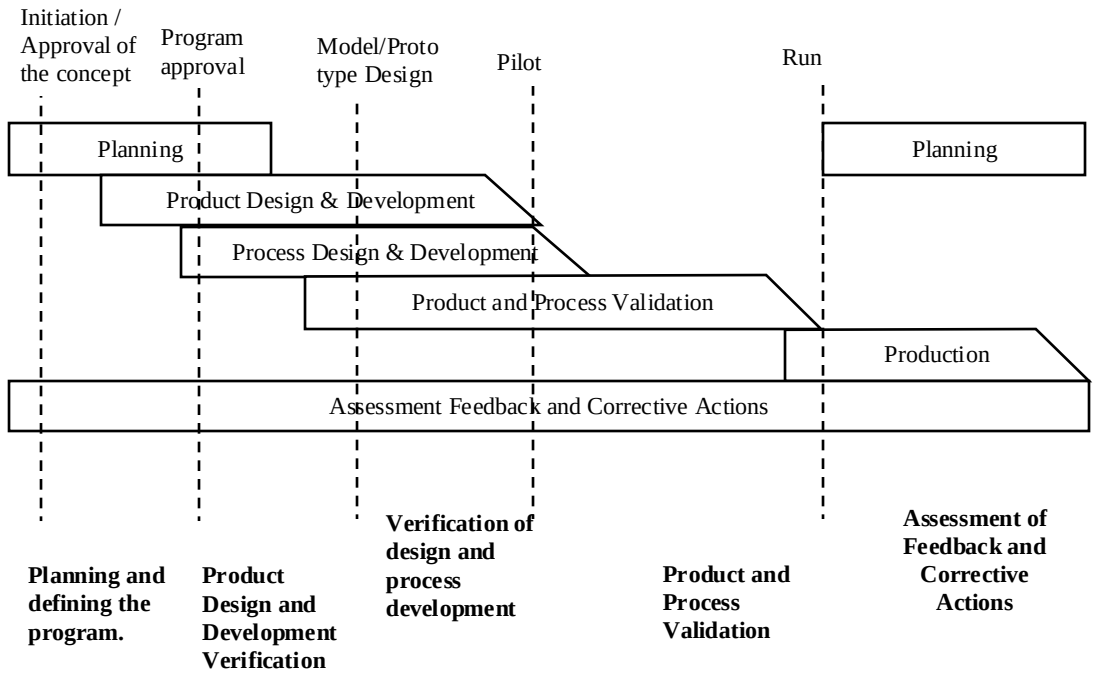
Plans Relative to Timing Chart

Along with the product quality planning cycle, it requires the planning team to concentrate on problem prevention.

Project teams must evaluate the feasibility of any change in the scope of the project and obtain customer approval for any changes.

See Figure 0.1 – Time graph.

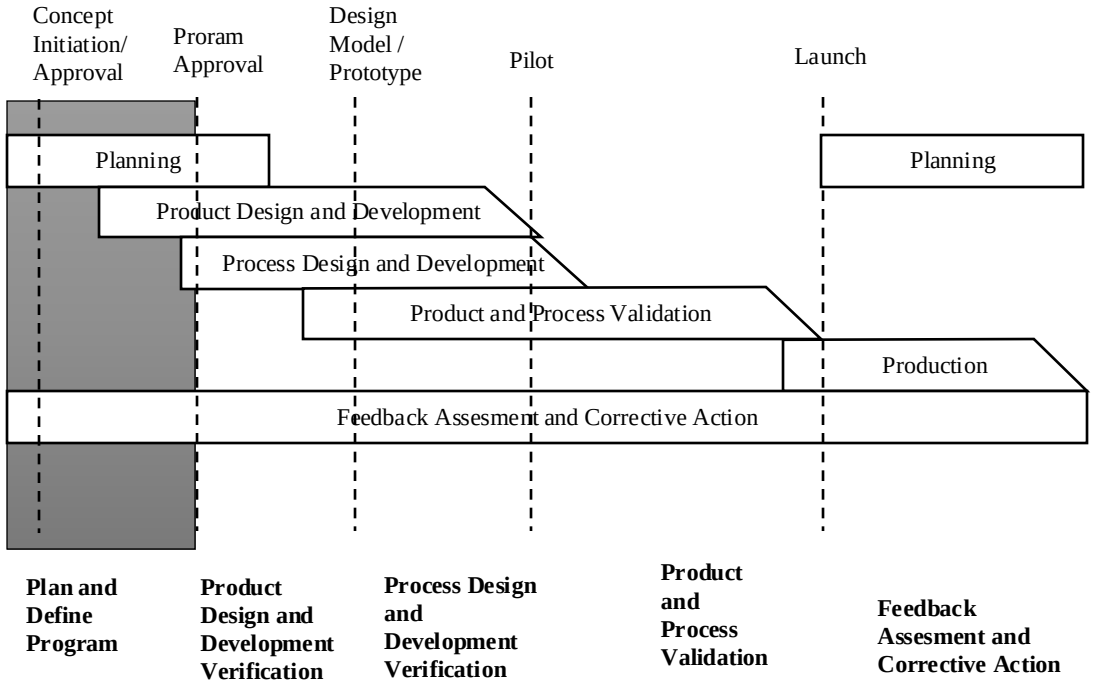
Figure 0.1 – Time graph



4. Chapter 1 – Program planning and definition

Danijel Suhanji, 02.2025, v1.0

Time graph


Concept Initiation/ Approval
Proram Approval
Design Model / Prototype
Pilot
Launch
Planning
Planning
Product Design and Development
Process Design and Development
Product and Process Validation
Production
Feedback Assesment and Corrective Action
Plan and Define Program
Product Design and Development Verification
Process Design and Development Verification
Product and Process Validation
Feedback Assesment and Corrective Action

Phase description

Describes how the needs and expectations of customers are related to the planning and definition of quality programs.

The goal of any product program is to meet the needs of customers while providing competitive value.

The initial step in the product quality planning process, which ensures that the needs and expectations of customers are clearly understood.

In cases where the customer requires the introduction of a new product or a change to an existing one, preliminary planning is the first step, long before discussing the design or redesign of the product. The purpose of the phase is to clearly define the requirements and expectations of customers regarding the product to be designed or redesigned.

This phase involves obtaining the necessary information and data to determine the customer's requirements. Once the requirements have been identified, the quality program can be defined. The result of this phase is product design, reliability and quality goals.

Inputs and outputs

Input	Output
Voice of the customer ➢ Market research (including OEM timing for vehicle production, and OEM timing for quantity); ➢ Historical information about warranties and quality; ➢ Team Experience	Design Goals
Business Plan and Marketing Strategy	Reliability and Quality Goals
Comparative (benchmark) product/process data	Preliminary BOM (Bill of Materials)
Product/Process Assumptions	Preliminary process flow chart
Product Reliability Studies	Preliminary identification of production and process special characteristics
Customer inputs ➢ Quality and reliability targets; ➢ Cost Targets; ➢ Other expected KPI objectives	Product Assurance Plan
Initial quality, JD powers, consumers reports	Capacity planning
	Leadership Support
	Change Management Implementation
	APQP Program Metrics
	Risk Assesment Mitigation Plan

Inputs to the planning and definition of the program phase

Voice of the customer ➢ Market research (including OEM timing for vehicle production, and OEM timing for quantity); ➢ Historical information about warranties and quality; ➢ Team Experience	->Complaints, recommendations, data and information obtained from internal and/or external customers. **Market research** -> Obtaining market research data and information reflecting the Voice of the Customer through: Interviews with customers; Customer questionnaires and surveys; Reports on testing and market positioning; New studies of product quality and reliability; Competitive product quality studies; Best practices; Lessons learned; Third-party data (such as JD Powers)... **Historical information** ->A list of historical concerns (internal and external) and wishes must be prepared to assess the potential for reocurrence during the design, manufacture, installation, and use of the product. See Table 1.1 - Sharing Information **Team Experience** Use the source of information from Table 1.2 – Team Experience

Tables 1.1 i 1.2

1.1 – information to share

Must communicate valid information to lower levels	Should communicate valid information to lower levels
➢ Best practices; ➢ Lessons learned; ➢ Warranty reports of the previous model or similar products; ➢ Capability indicators; ➢ Problem resolution reports; ➢ Customer plant returns and rejections; ➢ Key DFMEA/PFMEA failure modes; ➢ Other.	➢ Organizational internal reports on the quality; ➢ Analysis of returned products from the field; ➢ Social Media Sources.

1.2 – Team expirience

Source of information as appropriate
➢ Input from a higher-level system or past Quality Function Implementation (QFD) projects;
➢ Media commentary and analysis, such as magazines and newspaper reports;
➢ Letters and suggestions from customers;
➢ Best practices;
➢ Benchmarking;
➢ Lessons learned;
➢ Dealer comments;
➢ Comments from the fleet operator;
➢ Reports on behavior in the field;
➢ Internal evaluations using surrogate buyers;
➢ Track Test/Driving Test, Ride and Drive;
➢ Comments or direction of management;
➢ Problems and questions reported by internal customers;
➢ Government Requirements and Regulations;
➢ Overview of contracts;
➢ Design overview.

Inputs to the planning and definition of the program phase - cont

Business Plan and Marketing Strategy	->Setting the framework for the product quality plan. A business plan can set limits ->A marketing strategy defines the target customer, key selling points, and key competitors.
Comparative (benchmark) product/process data	Contributing to the establishment of product/process performance objectives through: ➢ Identification of appropriate criteria; ➢ Understanding the reason for the difference between the current status and the benchmark; ➢ Developing a plan to close the gap, achieve the benchmark, or exceed the Bernchmark;
Product/Process Assumptions	Assumptions that a product has certain characteristics, designs, or process concepts
Product Reliability Studies	The frequency of repair or replacement of components over certain periods of time and the results of long-term reliability/durability tests are considered

Applicable analitical techniques - Benchmarking

Benchmarking	->A systematic approach to identifying standards for comparison, and provides input for establishing measurable performance targets, as well as product design and process design ideas. ->It should include the identification of world-class or best-in-class based on customer performance measures and internal goals and research on how this performance was achieved. ->It provides a springboard for the development of new designs and processes.

Inputs to the planning and definition of the program phase– con.

Customer's inputs ➢ Quality and reliability targets; ➢ Cost targets; ➢ Other expected KPI objectives	They can provide valuable information relating to their needs and expectations, and should be used by the customer and/or organisation to develop agreed customer satisfaction measures
Initial quality, JD powers, consumers reports	Use of available relevant and credible sources and reports.

Outputs from the planning and definition of the program phase

Design Goals	Translating the Voice of the Customer into measurable design goals.
Reliability and Quality Goals	They are established on the basis of customer needs and expectations, program goals and reliability criteria.
Preliminary BOM (Bill of Materials)	It is established based on product/process assumptions and includes a list of potential suppliers. It is essential to have the right design and manufacturing process in place
Preliminary Process Flow Charts	Describe the manufacturing process using a process flow chart developed from a preliminary bill of materials and product/process assumptions

Outputs from the planning and definition of the program phase - continued

Preliminary identification of production and process special characteristics	The customer identifies the special characteristics of the product and process in addition to those selected by the organization through knowledge of the products and processes: ➢ Product assumptions based on an analysis of customer needs and expectations; ➢ Identification of reliability goals and requirements; ➢ Identification of special process characteristics from the expected production process; ➢ FMEA does a similar job.

Outputs from the planning and definition of the program phase - continued

Product Assurance Plan	->Translates design goals into design requirements and is based on the needs and expectations of customers. ->Can be developed in any format that the organization understands and should include: ➢ Review of program requirements; ➢ Identification of reliability, durability and allocation/assignment of objectives and/or requirements; ➢ An assessment of new technology, complexity, materials, applications, environment, packaging, services and production requirements, or any other factor that may jeopardize the program; ➢ Use of Failure Modes and Analysis of Effects (FMEA); ➢ Preparing preliminary engineering requirements.

Outputs from the planning and definition of the program phase - continued

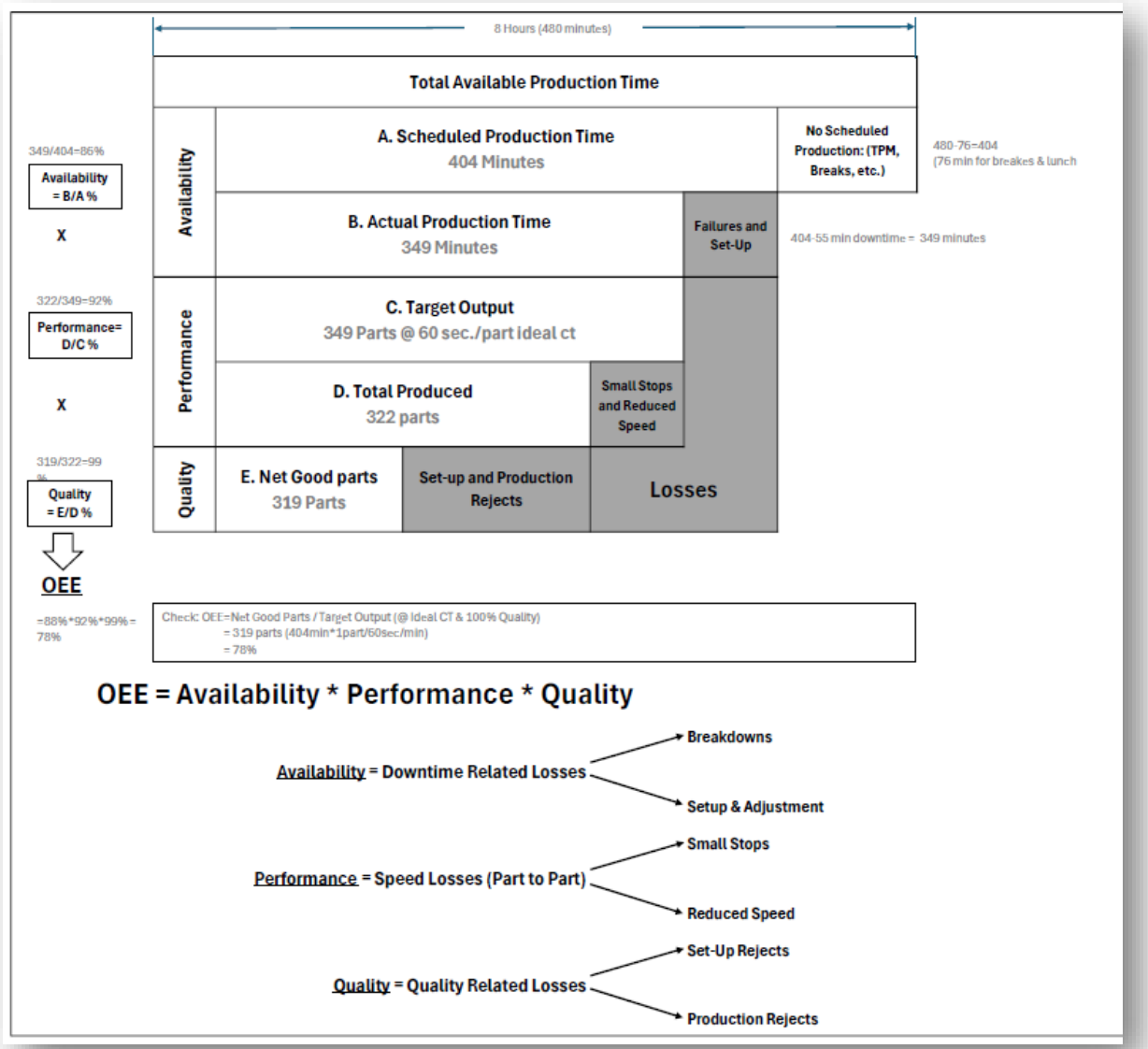
Capacity planning	➢ Surrogate/Historical Overall Equipment Effectiveness (OEE) review; ➢ Scope of program/timing (consider all other customers if they share equipment), including service or spare quantities; ➢ Making a Prototype considering the equipment and load of the plant; ➢ Bottle Neck Consider and alleviate Bottle neck opeations; ➢ A production support plan (ramp up) has been developed; ➢ The organization's capacity planning must include downtime related to the completion of the required tools, equipment and maintenance of the plant; ➢ Demonstrating the ability to meet customer contractual requirements throughout the program lifecycle through system capacity analysis and actual Run at Rate production to verify the accuracy of the analysis. Confirm in writing that all tiers supplying parts or services meet all quality and contractual requirements.

Applicable analitical techniques - OEE

OEE (Overall Equipment Effectiveness)	A measure of how well a manufacturing operation is used compared to its full potential, during the period when it is planned to operate. Advantages of OEE measurement: ➢ Improving the efficiency of equipment; ➢ Involvement/empowerment of plant employees; ➢ Reducing equipment downtime and maintenance costs; ➢ Improved maintenance cycle management; ➢ Increased productivity by identifying bottlenecks; ➢ Increased quality rate, reduced waste. Without historical data, OEE would be difficult to determine precisely. See Figure C5 for an example

Applicable analitical techniques – OEE continued

Figure C5



Outputs from the planning and definition of the program phase - Continued

Leadership Support	->Leadership participation in product quality planning meetings is vital to ensuring the success of the program. ->Leadership should perform a gate review at the end of each phase of product quality planning to strengthen its commitment and support. >The primary goal of advanced product quality planning is to maintain management support by demonstrating that all requirements have been met.
Change Management Implementation	->Changes during the APQP phases until the approval of the PPAP ->Institutional knowledge (i.e. Best practices, lessons learned) must be preserved, shared, and used for the benefit of existing and future products. Each APQP output document must have a change log, including at a minimum, the reason for the change, the applicant, approved by and the date. ->For further information, see Table 1.2 – Managing Changes. ->See the checklist for change management in Appendix A-8.

A-8

A-8 Change Management Checklist

Customer or Internal Part No _____ Revision Level _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Do you have a change management process?					
2	Do you have a written procedure for your change management process and does it include your sub-tiers?					
3	Do you have resources to manage the change management process?					
4	Do you have evidence that you received the required customer approval before implementing changes?					
5	Has the change been communicated and approved by all affected departments?					
6	Has the affected supplier been notified of changes?					
7	Have bank builds been considered?					
8	Have the quality documents been updated? (e.g., DFMEA, PFMEA, Control Plan, and Standardized Work).					
9	Is a reasonable sample size used for Production Trial Run (PTR), based on risk?					
10	Has consideration been given for the change in other areas (read-across)?					
11	Do you post quality alerts if applicable to the change?					
12	Do you have evidence of a part trial performed?					
13	Is your change management process the same for internal and external request?					
14	Are the parts contained/stored, and clearly identified prior to and after the PTR build?					
15	Are there change management meetings before and after the change?					

* Every "No" item must have approved action plan

Revision date: _____

Prepared By: _____

Table 1.2 – Managing changes

Definition of change	➢ Form: the shape, size, dimensions, mass, composition, and/or other physical attributes that uniquely characterize parts. ➢ Fit: The ability of an item to physically connect or interconnect or become an integral part of another item or assembly. Defines the relationship between part(s), assembly, packaging, and manufacturability (including fixtures, gauges, and containers); ➢ Function: Expected performance in relation to requirements, both intended and/or documented. Function is the reason for the existence of work.
Guiding principles	➢ APQP outputs form the basis for the approval of PPAPs, and are the basic and default standards for dimensional, material, process controls, and performance characteristics that meet the requirements for product form, fit, and function. ➢ Any change to the APQP output used for planning, verification or validation by the customer, organization or direct supplier must be communicated to all interested parties in a timely manner. Approvals must be documented; ➢ "Change in APQP output" is any change that occurs after the output has been reviewed and approved by the customer. The organization must communicate the change as soon as possible and follow the customer's process for re-approval of APQP output.
Additional requirements	➢ Certain special key features cannot be changed or eliminated by the organization without the approval of the customer; ➢ Error-proofing in design and processes must be documented, or traceable in the case of electronic records, in the appropriate APQP and PPAP records. ➢ When PPAP approval is achieved, follow the requirements in PPAP Section 3 - Requirements for Notification and Delivery to the Customer.

Applicable analitical techniques – Mistake proofing / Error proofing

Mistake-Proofing/Error-Proofing	->Mistake-proofing is a technique for identifying errors after they occur - controlling repetitive tasks or actions and preventing nonconformities from being passed on to the next operation and ultimately the customer. ➢ It tends to focus on detecting the presence of nonconformities and stopping further production or securing all non-conforming and suspicious parts ->Error-proofing is a technique used to identify potential defects in a process and design them within a product or process, or to eliminate the possibility that an error could produce nonconformities ➢ Ensures that they are retained in the process or prevented from being delivered to customers ->If devices are used to provide the necessary controls, these devices must be specified in the control plan, and a method for periodically verifying the effectiveness of the device in preventing or detecting failure modes or effects must be included in the control plan. ->The effectiveness of these methodologies and practices should be periodically verified using layered process audits (LPAs), SPC data analysis, or other methods agreed between the customer and the organization. ->See diagram C4 for an example

Applicable analitical techniques – Mistake proofing / Error proofing - continued

Figure C4

- Error-Proofing
  - Product design
    - Remove the possibility of error by designing out the potential cause during product development
  - Process design
    - Remove the possibility of error by designing out the potential cause during process development
  - Prevention
    - Designing the part or process so only the correct result can be performed
      - Unique connectors, guide pins, etc.
- Mistake-Proofing
  - Control
    - Designing the workspace to "Do It Right The First Time" (DIRTFT)
      - Lighting
      - Visual controls
      - Checklists and data entry verification
      - Hand-off protocol
      - Goals, KPIs, shift stand-up meetings, etc.
      - Layered Process Audits (LPA)
  - Detection
    - Notification of a nonconformance for immediate corrective action
      - Automated checking devices
      - Alarms and line stoppage
    - Outgoing QA checks
  - Correction
    - Incoming QA checks at the next operation
    - Off line rework

Outputs from the planning and definition of the program phase - Continued

APQP Program Metrics	->A review document, managed and completed by the project team manager, includes all critical elements of the quality program and quantifies the readiness of each element in relation to the program phase. ->The goal is to summarize the status of the program for presentation to the management at the gate review, they should always reflect the actual state of the program. ->All elements of the program contained in the metrics, including any special or unique features of the program, must be contained in the metrics.
Risk Assesment Mitigation Plan	->The goal is to reduce or eliminate the impact of risk on the program through Risk Evaluation and Mitigation Strategies (REMS). >REMS: A mitigation plan that includes, but is not limited to, prioritization, a communication plan, elements that ensure safe use, and implementation to assist users. ->REMS may include: avoidance, reduction or control, transmission, acceptance, and monitoring and monitoring. ->The project manager is responsible for overseeing this activity.

Confidential & Proprietary © 2023
Cooper Standard Holdings Inc. and affiliates. All rights reserved.

Applicable analitical techniques

APQP Program Metrics	->A review document managed and completed by the project team manager. ->Includes all critical elements of the quality program and quantifies the readiness of each element in relation to the program phase with the aim of summarizing the status of the program for presentation to management at the gate review. ->It should reflect the reality of the program. ->Include any special or unique characteristics of the program. ->See Figure C1 for an example.

Figure C1

	Project Leadership					Project Management Team									Last Review Date	6/22/xxxx
Responsible / Deliverables	Excecutive	Purchacing	Finance	Role #R4	Role #R5	Project Manager	IT Manager	Production Manager	Quality Manager	HR / Recruitment	Design / Styling	Engineering Manager	Engineering Manager	Material Manager	Status	
Initiate Planning	X														Number of Tasks	xx
Evaluate Risks			X												Number of Completed	xx
Get Approved Resources		X													%	
Obtain Equipment Approval			X													
Determine Program Requirements						X			X							Completed
Create Program Schedule (Timing)						X										In process
Determine Lead Time for Parts								X								Not started or missed target
Determine Equipment Timing and Inspection														X		
Testing and Verification							X							X		
Training for all Departments										X						
Target Date / Tasks	1/15/xx	2/8/xx	2/15/xx	3/5/xx	3/20/xx	4/5/xx	4/20/xx	4/5/xx	4/20/xx	5/5/xx	5/20/xx	6/5/xx	6/20/xx	6/5/xx	Responsible Owner	Action Plan
Assess Security Risks - Software		X													J. Smith	
Submit request for New Org. Template				X											D. Jones	
Review CSR and SOR for Complience	X														T. Samual	
Submit PO for xxx Tester			X												S. Test	
Create Orientation Packet for New Hires				X											A. Zeal	

Applicable analitical techniques – Risk Assessment Mitigation Plan

Risk Assessment Mitigation Plan	It is necessary to create it with the aim of managing risks and related activities. See Figure C7 for an example

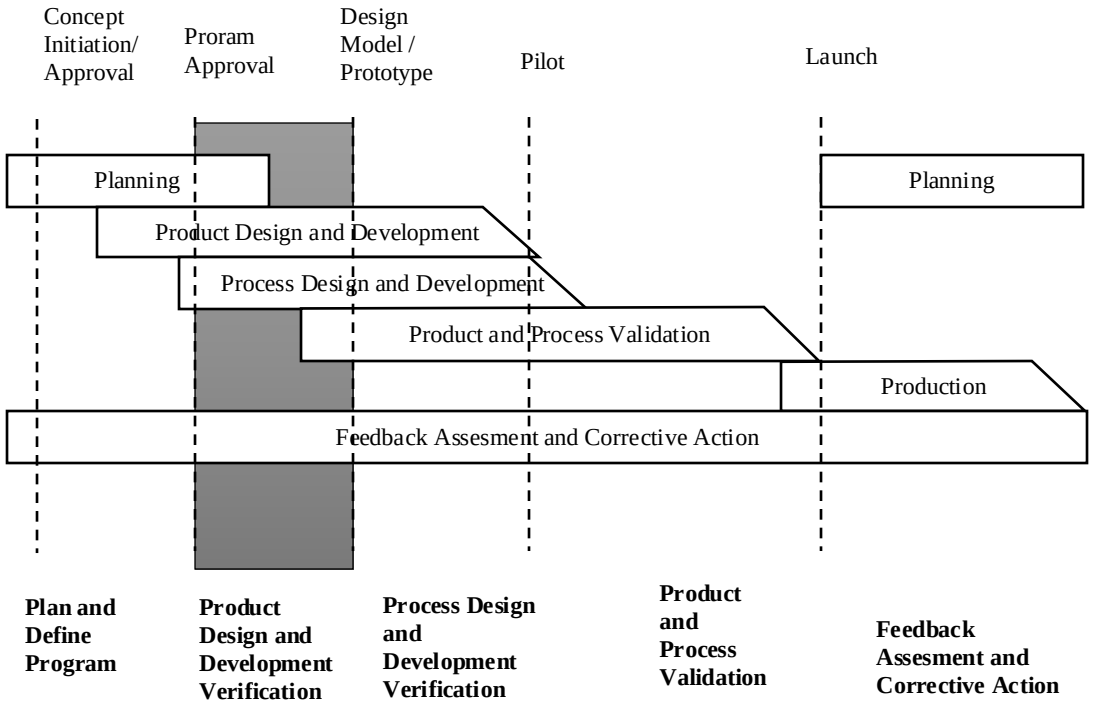
Figure C7

HAZARD	RISK	RISK RATING	RISK CONTROL / PLAN	IMPLEMENT / MONITOR	RESPONSIBILITY	RISK RATING AFTER CONTROL	RATING GUIDE
Supplier not Ready	High	8	Develop supplier	Weekly review meetings	Purchasing	4	HIGH 7 TO 10
Design Behind Schedule	Medium	5	Add design resource	Daily review status with design	Program Management	2	MEDIUM 4 TO 7
Plant Equipment Late	High	9	Daily status meetings with equipment supplier	Daily reports to senior management	Plant Management	5	LOW 1 TO 4

5. Chapter 2 – Product design and development

Danijel Suhanji, 02.2025, v1.0

Time graph


Concept Initiation/ Approval
Proram Approval
Design Model / Prototype
Pilot
Launch
Planning
Planning
Product Design and Development
Process Design and Development
Product and Process Validation
Production
Feedback Assesment and Corrective Action
Plan and Define Program
Product Design and Development Verification
Process Design and Development Verification
Product and Process Validation
Feedback Assesment and Corrective Action

Phase description

It describes the elements of the planning process during which design features and features are developed in almost final form.

All design factors are considered by the organization in the process of advanced product quality planning, even if the design is customer-owned or shared.

A preliminary feasibility analysis will be conducted to assess potential problems that may arise during production.

Inputs and outputs

Input	Output
Design Goals	DFMEA
Reliability and Quality Goals	Design for manufacturability, assembly and service
Preliminary BOM (Bill of Materials)	Design Verification
Preliminary Process Flow Chart	Design review
Preliminary identification of production and process special characteristics	Prototype Control Plan
Product Assurance Plan	Engineering drawings (including mathematical data)
Capacity planning	Engineering Specifications
Leadership Support	Material Specifications
Change Management Implementation	Changes to drawings and specifications
APQP Program Metrics	New equipment, tools and process features
Risk Assesment Mitigation Plan	Special production and process characteristics
	Gage/Testing Equipment Requirements
	Team Feasibility Commitment and Leadership Support

Outputs from the Product Design and Development phase

DFMEA	->A disciplined analytical technique that evaluates the probability of failure, as well as the effect of such failure, a living document, may include pre-selected product and process characteristics. ->AIAG & VDA FMEA Manual provides guidance for the preparation of DFMEA ->The FMEA design checklist in Appendix A-1 should be reviewed.
Design for manufacturability, assembly and service	->A simultaneous engineering process designed to optimize the relationship between design function, manufacturability, ease of assembly, and serviceability. ->As a minimum, it is necessary to take into account the data from Table 2.1 – Minimum design activities for production, assembly and development and expand it on the basis of knowledge and experience.
Design Verification	It confirms that the product design meets the requirements of customers.

2.1 - Minimum design activities for production, assembly and development

Activities
➢ Design, concept, function and sensitivity to production variations;
➢ Manufacturing and/or assembly process;
➢ Dimensional tolerances and material specifications;
➢ Performance requirements;
➢ Number of components;
➢ Adaptation of the process;
➢ Material handling;
➢ Serviceability (maintenance, repair or replacement in the field);
➢ Traceability of work.

A-1

A-1 Design FMEA Checklist

Customer or Internal Part No _____ Revision Level _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Was the DFMEA prepared using the current requirements from your customer?					
2	Have historical campaign and warranty data been reviewed?					
3	Have best practices and lessons learned from similar part DFMEAs been considered?					
4	Have corporate databases been used in the best practice, lessons learned reviews and read across all applicable locations?					
5	Does the DFMEA identify all special and critical characteristics Including fallure modes?					
6	Have pass-through characteristics (glossary) been identified and reviewed with affected suppliers for FMEA alignment and appropriate controls in the supply base?					
7	Have special characteristics designated by the customer or organization been reviewed with					
8	Have design characteristics that affect high risk priority fallure modes been identified?					
9	Have appropriate corrective actions been assigned to high risk priority numbers?					
10	Have appropriate corrective actions been assigned to high severity numbers?					
11	Have appropriate corrective actions been reviewed with cross-functional teams?					
12	Have risk priorities been revised when corrective actions have been completed and verifled?					
13	Have FMEAs been reviewed and approved, if required by customer engineering?					

* Every "No" item must have approved action plan

Revision date: _____

Prepared By: _____

Applicable analitical techniques – DVP&R

Design Verification Plan and Report (DVP&R)	A method for planning and documenting testing activities through each stage of product/process development from inception to ongoing refinement. ➢ Facilitates the development of a logical test sequence by requiring responsible areas to thoroughly plan the tests needed to ensure that a component or system meets all engineering requirements; ➢ Ensures the reliability of the product meets the goals of customers; ➢ Highlights situations where the customer's time requires an accelerated testing plan; ➢ It serves as a working tool for responsible areas through: ○ Summarize functional requirements, durability requirements, and requirements for testing reliability and results in a single document for ease of reference; ○ Providing the ability to easily prepare test status and progress reports for design review.

Applicable analitical techniques - DoE

Design of Experiments (DOE)	A test or series of tests in which potential influencing process variables are systematically changed according to a prescribed design matrix. ➢ Identify influencing variables among those who have been tested; ➢ Quantify effects in the range represented by the levels of variables; ➢ Gain a better understanding of the nature of the causal system at work in the process; ➢ Compare effects and interactions. Application can result: ➢ Improved contribution to the process; ➢ Reduced variability around the nominal or target value; ➢ Reduction of development time; ➢ Reduction of total costs.

Applicable analitical techniques – Design for manufacture and assembly

Design for manufacturability and assembly	->A simultaneous engineering process designed to optimize the relationship between design function, manufacturability, and ease of assembly. ->Plant representatives should be consulted early in the design process to review components or systems and provide input on specific assembly and manufacturing requirements.

Applicable analitical techniques – Design for service

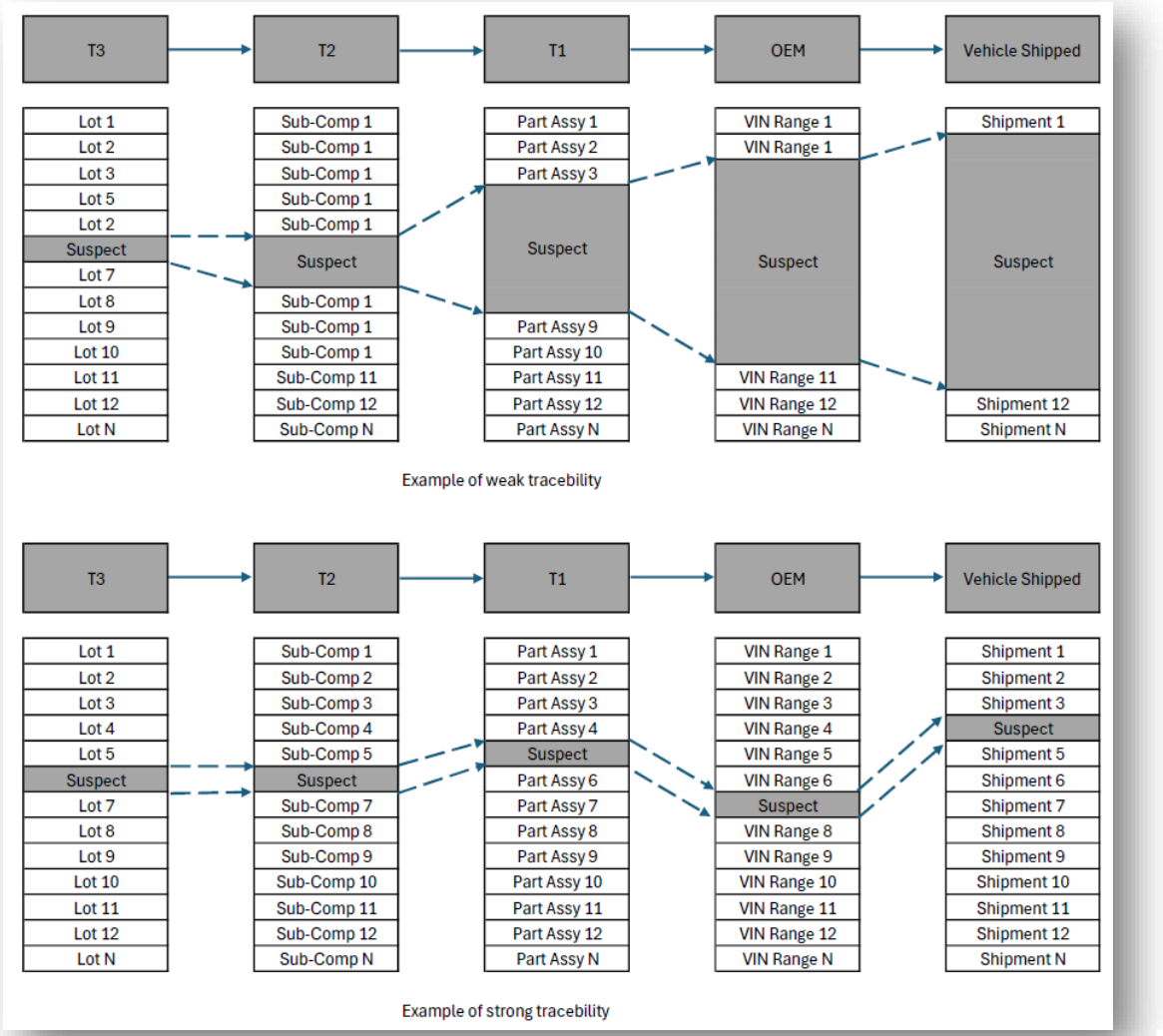
Design for serviceability	->A simultaneous engineering process designed to optimize the relationship between design function, ease of assembly, and ease of repair. ->Service engineering representatives should be consulted early in the design concept to review components, assemblies, and subsystems to provide information on specific service strategies, design criteria, requirements, and best practices.

Applicable analitical techniques - Tracebility

Traceability	Provides prompt and accurate data to limit the extent of potential problems, typically by enabling the retention of a suspicious and nonconforming product or the accurate identification of a suspected product that has evaded containment: ➢ The parts will have one-to-one VIN traceability; ➢ If this is not feasible, alternative methods such as multiple traceability in the VIN range can be used. ➢ The following should be considered: • Obtaining an agreement with your customer on which parts require traceability and type (see above); • Obtaining agreement with its customer on methods for identifying individual parts; • Obtaining consent from your customer about how the identifier for a particular part or group of parts will be read, associated with their product, and stored for future reference; • Include traceability considerations in FMEA products and processes; • Think about the persistence of identifiers throughout the supply chain and in the field; • Robust systems for FIFO and "mixed parts prevention"; • Refer to AIAG CQI-28, customer may have specific requirements for certain parts. See Figure C8 for an example of weak and strong traceability systems.

Applicable analitical techniques – Tracebility - continued

Figure C8



Outputs from the Product Design and Development phase – con.

Design review	->Regularly scheduled design verification progress monitoring meetings, with a series of verification activities that should include the assessment given in Table 2.2 Design Review, through the Design Verification Plan and Report (DVP&R). ->The team should consider and use Appendix C.
Prototype Control Plan	->Description of dimensional measurements and material and functional tests that will occur during the construction of the prototype. ->View AIAG Control Plan Manual for details
Engineering drawings (including mathematical data)	->Engineering drawings may contain special (characteristics that must be shown on the control plan. ->They should be reviewed to determine whether there is sufficient information for the dimensional arrangement of individual parts, and control or reference surfaces/locators must be clearly identified and dimensions must be evaluated. ->The team should ensure that the mathematical data is compatible with the customer's system.

2.2 – Design review

As a minimum, the design review should include:
➢ Considerations of Design/Functional Requirements;
➢ Formal goals of reliability and confidence;
➢ Duty cycles for a Component/Subsystem/System;
➢ Virtual simulation and bench test results;
➢ DFMEA(s);
➢ Design review for manufacturability, assembly, and service efforts;
➢ Experimental Design (DOE) and Circuit Variation Results (see Appendix C);
➢ Test to failure (special features);
➢ Progress of design verification.

Outputs from the Product Design and Development phase – con.

Engineering Specifications	The organization should determine what characteristics affect the fulfilment of functional, durability and appearance requirements.
Material Specifications	->Material specifications should be reviewed for special characteristics related to physical properties, performance, environment, handling and storage requirements and included in the Control Plan. ->Material specification should be documented in the design record
Changes to drawings and specifications	The team must ensure that changes are formally documented and immediately communicated to all parties involved in the organization, suppliers and customers
New equipment, tools and process features	->The organization should address these requirements and include them in the timeline. ->There must be a process in place to determine that new equipment and tools are capable and delivered on time. ->See the list of checks in Appendix A-3.

A-3

A-3 APQP New Equipment, Tooling and Test Equipment Checklist

Customer or Internal Part No _____ Revision Level _____

* Every "No" item must have approved action plan

Revision date: _____

Prepared By: _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1. Does the design require:						
a	New materials?					
b	Quick change?					
c	Volume fluctuations?					
d	Mistake-proofing?					
2. Have lists been prepared identifying: (Include all sub-tiers)						
a	New equipment?					
b	New tooling?					
c	New test equipment (including checking aids and masters for checking aids)?					
d	Is consideration given for andon detection for equipment and work station status?					
3	**Have acceptance criteria been agreed upon and documented per customer requirements for: (Include all sub-tiers)**					
a	New equipment?					
b	New tooling?					
c	New test equipment (including checking aids)?					
4	Will a preliminary capability study be conducted at the tooling and/or equipment manufacturer?					
5	Has test equipment feasibility and accuracy been established?					
6	Has consideration been given for verification of communications between automated systems (e.g., customer portals, data collection, functions captured, traceability, software capability) during equipment buy-off?					
7	Is a preventive maintenance plan complete for equipment and tooling?					
a	Critical tooling and machine parts need a min/max inventory level - long lead time parts					
8	Is there a contingency plan in place for long lead time items that can not be kept in inventory?					
9	Are setup instructions for new equipment and tooling complete, understandable, and in work instruction format?					
10	Will capable gages be available to run preliminary process capability studies at the equipment supplier's facility?					
a	Are sufficient resources allocated to support data collection?					
b	Is there a plan for all error-proofing devices that have not been validated to be 100% check until validation is complete?					
11	Has an error-proofing list been created for each piece of equipment (will need to complete other processes in APQP)?					
12	Will preliminary process capability studies be run at the processing plant?					
13	Have process characteristics that affect special product characteristics been identified?					
14	Were special product characteristics used in determining acceptance criteria?					
15	Does the manufacturing equipment have sufficient capacity to handle forecasted production and service volumes?					
16	Is testing capacity sufficient to provide adequate testing?					
	Has the measurement equipment been verified and documented showing qualification for the required scope of measurement and testing?					
	Has the PFMEA been comprehended and incorporated into tooling and equipment design?					
	Have changes been reported per customer requirements?					

DS-IMS

Outputs from the Product Design and Development phase – con.

Special production and process characteristics	->A list of preliminary special characteristics should be used as an input from the previous APQP phase. ->If a special characteristic is identified by the customer, the organization shall use an appropriate classification in accordance with the customer's requirements. ->The use of classifications designed by the organizations themselves is allowed if the customer agrees and there is documentation such as a correlation matrix that links to the customer's label. ->See the list of checks in Appendix C. Look at the specific requirements of customers.
Gage / Testing Equipment Requirements	Identify the requirements for measurement/testing equipment, add those requirements to the time chart.

Applicable analitical techniques – Special characteristics

Control Plan Special Characteristics	Recommended method for documenting and updating special characteristics. See Figure C3 for an example.

Figure C3

CONTROL PLAN - SPECIAL CHARACTERISTICS

☐ Prototype ☐ Pre-Launch ☐ Production ☐ Safe Launch

Control Plan Number		Key Contact/Phone		Date (Orig.)	Date (Rev.)
Part Number/Last Change Level		**Core Team**		**Customer Engineering Approval/Date (if required)**	
Part Name/Decription		**Supplier/Plant Approval/Date**		**Customer Quality Approval/Date (if required)**	
Supplier Plant	**Supplier Code**	**Other Approval/Date (if required)**		**Ostala odobrenja / Datum (ukoliko je potrebno)**	

Number	Description	Specification/Tolerances	Class	Product/Process	Drawing / Picture

Outputs from the Product Design and Development phase – con.

Team Feasibility Commitment and Leadership Support	->Organizations must assess the feasibility of the proposed design at this time and document along with any outstanding issues that require resolution and presented to management for their support. ->Ownership of the customer's design does not preclude the organization's obligation to evaluate the feasibility of the design. ->Must include consideration of all designs for manufacturability, assembly, and service requirements, including appearance. ->See the list of checks in Appendices A-2 and D.

A-2 Design information Checklist

A-2

Customer or Internal Part No _____ Revision Level _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
A. General						
1	Does the design require:					
a	New materials?					
b	Special tooling?					
c	New technology?					
d	New manufacturing process?					
2	Has assembly build variation analysis been considered?					
3	Has Design of Experiments been considered? (Consider DOE as a resource for testing and validation)					
4	Is there a plan for prototypes in place?					
5	Has a DFMEA been completed?					
a	If yes, was it completed by a cross-functional team?					
6	Has a DMA&S (Design For Manufacturability, Assembly, and Service) been completed?					
7	Have service and maintenance issues been considered?					
8	Has the Design Verification Plan been considered?					
a	If yes, was it completed by a cross-functional team?					
9	Are all specified tests, methods, equipment and acceptance criteria clearly defined and					
10	Have special characteristics been selected?					
11	Is there a plan to verify customer portals and security?					
12	Is Bill Of Material (BOM) complete?					
13	Are special characteristics properly documented?					
B. Engineering Drawings						
14	Are reference dimensions identified to minimize inspection layout time?					
15	Are sufficient control points and datum surfaces identified to design functional gages?					
16	Are tolerances compatible with accepted manufacturing standards?					
17	Can existing and available inspection technology measure all design requirements?					
18	Is the customer designated engineering change management process used to manage engineering changes?					
C. Engineering Performance Specifications						
19	Have special characteristics been identified?					
20	Are test parameters sufficient to address required use conditions, e.g., production validation and end use?					
21	Have parts manufactured at minimum and maximum specifications been tested as required?					
22	Will all product testing be done in-house?					
a	If not, is it done by an approved supplier? (Accredited or per Customer Specific Requirements).					
23	Is the specified in-process performance test sampling size and/or frequency consistent with manufacturing volumes?					
24	Is the method of checks/tooling/and testing equipment equivalent to the final processing location?					
25	Can manufacturing processes, including required pass-through, secondary checks, and daily error-proofing verifications, achieve and sustain specified tolerances on an ongoing basis?					
26	Has customer approval been obtained, e.g., for testing and documentation, as required?					
D. Material Specification						
27	Are special material characteristics identified?					
28	Where the organization is design responsible, are specified materials, heat treat and surface treatments compatible with the durability requirements in the identified environment?					
29	Where required, are the material suppliers on the customer approved list?					
	Is the organization developed and implemented a process to control incoming material quality?					
31	Have material characteristics requiring inspection been identified? If so, a					
a	Will characteristics be checked in-house?					
b	If checked in-house, is test equipment available?					
c	If checked in-house, is test equipment adequate for the task?					
d	If checked in-house, are competent people available to assure accurate testing?					
32	For pass-through material characteristics, has the control that is required been agreed upon with your customer?					
33	Will outside laboratories be used?					
a	Does the organization have a process in place to ensure laboratory competency such as accreditation? NOTE: Competency needs to be assured, regardless of the organization's relationship with the laboratory.					
34	Have the following material requirements been considered:					
a	Handling, including environmental aspects?					
b	Storage, including environmental aspects?					
c	Have the materials/substance composition been reported in accordance with customer requirements e.g., IMDS?					
d	Have polymeric parts been identified/marked per customer requirements?					
e	Labeling requirements for shipping, containers, and components?					

*** Every "No" item must have approved action plan**

Revision date: _____

Prepared By: _____

Appendix D

TEAM FEASIBILITY COMMITMENT

Customer: _____ Date: _____

Part number: _____ Part name: _____

Revision level: _____

Feasibility considerations

Our product quality planning team has considered the following questions.

The drawings and/or specifications provided have been used as a basis for analyzing the organizations ability to meet all specified requirements. All "no" answers are supported with attached comments identifying our concerns and/or proposed changes to enable the organization to meet the specified requirements.

Yes	No	Consideration
		Is product adequately defined (application requirements, etc.) to enable feasibility evaluation?
		Can Engineering Performance Specifications be met as written?
		Can appearance requirements be met as designed?
		Can product be manufactured to tolerances specified on drawing?
		Can product be manufactured with process capability that meet requirements?
		Is there adequate capacity to produce product?
		Does the design allow the use of efficient material handling techniques?
		Can the product be manufactured within normal cost parameters? Abnormal cost considerations may include:
		- Costs for capital equipment?
		- Costs for tooling?
		- Alternative manufacturing methods?
		Is statistical process control required on the product?
		Is statistical process control presently used on similar products?
		Where statistical process control is used on similar products:
		- Are the processes in control and stable?
		- Da li sposobnost procesa zadovoljava zahteve kupaca?

Conclusion

	Feasible	Product can be produced as specified with no revisions
	Feasible	Changes recomanded (see attached)
	Not feasible	Design revision required to produce product within the specified requirements

_____ Team member/Title/Date

_____ Team member/Title/Date

_____ Team member/Title/Date

_____ Team member/Title/Date

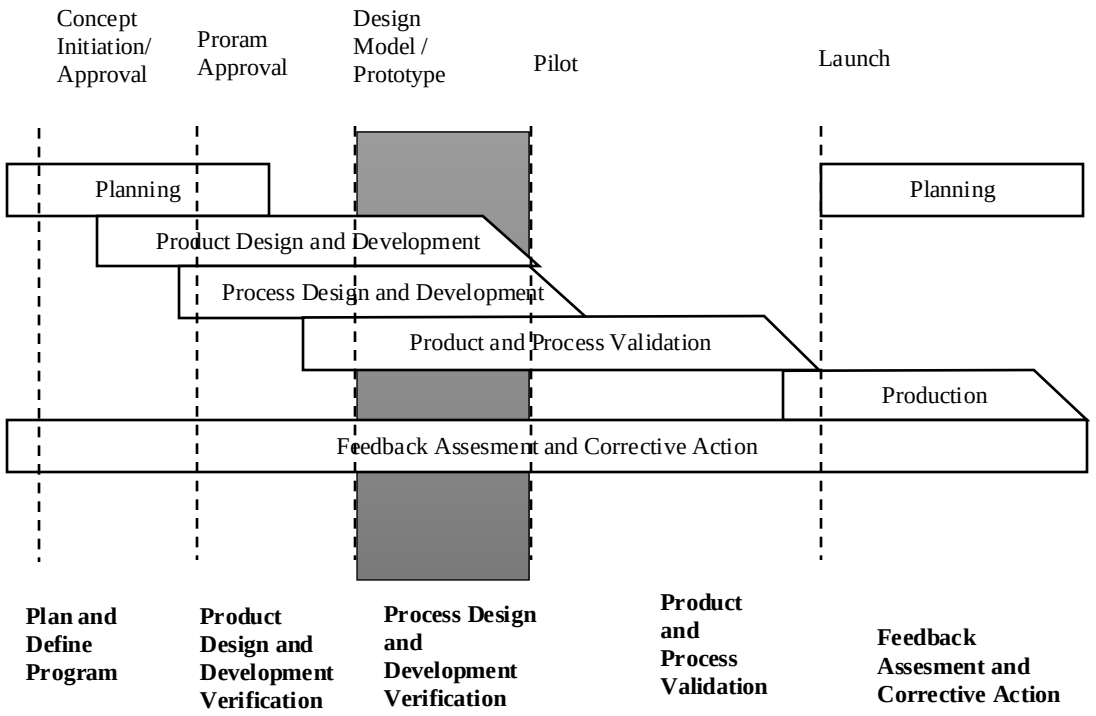
_____ Team member/Title/Date

_____ Team member/Title/Date

6. Chapter 3 – Process design and development

Danijel Suhanji, 02.2025, v1.0

Time graph


Concept Initiation/ Approval
Proram Approval
Design Model / Prototype
Pilot
Launch
Planning
Planning
Product Design and Development
Process Design and Development
Product and Process Validation
Production
Feedback Assesment and Corrective Action
Plan and Define Program
Product Design and Development Verification
Process Design and Development Verification
Product and Process Validation
Feedback Assesment and Corrective Action

Phase description

It discusses the main characteristics of the development of the production system and related control plans to achieve quality products.

It is designed to ensure the comprehensive development of an efficient production system.

It involves planning the production process for a new or improved product. The idea is to consider product specifications, product quality, and production costs when designing and developing a manufacturing process. The process must be able to function efficiently and produce the expected quantities in order to keep up with customer demands.

Inputs and outputs

Input	Output
DFMEA	Packaging Standards and Specifications
Design for manufacturability, assembly and service	Process/Product Quality System Review
Design Verification	Process Flow Diagram
Design review	Plant Layout
Prototype Control Plan	PFMEA
Preliminary identification of production and process special characteristics	Control Plan – Pre-Launch
Engineering drawings (including mathematical data)	Process Instructions
Engineering Specifications	MSA Plan
Material Specifications	Preliminary Process Capability Study
Changes to drawings and specifications	Leadership Support
New equipment, tools and process features	
Special production and process characteristics	
Gage/Test Equipment Requirements	
Team Feasibility Commitment and Leadership Support.	

Outputs from of the Design and Development Process

Packaging Standards and Specifications	->Packaging design should ensure that the performance and characteristics of the product will remain unchanged during packaging, transit and unpacking. ->Packaging should be compatible with all identified material handling devices, including robots. ->Should be incorporated into any packaging specifications for the product, including service packaging. It is necessary to follow customer's packaging standards or generic packaging requirements. ->The design of the packaging should ensure the integrity of the product at the point of use. ->Individual packaging of the product should be provided for production and service.

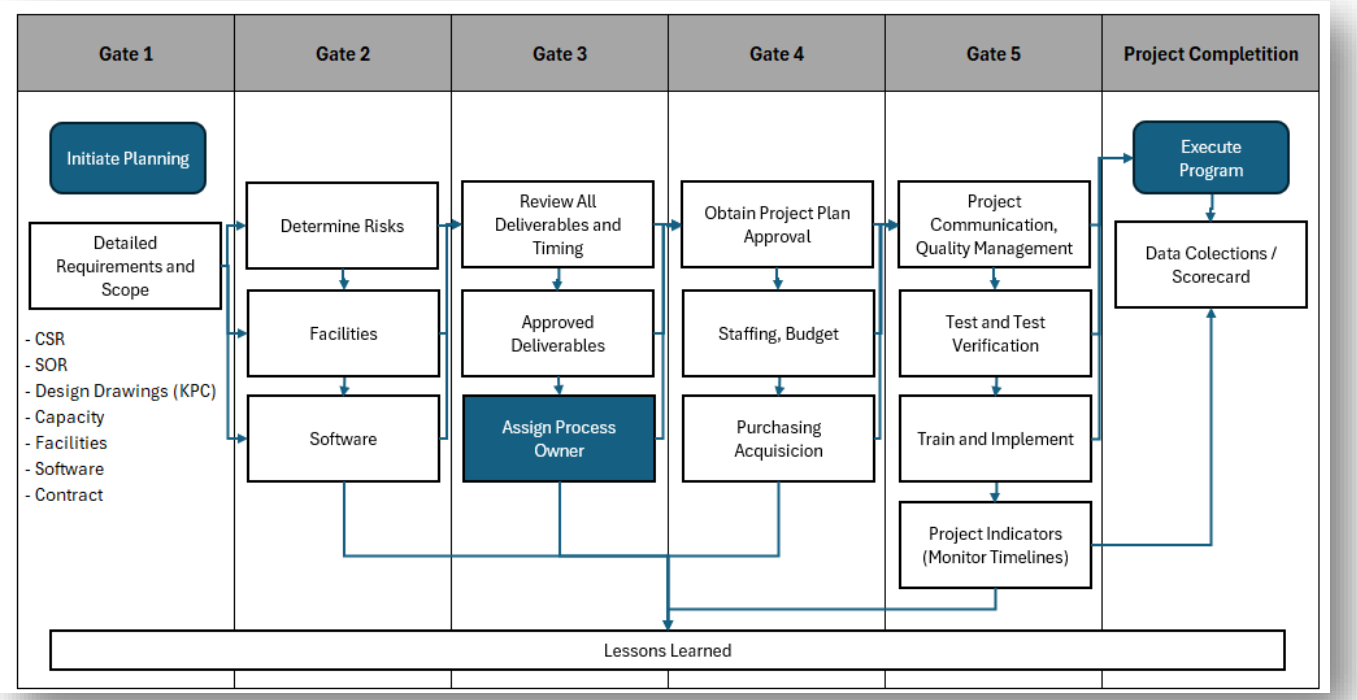
Outputs from of the Design and Development Process – cont.

Process/Product Quality System Review	->The quality management system of the production site must be reviewed. ->Any additional controls and/or procedural changes required for the manufacture of the product must be updated, documented, and included in the process flow diagram, PFMEA, process control plan, and operating instructions. ->The checklist in Appendix A-4, or equivalent, should be used.
Process Flow Chart	->A schematic representation of a current or proposed process flow, used to analyze the sources of variation of machinery, materials, methods, and labor from the beginning to the end of the manufacturing or assembly process and to emphasize the influence of the source of variation on the process. ->The checklist in Appendix A-6, or equivalent, should be used.
Plant Layout	->It should be developed and reviewed in such a way as to optimize material movement, handling and use of value-added surfaces, and should facilitate the synchronous flow of materials through the process. ->All material flow should be in accordance with the process flow diagram and control plan. ->The checklist in Appendix A-5, or equivalent, should be used.

Applicable analitical techniques – Process flow chart

Process Flow Chart	->A visual approach to describing and developing sequential or related work activities. ->They should be used to identify improvements and to locate significant or critical characteristics of products and processes that will be addressed in control plans that will be developed later. ->See Figure C6 for an example

Figure C6



A-4 Product/Process Quality Checklist

A-4

Customer or Internal Part No _____ Revision Level _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Is customer assistance or approval required for the development of the control plan?					
2	Has the organization identified who will be the quality liaison with the customer?					
3	Has the organization identified a qualified and trained employee who will be the quality liaison with its suppliers?					
4	Has the quality management system been reviewed and approved per current customer specific requirements (CSR)?					
5	Are there sufficient personnel identified to cover:					
a	Control plan requirements?					
b	Layout inspection?					
c	Engineering performance testing?					
d	Problem reaction and resolution analysis?					
e	Programming (system updates)?					
f	Work instructions maintenance/updates (timely updates)?					
6	Is there a documented training program that:					
a	Includes all employees?					
b	Lists who has been trained? - Current and posted in area (e.g., Current Training Schedule, Harvey Ball 4 quadrant chart)					
c	Provides a training schedule?					
7	Has training been completed for:					
a	Statistical process control?					
b	Capability studies?					
c	Problem solving?					
d	Mistake-proofing? (e.g., error-proofing/red rabbits)					
e	Reaction plans?					
f	Material handling? (handling of defective material)					
g	Other topics as identified?					
8	Is each operation provided with process instructions that are linked to the control plan?					
9	Are standard operator instructions accessible at each work station?					
10	Do operator instructions include pictures, diagrams, and are in understandable language?					
11	Are all special characteristics identified?					
a	If yes, are they posted at work stations?					
12	Are passthrough features included in the standard operator instructions?					
13	Were operators/team leaders involved in developing standard operator instructions?					
14	Do inspection instructions include:					
a	Easily understood engineering performance specifications?					
b	Test frequencies which have been based upon industry standards, statistical process control methods?					
c	If sampling frequency is not 100%, is the frequency based upon volume produced to support effective containment? (see AIAG Control Plan Manual, Control Plan form, field 23 for additional					
d	Sample sizes?					
e	Reaction plans?					
f	Documentation requirements?					
15	Are visual aids:					
a	Appropriate, easily understood and comprehensive?					
b	Available?					
c	Accessible?					
d	Approved?					
e	Dated and current?					
	a procedure to implement, maintain, and establish reaction plans, for issues such as ontrol conditions based on statistical process control?					
	an identified problem solving process that includes root cause analysis?					

18	Are the latest drawings and specifications available for the operator, at the points of the inspection?					
a	Have engineering tests (dimensional, material, appearance, and performance) been completed and documented as required in accordance with customer requirements?					
19	Are the current forms/logs available for appropriate personnel to record inspection results?					
20	Are the following available and placed at the appropriate points of the operation?					
a	Monitoring and measurement devices?					
b	Gage instructions?					
c	Reference samples?					
d	Inspection logs?					
21	Have provisions been made to certify and calibrate gages and test equipment at a defined frequency that is appropriate?					
22	Have required measurement system capability studies been:					
a	Completed and documented?					
b	Accepted?					
23	Have initial process capability studies been conducted per customer requirements?					
24	In case of inadequate process capability, is there a documented containment plan until process capability has been achieved?					
25	Are layout inspection equipment and facilities adequate to provide initial and ongoing layout of all details and components in accordance with customer requirements?					
26	Is there a documented procedure for controlling incoming material that may include, for example, the following items:					
a	Characteristics to be inspected? (e.g., drawings, critical features, pass-through)					
b	Frequency of inspection? (e.g., PFMEA/Control Plan)					
c	Sample size?					
d	Designated location for approved product?					
e	Disposition of nonconforming products?					
27	Have sample production parts been provided per customer requirements?					
28	Is there a procedure to identify, segregate, and control nonconforming products to prevent shipment?					
29	Are there locked bins?					
30	Are rework/repair procedures available to ensure conforming product?					
31	Is there a procedure to requalify repaired/reworked material? (included Independent Repair					
32	Has a master or qualified sample, if required, been retained at work station/center as part of the first piece approval/in-process inspection (i.e., boundary sample, master good)?					
33	Is there an appropriate lot traceability procedure from incoming through shipping? (to minimize exposure to your customer)					
34	Are periodic audits of outgoing products planned and implemented?					
35	Are periodic assessmerits of the quality system planned and implemented?					
36	Has the customer approved the packaging and the packaging specification, including backup packaging?					
a	If any updates to the packaging - has containerization been provided the new information immediately?					

*** Every "No" item must have approved action plan**

Revision date: _____

Prepared By: _____

A-5

A-5 Flor Plan Checklist

Customer or Internal Part No _____ **Revision Level** _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Have lean concepts been applied in considering material flow?					
2	Does the floor plan identify all required process and inspection points?					
3	Are all special characteristic stations identified on Plant Layout - for example all trace stations, (including teardown)?					
4	Is andon equipment identified at each station?					
5	Have clearly marked areas for all material, tools, and equipment at each operation been considered?					
6	Has sufficient space been allocated for all equipment?					
7	Are process and inspection areas:					
a	Of adequate size?					
b	Properly lighted?					
c	Current work instructions?					
d	Current gages/measuring tools?					
8	Do inspection areas contain necessary equipment and record storage?					
9	Are there adequate:					
a	Staging areas?					
b	Impound areas?					
c	Impound areas?					
10	Are inspection points located to prevent the shipment of nonconforming products?					
11	Are there controls for each process to eliminate contamination or inappropriate mixing of product?					
12	Is material protected from overhead or air handling systems contamination?					
13	Have facilities been provided for final product audit?					
14	Are facilities adequate to control movement of nonconforming incoming material?					
15	Is there a containment area for damaged containers?					
16	Have changes been reported per customer requirements?					

*** Every "No" item must have approved action plan**

Revision date: _____

Prepared By: _____

A-6

A-6 Process Flow Chart Checklist

Customer or Internal Part No _____ Revision Level _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Does the flow chart illustrate the entire process from receiving through shipping, including outside processes and services?					
a	Have all customer portals been verified for all updates?					
b	Are all label requirements for each customer reviewed and understood?					
2	In the development of the process flow chart, was the DFMEA used, if available, to identify specific characteristics that may be critical?					
3	Is the flow chart linked to product and process checks in the control plan and PFMEA?					
4	Have special characteristics stations been identified?					
5	Does the flow chart describe how the product will move, e.g., roller conveyor, slide containers?					
6	Has the pull system/optimization been considered for this process?					
7	Have provisions been made to identify and inspect reworked product before being used?					
8	Are re-entry points identified in the flow chart?					
9	Are material controls for movement and staging of product, including appropriate identification, properly defined and implemented? The controls should address incoming supplier product as well as subcontracted processes.					

* Every "No" item must have approved action plan

Revision date: _____

Prepared By: _____

Outputs from of the Design and Development Process – cont.

PFMEA	->It must be completed during product quality planning and before the start of production. ->It is a disciplined review and analysis of a new or revised process and is conducted to anticipate, resolve, or monitor potential problems of the process. ->See the AIAG & VDA FMEA Manual and customers' specific requirements. The FMEA process checklist in Appendix A-7 should be used.
Control plan – Pre-launch	->Description of dimensional measurements, materials and functional tests that will occur after the prototype and before the initial launch of production. ->The customer may request a safe-launch plan during the pre-series. ->Refer to the AIAG Control Plan Manual. The checklist in Appendix A-10 should be used.

A-10

A-10 Control Plan Checklist

Applicable control plan stage: Prototype ☐
Pre-launch ☐
Safe Launch ☐ (If safe Launch is included in Pre-Launch or Production control plan, check both)
Production ☐

Customer or Internal Part No _____ **Revision Level** _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Was the control plan developed according to the methodology described in the AIAG Control Plan Manual?					
2	Were DFMEA, PFMEA and Process Flow Chart used to prepare the control plan?					
3	Have all the controls identified in the PFMEA been included in the control plan?					
4	Are all DMFEA items with severity rank of 9-10 that flow to PFMEA for control designated as special characteristics?					
5	Are all special product/process characteristics included in the control plan?					
6	Are material specifications requiring inspection identified?					
7	Does the control plan address incoming (material/components) through processing/assembly including packaging?					
8	Are all pass-through characteristics with last point of control at the organization that may impact the customer on this control plan?					
9	Are all interdependent processes included on this control plan, or linked to this control plan?					
10	If there are repair or rework processes, are they included on this control plan or on a separate control plan linked to this control plan?					
11	Have repair and rework processes been approved by customer?					
12	Are engineering performance testing and dimensional requirements identified?					
13	Are all error-proofing devices listed on the control plan, with method and frequency to confirm effectiveness or proper functioning?					
14	Does the frequency to confirm effectiveness or proper functioning of error-proofing devices enable effective containment of product produced since the last good verification check?					
15	Are sample sizes based upon industry standards, statistical sampling plan tables, or other statistical process control methods or techniques?					
16	If sampling frequency is not 100%, is the frequency based upon volume produced to support effective containment?					
17	Are gages and test equipment available as required by the control plan?					
18	Are the gage methodology and compatibility appropriate to meet customer requirements?					
19	Have measurement systems analysis been completed in accordance with customer requirements?					
20	If required, has the customer approved the control plan?					
21	Have lessons learned and "Read Across" actions been implemented?					

*** Every "No" item must have approved action plan**

Revision date: _____

Prepared By: _____

Control plan form

CONTROL PLAN

DS-IMS

(1) ☐ Prototype ☐ Pre-Launch ☐ Production ☐ Safe Launch Page _____ of _____

Control Plan Number (2)	Key Contact/Phone (7)	Date (Orig.) (9)	Date (rev.) (10)
Part Number/Last Change Level (3)		Customer Engineering Approval/Date (if required) (11)	
Part Name/Decription (4)	Supplier/Plant Approval/Date (8)	Customer Quality Approval/Date (if required) (12)	
Supplier Plant (5) / Supplier Code (6)	Other Approval/Date (if required) (13)	N/A (13)	

PART/PROCESS NUMEBR (14)	PROCES NAME/OOPERATION DESCRIPTION (15)	MACHINE,DEVIE, JIG TOOLS FOR MFG. (16)	CHARACTERISTICS			SPECIAL CHAR. CLASS (20)	METHODS					REACTION PLAN	
			NO. (17)	PRODUCT (18)	PROCESS (19)		PRODUCT/PROCESS SPECIFICATION/TOLERANCE (21)	EVALUATION/MEASUREMEN (22)	SAMPLE (23) SIZE	SAMPLE (23) FREQ.	CONTROL METHOD (24)	ACTION (25)	OWNER/RESPINSIBLE (26)

OPERATION DRAWING 1.

eg. part of the drawing with marked dimensions

Control Plan Example

CONTROL PLAN

DS-IMS

☐ Prototype ☐ Pre-Launch ☐ Production ☐ Safe Launch

Control Plan Number	Key Contact/Phone	Date (Orig.)	Date (rev.)
CP-215128	D. S. / 555-543-7809	7.11.2021	5/26/2023 (Rev 2.)
Part Number/Last Change Level		**Customer Engineering Approval/Date (if required)**	
12345678AC		N/A	
Part Name/Decription	**Supplier/Plant Approval/Date**	**Customer Quality Approval/Date (if required)**	
Stabilizer Bar, Rear	2/14/2021	2/15/2021	
Supplier Plant	**Supplier Code**	**Other Approval/Date (if required)**	**Other Aproval/Date (if required)**
Stab Bar Inc.	82842 MK		N/A

PART/PROCESS NUMEBR	PROCES NAME/OOPERATION DESCRIPTION	MACHINE,DEVIE, 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	ACTION	OWNER/RESPINSIBLE
10	Gauging	Check Fixture		Part Shape / Dimensions			Correct Contour / Eye Location Per Drawing	Contur Gauge	1 Piece	100%	Work Instruction: QI-PRD-01	Follow Instructions in QI-PRD-11	Gauging Associate
								Verify Gauge with Master Sample	1 Piece	Prior to First Piece	Work Instruction: QI-PDR-01, Check Sheet: PRD-030	Follow Instructions in QI-PRD-03	Gauging Associate
20	Fitting (Rework)	Fitting Press		Part Shape / Dimensions			Correct Contour / Eye Location Per Drawing	Contur Gauge	1 Piece	100% (Each Reworked Part)	Work Instruction: QI-PRD-01	Follow Instructions in QI-PRD-11	Gauging Associate
				Appearance			No Detrimental Marks	Visual Inspection	1 Piece	100%	Work Instruction: QI-PRD-01	Follow Instructions in QI-PRD-11	Gauging Associate
				Eye Hole Diameter			16,0 +/-0,25mm	Contur Gauge / Plug Gauge	1 Piece	100%	Work Instruction: QI-PRD-01	Follow Instructions in QI-PRD-11	Gauging Associate
60	Rework - Shot Peen	Shot Peen		Part without Paint			Bar with All Paint Removed	Visual Inspection	Every Bar	100%	Work Instruction: QI-STP-01	Run Bar(s) Through Shot Peen Process Until All Paint Has Been Removed	Operations Manager
30	Caliper Assembly	Assembly Dial		Bracket and Housling Assembly			Correct Caliper Housing	In-line Visual System	1 Piece	100%	Work Instruction: QI-AH-01	Follow Instructions in KAO-CC6	Assembly Associate
					Error-Proofing Confirmation		Proper Function of Vision System	Red Radit	1 Piece	Start of Each Shift / Changeover / Tooling Change	Work Instruction: QI-RR-01, Check Sheet: RR-001	Follow Instructions in KAO-RR9	Assembly Associate
6	Brake Rotor Machining	CNC		Brake Plate Surface Finish			0,4-0,18 RA	Profilometer	1 Piece	Every 30 Parts	Work Instruction: WI-CNC-01, Check Sheet: CS-012	Follow Instructions in RP-9	Quality Assurance Manager
6 (SLP)	Brake Rotor Machining	CNC		Brake Plate Surface Finish			0,4-0,18 RA	Profilometer	1 Piece	100%	Work Instruction: WI-CNC-01, Check Sheet: CS-012	Follow Instructions in RP-9	Quality Assurance Manager
30	Eye Hole Punch	Press 15		Hole Diameter			36,0 +/-0,05mm	Profilometer	1 Piece	Every 10 Parts	Work Instruction: QI-23, SPC & X&R Chart CAP-3	Follow Instructions in RP-6	Quality Assurance Manager

Applicable analitical techniques - FMEA

Failure Mode and Effects Analysis (FMEA)	A systematic approach to the execution of engineering disciplines to deliver customer expectations while avoiding the ways and effects of product and process failures.

A-7

A-7 Process FMEA Checklist

Customer or Internal Part No _____ **Revision Level** _____

	Question	Yes	No	Comment / Action Required	Person Responsible	Due Date
1	Is the DFMEA and Process Flow Diagram (PFD) used to develop the PFMEA?					
2	Does the PFMEA contain failure mode read across from DFMEA?					
3	Was the process FMEA prepared by a cross-functional team?					
4	If yes, has the team taken into account all customer specific requirements, including FMEA methodologies as shown in the current edition of FMEA?					
5	Have all operations including subcontracted, or outsourced processes and services been considered?					
6	Have all operations affecting customer requirements including fit, function, durability, governmental regulations and safety been identified and listed sequentially?					
7	Were similar part/process FMEA's considered?					
8	Have historical campaign and warranty data been reviewed and used in the analysis?					
9	Are the product and process requirements used to determine the failure modes aligned with process functions and PFD?					
10	Do the effects consider the customer in terms of the subsequent operation, assembly, and					
11	Is the severity for each failure mode calculated based on the highest effect and match customer requirements?					
12	Have the causes been described in terms of something that can be corrected or controlled?					
13	Is historical data (warranty data, customer records, manufacturing data, etc.) used to identify the occurrence number for each cause?					
14	Is occurrence number defined according to customer requirements?					
15	Are preventive controls focusing on cause/failure mode control before going to the next operation?					
16	Has severity and/or occurrence risk been taken into account when selecting detection controls?					
17	Was supplier and/or customer risk priority method used to prioritize PFMEA risk?					
18	Are detection numbers according to customer requirements?					
19	Does PFMEA consider recommended actions based on supplier and/or customer risk prioritization method?					
20	Have the appropriate controls to address all of the identified failure modes been applied?					
21	Were detection and occurrence revised when corrective action was completed?					
22	Do the effects consider the customer in terms of the subsequent operation, assembly, and					
23	Were customer plant problems used as an aid in developing the PFMEA?					

*** Every "No" item must have approved action plan**

Revision date: _____

Prepared By: _____

Outputs from of the Design and Development Process – cont.

Process Instructions	It must be ensured that the process instructions provide sufficient understanding and detail for all personnel who have direct responsibility for the operation of the process. The minimum sources are: ➢ FMEAs; ➢ Control plan(s); ➢ Engineering drawings, performance specifications, material specifications, visual standards and industry standards; ➢ Process flow diagram; ➢ Plant layout; ➢ Packaging standards and specifications; ➢ Process parameters; ➢ Organizational expertise and knowledge of processes and products; ➢ Handling requirements; ➢ the process operators. They should be visible, accessible to operators and supervisors, and contain parameters for adjustment. Look at the customer's specific requirements.

Outputs from of the Design and Development Process – cont.

MSA Plan	Provision must be made for the development of a plan to achieve the necessary analysis of the measurement systems. **It should include**, as a minimum: ➢ The scope of the laboratory that corresponds to the necessary measurements and tests, ➢ Responsibility to ensure linearity of scales, accuracy, repeatability, repeatability, and correlation for duplicate scales. Refer to the AIAG Measurement Systems Analysis (MSA) manual and specific customer requirements.
Preliminary Process Capability Study Plan	->A preliminary plan for the process capability study must be developed. ->The characteristics identified in the control plan will serve as a basis. ->Refer to the AIAG Production Part Approval Process (PPAP) manual, Statistical Process Control (SPC), and customer-specific requirements.

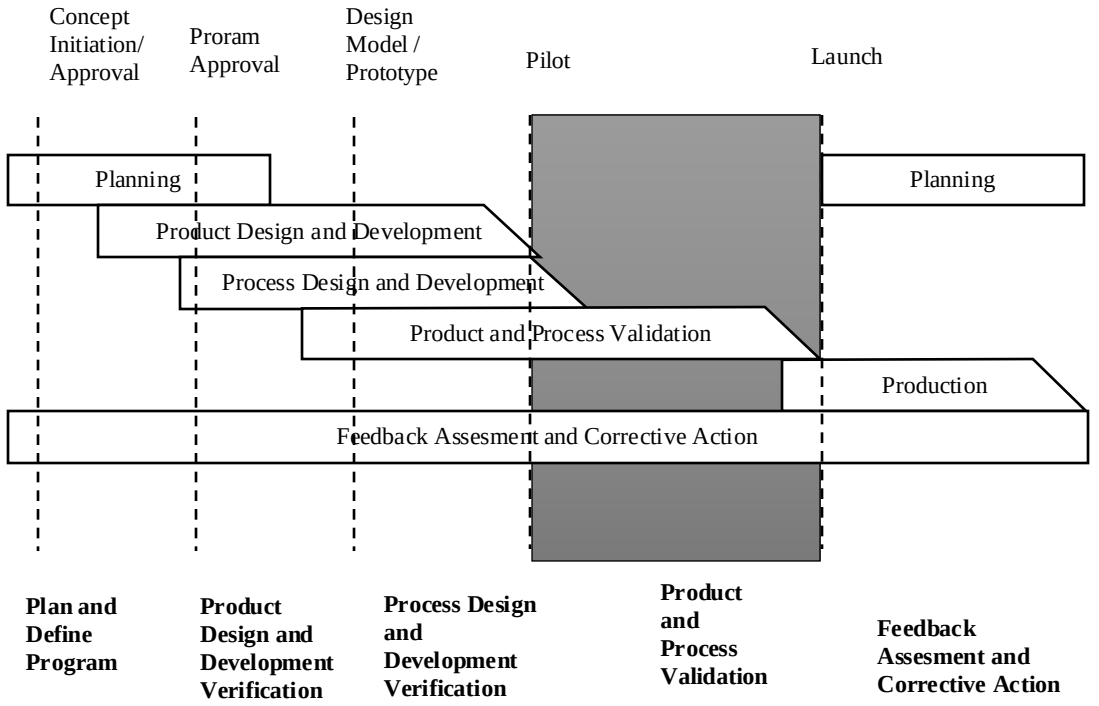
Outputs from of the Design and Development Process – cont.

Leadership Support	A formal review should be scheduled designed to strengthen management's commitment at the end of the design and process development phase, with the aim of informing management, as well as receiving support to help resolve any outstanding issues.

7. Chapter 4 – Product and process validation

Danijel Suhanji, 02.2025, v1.0

Time graph


Concept Initiation/ Approval
Proram Approval
Design Model / Prototype
Pilot
Launch
Planning
Planning
Product Design and Development
Process Design and Development
Product and Process Validation
Production
Feedback Assesment and Corrective Action
Plan and Define Program
Product Design and Development Verification
Process Design and Development Verification
Product and Process Validation
Feedback Assesment and Corrective Action

Phase description

It discusses the main characteristics of the validation of the production process through the evaluation of a significant production run.

Additional concerns regarding the pre-launch control plan should be identified for investigation and resolution prior to regular production runs.

This is a test stage to validate the production process and the final product. The end results of this phase include the confirmation of the capability and reliability of the production process and the criteria for accepting product quality. Trial production batches are carried out, and the output of the product is tested to confirm the effectiveness of the staggered approach to production. All necessary adjustments are made before moving on to the next stage.

Inputs and outputs

Input	Output
Packaging Standards and Specifications	Significant produciton run
Review of the Process/Product Quality System	MSA
Process Flow Diagram	Preliminary Process Capability Study
Plant Layout	Production Part Approval
PFMEA	Product Validation Testing
Control Plan – Pre-Series	Packaging Evaluation
Process Instructions	Production Control Plan
MSA Plan	Quality Planning Sign-Off and Leadership Support
A preliminary plan for a process capability study	
Leadership Support	

Outputs from the Design and Development Process phase

Significant production run	->It must be carried out using production tools, production equipment, production environment (including production operators), production plant, production meters and production quantity. ->All checks on the control plan must be carried out at least once during the length of a significant production start-up. ->The minimum batch quantity is usually set by the customer, but may be exceeded by the organization. ->Outputs as a minimum are given in Table 4.1 – Outputs of significant production run ->Refer to the AIAG Production Part Approval Process (PPAP) manual or corresponding customer-specific requirements for further details

4.1 – Outputs of significant significant production run

Output
➢ Preliminary process capability study; ➢ Measurement systems analysis; ➢ Production rate shown; ➢ Process review; ➢ Production validation testing; ➢ Approval of the production part; ➢ Packaging evaluation; ➢ First Time Capability (FTC); ➢ Sign-off quality planning; ➢ Sample of production parts; ➢ First Time Quality (FTQ); ➢ Master samples, including appearance approval samples, if applicable.

Outputs from the Design and Development Process phase – con.

MSA	->All monitoring and measuring devices should be subjected to an analysis of the measuring system before a significant production runand should be used to verify all identified characteristics according to the production control plan. ->Refer to the AIAG Measurement Systems Analysis (MSA) manual.
A preliminary study of the capabilities of the process	->Provides an assessment of the readiness of the process for production. ->It should be carried out on all special features and/or according to the customer's specific requirements identified in the control plan using randomly selected parts. ->Refer to the AIAG Production Part Approval Process (PPAP) and AIAG Statistical Process Control (SPC) manual and customer’s specific requirements.

Outputs from the Design and Development Process phase – con.

Produciton Part Approval	->The purpose of the PPAP is to provide evidence that all design requirements and customer specifications have been properly understood and fulfilled by the organization and that the manufacturing process will consistently produce a product that meets these requirements during actual production at the specified production rate. ->Refer to the AIAG Production Part Approval Process (PPAP) manual.
Product Validation Testing	It refers to engineering tests that confirm that products made from manufacturing tools and processes meet customer's engineering standards
Packaging Evaluation	All test deliveries and test methods must evaluate the protection of the product from damage to normal transportation and adverse environmental factors

Outputs from the Design and Development Process phase – con.

Production Control Plan	->Description of the system for controlling production parts and processes during serial production. ->Represents a living document and should be updated to reflect the addition or deletion of controls based on experience gained from the production of parts. ->The start of production will include a "safe launch" period. Safe-Launch is designed to contain potential nonconformities, and usually involves additional inspection items or increased frequency of checks and monitoring, and may include stricter control or specification restrictions. ->Consult the customer for specific requirements. ->Refer to the AIAG Control Plan Manual

Outputs from the Design and Development Process phase – con.

Quality Planning Sign-Off and Leadership Support	An inspection should be carried out at the manufacturing site(s) and a formal signature shall be coordinated indicating to leadership that the relevant APQP activities have been completed prior to the first delivery of the product and shall include an overview of the following: ➢ Process flow diagrams; ➢ Control plans. Check if they exist, if they are available and if they are being monitored; ➢ Instructions for the process. Check to see if they contain any special features that all PFMEA recommendations are addressed. Compare process instructions, PFMEA, and process flow diagram to the control plan; ➢ Devices for monitoring and measuring. Repeatability and repeatability (GR&R) and proper use; ➢ Demonstration of the required capacity. Using production processes, equipment and personnel, check whether the process is able to meet the specified production capacity and meet customer requirements. A review should be scheduled with leadership to inform them about the status of the program and get their support with all outstanding issues. A summary of the product quality planning and the approval report shown in Appendix E.

Appendix E

PRODUCT QUALITY PLANNING SUMMARY AND APPROVAL

DATE: _____

PRODUCT NAME: _____ BROJ PROIZVODA / REV: _____

CUSTOMER: _____ PROIZVODNI POGON: _____

1. PRELIMINARY PROCESS CAPABILITY STUDY

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
Ppk - Special characteristic			
Ppk - Other characteristic			

2. PRODUCTION CONTROL PLAN APPROVAL

Approved Yes ☐ No* ☐

Customer approval Yes ☐ No* ☐ Not required ☐

3. INITIAL PRODUCTION SAMPLES
CHARACTERISTIC CATEGORY

	QUANTITY			
	SAMPLE	CHARACTERISTIC PER SAMPLE	ACCEPTABLE	PENDING*
DIMENSIONAL				
VISUAL				
LABORATORY				
PERFORMANCE				

4. GAGE AND TEST EQUIPMENT
MEASUREMENT SYSTEM ANALYSIS (MSA)

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
SPECIAL CHARACTERISTICs			
OTHER CHARACTERISTICs			

5. PROCESS MONITORING

	QUANTITY		
PROCESS MONITORING INSTRUCTIONS	REQUIRED	ACCEPTABLE	PENDING*
PROCESS SHEETS			
VISUAL AIDS			

6. PACKAGING/SHIPPING

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
PACKAGING APPROVAL			
SHIPPING TRIALS			

7. SIGNIFICANT PRODUCTION RUN MEETS CUSTOMER AND INTERNAL PRODUCTION PLANNING: YES N☐ ☐

8. TIERED SUPPLIER READINESS

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
Ppk - SPECIAL CHARACTERISTICS			
CONTROL PLAN			
MSA			
SIGNIFICANT PRODUCTION RUN			

9. PRODUCTION PART APPROVAL (PPAP)
CUSTOMER APPROVAL STATUS

APPROVED ☐
INTERIM APPROVAL* ☐
REJECTED* ☐
NOT REQUIRED ☐

10. LESSONS LEARNED IMPLEMENTATION

	COMPLETE	PENDING*
FROM PAST PROGRAMS & PRECEDING STAGES		

*If pending, must have action plan

11. APPROVALS

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

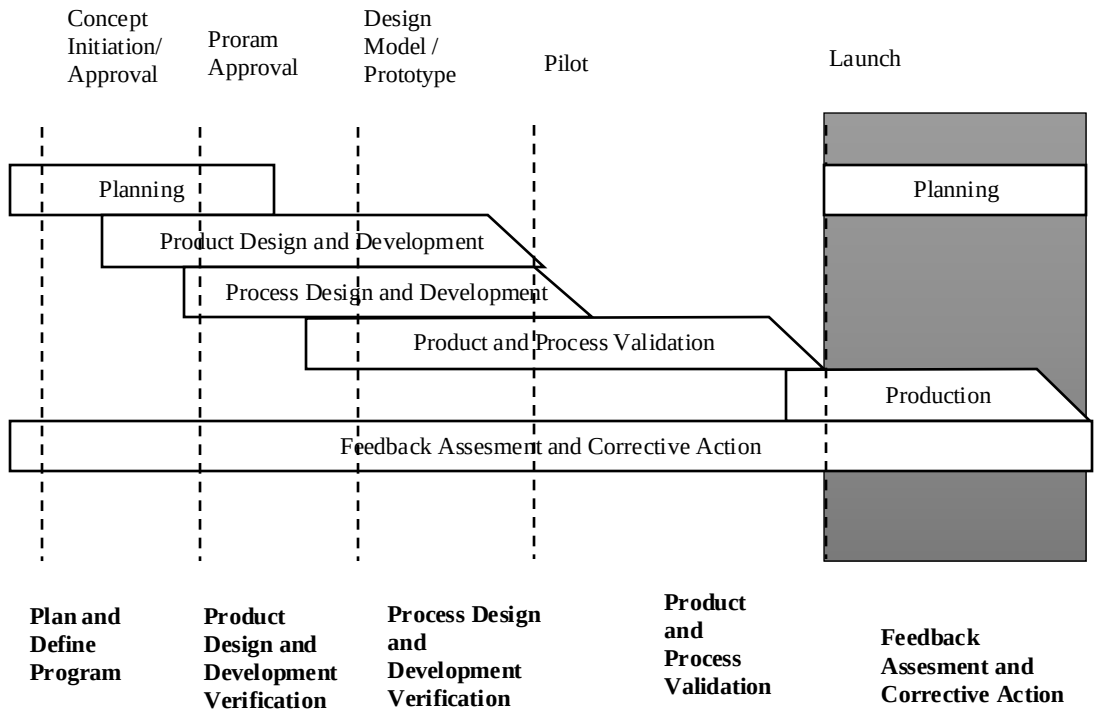
*REQUIRES PREPARATION OF AN ACTION PLAN TO TRACK PROGRESS

DS-IMS

8. Chapter 5 – Feedback, Assesment, Corrective action

Danijel Suhanji, 02.2025, v1.0

Timing graph



Phase description

It is the stage of component production in which output can be evaluated when all special and common causes of variation are present and the effectiveness of product quality planning efforts is evaluated.

Quality planning should also be carried out whenever a product or process change is made after the launch and validation of the process, up to and including the PPAP for the implemented change.

The launch of full-scale production occurs at this stage, with an emphasis on process evaluation and improvement. Activities such as reducing process variations, identifying problems, and initiating corrective actions to support continuous improvement are mainstays at this stage. Collecting and evaluating customer feedback, as well as collecting data related to process efficiency and quality planning effectiveness, is important at this stage.

Inputs and outputs

Input	Output
Significant Produciton Run	Reduced variation
MSA	Improved customer satisfaction
Preliminary Process Capability Study	Improved customer service and delivery
Production Part Approval	Effective use of lessons learned/best practices
Product Validation Testing	
Packaging Evaluation	
Production Control Plan	
Quality Planning Sign-Off and Leadesrhip Support	

Outputs from the Feedback, Process and Corrective Actions phase

Reduced variation	->Control charts and other statistical techniques should be used as tools to identify process variations, resulting in analysis (value analysis and variation reduction) and corrective action and continuous improvement. ->Need to develop proposals, including cost, time, and expected improvement for customer review ->Refer to the AIAG Statistical Process Control (SPC) manual and any applicable specific customer requirements
Improved customer satisfaction	->A lot can be learned by the organization and the customer, and the organization and the customer become partners in bringing about change. ->The effectiveness of product quality planning efforts can also be evaluated. ->Refer to the AIAG PPAP Manual, Section 3.1 and any applicable specific customer requirements

Outputs from the Feedback, Process and Corrective Actions phase - cont

Improved customer service and delivery	->Represents the organization and partnership with customers to solve problems and continuously improve ->When problems arise in the customer's environment, effective suppression of problems and timely delivery of spare parts is vital ->If problems arise in the field (problems related to the end user), the customer relies on the organization to support the correction of problems and the timely availability of spare parts in the field service organization ->Experience provides the customer and organization with the necessary knowledge to reduce process variation, inventory, and quality costs.

Outputs from the Feedback, Process and Corrective Actions phase - cont

Effective use of lessons learned/best practices	It represents the capture, retention, and application of knowledge and should be reviewed after each stage of the APQP process. As a minimum, the input includes: ➢ Overview of things that gone right / Things that gone wrong (TGR / TGW); ➢ Information from warranty and other performance metrics; ➢ Corrective action plans; ➢ "Read across" with similar products and processes; ➢ DFMEA and PFMEA studies; ➢ Preservation of institutional knowledge through constant documentation of solutions to protect against errors. It is recommended that lessons learned and best practices be incorporated into the baseline or family DFMEA and PFMEA as needed Refer to the AIAG & VDA FMEA Manual, Section 1.3.6

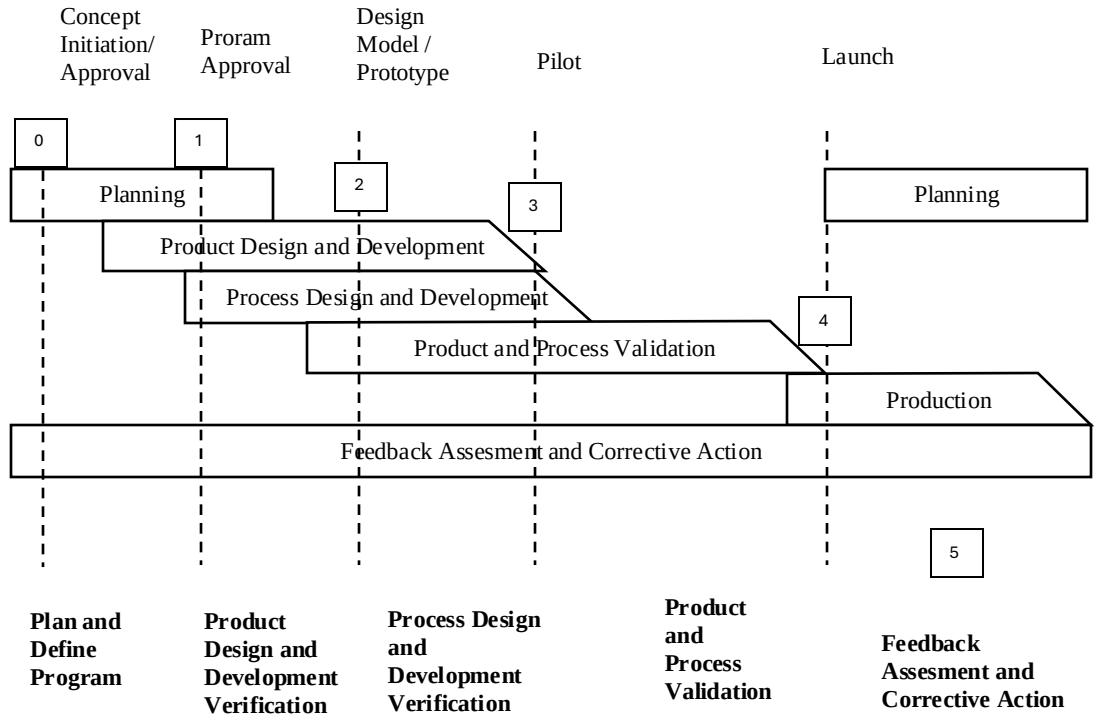
9. Gated Management

Danijel Suhanji, 02.2025, v1.0

What is Gated Management

The Gated Management framework in this appendix provides an example of a more holistic approach that meets the expectation of Leadership sign-off (gate review) at the conclusion of ***every product quality planning phase***.

The figure below shows the Product Quality Planning Timing Chart, with 6 "gates" identified, corresponding to program milestones.



One of the keys to the success of Advanced Product Quality Planning is the interest, commitment, and support of leadership

Leadership should sign-off (gate review) at the conclusion of every product quality planning phase

Donja tabela sumira okvir preispitivanja rukovodstva na svakom gate-u.

What is Gated Management

The Product Quality Planning Summary and Approval forms are provided in the following pages, along with instructions on how to fill out the forms and actions needed based on the results of the gate review.

The Product Quality Planning Summary and Approval forms indicate that items with incomplete or unacceptable results require development of an action plan. It is recommended that the organization develop a clear escalation process, both internally and with the customer, in cases where gate reviews conclude incomplete or with unacceptable results.

In some cases, changes will occur after a "gate" has been approved. Gate 1 approval includes confirmation of the change management log, which is to be confirmed at all subsequent gate reviews as confirmation that all changes have been managed appropriately, including reapprovals of past deliverables if applicable.

See APQP 1.15 Change Management Implementation and Checklist A-8 for additional detail.

Donja tabela sumira okvir preispitivanja rukovodstva na svakom gate-u.

Gate 0

Gate	Decision(s) to be Made; Results Documentation	Information to be confirmed (at minimum) - Numbers reference APQP section
0	**Concept Initiation/Approval** E-0 Product Quality Planning Summary & Approval	➢ APQP Risk Assessment; ➢ Team Responsibilities (RASIC, etc.); ➢ Capacity Assessment; ➢ Leadership Support Assessment; ➢ Technology Requirements Assessment; ➢ Facility and Infrastructure Readiness Assessment; ➢ Resources Readiness Assessment; ➢ Sourcing Assessment; ➢ Styling/Appearance Assessment; ➢ 0.10 Product Quality Timing Plan; ➢ APQP Program Metrics development; ➢ Lessons Learned Implementation

PRODUCT QUALITY PLANNING SUMMARY AND APPROVALS
GATE 0 PROGRAM CONCEPT

DATE: _____ BROJ PROIZVODA / REV: _____

PRODUCT NAME: _____ PROIZVODNI POGON: _____

CUSTOMER: _____

1. PROGRAM ASSESMENTS: (results of feasibility assesment related to):

	RESULT/STATUS*	
	ACCEPTABLE (Y/N)	PENDING
0.1 APQP RISK ASSESMENT		
1.13 CAPACITY ASSESMENT		
1.14 LEADERSHIP SUPPORT ASSESMENT		
TECHOLOGY REQUIREMENTS ASSESMENT		
FACILITY AND INFRASTRUCTURE READINESS ASSESMENT		
RESOURCES READINESS ASSESMENT		
SOURCING ASSESMENT		
STYLING/ APPEARENCE ASSESMENT		
TIMING PLAN ASSESMENT		

*RESULT
If "ACCEPTABLE" is NO, must have an action plan detailing how to address
If "PENDING", enter planned date of completition

2. PROGRAM MANAGEMENT

	RESULT/STATUS*	
	ACCEPTABLE (Y/N)	PENDING
TEAM RESPONSIBILITIES		
APQP METRICS DEVELOPMENT		

3. LESSONS LEARNED IMPLEMENTATION

	COMPLETE	PENDING
FROM PAST PROGRAM ASSESMENTS		

*If pending, must have action plan

4. Approvals (signed by all relevant members)

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

Gate 1

1	**Program Approval** E-1 Product Quality Planning Summary & Approval	➢ 1.12 Product Assurance Plan; ➢ 1.13 Capacity Planning; ➢ 1.14 Leadership Support Plan; ➢ 1.15 Change Management; ➢ 1.16 APQP Program Metrics; ➢ 1.17 Risk Assessment Mitigation Plan; ➢ Facility and Infrastructure Readiness Plan; ➢ Resources Readiness Plan; ➢ Supplier Sourcing & Readiness Plan; ➢ Program Timing Plan; ➢ Lessons Learned Implementation;

PRODUCT QUALITY PLANNING SUMMARY AND APPROVALS
GATE 1 PROGRAM APPROVAL

DATE: _____ BROJ PROIZVODA / REV: _____

PRODUCT NAME: _____ PROIZVODNI POGON: _____

CUSTOMER: _____

1. PROGRAM PLANNING:

	RESULT/STATUS*	
	ACCEPTABLE (Y/N)	PENDING
1.12 PRODUCTION ASSURANCE PLAN		
1.13 CAPACITY PLANNING		
1.14 LEADERSHIP SUPPORT PLAN		
1.15 CHANGE MANAGEMENT (LOG)		
1.16 APQP PROGRAM METRICS		
1.17 RISK ASSESMENT MITIGATION PLAN		
FACILITY AND INFRASTRUCTURE READINES PLAN		
RESOURCES READINESS PLAN		
SUPPLIER SOURCING & READINESS PLAN		
PROGRAM TIMING PLAN		

*RESULT
If "ACCEPTABLE" is NO, must have an action plan detailing how to address
If "PENDING", enter planned date of completition

2. LESSONS LEARNED IMPLEMENTATION

	COMPLETE	PENDING
FROM PAST PROGRAM ASSESMENTS		

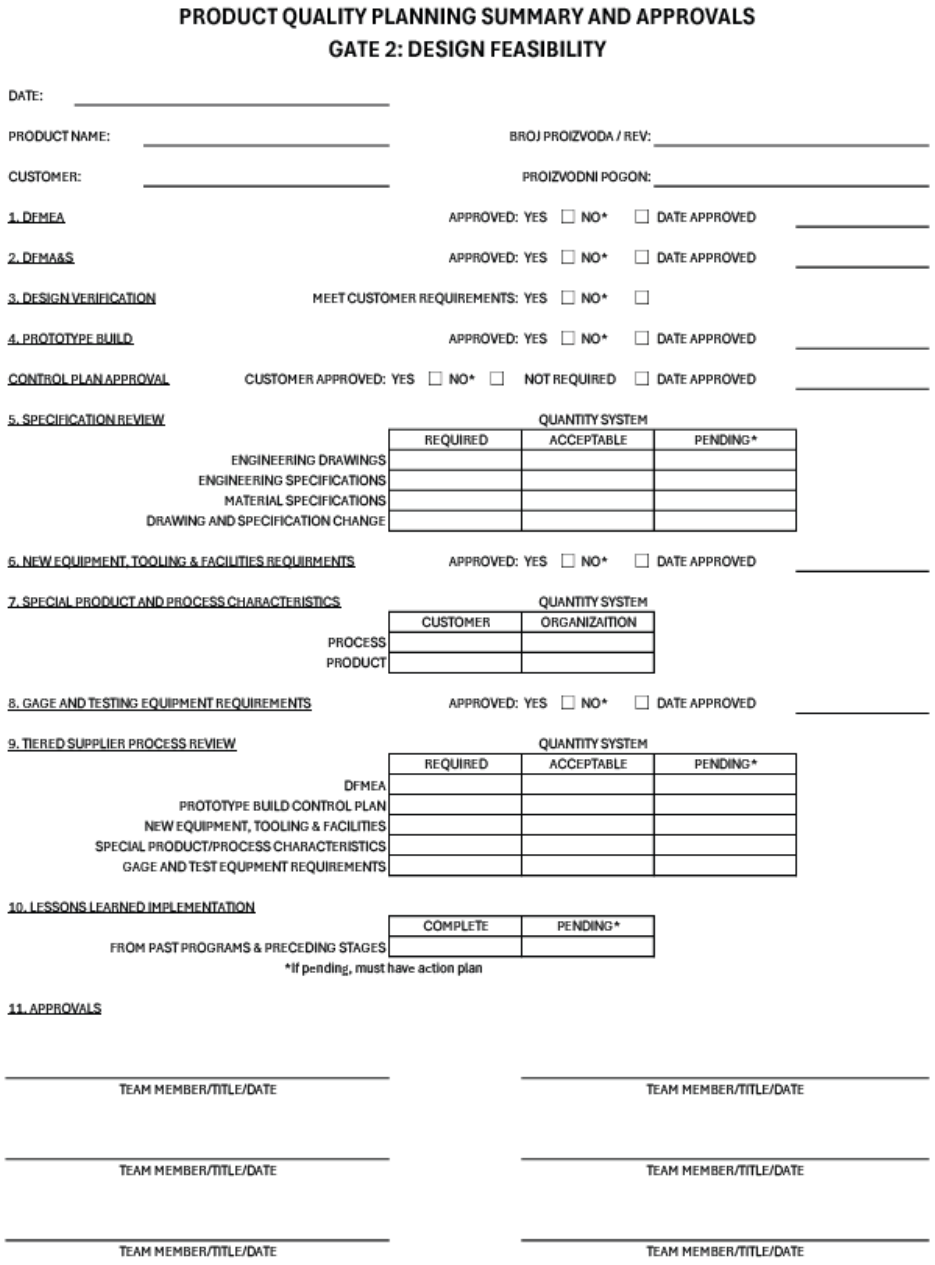
*If pending, must have action plan

3. APPROVALS

TEAM MEMBER/TITLE/DATE	TEAM MEMBER/TITLE/DATE
TEAM MEMBER/TITLE/DATE	TEAM MEMBER/TITLE/DATE
TEAM MEMBER/TITLE/DATE	TEAM MEMBER/TITLE/DATE

Gate 2

2	**Design Feasibility Approval** E-2 Product Quality Planning Summary & Approval D Team Feasibility Commitment	➢ Design can be produced as defined; ➢ Process Capability outlook OK (based on history); ➢ Adequate Capacity; ➢ Design allows efficient material handling, assembly & serviceability; ➢ Within normal cost parameters; ➢ Tiered Supplier Design Review; ➢ Lessons Learned Implementation



PRODUCT QUALITY PLANNING SUMMARY AND APPROVALS
GATE 2: DESIGN FEASIBILITY

DATE: _____

PRODUCT NAME: _____ BROJ PROIZVODA / REV: _____

CUSTOMER: _____ PROIZVODNI POGON: _____

1. DFMEA — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

2. DFMA&S — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

3. DESIGN VERIFICATION — MEET CUSTOMER REQUIREMENTS: YES ☐ NO* ☐

4. PROTOTYPE BUILD — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

CONTROL PLAN APPROVAL — CUSTOMER APPROVED: YES ☐ NO* ☐ NOT REQUIRED ☐ DATE APPROVED _____

5. SPECIFICATION REVIEW — QUANTITY SYSTEM

	REQUIRED	ACCEPTABLE	PENDING*
ENGINEERING DRAWINGS			
ENGINEERING SPECIFICATIONS			
MATERIAL SPECIFICATIONS			
DRAWING AND SPECIFICATION CHANGE			

6. NEW EQUIPMENT, TOOLING & FACILITIES REQUIRMENTS — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

7. SPECIAL PRODUCT AND PROCESS CHARACTERISTICS — QUANTITY SYSTEM

	CUSTOMER	ORGANIZATION
PROCESS		
PRODUCT		

8. GAGE AND TESTING EQUIPMENT REQUIREMENTS — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

9. TIERED SUPPLIER PROCESS REVIEW — QUANTITY SYSTEM

	REQUIRED	ACCEPTABLE	PENDING*
DFMEA			
PROTOTYPE BUILD CONTROL PLAN			
NEW EQUIPMENT, TOOLING & FACILITIES			
SPECIAL PRODUCT/PROCESS CHARACTERISTICS			
GAGE AND TEST EQUIPMENT REQUIREMENTS			

10. LESSONS LEARNED IMPLEMENTATION

	COMPLETE	PENDING*
FROM PAST PROGRAMS & PRECEDING STAGES		

*if pending, must have action plan

11. APPROVALS

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

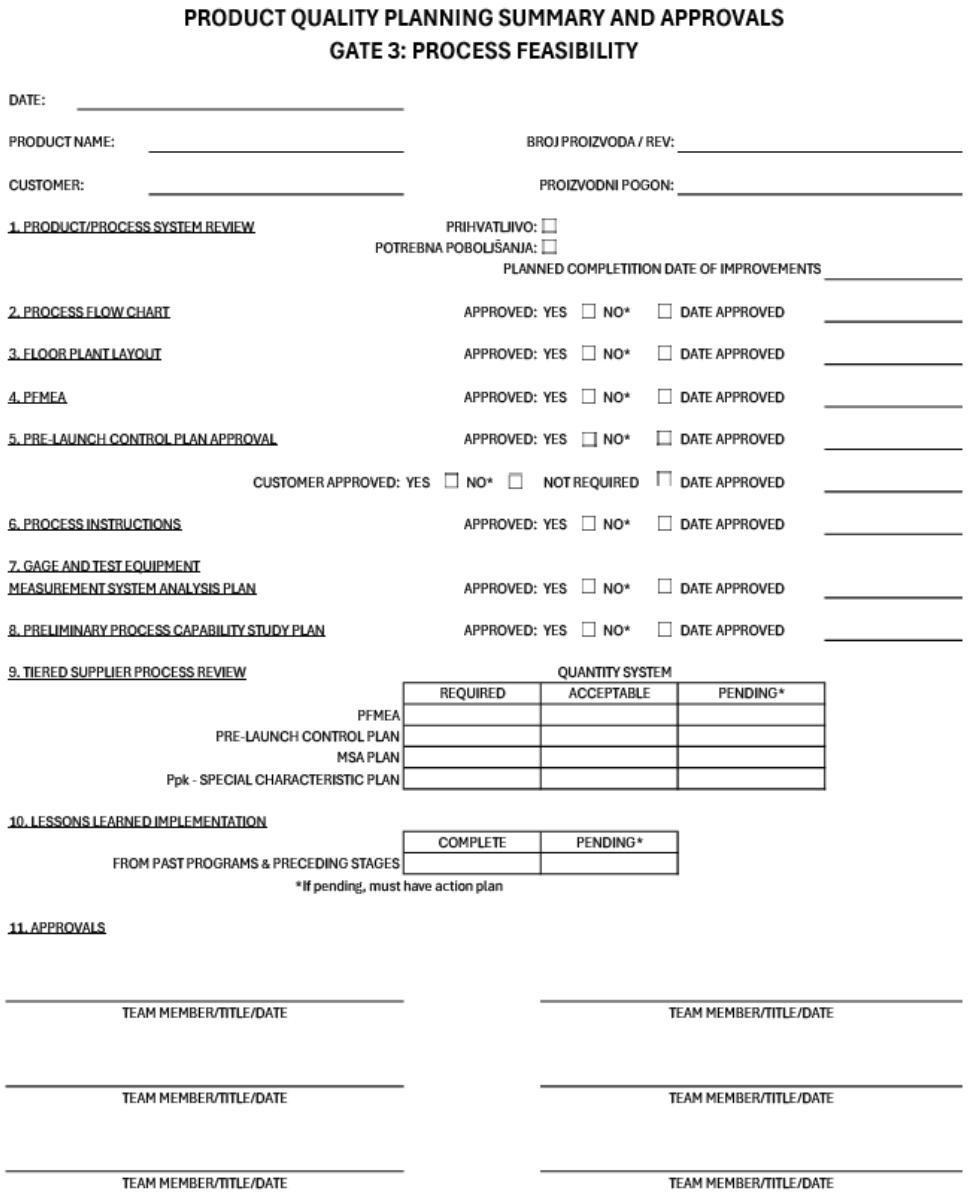
_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

Gate 3

3	**Process Feasibility Approval** E-3 Product Quality Planning Summary & Approval	➢ Packaging standards can be met; ➢ Site QMS assess/plan (including personnel/training); ➢ Process Documentation (Process Flow-->PFMEA->CP--> WI); ➢ MSA and SPC studies; ➢ Tiered Supplier Process Capability; ➢ Lessons Learned Implementation



PRODUCT QUALITY PLANNING SUMMARY AND APPROVALS
GATE 3: PROCESS FEASIBILITY

DATE: _____

PRODUCT NAME: _____ BROJ PROIZVODA / REV: _____

CUSTOMER: _____ PROIZVODNI POGON: _____

1. PRODUCT/PROCESS SYSTEM REVIEW — PRIHVATLJIVO: ☐ POTREBNA POBOLJŠANJA: ☐ PLANNED COMPLETITION DATE OF IMPROVEMENTS _____

2. PROCESS FLOW CHART — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

3. FLOOR PLANT LAYOUT — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

4. PFMEA — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

5. PRE-LAUNCH CONTROL PLAN APPROVAL — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

CUSTOMER APPROVED: YES ☐ NO* ☐ NOT REQUIRED ☐ DATE APPROVED _____

6. PROCESS INSTRUCTIONS — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

7. GAGE AND TEST EQUIPMENT MEASUREMENT SYSTEM ANALYSIS PLAN — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

8. PRELIMINARY PROCESS CAPABILITY STUDY PLAN — APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

9. TIERED SUPPLIER PROCESS REVIEW — QUANTITY SYSTEM

	REQUIRED	ACCEPTABLE	PENDING*
PFMEA			
PRE-LAUNCH CONTROL PLAN			
MSA PLAN			
Ppk - SPECIAL CHARACTERISTIC PLAN			

10. LESSONS LEARNED IMPLEMENTATION

	COMPLETE	PENDING*
FROM PAST PROGRAMS & PRECEDING STAGES		

*If pending, must have action plan

11. APPROVALS

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

Gate 4

4	**Launch Readiness/Approval** E-4 Product Quality Planning Summary & Approval	➢ Significant Production Run; ➢ PPAP, including PV testing; ➢ MSA and SPC studies; ➢ Packaging Evaluation; ➢ Process Documentation (Process Flow-> PFMEA-> CP-> WI); ➢ Tiered Supplier Launch Readiness; ➢ Lessons Learned Implementation

TEAM MEMBER/TITLE/DATE

TEAM MEMBER/TITLE/DATE

TEAM MEMBER/TITLE/DATE

TEAM MEMBER/TITLE/DATE

TEAM MEMBER/TITLE/DATE

TEAM MEMBER/TITLE/DATE

PRODUCT QUALITY PLANNING SUMMARY AND APPROVALS
GATE4: LAUNCH REDINESS

DATE: _____

PRODUCT NAME: _____ BROJ PROIZVODA / REV: _____

CUSTOMER: _____ PROIZVODNI POGON: _____

1. PRELIMINARY PROCESS CAPABILITY STUDY

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
Ppk - Special characteristic			
Ppk - Other characteristic			

2. PRODUCTION CONTROL PLAN APPROVAL — Approved: Yes ☐ No* ☐ Not required ☐

Customer approval: Yes ☐ No* ☐

3. INITIAL PRODUCTION SAMPLES
CHARACTERISTIC CATEGORY

	QUANTITY			
	SAMPLE	CHARACTERISTIC PER SAMPLE	ACCEPTABLE	PENDING*
DIMENSIONAL				
VISUAL				
LABORATORY				
PERFORMANCE				

4. GAGE AND TEST EQUIPMENT
MEASUREMENT SYSTEM ANALYSIS (MSA)

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
SPECIAL CHARACTERISTICs			
OTHER CHARACTERISTICs			

5. PROCESS MONITORING

	QUANTITY		
PROCESS MONITORING INSTRUCTIONS	REQUIRED	ACCEPTABLE	PENDING*
PROCESS SHEETS			
VISUAL AIDS			

6. PACKAGING/SHIPPING

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
PACKAGING APPROVAL			
SHIPPING TRIALS			

7. SIGNIFICANT PRODUCTION RUN — MEETS CUSTOMER AND INTERNAL PRODUCTION PLANNING: YES N☐ ☐

8. TIERED SUPPLIER READINESS

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
Ppk - SPECIAL CHARACTERISTICS			
CONTROL PLAN			
MSA			
SIGNIFICANT PRODUCTION RUN			

9. PRODUCTION PART APPROVAL (PPAP)
CUSTOMER APPROVAL STATUS

APPROVED	☐
INTERIM APPROVAL*	☐
REJECTED*	☐
NOT REQUIRED	☐

10. LESSONS LEARNED IMPLEMENTATION

	COMPLETE	PENDING*
FROM PAST PROGRAMS & PRECEDING STAGES		

*If pending, must have action plan

11. APPROVALS

DS-IMS

Gate 5

5	**Feedback, Assessment & Corrective Action** E-5 Product Quality Planning Summary & Approval	➢ Process Capability Results; ➢ Approval to End Safe Launch, Implement Production Control Plan Lessons Learned Incorporation

PRODUCT QUALITY PLANNING SUMMARY AND APPROVALS
GATE5: FEEDBACK, ASSESMENT & CORRECTIVE ACTIONS

DATE: _____

PRODUCT NAME: _____ BROJ PROIZVODA / REV: _____

CUSTOMER: _____ PROIZVODNI POGON: _____

1. PROCESS CAPABILITY STUDY

	QUANTITY		
	REQUIRED	ACCEPTABLE	PENDING*
Ppk - SECIAL CHARACTERISTICS			
Ppk - OTHER CHARACTERISTICS			

2. PRODUCTION CONTROL PLAN APPROVAL APPROVED: YES ☐ NO* ☐ DATE APPROVED _____

CUSTOMER APPROVED: YES ☐ NO* ☐ NOT REQUIRED ☐ DATE APPROVED _____

3. LESSONS LEARNED IMPLEMENTATION

	COMPLETE	PENDING*
CURRENT PART (FMEA/CP/WORK INSTRUCTIONS)		
FAMILY/FOUNDATION FMEAs/CPs		
"READ ACROSS" SYSTEM UPDATED		

4. APPROVALS

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

_____ TEAM MEMBER/TITLE/DATE

*REQUIRES PREPARATION OF AN ACTION PLAN TO TRACK PROGRESS

10. Analitical tehniques

Danijel Suhanji, 02.2025, v1.0

Primenljive analitičke tehnike – Analiza varijacije sklopa

Assembly Build Variation Analysis	Simulates assembly build-up and examines tolerance accumulation, statistical parameters, sensitivity, and "what if" investigation

Primenljive analitičke tehnike – Metoda kritične staze

Critical Path Method	It can be a Pert or Gantt chart that shows the chronological order of tasks that require the highest expected time to achieve. It can provide valuable information such as: ➢ Mutual relations; ➢ Early prediction of problems; ➢ Identification of liability; ➢ Identifying, allocating, and leveling resources.

11. Change description in tables

Danijel Suhanji, 02.2025, v1.0

Change description - General

Old manual	New manual	A brief overview of the changes
Section 6 – Control plan methodology		**Deleted** section Replaced with AIAG Control Plan Manual
	Appendix B - Managing Gates	**New addition** A new appendix that talks about managing gates in the APQP process, called Appendix B
Appendix B - Analytical Techniques	Appendix C - Analytical Techniques	Changed the name of the add-on – from Appendix B to Appendix C (see below for all changes in Appendix)
Appendix C - Reference material	Appendix F - Reference material	Changed the name of the appendix – from Appendix C to Appendix F (See below if there are any changes.)
	Appendix G - Section for Specific Guidelines	**New addition**
Appendix F – Terms	Appendix H - Concepts	Changed the name of the appendix – from appendix F to appendix H (all changes in the appendix will not be a detailed explanation – see in red)
Appendix G - Index	Appendix I - Index	Changed the name of the appendix – from appendix G to appendix I (any changes in the appendix will not be a detailed explanation)

Change description – Chapter Introduction

Old manual	New manual	A brief overview of the changes
Forward	Forward	The Product Quality Planning Circle has been revised, where for the Do, Check, Act phases, it has been added that it is necessary to review the Lessons learned and Best Practices. Further, an SIPOC diagram has been added to illustrate the organization Next, a table with a display of the supply chain has been added
Introduction	Purpose of the manual	The Introduction chapter of the previous manual is now called The Purpose of the Manual. The OEMs are Ford, GM, and Stellantis. Chrysler has been removed as an OEM compared to the previous version. The terms "Organization" and "Supplier" have been removed and replaced by other definitions (see SIPOC). The benefit related to communication with all stakeholders has been redefined, not just the recipients as it was written in the previous version. References related to ISO/TS 16949 have been renamed IATF 16949 It is further noted that nothing in the manual can replace the requirements of IATF 16949 and the CSRs An obligation has been added to the APQP teams that all checklists must be reviewed
The Fundamentals of Product Quality Planning	Fundamentals of Advanced Product Quality Planning (APQP)	Product quality planning is now called Advanced ProductQuality Planning, with a change in definition where in addition to meeting customer requirements, it is now added that all performance and quality requirements need to be met. Furthermore, instead of the benefit of Avoiding late changes, it has now been changed to Increase FTQ (First Time Quality) of the product

Change description – Chapter Introduction - continued

Product Quality Planning Responsibility Matrix	Responsibilities of Product Quality Planning	The responsibility matrix has been abolished, but the division into quality planning functions has been retained: ➢ Responsible for the design, to which all sections of the manual apply; ➢ They are not responsible for the design (production or service organizations), where certain points from sections 1 and 2 may not be applicable (in agreement with customers)
Part of the Basics of Quality Planning	Beggining	Created a new chapter Beggining, with activities listed below

Change description – Chapter Beggining - continued

Old manual	New manual	A brief overview of the changes
Organizing the team	Organizing the team	The new manual requires representatives of the leadreship of multifunctional teams to be involved in the process. Further, it was added that the organization must have a methodology for determining high risks based on the A-0 appendix to the manual. Furthermore, the need to establish an initial meeting (kick-off meeting) with representatives of the team's management, including selected suppliers, has been added
Defining the scope	Defining the scope	The requirement for the debranding of specific customer requirements has been redefined, where organizations are now required to ask their customers for detailed requirements and to clarify any requirements that are not fully understood with the customer. Instead of Appendix B, the manual is now referenced to Appendix C. With an understanding of all the customer's requirements of the program, it has now been added to develop a customer-specific requirements statement
Team to team	Team to team	In addition to communication within the organization and the customer, a requirement has now been added to establish communication with the recipients. It is also possible that the communication itself may include regular meetings.

Change description – Chapter Beggining - continued

Training	Training	It is added that the customer may have additional APQP training requirements, and that these requirements can be assessed through Core Tools Self-Assessment from the AIAG website.
	Sourcing	**A new chapter** has been added with the aim of connecting the purchasing process and the APQP team, defining requirements for the selection and risk analysis of suppliers (High risk supplier evaluation). There is also a reference to the A-9 checklist
Customer and organization involvement	Customer and organization involvement	It was added that in the event that the customer designates a supplier, it is the responsibility of the organization to work with the supplier to fulfill the APQP obligations. Also, in the event that the supplier is a competitor, or there are confidentiality concerns, the organization and the buyer must initiate a discussion on how to obtain the required information and document the agreement in the commercial contract.
Simultaneous Engineering	Simultaneous Engineering	No changes

Change description – Chapter Beggining - continued

Control plan	Control plan	For the Prototype Configuration Plan, a clarification has been added that its creation is typically driven by a design or engineering function. For the Pre-Launch Control Plan, it has been added that the customer may require a safe launch or an extended retention period during the pre-launch phase For the Serial Production Control Plan, it was added that the start of serial production must include a safe launch or an extended retention period to ensure that potential non-conformities are contained.
Resolving Concerns	Resolving Concerns	No changes
Product Quality Planning Timing	Product Quality Planning Timing	The timing plan, in addition to previous tasks and other activities, must include a list of the customer's and internal milestones, as well as a review of the gate phases. The reference has been changed from Appendix B to Appendix C.
Plans vs Timing Chart	Plans vs Timing Chart	Instead of requiring the planning team to be ready to modify product quality plans, it is now required that the project team must evaluate the feasibility of any change in the scope of the project, as well as obtain approval from the customer (for example: time, cost, quality...), with the aim of approval and proper management of the project. The graph extends the design and development of the product to the pilot phase – previously it ended at the model/prototype design phase The prototype phase has been renamed to the model/prototype design phase.

Change description – Chapter 1

Old manual	New manual	A brief overview of the changes
Timing Chart & outputs	Timing Chart & outputs	They have been added as outputs (which have now been added to be inputs in phase 2): ➢ Capacity planning; ➢ Change Management Implementation; ➢ APQP Program Metrics; ➢ Potential Risk Mitigation Plan
Introduction and Inputs	Introduction and Inputs	The following types of entrances are recognized in the customer inputs: ➢ Quality and reliability targets; ➢ Cost tagrets; ➢ Other expected KPI objectives Also, as an input, it is added: ➢ Initial Quality, JD Powers, User Reports In this chapter, the outputs from this phase are removed.

Change description – Chapter 1 - continued

Voice of the customer	Voice of the customer	In Chapter 1.1.1 – Market Research, third-party data (such as JD Powers) has been added as the source of customer voice. In Chapter 1.1.2 – Historical Information on Warranty and Quality, it is required that instead of previously only the customer's history of concerns, all internal and external concerns are now used. It is added that this information (which is applicable) must be communicated by the organization to the lower tiers of the supply chain. Two levels of information have been added: which must be shared with them, as well as which should be shared Changes to the information that must be shared: ➢ From the information related to warranties, it has now been added that these are information of previous models or similar products; ➢ Added a requirement to use key issues/risks from DFMEA/PFMEA. Changes to the information that sould be shared: ➢ Added a requirement to share Internal Organizational Quality Reports; ➢ A requirement to share information obtained from social media sources has been added. In Chapter 1.1.3 – Team Experience, the following sources of information have been changed: ➢ Benchamrking has been added; ➢ Test and test drives; Driving and Drivers (formerly just called Road Tests); ➢ Added design review.

Change description – Chapter 1 - continued

Marketing Business Plan and Strategy	Marketing Business Plan and Strategy	No changes
Product/process benchmark data	Product/process benchmark data	Appendix B renamed Appendix C
Product Reliability Studies	Product Reliability Studies	No changes
Customer inputs	Customer inputs	No changes
Design Goals	Design Goals	No changes
Reliability and Quality Goals	Reliability and Quality Goals	As one of the possible quality goals, customer disruption is added.
Preliminary BOM (Bill of Materials)	Preliminary BOM (Bill of Materials)	No changes
Preliminary process flow chart	Preliminary process flow chart	No changes
Preliminary identification of special production and process characteristics	Preliminary identification of special production and process characteristics	No changes
Product Assurance Plan	Product Assurance Plan	No changes

Change description – Chapter 1 - continued

	Capacity planning	**A new chapter** has been added Added in order to ensure efficient and effective execution of capacity planning
Management Support	**Leadership** Support	The main change is that now the support of the Leadership is considered not only the upper management, but also the top management. It is now required from top management to sign-off when reviewing gates at the end of each phase of product quality planning, in order to reinforce their support and commitment (previously, management only needed to be notified at the end of each phase).
	Implementing Change Management	**A new chapter** has been added It is focused on managing changes to the focal stages of the APQP, and all lessons learned and best practices must be made and used in the future. Each outgoing APQP document must contain a log of the changes, and as a minimum, the reason for the change, who requested the change, the date, and the person who approved the change. A definition has been added when it is necessary to trigger a change notification (3 types of changes have been defined). Add the principles and requirements related to change management.

Change description – Chapter 1 - continued

	APQP Program Metrics	**A new chapter** has been added Added a requirement for the existence of a document with an overview of the metrics of the APQP program.
	Potential Risk Mitigation Plan	**A new chapter** has been added It is designed to reduce or eliminate the impact of risk on the program.

Change description – Chapter 2

Old manual	New manual	A brief overview of the changes
Timing Chart & Outputs	Timing Chart & Outputs	There are no new outputs (which have now been added to be phase 3 inputs): ➢ There is no more splitting on the output design, as well as APQP outputs The output design for production and assembly has been changed, and finally serviceability has been added
Introduction and Inputs	Introduction and Inputs	The following inputs have been added: ➢ Capacity planning; ➢ Change Management Implementation; ➢ APQP Program Metrics; ➢ Potential Risk Mitigation Plan In this chapter, the outputs from this phase are removed.
DFMEA	DFMEA	Now, instead of all the others, the AIAG/VDA FMEA manual is mentioned as a reference.
Design for manufacturability, assebly	Design for Manufacturability, Assembly and Service	Added service requests that weren't there before. To the list of minimum items that the team needs to take into account are added: ➢ Serviceability (maintenance, repair or replacement in the field); ➢ Traceability of work.

Change description – Chapter 2 - continued

Design Verification	Design Verification	No changes
Design Review	Design Review	In the minimal items to be considered, in the Design of Experiments (DOE), as well as in the section related to the use of appropriate analytical techniques, the manual refers to Appendix C instead of Appendix B
Creating a prototype control plan	Creating a prototype control plan	The methodology now refers to the AIAG control plan manual
Engineering drawings (including mathematical data)	Engineering drawings (including mathematical data)	No changes
Engineering Specifications	Engineering Specifications	No changes
Material Specifications	Material Specifications	A requirement has been added that material specifications must be documented in design records.
Changes to drawings and specifications	Changes to drawings and specifications	It was added that instead of all areas covered by the changes, communication is made to all covered areas within the organization, with the customer and supplier.
New equipment, tools and plant requirements	New equipment, tools and plant requirements	No changes

Change description – Chapter 2 - continued

Special production and process characteristics	Special production and process characteristics	Added a requirement to use customer labels with special characteristics and correlation matrices if the organization uses its own labels. Excluded reference to the control plan chapter in the manual and added reference to Appendix C
Requirements for Gauges/Test Equipment	Requirements for Gauges/Test Equipment	No changes
Team feasibility commintment and leadership support	Team feasibility commintment and leadership support	A requirement has been added to take into account all design guidelines for manufacturing, assembly and serviceability when reviewing designs.

Change description – Chapter 3

Old manual	New manual	A brief overview of the changes
Timing Chart & Outputs	Timing Chart & Outputs	No new outputs (which have now been added to be phase 4 inputs)
Introduction and Inputs	Introduction and Inputs	Input has been changed: ➢ In the end, serviceability is added to the design for manufacturability and assembly In this chapter, the outputs from this phase are removed.
Packaging Standards and Specifications	Packaging Standards and Specifications	Requirements for service packaging specifications have been added.
Product/process quality system review	Product/process quality system review	A requirement has been added that for every control and procedural change required for the production of a product, in addition to the previous version of the production control plan only, the process flow chart, PFMEA and operating instructions must now be updated The requirement has been changed from A-4 to A-4 or equivalent during this process.
Process flow diagram	Process floe diagram	The requirement has been changed from A-6 or equivalent to be used during this process.

Change description – Chapter 3 - continued

The Layout of the shopflor	The Layout of the shopflor	It has now been added to the layout role that it is still used to determine important control items, such as in addition to those listed in the previous version, process characteristics, inspection and re-entry points. The requirement has been changed from A-5 to A-5 or equivalent during this process.
Characteristic matrix		Removed complete chapter
PFMEA	PFMEA	All previous references to PFMEA manuals have been replaced by the AIAG/VDA manual. The requirement has been changed to not be able to use the A-7 checklist during this process.
Pre-launch contro plan	Pre-launch contro plan	Here, the link to the control plan section from the previous version of the manual has been replaced with a link to the new control plan manual. Added the ability for the customer to request Safe Launch in pre-series production. The requirement has been changed from A-10 (formerly A8) to be used during this process.
Process Instructions	Process Instructions	No changes
Measurement System Analysis Plan	Measurement System Analysis Plan	All manuals have been replaced with AIAG MSA manual
A preliminary plan for a process capability study	A preliminary plan for a process capability study	All manuals have been replaced with AIAG PPAP and SPC manual
Leadership Support	Leadership Support	The change refers to the fact that leadership is now included, in addition to the previous upper level of management of the organization

Change description – Chapter 4

Old manual	New manual	A brief overview of the changes
Timing Chart & Outputs	Timing Chart & Outputs	No new outputs (which have now been added to be Phase 5 entrances)
Introduction and Inputs	Introduction and Inputs	During this phase, the control plan is validated and the process flow chart is monitored in the same way as it would be during serial production. In this chapter, the outputs from this phase are removed.
Significant production run	Significant production run	The reference manuals have been replaced by the AIAG PPAP manual. Furthermore, the requirement has been added that the check against the control plan must be carried out at least once during the start of production. At the exit, in the section for master samples now it just says: ➢ First time quality (FTQ) ➢ Master samples (as required)
Measurement system analysis	Measurement system analysis	The requirement that all monitoring and measuring equipment must be subjected to an analysis of the measurement system before the start of production has been changed, and that they must be used to verify all identified characteristics according to the control plan during the start of production. The reference manuals have been replaced by the AIAG MSA manual.

Change description – Chapter 4 - continued

Preliminary Process Capability Studies	Preliminary Process Capability Studies	It is clarified that the study must be carried out on all special characteristics defined within the control plan, using randomly selected parts if possible. The reference manuals have been replaced by the AIAG PPAP and SPC manual.
Production part approval	Production part approval	As the previous version stated the purpose of the PPAP is to provide evidence that the customer's engineering design records are specification requirements understood by the organization, it was added that they must also be achieved. As it was written in the previous version, the process should have the potential to consistently produce parts that meet the above requirements, in the new version the potential has been replaced by the term: that the production process will consistently produce parts that achieve... The reference manuals have been replaced by the AIAG PPAP manual.
Production Testing Validation	Production Testing Validation	No changes (wording only)
Packaging Evaluation	Packaging Evaluation	A requirement has been added that, when necessary, it is necessary to verify the effectiveness of the backup package.

Change description – Chapter 4 - continued

Production Control Plan	Production Control Plan	It added that the start of serial production must include a safe launch or a period of extended retention to ensure that potential non-conformities are contained, through additional inspections or increased frequency of checks, or the use of tighter specification limits. References to the sections related to the control plan have been replaced by the AIAG PPAP Manual.
Sign-off quality planning and leadership support	Sign-off quality planning and leadership support	In the demonstration of the required capacity, it was added that it is necessary to verify that the process is capable of meeting the required production capacity and all customer requirements. Specifics can be found within specific customer requirements, and this demonstration may require several production runs for verification. The reference manuals have been replaced by the AIAG MSA manual.

Change description – Chapter 5

Old manual	New manual	A brief overview of the changes
Timing Chart & Outputs	Timing Chart & Outputs	No new outputs (which have now been added to be Phase 5 entrances)
Introduction and Input	Introduction and Ipnut	Quality planning should be carried out whenever a product or process change is implemented after the process has been initiated and validated, up to and including the PPAP for the applied change. The reference manuals have been replaced by the AIAG SPC manual.
Reduction of variation	Reduction of variation	The reference manuals have been replaced by the AIAG SPC manual.
Improving customer satisfaction	Improving customer satisfaction	A reference has been added to the AIAG PPAP Manual, Section 3.1 – Customer Notification and any applicable specific customer request.
Improving service and delivery to the customer	Improving service and delivery to the customer	The clarification of spare parts has been reworked, it is now required that whenever a problem occurs in the customer's environment, it is vital to effectively contain the problem and deliver spare parts. The clarification of the problems in the field has been reworked, the customer expects the organization to support him in correcting the problem and the availability of spare parts at the customer's service organizations.
Effective use of lessons learned/best practices	Effective use of lessons learned/best practices	It is recommended that lessons learned and best practices be collected throughout the APQP process. It was added that the lessons learned and best practices were incorporated into the DFMEA and PFMEA as applicable (and a link to the AIAG/VDA FMEA manual was added). Added entry: Preservation of Institutional Knowledge.

Change description – Appendix A

Old manual	New manual	A brief overview of the changes
Purpose of Checklists	Purpose of Checklists	A little better explained the purpose of checklists
	APQP Risk Factor Checklist	**Added** a new checklist
DFMEA Checklist	DFMEA Checklist	Instead of 10, there are now 13 questions
Checklist for design information	Checklist for design information	Instead of 31, there are now 34 questions with additional sub-questions for individual questions
Check List for New Equipment, Tools and Test Equipment	Check List for New Equipment, Tools and Test Equipment	Instead of 14, there are now 19 questions with additional sub-questions for individual questions
Checklist for Product/Process Quality	Checklist for Product/Process Quality	Instead of 32, there are now 36 questions with additional sub-questions for individual questions
Checklist for Plant Layout	Checklist for Plant Layout	Instead of 12, there are now 16 questions with additional sub-questions for individual questions
Checklist for process flow chart	Checklist for process flow chart	Instead of 7, there are now 9 questions with additional sub-questions for individual questions
Checklist for FMEA	Checklist for FMEA	Instead of 11, there are now 23 questions
	Change Management Checklist	**Added** a new checklist
	Sourcing Check List	**Added** a new checklist
Checklist for Control Plan	Checklist for Control Plan	Instead of 12, there are now 21 questions

Change description – Appendix B

Old manual	New manual	A brief overview of the changes
Purpose of Analytical Techniques	Purpose of Analytical Techniques	A little better explained purpose of using Analytical techniques
	APQP Program Metrics	**Added** a new analytical technique
Characteristic matrix		Excluded from the new manual
	Design for Serviceability	**Added** a new analytical technique
	FMEA	**Added** a new analytical technique
Mistake proofing/Error Proofing	Mistake proofing/Error Proofing	The difference between these two methods is fully explained
	OEE	**Added** a new analytical technique
Process flow chart	Process flow chart	Added image showing an example of aprocess flow chart
QFD		Excluded from the new manual
	Risk Mitigation Assesment Plan	**Added** a new analytical technique
	Traceability	**Added** a new analytical technique

Change description – Appendix E

Old manual	New manual	A brief overview of the changes
Appendix E	Appendix E	Added activities and clarifications related to: ➢ Significant production run; ➢ Tiered supplier readiness; ➢ PPAP; ➢ Implementation of the lessons learned.

Change description – Appendix F

Old manual	New manual	A brief overview of the changes
Reference Material	Reference Material	Updated in accordance with the current names of the reference materials. Added reference materials for: ➢ Control plan; ➢ CQI-8; ➢ CQI-4; ➢ CQI-19; ➢ CQI-28.

DS-IMS

– THE END –

Thank you for your attention