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# Supply Partner Quality Assurance Manual

Sixth edition | 2022



# Introduction

**Quality lasts when we put it first.** Every day in the Volvo Group, we are relentlessly working to improve our processes, products, services, and competences to be the best in class in our industry.

Our customers expect continuous world-class performance to operate their business with high uptime and excellent features. We must jointly work to satisfy their expectations every day and every hour. Hence, we see a need to continuously improve - leading to updated and added requirements to reflect the new, dynamic business environment we jointly operate in.

In this new edition you will for instance find added requirements on cyber-security, raised expectations on our audit result and introducing Phased PPAP to name a few.

Partnership is the new leadership, meaning we need to join forces to be successful in this journey. And we can't only think in "Tier-1/Customer" cooperation. We need to build a resilient and high performing supply network together with all quality-critical supply partners, independent at what Tier-N level they are.

We trust that you will embrace and deploy this point of view. We expect you to have full control of your supply network, to know where the risks and weaknesses are and address all of them together with us. This needs full transparency and control over critical components, production processes and supply partners wherever in the supply network they may be.

This manual applies to all supply partners for Volvo Trucks, Mack Trucks, Renault Trucks, Volvo Eicher Powertrain (VEPT), Volvo Bus, Nova Bus, Prevost Bus, Volvo Construction Equipment (VCE) and Volvo Penta. With this as our common ground, we will develop and maintain a strong, stable, long-term, and successful supply network where we proactively and predictively secure zero defects together.



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# Using this document



## Organization

This document defines the expectations and working procedures intended to assist supply partners in achieving and maintaining a successful working business relationship with the Volvo Group. This document is organized in eight chapters explaining our main processes.

We do expect this manual to be widely shared, read and understood within the supply partner development, manufacturing and quality organization.

## Non-Quality related Procedures

In addition to this Supply Partner Quality Assurance Manual, Volvo Group maintains a set of procedures that define specific requirements and expectations in key areas. These Procedures cover Volvo Group requirements related to the environment, corporate social responsibility, sustainability, logistics. The Procedures are available on the Volvo Group Supplier Portal. Always contact the Volvo Group Buyer or Supplier Development/Quality Engineer (SDE/SQE) if you have questions related to our procedures and requirements.

## Scope

This Supply Partner Quality Assurance Manual is a joint document recognized and used by the following organizations: Volvo Trucks, Mack Trucks, Renault Trucks, Volvo Eicher Powertrain (VEPT), Volvo Bus, Nova



Bus, Prevost Bus, Volvo Construction Equipment (VCE) and Volvo Penta. Nova Bus and Prevost Bus may be referred to as Volvo Bus North America (VBNA).

To simplify the text in this document, the name Volvo Group refers to this collective group of companies. The word Vehicle may refer to both trucks, buses, machines and equipments.

Text in frame boxes like this provide an overview of the information in the section and may be used as a quick reference.

**MANDATORY REQUIREMENTS ARE HIGHLIGHTED IN THIS FORMAT**

## Volvo Group Supplier Portal

Volvo Group Supplier Portal is the web entry point on [www.volvogroup.com/suppliers](http://www.volvogroup.com/suppliers), which enables collaboration between Volvo Group and its supply as well as business partners. The portal allows supply partners to access all relevant documents and news needed to collaborate efficiently.

Most of the content is common to all Volvo organizations. Any organization specific content is highlighted at the end of each page.

If you are not able to find the relevant document you are searching for, please contact your Volvo buyer or quality contact.

Supply partners are responsible for applying for access to Volvo Group Supplier Portal by contacting the Buyer or [cmsservices@volvo.com](mailto:cmsservices@volvo.com).

Supply partners are required to maintain the contact details for key individuals and business information for their organization and are required to review the contact information at least every three months or whenever a supply partner organizational change is occurring.

Latest version of this Supply Partner Quality Assurance Manual is also available there.

## **Supply partners feedback**

We welcome and encourage feedback concerning this document. Any suggestions, including suggestions for adding additional information or improvements to this document, should be e-mailed to [sqam@volvo.com](mailto:sqam@volvo.com)



# 1. Safety management

Protecting the customer



From the founding of Volvo in the 1920's, quality and safety have been core values of the corporation. Since that time, the commitment to the research and development of new and often unique safety solutions has made the Volvo name synonymous with safety around the world.

Today, Quality, Safety and Care for the Environment continue to be the core values of the Volvo brands and form a foundation for all business practices including the cooperation between the Volvo Group and our supply partners.

The Volvo Group definition of safety not only includes the safety of the immediate user of our products, but also understanding the entire scope of potential impact of our products on society.

The primary objective is to develop products that assist in preventing accidents from occurring or, in the event an accident does occur, to minimize the consequences for the drivers and others on the road.

The supply partner's contribution to safety lies in developing innovative solutions, implementing safety features and producing fully conforming products. The Volvo Group Safety Management Program focuses on both supply partners' management systems, and product quality related to safety.

Safety Management applies to a part, function or feature when a non-conformance related to the product would create a safety hazard.

## 1.1 Definition

Safety requirements are determined based on the potential of a feature, product or system to create a personal hazard to any person in contact with the products or effects caused by the product. A Safety Customer Effect is considered when a danger can lead to injuries to vehicle operators, passengers, other travelers, passers-by or maintenance personnel. Supply partners of a safety critical part are categorized as a Safety Part Supply partner.

Volvo Group defined safety critical parts by the feature of the part and or based on the use, function or application of the part. For the later, there is no single feature or characteristic of the part that defines the part as safety critical, rather the safety critical designation relates to the safe reliable function of the part itself. These parts shall meet all the requirements of a safety critical part apart from the requirement to maintain capability of a specific feature. In our continues strive to focus on Safety we have now as well included Functional Safety and Cybersecurity.

Supply partners of parts on the list of safety parts will be notified by the presence of a check box on the Part Version Report (PVR) or by notification from the SDE/SQE assigned for the component.

Safety related features are designated by the presence of the symbol [CC] next to the feature on the drawing or in a specification. If any feature of a part is considered safety critical, the part is a safety critical part. All the activities related to safety management are required if any feature of a part is identified as having an impact on safety, and the part is considered safety critical.

## 1.2 Responsibility

The production of safe, fully conforming products to the Volvo Group companies is the supply partner's responsibility and is part of the supply partner's contractual commitment. Any assistance provided by Volvo Group does not in any way limit the supply partner's responsibility to supply parts that conform to all technical specifications and standards, as well as regulatory, contractual and legal demands.

Supply partners are required to conduct a criticality analysis for features of the product design and production process that could result in a safety effect. For supply partners having design responsibility, special characteristics related to safety must be clearly identified within their design specifications, verification/validation plans, drawings, and technical documentation. Supply partners who are design responsible for products impacting safety are required to develop System, Sub-System, Design and Process Failure Modes Effects Analysis to assist in the analysis.

Volvo Group must be notified of any product features or functions where the potential failure mode and associated customer safety effect are assigned a high severity score (9 or 10). (Severity for any features identified by Volvo Group with a [CC] must have a severity score of a 9 or 10 on the supply partner's FMEA.)

**VOLVO GROUP MUST BE NOTIFIED IMMEDIATELY IN THE EVENT A NON-CONFORMANCE OR POTENTIAL CUSTOMER RISK IS IDENTIFIED**

A safety critical characteristic is identified when non-compliance with the requirement has the potential to lead to a Customer Safety effect.

The Volvo Group standard for identifying and grading critical characteristics is the STD 105-0007 "Special Characteristics Definition and Application".

The methods used for marking lot/serial numbers on safety critical parts must support identification, traceability and failure investigation through

all phases of the product's life. In principle, the serial number or lot number should be applied to the actual part and preferably should be easily visible when mounted on the vehicle. When feasible, the [CC] symbol must be included on the part label. This would apply if the drawing is marked with a [CC].

Unless otherwise specified in product documentation, the preferred method for marking is:

- Item serialization
- Bar code (in accordance with Volvo STD 103-0013 or Volvo Group approved alternative)
- Recording of safety critical part or process parameters (preferred)
- Recording OK/not OK is acceptable with evidence of 100% effectiveness

For Traceability requirements see chapter 7.3

## 1.3 Production and functional requirements

Regarding dimensional, material, test and functional requirements for product features identified as safety critical [CC], the following requirements apply and supersede the general requirements. Safety critical characteristics must be clearly identified throughout the manufacturing process and in all associated documentation such as Process FMEA, control plans and work instructions.

For identification and requirements for Special Characteristics see chapter 6.4

For Functional Safety see chapter 6.11

During the APQP, process audits or PPAP activities, the SQE will verify the evidence of completion and compliance to these requirements for concerned products.

Thorough documentation is necessary to:

- Demonstrate that critical components do not have any safety related defects, either from the Volvo Group or supply partner

- Demonstrate that both Volvo Group and legal requirements are met
- Limit the number of products subjected to field actions if any

## **NO DEVIATIONS ARE ALLOWED ON SAFETY CRITICAL FEATURES**

### **1.4 Safety Management Audit**

Supply partners of safety critical components or assemblies must have safety system requirements embedded in their quality management system. Supply partners must be able to demonstrate they have the organization, systems, processes, and competencies to manage the Volvo Group requirements related to safety critical features.

Volvo Group has developed and uses a technical audit to evaluate the Safety Management Systems of supply partners of a safety part or parts. This audit evaluates the presence of an adequate management system and the capabilities to properly manage safety parts throughout the production process.

A supply partner that has a safety part without a critical characteristic will be required to complete a Short Safety Management Audit.

A supply partner who is supplying a part that has been identified as a safety part and contains a critical characteristic will be required to participate in the Safety Management Audit (SMA). The SMA will be conducted during the sourcing process and potential supply partners are required to achieve a passing score prior to the award of business.

Supply partners are re-audited periodically to ensure that the SMA systems and processes impacting quality remain in place. Volvo Group reserves the right to conduct an SMA at any time following a major quality spill, recall or when a safety risk is identified.

## 1.5 Supply network Management

Supply partners are responsible to ensure that all sub-supply partners and contractors are aware of and comply with the requirements related to safety requirements. Tier I supply partners must have procedures and practices to ensure an adequate level of control and requirements are deployed at all supply partners or sub-supply partners whose product or processes could have an effect on safety related features.

Volvo Group requires tier I supply partners to have an active Safety Management Audit process for their supply partners. The tier I supply partner is responsible to secure the whole Supply network.

- Identify and perform analysis of tier 2 safety parts.
- Identify the [CC] on the technical specifications and communicate to tier 2 supply partners.
- Communicate Product Safety, traceability, and Manufacturing Process requirements for [CC].
- Deploy Safety Management Audit
- Control and advise us of changes of material, product, process changes or re-sourcing activities.

Volvo Group does not assume responsibility for the supply partner's SMA program, audit results, or follow-up activity. All responsibility for the SMA program and the quality of safety critical parts remain the responsibility of the tier I supply partner.

“Pass through parts” are defined as parts that are shipped to Volvo Group by a supply partner who processes parts from their supply partners, without value added activity or modification to form, fit or function to the safety critical feature. Tier I supply partners assume all responsibility for the quality of “pass through parts” that are considered safety critical. This requirement applies to parts or features identified as safety critical by either Volvo Group criteria or criteria identified by the supply partner as having the potential to impact safety.

# 2. Basic requirements

Performance expectations  
and management requirement



## EXPECTED ATTITUDE:

“Never satisfied, let nothing happen by chance  
and strive for ZERO defect performance”

Supplying products and services for the vehicle industry is a fast-paced and demanding business that requires the ability to mass produce complex assemblies and products employing state-of-the-art technologies.

To achieve this level of performance, the vehicle industry has developed specialized processes and systems to support the demands of this type of production while delivering premium quality expected by the vehicle customer.

Volvo Group has adopted quality processes and systems where successful application by our supply partners is key to shared success.

The success of our performance is determined by the final customer. Volvo Group's customers are the businesses and people who rely every day on safe, reliable transport solutions.

We believe that achieving this level of quality and reliability can only be achieved by **systematically following robust, state of the art processes, and rigorous planning and monitoring. We expect supply partners to design and invest in production processes using state of the art technology, including all fixtures, gauges and other equipment for quality controls, to eliminate the risk of human errors.**

This requires a customer focus mindset, continuous communication, a continuing search for effective solutions, and opportunities for continuous improvement.

## 2.1 Performance expectations

The table below defines the target performance levels for Volvo Group supply partners. Our desire is for all Volvo Group supply partners to strive to meet and exceed these target values. All supply partners are expected to have a Zero-Defect approach to quality and demonstrate a continuous improvement towards the Zero-Defect goal.

For specific products, additional part specific targets may be defined in the Request for Quotation (RFQ).



Measurement	Requirement
<b>Field quality</b> <ul style="list-style-type: none"> <li>• Warranty</li> <li>• Fault Frequency</li> <li>• External Campaign/recall</li> <li>• Customer / Supply partners / Manufacturing Product issue (CPI/ SPI/MPI) (TFR for VCE (ref. 8.8)</li> </ul>	<ul style="list-style-type: none"> <li>• Zero Safety Issues</li> <li>• Zero Field Issues</li> </ul>
<b>Zero km quality</b> <ul style="list-style-type: none"> <li>• Internal Campaigns</li> <li>• First Time Through (FTT)</li> <li>• Line Stop</li> <li>• Product Audit</li> <li>• QPM (ref. 8.4)</li> <li>• PPM</li> </ul>	<ul style="list-style-type: none"> <li>• Zero production impact</li> <li>• Zero PPM</li> <li>• Zero QPM</li> </ul>
<b>Problem solving</b> <ul style="list-style-type: none"> <li>• Field quality issues lead time (ref. 8.8)</li> <li>• Inspection Report lead time (ref. 8.2)</li> <li>• 8D Robustness</li> </ul>	<ul style="list-style-type: none"> <li>• Meet reaction and resolution lead times</li> <li>• Zero recurrence</li> </ul>
<b>Management system</b> <ul style="list-style-type: none"> <li>• Audit compliance</li> </ul>	<ul style="list-style-type: none"> <li>• Self-audit compliance prior to Volvo/ certification body's audit</li> <li>• Zero Volvo audit findings without an agreed-upon action plan</li> </ul>

## 2.2 Quality Management systems requirements

Measurement	Requirement
Quality system	<ul style="list-style-type: none"> <li>• Volvo Group Trucks: IATF 16949:2016.</li> <li>• Other Volvo brands: ISO 9001:2015</li> </ul>
Supplier Evaluation Model (SEM)	<ul style="list-style-type: none"> <li>• Volvo Group Trucks: Score <math>\geq</math> 80%. No stopping parameter.</li> <li>• Other Volvo brands: Score <math>\geq</math> 70%. No stopping parameter.</li> </ul>
Product Safety Management Program (Applicable to supply partners of safety part)	<ul style="list-style-type: none"> <li>• Score <math>\geq</math> 80%. No stopping parameter.</li> </ul>
Index audit (Applicable to supply partners of Index related production processes, ref. 3.6)	<ul style="list-style-type: none"> <li>• Score <math>\geq</math> 70%. No stopping parameter</li> </ul>
VOLVO Customer Specific Requirements	<p>Compliance to:</p> <ul style="list-style-type: none"> <li>• Review of Technical Specification (RTS)</li> <li>• Conformity of Production (COP),</li> <li>• Part Application Agreement (PAA),</li> <li>• Part Handling Review (PHR)</li> <li>• Capacity Assessment Sheet (Capacity planning - Significant Production Run - Run at Rate)</li> <li>• Conforming Parts Out of Tool in Plant Delivery (CPOT/IPD)</li> <li>• Digital Shape Model (DSM)</li> <li>• Annual product requalification (as per IATF 16949:2016, section 8.6.2)</li> </ul>
Automotive requirements	<p>Compliance to:</p> <ul style="list-style-type: none"> <li>• ISO 26262 Road Vehicles – Functional Safety</li> <li>• Cybersecurity Quality and Development Process Requirements (CS-QDPR)</li> <li>• ISO21434 Road vehicles – Cybersecurity</li> <li>• Cybersecurity Maintenance Agreement</li> </ul>

Measurement	Requirement
Software (Applicable to supply partners delivering software)	<ul style="list-style-type: none"> <li>• ASPICE CL3 or ISO33000 CL3.</li> <li>• Capability level 3 proven by assessment reports by an accredited 3rd party</li> </ul>
Cybersecurity	<ul style="list-style-type: none"> <li>• ISO27001 certification</li> <li>or</li> <li>• Based on ISO27000, develop a cybersecurity management system including but not limited to : <ul style="list-style-type: none"> <li>• IT policy including cybersecurity specific areas</li> <li>• Self assessment and testing of resistance towards internal and external threats</li> <li>• Execute internal training on cybersecurity</li> <li>• Develop mitigation plan in case of attack</li> </ul> </li> </ul>



# 3. Sourcing

Join the Volvo Group team



Awarding business to a supply partner is a very important decision made by the Volvo Group. It directly impacts our ability to deliver to our customers, remain competitive, live up to the expectations of what a premium brand stands for and deliver future developments through projects.

The Volvo Group Global Sourcing Process is designed to ensure that all divisions of Volvo Group can contribute to the selection process and ensures the coordination of these decisions across all Volvo Group locations.

It's the first step in building a strong relationship between the Volvo Group and our supply partners.

Supply partners have an important role to play in the selection process:

- Actively participating in evaluation audits performed by the Volvo Group
- Demonstrating their capability to achieve future quality results
- Responding to action plans to reach the requested level

The following chapter explains the main steps related to quality requirements in the process required to become a Volvo Group supply partner.

In this section the information that supply partners can expect to receive and the evaluations that are required are further defined.

### **3.1 Quality Management System requirements**

Supply partners to the truck brands are required to have a Quality Management System approved by a third-party registrar meeting the requirements of IATF 16949.

Supply partners to other Volvo divisions are required to have a Quality Management System approved by a third-party registrar meeting the requirements of ISO 9001.

Volvo supply partners are required to have an Environmental Management system compliant to ISO 14001 in place, functioning and approved by a third-party registrar.

### **3.2 Confidentiality agreement**

Volvo Group realizes that maintaining an effective supply partner/customer relationship may require sharing information, communications, data or technology that is sensitive or confidential. Before receiving a Request for Quotation (RFQ), supply partners are required to sign and return a confidentiality agreement. The supply partner shall treat all information and data related to the business relationship with Volvo Group in strict confidence and report any intentional or non-intentional breach of confidentiality to Volvo Group management. The Confidentiality Agreement template will be sent by the Buyer.

### **3.3 Short Supplier Evaluation Model**

Typically, the first formal contact with a supply partner will be a Request for Information (RFI). At that time supply partners will be requested to complete the Short Supplier Evaluation Model (Short SEM). The Short SEM collects general data about the company, its products and capabilities. Specific quality topics included in the Short SEM are:

- **Quality Systems:**

Application and certification by an accredited third party to ISO 9001 or IATF 16949 Quality Management System and ISO 14001 Environmental Management System

- **Quality Performance:**

Past performance in quality, reliability and deliveries

- **Reliability:**

Practices in place for verification and validation testing that ensures their products will meet the minimum useful life expectations

Current Volvo Group supply partners who have not participated in a recent evaluation may be requested to complete a Short SEM or participate in a standard on-site SEM prior to the award of additional business.

Volvo Group routinely monitors all current supply partners based on their performance as measured in the Supply partner Scorecard (PPM, QPM, recent audit scores, Inspection Reports, Low Performing Supplier (LPS) status, etc.). Based on these results, Volvo Group may request a new Short SEM to be completed or request further evaluation audits.

## 3.4 Request for Quotation

To be considered for business, supply partners must fully address each section of the RFQ and include all the requested supporting documents when responding. This includes, but is not limited to:

- Preliminary Advanced Product Quality Plan (APQP)
- Review of Technical Specification (RTS)
- Statement of Work (if requested)
- Documents needed to support the information in the RFQ response
- Capacity Assessment sheet Questionnaire
- Predefined special characteristics
- Potential Tier 2 supply partner list

The quality requirements and targets are highlighted in the quality section of the RFQ. Supply partners are expected to be able to fulfill all quality requirements. Volvo Group may audit the evidence related to the fulfillment of these quality requirements. In the event of where all requirements cannot be fulfilled, supply partners may be required to develop and submit an action plan with the returned RFQ. Supply partners are responsible for

all costs associated with the fulfilment of the quality requirements. Some of these requirements may require testing at Volvo Group approved testing facilities. These costs should be included in all RFQ responses.

### 3.5 Supplier Evaluation Model

The Volvo Group Supplier Evaluation Model (SEM) has been developed based on a history of working with supply partners, lessons learned and “Best in Class” practices. This audit normally takes two to three days, depending on the size of the organization and is required for each supply partner manufacturing location that will be shipping to a Volvo Group site.

The Volvo Group SEM is the primary tool for the evaluation and selection of supply partners. The audit is designed to provide a broad, overview of the supply partners’ organization. The SEM is an on-site face-to-face evaluation of a supply partners’ capabilities.

Supply partners for trucks division must achieve a minimum score of 80% and achieve an acceptable score on all “Stopping Parameters”.

Supply partners for other divisions must achieve a minimum score of 70% and achieve an acceptable score on all “Stopping Parameters”.

The SEM audit is based on the evaluation of 11 criteria:

- Company profile
- Management
- Environment
- Quality
- Logistics
- After market
- Competence
- Product development
- Finance
- Productivity
- Sourcing

**POTENTIAL SUPPLY PARTNERS MUST COMPLETE THE VOLVO GROUP SEM WITH AN “APPROVED” SCORE TO BE CONSIDERED FOR THE AWARDED VOLVO GROUP BUSINESS**



### 3.6 Index audits

Volvo Group has developed a group of technology-based process audits (Index Audits) that focus on production processes that use technology considered critical to the function of the products. This audit is applicable for all supply partners, sub supply partners and sub-contractors. The Index Audit is required for award of business. It may also be used in process improvement or critical problem investigation.

Completion of the Index audit is a requirement for consideration of award of new business. Current supply partners, who provide products covered by any of the technologies listed below, but have not had an Index audit assessment, shall contact the Buyer and SQE to arrange for an audit and approval to ensure continued business with Volvo Group.

Volvo Group has developed a group of technology-based process audits (Index Audits) that focus on production processes that use technology considered critical to the function of the products. The Index Audit is required for award of business. It may also be used in process improvement or critical problem investigation.

All supply partners shall be re-evaluated, or follow-up (Index Audits) is initiated if there are any significant changes in process or on five years rolling basis. Technical Specialist along with SQE manager decides on the need for INDEX based on:

- 1. Previous Index results
- 2. Business evolutions with the supply partner
- 3. Organizational changes

Current Index Technologies:

- Casting (Iron & Aluminium)
- Forging, Sintering & Heat Treatment
- Steel Mill
- Machining
- Cleanliness (Refers to the Chapter 6.6)
- Polymer (Plastics & Rubber)
- Surface Treatment
- Electronics
- Software
- Safety Management (refers to the Chapter 1)

### **3.7 Sustainability assessments and Corporate Social Responsibility (CSR) audit**

As a supply partner of Volvo Group, you are required to conduct the Supplier Assurance Questionnaire (SAQ), and your result will determine whether you can be awarded a new business or not. The buyer will inform how to proceed.

Similar to SAQ, on-site Corporate Social Responsibility (CSR) audits are an essential part of the Volvo Group supply partner sustainability assessment. CSR audits are conducted of all potential supply partners who according to external assessment tools are located in a high-risk country. The Volvo CSR auditors will assess your compliance versus the Volvo Group Supply Partner Code of Conduct, review documents, management systems, facilities, as well as conduct employee interviews.

Current supply partners to Volvo Group that have not participated in a recent CSR audit may be requested to participate in an audit. It is a risk based audit, and all critical and high risk findings should be closed regardless of audit score.

# 4. Advanced Product Quality Planning

Driving quality



Staying competitive in the markets where Volvo Group operates requires regular improvements to existing product and continuous development of new products.

Supporting the introduction of new products requires a well-defined and organized process for project planning and launch.

Volvo Group organizes all new product introductions as projects. Supply partners are required to have an effective project planning process that can support the Volvo Group process and timing for project management.

Volvo Group expects supply partners to follow the Automotive Industry Action Group (AIAG) guideline for APQP as the standard planning method for bringing products to production.

Supply partners are expected to develop a detailed Advanced Product Quality Plan for the development of processes used to produce Volvo Group products.

The following chapter describes the expectations related to APQP and requirements for synchronizing the plan with the Volvo Group Develop Product & Aftermarket Product Portfolio Process (DVP).

## 4.1 Advanced Product Quality Planning

It is always the customer who determines if we are best in class. But before our products reach our customers, the ultimate quality of delivered parts is determined already during the design and development phase of the production process. Volvo Group focus on front loading the development activities of a project.

**SUPPLY PARTNERS ARE RESPONSIBLE TO DEVELOP AND DRIVE APQP FOR ALL COMPONENTS DELIVERED TO VOLVO GROUP**

Volvo Group expects supply partners to create product launch plans to support:

- Launch of all new components intended for serial production
- Significant changes to existing products or processes
- Development of new manufacturing processes

The objective of the planning process is to deliver the project on time, at the right cost and at the highest level of quality. The initial development of the APQP should begin upon receipt of the Request for Quotation (RFQ). This initial plan must be included as part of the RFQ response package.

**Volvo Group requires supply partners to use Advanced Product Quality Planning (APQP) as the tool to support process development, integration and validation. The AIAG publication “Advanced Product Quality Planning (APQP) and Control Plan” should be used as a reference in developing these plans. Supply partners’ plans should include Volvo Group specific requirements.**

More information on Volvo Group's expectations on supply partner's project plan, is available on the Volvo Group Supplier Portal.

APQP is expected both for hardware development and Software development.

**APQP identifies the tasks to be completed, the expected timing, assigned responsibility for completion and the critical path.**

## 4.2 Responsibilities in APQP

Successful projects require high level of close cooperation and teamwork with the supply partners. Here is a short list of the key areas of responsibility:

### **Supply partner is responsible for:**

- Assigning a dedicated project manager or APQP leader
- Organizing a cross-functional APQP project team
- Developing and executing an APQP Plan to support a successful product launch

### **Volvo Group is responsible for:**

- Identifying the Volvo Group project team members
- Assigning a Supplier Quality / supplier development Engineer (SQE/SDE) to support the completion of APQP activities with the project team
- Identifying key milestones and project parameters

## 4.3 Key Components

All parts used in the vehicle are important to customer satisfaction and the safe, reliable operation of the final product. However, there are some parts that require additional attention designated as "Key Components". At the start of a project, a Volvo cross-functional project team identifies those parts that will be subjected to closer control and monitoring.

## 4.4 APQP reviews

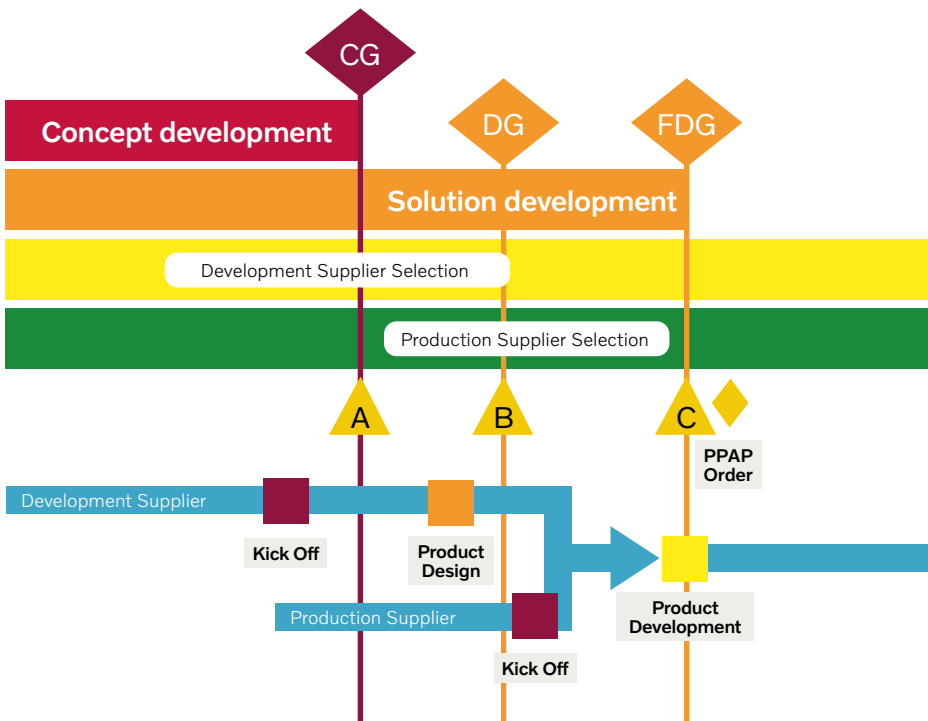
Design responsible supply partners, supply partners of key component parts, supply partners of SW and supply partners of parts assessed with a risk by the SQE are required to report the project status at established intervals during the project development. As a rule, these reviews are held prior to the project milestones or drawing revision release. Supply partners

APQP reviews are formal meetings where Volvo Group reviews supply partners' project plan and status. During this meeting, Volvo Group and supply partners jointly confirm that the project is on track with respect to deadlines and results.

should prepare for these project review meetings by completing or updating the APQP review template, their project plan and the project milestone dates.

The initial APQP review meeting (Kick-Off review) should occur after the award of business. The final review is concurrent to the launch of the product.

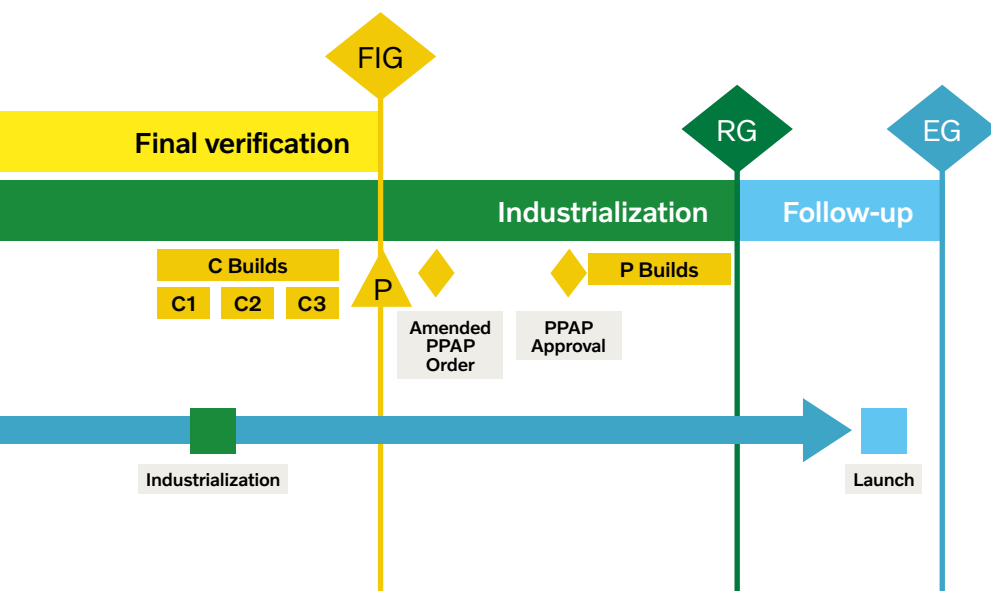
## APQP timing



This review is intended to ensure that all open issues are resolved, that there is adequate capacity to support on-going production needs and a lessons learned has been conducted to improve future APQP activities.

Supply partners are responsible to complete and maintain the information for each review meeting. The completed form will be used by the joint team as the basis for evaluating the project status. Forms to be used for the reviews will be provided by the SQE-SDE on due time.

The following illustration demonstrates the relationship between Volvo Group's Product Development Process (DVP) and the supply partner's project plan:

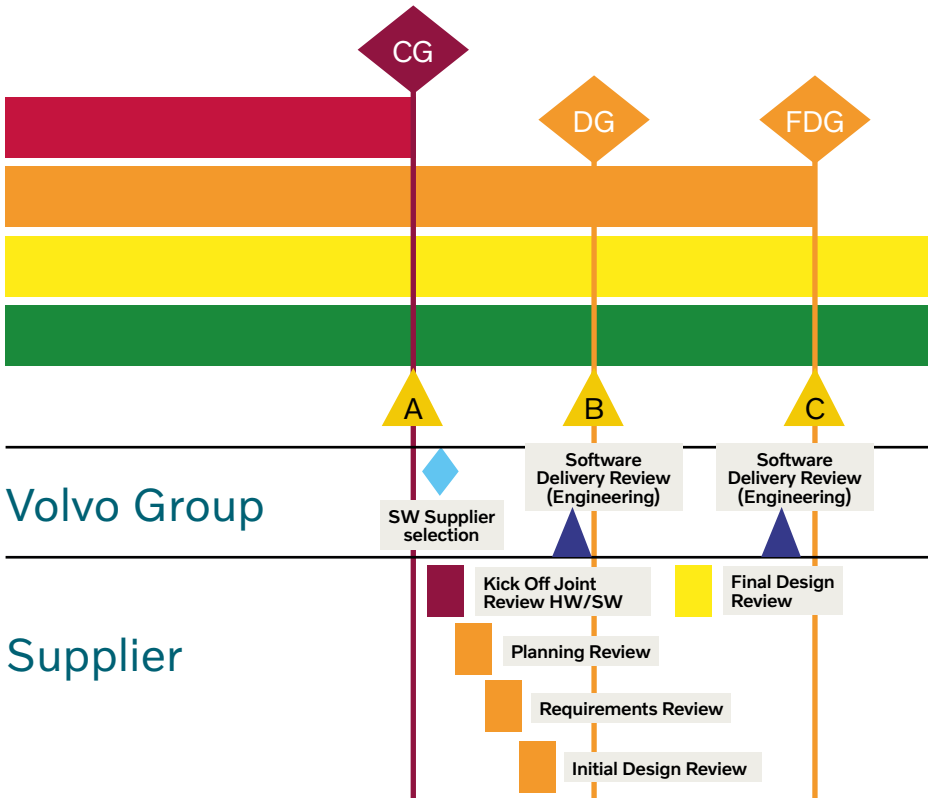


**Note:** If phased PPAP is applied, please refer to section 5.2 for the PPAP approval milestones.

## 4.5 Software APQP

The process used for the quality assurance of software is centered around joint reviews similar to those used for product development and production. Software APQP reviews are optional for VBNA supply partners unless requested by the responsible VBNA SQE (VBNA software supply partners are encouraged to use APQP as a project management tool).

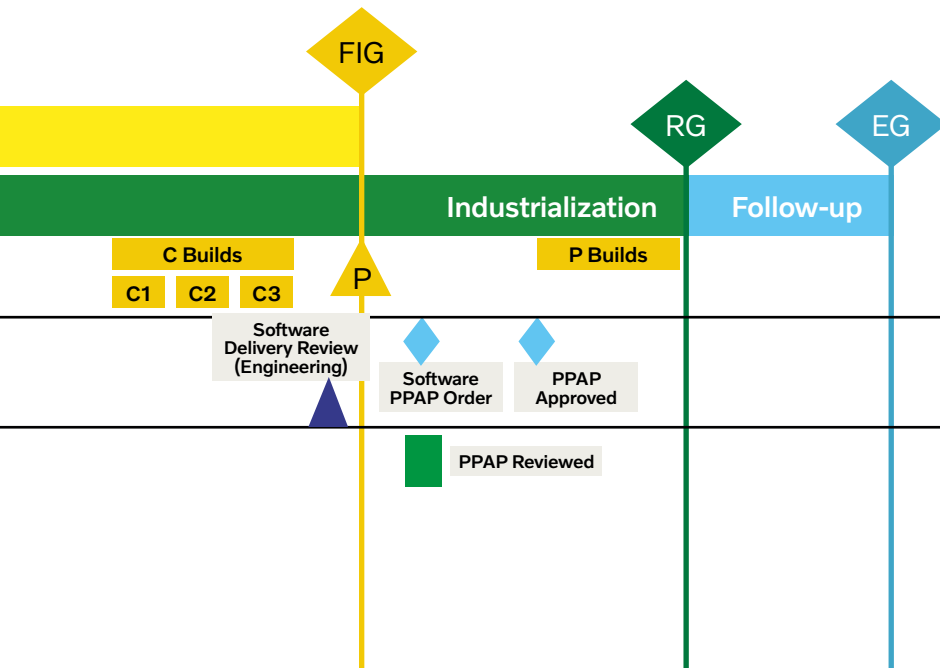
### Software APQP timing





SW APQP joint reviews in a normal software development project are focused as follows:

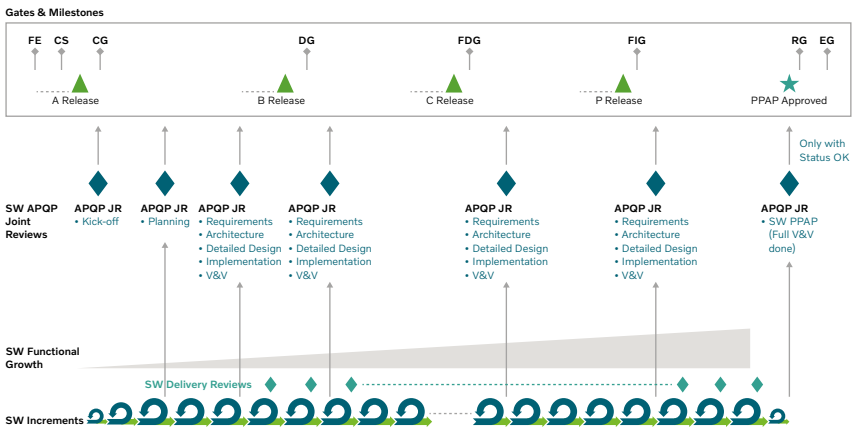
- Kick Off review HW/SW
- Planning review
- Requirements review
- Design review
- SW PPAP review



The Planning, Requirement and Design review focus areas are tailored to fit the project setup and timing.

In case of Agile driven development, the planning, requirement and design review focus areas are incrementally growing through the project phase and might be continuously performed, as shown below. The SW APQP will need adjustments to fit the project setup and this will be planned by the responsible SQE.

## SW APQP Joint Reviews And SW Delivery Reviews



As most of the software development occurs during the product design phase of the project, most of the reviews occur during this phase. The only exception is the Software (SW) PPAP Review.

The requirements applicable to supply partner software projects and quality assurance system are described in a separate requirement document called Software Quality and Development Process Requirements (SW-QDPR).

For Embedded Software, SW PPAP is a prerequisite to the full (SW+HW) component PPAP.

# 5. Production Part Approval Process

Approval of new or revised parts



The Production Part Approval Process (PPAP) demonstrates that the manufacturing process used to produce parts for the Volvo Group is fully developed, thoroughly tested, and capable of serial production of parts conforming to the technical specifications.

For the PPAP (as for the APQP) Volvo Group expects supply partners to follow the AIAG requirements, using the requirements applicable for trucks and heavy equipment.

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

- The design records and specifications have been properly understood and met
- The manufacturing process has the capability to produce conforming parts in the actual production environment
- The manufacturing process has the capacity to support production quantities at a consistent quality level

## 5.1 Reference

Supply partners shall ensure that the PPAP document and sample submissions are in accordance with the requirements of the Automotive Industry Action Group (AIAG) PPAP Manual (latest edition, using requirement as applied to truck and heavy equipment). Supply partners of service parts shall follow the latest AIAG requirements document Service Production Part Approval Process (Service PPAP). Additional guidelines and a copy of the Part Submission Warrant (PSW) and Software specific Submission Warrant (SSW) template are available on the Volvo Group Supplier Portal.

Volvo Group requires its supply partners to follow the Customer Notification and Submission requirements as specified in the AIAG PPAP Manual that includes but is not limited to:

- Introduction of new components
- Changes to an existing part
- Drawing or specification changes
- Corrections to a prior discrepancy
- Supply partner process change
- Material changes or substitutions
- Changes of sub-tier supply partners

**VOLVO GROUP REQUIRES PPAP APPROVAL PRIOR TO SHIPMENT OF ANY PRODUCTS FOR USE IN CUSTOMER VEHICLES**

**WHEN PHASED PPAP APPLIED, VOLVO GROUP REQUIRES AT LEAST PRODUCT PPAP APPROVAL PRIOR TO SHIPMENT OF ANY PRODUCTS FOR USE IN CUSTOMER VEHICLES**

**WHEN SAFETY PART, VOLVO SMA SCORE MUST BE ACCEPTED PRIOR PPAP**

## 5.2 Process

Volvo Group uses a four step release process for new part development:

- **A-release:** Creation stage, during which parts and documents are created. The purpose of the A-release is to give early part information to the project organization in order to get feedback regarding the intended new design and/or changes.
- **B-release:** Verification Stage, with the main purpose of the B-release to secure that the parts can be used to build and verify prototype products in an early phase of a project.
- **C-release:** Tooling stage, with the main purpose to release approved parts (and documentation) for orders of series production tooling and/or manufacturing equipment and for the build of pilot series products. The C-release shall also be used (even if no tooling is involved) to secure initial sample ordering in good time.
- **P-release:** Production stage, with the main purpose to communicate in the organization that the concerned part(s) is/are approved for application and assembly in series production conditions and that the part and engineering documentation reflect this condition.

Once the design is considered firm enough, the Buyer will issue a Sample Order to notify the supply partner that a PPAP is required. Supply partners are then authorized to place tooling orders and start the production process design and development. The due date must be the date when PPAP documents at Volvo Group premises. This date will normally be two weeks before the approval by the Volvo Group. Check with the SQE-SDE for special situations. Supply partners are responsible to verify that all technical documentation (Part Version Report, Drawing, Technical Requirements, Digital Shape Model, etc.) has been supplied. Any questions regarding the technical document package should be directed to the Buyer. This early release is intended to give supply partners as much time and information as possible to prepare for start of production. This sample order will be amended once the P-documents and specifications are completed.

PPAPs can only be approved based on the P-release of the drawing and document package.

The preliminary target date for PPAP submission is included in the RFQ information. Additional information concerning the target date for PPAP submission will be included in the Sample Order. PPAP submission dates

must be planned as a milestone in the supply partner's APQP plan. Any issues resulting in delays or changes to the PPAP target date should be agreed with the Buyer and SQE-SDE.

The supply partner is responsible for the PPAP preparation:

- Supply partners must notify the Buyer and SQE of the proposed shipment date; failure to acknowledge the PPAP order is considered agreement to the due date
- Supply partners (tier I) are responsible for the planning, approval, corrective action, follow-up and retention of PPAPs submitted by sub-supply partners and sub-contractors
- Supply partner must indicate to the SQE if this PPAP part has been produced from new, revised or refurbished Volvo Group owned tooling, including our tooling order number as reference
- Cpk studies on special characteristics, identified by [SC] or [CC], must be completed on a minimum of 30 pieces selected at random from the SPR parts\*
- 100% dimensional evaluation (including evaluation to the Digital Shape Model) is required on five parts selected from the Significant Production Run (SPR)\*\*

\*For supply partners delivering small production runs, the requirement for Cpk studies and SPR may be waived with approval by the SQE

\*\*Cpk studies and SPRs are waived for Service Part supply partners

Upon satisfactory completion of all required measurements and tests, the supply partner shall complete the required information on the Part Submission Warrant and/or the Software Submission Warrant (PSW/SSW).

Completing the PSW/SSW:

- Supply partners are requested to use the Volvo Group PSW/SSW form that is available on the Volvo Group Supplier Portal
- A separate PSW or SSW shall be completed for each Volvo Group part number unless otherwise specified by the SQE
- The PSW/SSW shall be signed by the authorized supply partner representative before submission

The SQE will review all PPAP packages and assign one of the following:

- Fully approved and in compliance with all specifications
- Conditional or interim approval
- Not approved

In the case where interim approval is given, it must be supported with an approved deviation. All deviation requests require review and approval by Volvo. Full approval of the deviation also requires a plan from the supply partner that addresses correction of all open issues (ref. 7.2).

The full approval of the PPAP triggers the release of the final funding for tooling. Supply partners are required to upload their tooling inventory information on Volvo Group Supplier Portal and submit photographs of the tool and the tooling asset identification for the final release of funds. A yearly inventory update shall be performed by the Supply partner, focusing on the tooling remaining capacity. Volvo Group owned tooling must be identified with the following information:

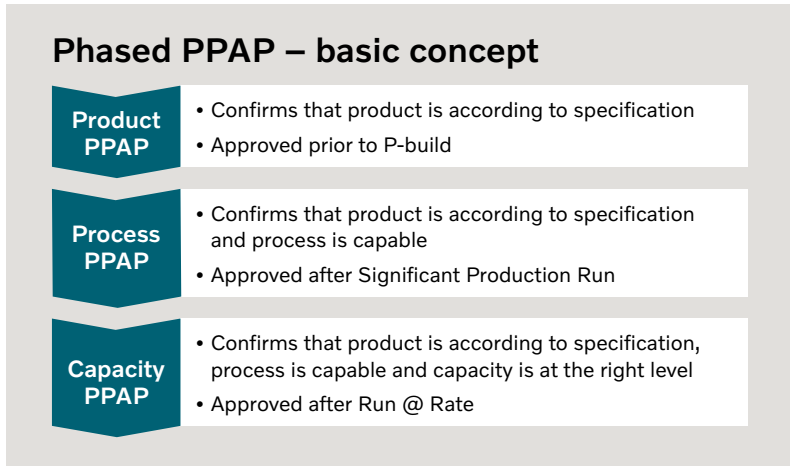
- “Property of Volvo Group”
- Tool Number (Asset Number)
- Part Number
- Part Name

## Phase PPAP Guidelines

Not applicable to VCE.

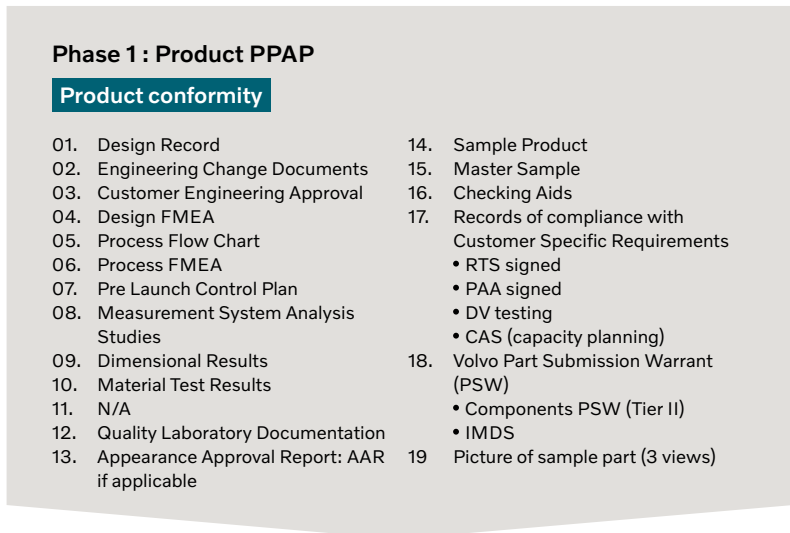
In order to improve flexibility and quality assurance during project introduction, Volvo Group has taken the approach of using Phased PPAP process. This helps aligning PPAP deliverables for process stability closer to start of production. Volvo SQE will inform you when to apply the Phased PPAP.

The basic concept is as follow:



PPAP elements required for each phase are described below.

## PPAP Phases





## Phase 2 : Process PPAP

### Product conformity and Process validation

#### Update of documents from phase 1

- |   |   |
|---|---|
| 01. Design Record                                 | 14. Sample Product  |
| 02. Engineering Change Documents                  | 15. Master Sample   |
| 03. Customer Engineering Approval                 | 16. Checking Aids   |
| 04. Design FMEA                                   | 17. Records of compliance with Customer Specific Requirements |
| 05. Process Flow Chart                            | • Surface Treatment Index Model                               |
| 06. Process FMEA                                  | • PV testing  |
| 07. Production Control Plan                       | • CAS (based on Significant Production Run - SPR)             |
| 08. Measurement System Analysis Studies           | 18. Volvo Part Submission Warrant (PSW)                       |
| 09. Dimensional Results                           | 19. Picture of sample part (3 views)                          |
| 10. Material Performance Test Results             |   |
| 11. Initial Process Capabilities Studies          |   |
| 12. Quality Laboratory Documentation              |   |
| 13. Appearance Approval Report: AAR if applicable |   |

## Phase 3 : Capacity PPAP

### Product conformity, Process validation and Capacity verification

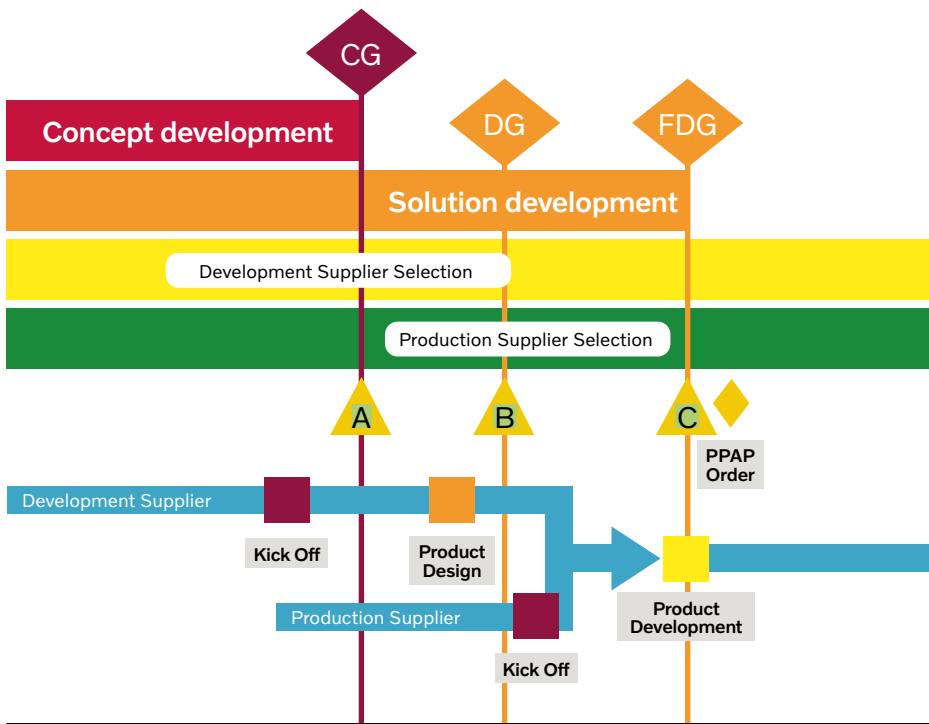
#### Update of documents from phase 1 and phase 2

- |  |   |
|--|---|
| 01. Design Record                          | 12. Quality Laboratory Documentation                          |
| 02. Engineering Change Documents           | 13. Appearance Approval Report: AAR if applicable             |
| 03. Customer Engineering Approval          | 14. Sample Product  |
| 04. Design FMEA                            | 15. Master Sample   |
| 05. Process Flow Chart                     | 16. Checking Aids   |
| 06. Process FMEA                           | 17. Records of compliance with Customer Specific Requirements |
| 07. Production Control Plan                | • CAS (based on Run @ Rate) all lines/machines and tools      |
| 08. Measurement System Analysis Studies    | 18. Volvo Part Submission Warrant (PSW)                       |
| 09. Dimensional Results                    | 19. Picture of sample part (3 views)                          |
| 10. Material Performance Test Results      |   |
| 11. Long Term Process Capabilities Studies |   |

Full PPAP approval is occurring only after approval of the 3 PPAP phases. SQE together with supply partner will define how many parts to produce and when to perform Significant Production Run and Run @ Rate.

The following illustration references the 3 PPAP phases in Volvo's development process timeline :

### Principle phased PPAP timeline

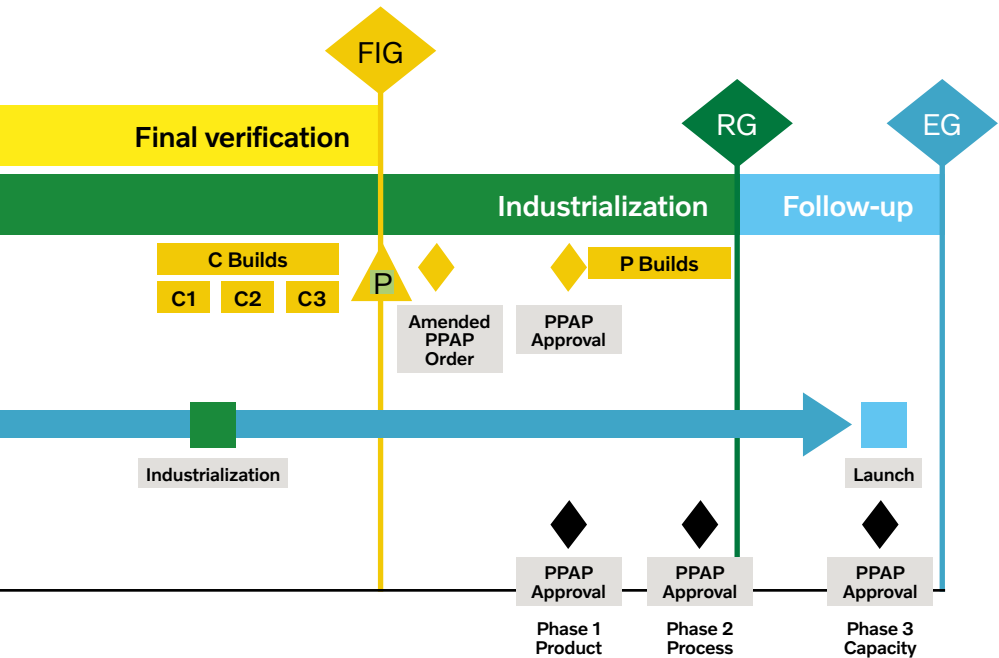


### 5.3 Significant Production Run

A Significant Production Run (SPR) is required for all new part introductions. This sample run is to be conducted using production tooling/equipment, environment (including production operators), facility, and cycle time.

The SPR requires that an adequate quantity of parts be produced to allow:

- Overall process stabilization
- Accurate calculation of manufacturing cycle time
- Determine production through-put time
- Capacity assessments
- Completion of capability studies



The minimum quantity of parts to be produced during the SPR is specified by Volvo Group but can be increased by the supply partner. The number of parts produced during the SPR should be determined by the type of equipment, tooling and production processes required by the type of part. Supply partners should ensure enough parts are produced during the SPR to ensure that the process is fully tested. Samples used for the PPAP must be taken from the parts produced during the run. The single part weight shall be determined at this time and included on the PSW. The single part weight is determined by taking the average weight of at least five parts produced during the SPR. The weight shall be expressed considering the Unit of Measure specified in the PVR. The weight of the part submitted on the PSW shall be measured and expressed to four significant figures to secure enough accuracy.

An analysis of weight discrepancies including measurement uncertainty can be requested if we have a deviation between the weight documented in the PSW and the weight measured through Volvo Group internal weight quality control.

The SPR also provides a good opportunity to identify and correct potential manufacturing process bottlenecks. To be fully accurate, the capacity calculated from the SPR results should consider the actual Overall Equipment Effectiveness (OEE) results from the process and include any planned down time.

**PPAP, RESPECTIVELY PRODUCT PPAP IN CASE PHASED PPAP IS APPLIED, MUST BE FULLY APPROVED OR HAVE INTERIM PPAP APPROVAL WITH APPROVED DEVIATION BEFORE P-BUILDS. REMINDER :( REF. 1.3) : NO DEVIATION ALLOWED ON SAFETY CRITICAL FEATURES.**

## 5.4 Documentation requirements

Supply partners are required to submit a Level 4 PPAP package for all components unless other arrangements have been requested by Volvo. The minimum requirements for a Level 4 PPAP include:

- The Production (P) Release of the Volvo Group Drawing
- Part Version Report (PVR)
- Technical Requirements Document
- Dimensional results (including component comparison to the digital shape model)
- Process Flow Diagram
- Process FMEA
- Control Plan
- Material test results
- Performance test results
- Appearance approval report if applicable
- Conformity of Production Certificate (ref. 6.5, if applicable)
- Approved MDS Report
- Part Submission Warrant (PSW)
- Completed Review of Technical Specifications

Supply partners shall only submit PPAP packages based on the Volvo Group production-released drawings (P-released drawings).

Supply partners are required to submit documents according to the order revision level of the Volvo Group drawings, Part Version Report, and Technical Requirements to ensure that the Production Part Approval has been conducted on the correct revision of the specifications.

PPAPs cannot be approved based on supply partner's drawings. The Volvo Group drawing must include reference "balloons" supporting dimensional checks. Actual component comparison to the Volvo Group Digital Shape Model must be submitted with the PPAP package.

The SQE may ask for the submission of additional information. Prior to submission, supply partners should contact the SQE to determine if additional documentation is required. Proprietary documents that cannot be submitted must be available for review. Supply partners may be required to travel to Volvo Group sites for this review.

The requirements associated with MDS reporting are required for the full approval of the PPAP, refer to section 6.8.

To avoid delays and deviations, supply partners should ensure that these requirements are initiated upon receiving the initial sample order.

Supply partners will be notified via a signed PSW and/or a SSW regarding the status of the PPAP (approval, rejected, or interim approval).

## Document requirements

Requirements	Level 1	Level 2	Level 3	Level 4	Level 5
1 Design record	R	S	S	*	R
2 Engineering change documents, if any	R	S	S	*	R
3 Volvo Group engineering approval, if required	R	R	S	*	R
4 Design FMEA	R	R	S	*	R
5 Process flow diagrams	R	R	S	S	R
6 Process FMEA	R	R	S	S	R
7 Control plan	R	R	S	S	R
8 Measurement System Analysis studies	R	R	S	*	R
9 Dimensional results	R	S	S	S	R
10 Material and performance test results	R	S	S	S	R
11 Initial process studies	R	R	S	*	R
12 Qualified laboratory documentation	R	S	S	*	R
13 Appearance Approval Report (AAR), if applicable	S	S	S	S	R
14 Sample product	R	R	S	*	R
15 Master sample	R	R	R	*	R
16 Checking aids	R	R	R	*	R
17 R Volvo Group specific requirements	R	S	*	R	
18 Part Submission Warrant (PSW)	S	S	S	S	R
19 Picture of sample part (3 views)**	S	S	S	S	R

S The supply partner shall **submit** a copy of the records or documentation and retain a copy at appropriate locations

R The supply partner shall **retain** at appropriate locations and make available to Volvo Group upon request

\* The supply partner shall retain at appropriate locations and submit to Volvo Group upon request

\*\* Volvo Group specific requirement

For VCE and for PPAP Level 4 , Dimensional results and PSW to be submitted (S). All other documents to be retained (R).

## 5.5 Approval of software

The Volvo Group Software Approval Process demonstrates that software developed for Volvo Group is fully specified, thoroughly tested and capable of performing to the functional and non-functional requirements. The software covered by these requirements includes software embedded into component hardware parts, stand-alone software incorporated into a hardware component but having an assigned part number, and software as a standalone product. Supporting evidence in this section is required to verify that all of the software requirements, design records, and specifications have been properly understood and met.

Significant test coverage is required for all new part introductions and is the basis for the Software Approval Process.

Supply partners are required to submit a Software Approval Process document package unless arrangements have been agreed between Volvo Group and the supply partner. Supply partners may be requested to submit a request for deviation documenting exceptions.

The minimum requirements for Software Approval include:

- Customer requirements baseline reference
- Requirements traceability matrix
- Software Test Plan (SWTP)
- Software Test and Verification Report (SWTR)
- Software Version Description (SWVD)

Additional guidelines and a copy of the Software Submission Warrant (SSW) template are available on the Volvo Group Supplier Portal.

## Software documentation requirements

1	Statement of Work (SOW)	R
2	QDPR compliance matrix	R
3	Communications plan	R
4	Document traceability matrix	R
5	Responsibilities matrix	R
6	Skills and training matrix	R
7	Customer requirement baseline reference	R
8	Software Requirements Specification (SWRS)	R
9	Software Development Plan (SWDP)	R
10	Software Development Schedule (SWDS)	R
11	Risk management plan	R
12	Risk management list	R
13	Progress reports	R
14	Complexity report	R
15	Software Quality Plans (SWQP)	R
16	Software Design Description SWDD)	R
17	Hardware/Software interface specification	R
18	Requirements traceability matrix	S
19	Node Function Implementation Plan (FIP)	R
20	Software Test Plan (SWTP)	S
21	Software Test Description (SWTD)	R
22	Software Test and Verification Report (SWTR)	S
23	Software Version Description (SWVD)	S
24	Software Product Specification (SWPS)	R
25	Software Configuration Management Plan (SWCP)	R
26	Software configuration item list	R
27	Software Worst-Case Analysis Report (SWWCA)	R
28	Software maintenance plan	R
29	Source code	R
30	ASPICE assessment report	R
31	ASPICE assessment action plan	R

S The supply partner shall **submit** a copy of the records and retain a copy at appropriate locations

R The supply partner shall **retain** a copy and make available to Volvo Group upon request



# 6. Volvo Group specific requirements

Customer specific activities

Review of Technical Specification	Product Application Agreement	Part Handling Review	Special characteristics	Legal requirements and Conformity of Production
Cleanliness requirements	Prototype parts and CPOT-IPD	SOC and MDS reporting	Pre-launch control plans	Service parts requirements
Functional safety requirements	System- or organizational changes	Product Requalification	Cybersecurity requirements	

In addition to the specific activities required by Advanced Product Quality Planning, Volvo Group has developed a group of activities that support the process of new part introduction in serial production. These additional requirements have been developed in response to lessons learned in previous projects or to address specific customer needs.

These tasks require close cooperation between the members of the Volvo Group and supply partner's project teams. Supply partners are expected

to take active part in these activities. All of the tasks required to support these activities should be included in the supply partner's project plan.

In addition to the requirements described in the AIAG APQP reference manual, Volvo Group requests the planning and completion of the following cross-functional activities:

- Review of Technical Specifications (RTS)
- Product Application Agreement (PAA)
- Part Handling Review (PHR)
- Process audit

**SUPPLY PARTNERS ARE RESPONSIBLE TO COMPLETE THE RTS FOR ALL NEW PARTS OR DESIGN CHANGES**

## 6.1 Review of Technical Specifications

The goal of this process is to ensure supply partners have a complete understanding of the technical requirements of the product supplied and the capability to meet those requirements. The process is intended to identify potential production constraints and minimize the need for late design changes or design changes after the PPAP order or Tooling Order have been placed. In addition, supply partners are encouraged to suggest improvements that would result in reduced costs or improved quality.

The RTS ensures that all the technical information defining the component has been thoroughly reviewed, clearly understood by the supply partner and is feasible to produce. The RTS process also provides the opportunity to collect and incorporate the supply partner's comments and suggestions into the drawings and technical specifications.

During the RTS process Volvo Group welcomes supply partner suggestions that will improve the quality of the product or reduce the costs associated with either tooling or the product.

Volvo Group has developed a unique system for control of technical documentation including the drawing. This system uses the Part Version Report

The RTS checklist includes part marking requirements. This refers to not only the type and method of applying the marking but also the content, size and physical location on the component. Marking content can include the part number, date codes, traceability codes, re-cycling symbols, material type, country of origin, as well as any branding requirements. All marking requirements need to be thoroughly reviewed and understood during the RTS review process.

(PVR) rather than a drawing as the top level document. The PVR contains the part number, drawing number, current revision data, the applicable Digital Shape Model and references to related technical information. The DSM is to be considered as part of the technical information defining the part geometry similar to the 2D drawing, technical regulation, Volvo Group standards, etc. Compliance to the DSM must be confirmed and demonstrated for the purpose of PPAP approval unless prior approval and waiver is granted by Volvo Group SQE-SDE, reference Volvo Group Standard STD 101-0001.

### Part Version Report : where to find relevant information

The image shows a 'VOLVO Part Version Report' form. The form includes sections for 'Part Details', 'Material', 'Surface Treatment', 'Criticality', 'References', 'Digital Model', 'Technical Requirements', 'Constituent Parts', and 'Marking'. Green callout boxes with lines pointing to specific fields on the form are labeled as follows:

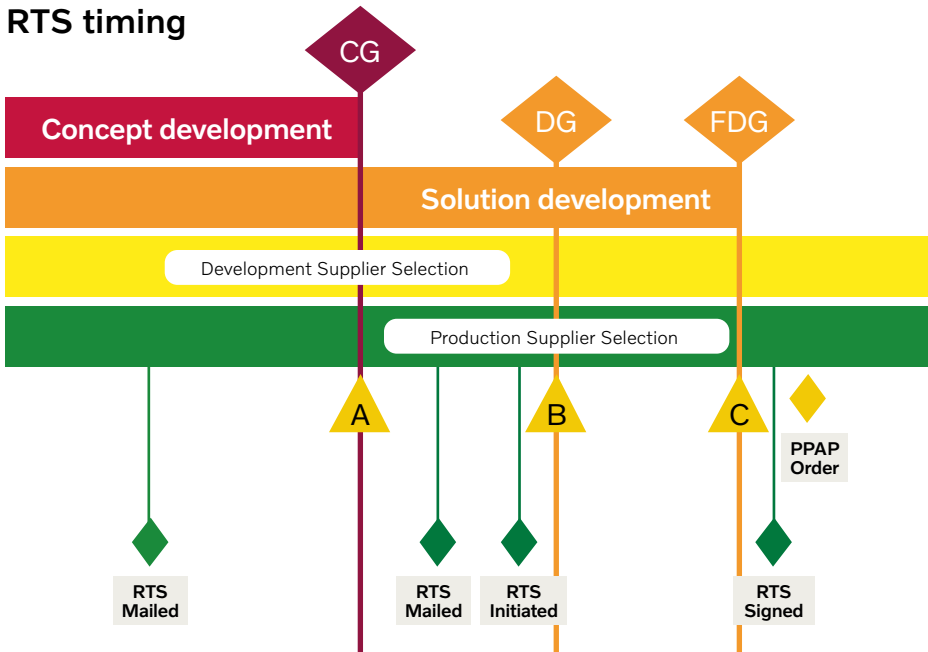
- Material
- Surface treatment
- Highest criticality
- Applicable substance list
- Primary references
- Digital model
- Technical (Notes) Requirements
- Constituent Parts
- Marking

Supply partners should carefully review the PVR and all of the referenced documents to ensure a thorough understanding of the technical requirements.

The RTS is a process Volvo Group has developed to assist supply partners in the review of the technical requirements of the part or product they will supply. The objective is to ensure that supply partners have identified and thoroughly reviewed all of the technical documents, standards, and specifications defining the product.

The RTS compliance matrix is included with the RFQ documentation and shall be completed by the supply partner and returned together with the rest of the RFQ documentation. As part of this review, supply partners must determine if any of the technical areas included in the Index Audit section (ref. 3.6) of this document apply to their products.

## RTS timing

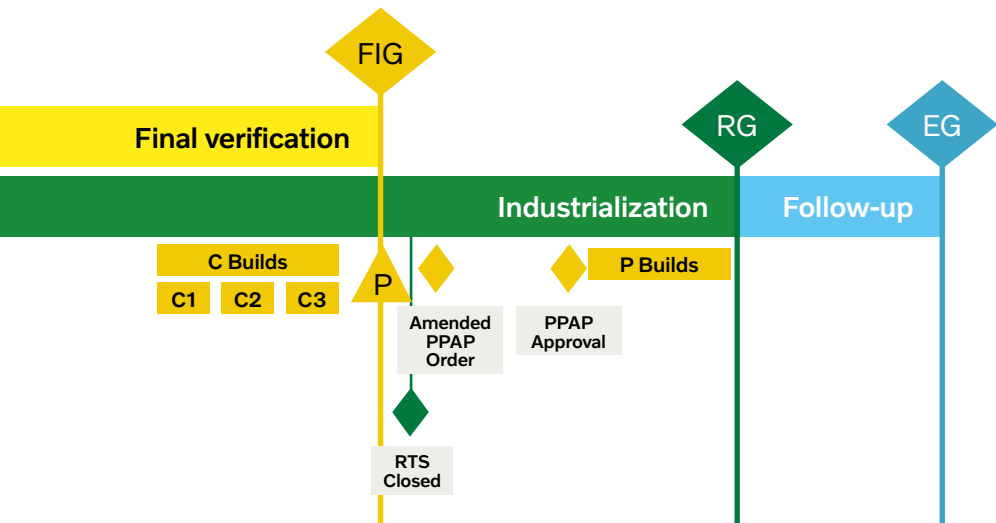


Supply partners must be prepared to prove activities required to ensure that all processes covered by one of the Index technologies are performed by approved sub-supply partners, unless approved by the appropriate Volvo Group Technology Specialist.

After the RTS compliance matrix is submitted and reviewed by Volvo Group, the RTS is signed by both Volvo Group and the supply partner.

Signing the RTS signifies agreement by all parties that the Technical Requirements, Volvo Group Standards and General Specifications applicable to the part have been received, are understood and are achievable.

The RTS provides a record of specification or production issues discussed during the part launch. Supply partners shall include a copy of this signed RTS with the PPAP documentation package. This ensures that all issues raised during the RTS process are properly addressed during the PPAP review.



Additional information is available in the Quality section of the Library on the Volvo Group Supplier Portal.

## 6.2 Product Application Agreement

The Product Application Agreement (PAA) is a process intended to ensure that supply partners fully understand and accept the installation and operating conditions of a supply partner developed component.

**THE PAA IS MANDATORY FOR KEY COMPONENTS WHERE THE SUPPLY PARTNERS IS FULLY OR PARTIALLY RESPONSIBLE FOR THE DEVELOPMENT**

This process involves a joint review by the supply partner and Volvo Group of the performance requirements and the physical installation of the component in the final application.

By signing the PAA, the supply partner agrees with the environment and application in which their product is to be used.

The PAA is designed to anticipate and prevent problems related to the integration of supply partners designed parts into a system or a sub-system. The process provides an opportunity for the supply partners to review the performance of their product in the final application.

## 6.3 Part Handling Review

To ensure that the quality of a supply partner component is maintained during shipping, storage, handling, testing or installation after transfer of ownership to Volvo Group, the supply partner is invited to participate in a Part Handling Review (PHR). The purpose of the PHR is to prevent the possibility of compromising product quality due to improper handling or installation, by sharing information and gaining the supply partner's observations. The PHR is not mandatory, but may be conducted upon Volvo or supply partner request, at each Volvo Group facility using the supply

partner's component as delivered in the agreed production packaging. The supply partner is encouraged to participate in a review of handling, and installation activities from receipt at a Volvo Group facility until shipment to the next facility or customer.

## 6.4 Special characteristics

While all characteristics of a part are required to conform to specifications, there are a few characteristics that are selected as special characteristics.

The selection criteria and guidelines related to special characteristics are based on the Volvo Group standard: STD 105- 0007 "Special Characteristics Definition and Application". This standard describes the system currently used by Volvo Group to highlight and grade critical characteristics appearing in drawings and technical specifications. Special characteristics are identified using the symbols [CC] or [SC] next to a feature in a Volvo Group technical document.

Critical Characteristics [CC] refer to special characteristics which affect safety. Significant Characteristics [SC] refer to special characteristics which can affect compliance with regulations (for emission regulations: use STD 105-0004), form, fit, function and performance, or subsequent manufacturing-process steps.

Volvo Group must be notified of any product features or functions where the potential failure mode and associated customer safety effect are assigned a high severity score (9 or 10). (Severity for any features identified by Volvo Group with a [CC] must have a severity score of a 9 or 10 on the supply partner's FMEA.)

For all features identified as a special characteristic, the following requirement applies:

	Critical Characteristics level [CC]	Significant Characteristics level [SC]
Process under statistical control, normally distributed	<p><b><math>C_{pk} \geq 1,67</math></b></p> <ul style="list-style-type: none"> <li>• Process appropriate checking frequency</li> <li>• On-going SPC**</li> <li>• Ppk analysis every six months</li> </ul>	<p><b><math>C_{pk} \geq 1,33 / 1,67^*</math></b></p> <ul style="list-style-type: none"> <li>• Process appropriate checking frequency</li> <li>• On-going SPC**</li> <li>• Compliance to capability requirement</li> </ul>
Process not under statistical control or capability not achieved	<ul style="list-style-type: none"> <li>• Electronic or automated poka yoke</li> <li>• Effectiveness verified once per shift</li> <li>• Volvo Group approved action plan for achieving process control and capability</li> </ul>	<ul style="list-style-type: none"> <li>• 100% inspection</li> <li>• Action plan for achieving process control and capability</li> </ul>

\*Electronic Components

\*\*Data records resulting from SPC, such as control charts or electronic data, must be stored and available upon request.

Data records resulting from Statistical Process Control (SPC), automated checking, and inspection results must be available for download upon request by the Volvo Group SQE-SDE. The data must include identification of the production lot or serial number information.

In addition to the demands detailed in the table above, the supply partner must apply the following requirements on the shop floor:

- Identification of the operations which have a direct or indirect influence on a safety feature
- Clear signs or placards defining the characteristic and potential effects of non-compliance on safety feature
- Training status and authorization for all operators working on safety feature related workstation
- Rework of EE components is not allowed\*

\* This requirement does not apply to remanufactured electrical or electronic components.



The requirements related to special characteristics are also applied to all parts classified as Safety Critical or Conformity of Production (COP). The specific application and any additional requirements related to Safety and COP are detailed in the relevant sections of this document.

In addition to the special characteristics identified in Volvo Group drawings or technical documents, supply partners must identify any special characteristics related to their product. Supply partners should communicate any special characteristics identified along with their standards for selecting and ranking critical or key characteristics and the methods used for identification on drawings. Supply partners shall also define any special considerations for handling, assembly, application, capability or use required to ensure safe, reliable performance of the product.

## **6.5 Legal requirements and Conformity of Production**

Legal Requirements and Conformity of Production (COP) refer to individual components or systems that are directly connected to vehicle regulations. The vehicle approval in several countries is linked to valid component type approval at our supply partners, since Volvo Group uses them to obtain system and vehicle approval. Therefore, supply partners must be well acquainted with the regulations and legal requirements that apply to their components, both as used within a vehicle and on a standalone basis (such as a service part) on a worldwide level, in order to obtain the type approval of the supplied component.

Volvo Group requires supply partners to follow the regulation to obtain their approvals as well as follow all valid regulations related to COP during the part's lifetime. By conducting business with the Volvo Group, all supply partners agree to comply with any and all such regulations. Each time the supply partner changes the authority approval (new extension, new amendment level or whatever the reason), the supply partner will provide that information to Volvo Group six months in advance, since the system and, potentially, vehicle certificates are impacted. Any update of a certificate from authority to supply partner, the supply partner is required to immediately send a copy of that signed document to the Volvo Group.

Volvo Group will, during APQP/PPAP, endeavor to confirm that the supply partners have a system in place to record and document their own process of COP, so the COP approval continues to be valid, although ultimately it is understood that this responsibility rests solely with the supply partner. Volvo Group will always require, and all supply partners conducting business with Volvo Group agree, that if a supply partner is in a non-conformity situation during COP testing that Volvo Group is immediately informed by such supply partner, and further that such non-conformity is promptly corrected. By conducting business with Volvo Group our supply partners agree that the Volvo Group may at any time inspect the supply partner's ability to monitor its COP system.

**Governmental authorities, the automotive industry and environmental organizations have developed guidelines and regulations that are placed on vehicle manufacturers. These regulations apply both to the customer vehicle and to the manufacturing processes. Ensuring compliance to these regulations is referred to as Conformance of Production or COP.**

Parts that have the potential to impact compliance, legal regulations or features, such components are identified using the symbols [2R] or [3R]. These symbols appear on Volvo Group drawings or are stated within the related Volvo Group technical specifications controlling the part. The determination [2R] or [3R] grading is based on an assessment of how seriously the consequences of non-compliance with the

requirements for the characteristic in question, will impact Volvo Group's compliance with the legal or governmental requirement. This assessment will in no way relieve any supply partner of the responsibilities described previously.

Volvo Group standard STD 105-0004 defines the guidelines for grading characteristics. This standard generally applies to components intended for POWERTRAIN applications (engines, transmissions and drive axles), but may apply to any component of a vehicle.

All parts with features designated as [2R], [3R] are also considered "Key Components" and are subjected to the same level of control. The des-

ignation of [2R] or [3R] differentiates the degree of significance of the characteristic in question.

It is mandatory for [2R], [3R] parts to be inspected or tested and the necessary documentation (inspection results, test reports, certificates) to be kept at the supply partner for a period of time consistent with the documentation retention policy. All inspections or tests required to ensure compliance to [2R], [3R] regulation must be included in the control plan. A summary of the results from inspections or tests must be communicated to the Volvo Group at regular intervals. Conformance to COP process requirements must be respected during the entire product lifetime. No changes to product or process are allowed without formal approval from Volvo Group. No deviations are allowed on features designated as [2R].

When characteristics for regulatory compliance are identified the following requirement applies:

	COP Characteristics level 2R	COP Characteristics level 3R
Process under statistical control, normally distributed	<p><b>C<sub>pk</sub> ≥ 1,33</b></p> <ul style="list-style-type: none"> <li>• On-going SPC*</li> <li>• Ppk analysis conducted every 12 months</li> </ul>	<p><b>C<sub>pk</sub> ≥ 1,33</b></p> <ul style="list-style-type: none"> <li>• Inspection completed to control plan**</li> <li>• Ppk analysis conducted every 3 years</li> </ul>
Process not under statistical control or capability not achieved	<ul style="list-style-type: none"> <li>• Machine or process 100% automated checking surveillance</li> <li>• Action plan for achieving process control and capability</li> </ul>	<ul style="list-style-type: none"> <li>• Machine or process 100% automated checking surveillance</li> <li>• Action plan for achieving process control and capability</li> </ul>

\*Data records resulting from SPC, such as control charts or electronic data, must be stored and available upon request.

\*\*Inspection results must be recorded, maintained, stored and available upon request.

In the event of non-conformance of an identified characteristic or component escaping the supply partner's location, the following actions must take place immediately:

- Notify the Plant Supplier Quality (SQP) at the affected Volvo Group facilities and the SQE-SDE
- Containment at supply partner, Volvo Group facilities and in transit
- Short term corrective action
- Begin cause analysis
- Develop an action plan to recover full conformance

**ALL [2R], [3R] FEATURES MUST BE MEASURED AND THE RESULTING DOCUMENTATION MAINTAINED**

## **6.6 Cleanliness requirements**

Technology and performance enhancements to the vehicles requires improved cleanliness of certain components. The cleanliness requirement will be specified on the part drawing or in the Technical Requirements document.

When required, cleanliness testing should be performed by the relevant Volvo Group Standard.

Alternative testing methods must be approved by Volvo Group Product Development.

Supply partners are required to perform cleanliness testing at intervals that demonstrate adequate control of the cleaning process.

Frequency of testing should be specified, documented, and agreed upon during PPAP process.

In addition, a Cleanliness Audit in accordance with Volvo Group Standard STD: 107-0003 may be required by the SQE. The SQE will provide the appropriate information if a Cleanliness Audit is required.

Even when cleanliness is not specified on the PVR, drawing, Technical Requirements or standards, parts shall be delivered free from dirt, machining chips, burrs, or rust.

## 6.7 Prototype parts and CPOT-IPD

To support design verification testing, or early build trials, supply partners may be required to deliver prototype parts. By the Volvo Group definition, prototype parts are any parts that can be built on a production process other than the final PPAP approved process. Prototype parts may be requested at different times during the product design cycle.

The requirements for the respective levels of prototype parts are:

- Prototype parts to the A or B documentation release:
- Parts are expected to be fully conforming to Volvo Group dimensional specifications
- Prototype parts to the C documentation release:
- These prototype parts are designated as Conforming Part out of Tool (CPOT), with the purpose to ensure the production intent tooling is capable of producing parts conforming to the drawing and technical specifications early in the APQP Process Development phase

CPOT shall meet the following requirements:

- Be geometrically and functionally correct based on agreed drawing release
- Produced on serial intent tooling when specific tooling is required
- Be verified by the supply partner for conformance to all dimensions and features according to the agreed technical specification
- Be produced by the production supply partner
- In cases where specialized tooling is required, the parts may be manufactured at the tool maker's location (the CPOT pick up point shall be equal to the regular pick-up point for serial production).

The appearance requirements for CPOT may be waived based on agreement between the Volvo Group and supply partner during the RTS process (e.g. no chroming, no graining).

**VOLVO**

**Part Version Report**

Part Number  
**23319821**

---

Name: BRACKET  
 Description: EPS/IFE LIFTING EYE  
 Characteristics: FRONT RIGHT  
 Part Type: D: Single part  
 Software Relation:

Function Group: 2181  
 Function Group Desc: 2181: engine anchorage  
 Unit Of Measure: (pc) piece  
 Design Location: RV: Renault Trucks  
 Design Responsible: 07343

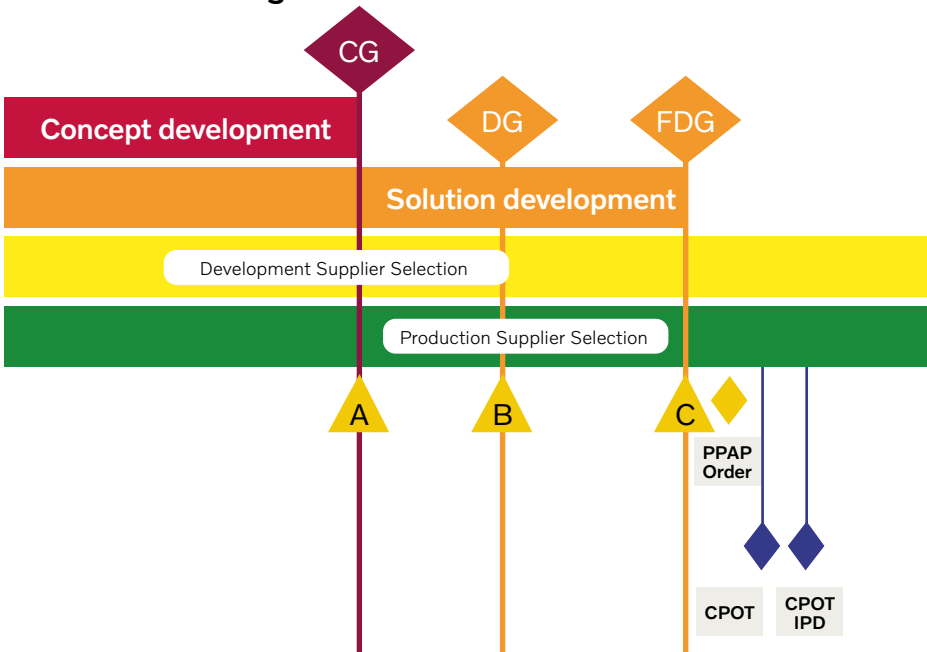
Multi Identity

Domain	Part Number	Version	DCN	Status
VOLVO	23319821	P05	D-18836-07	Valid
RENAULT TRUCKS	7423319821			

Document and product release version (e.g. "P05")

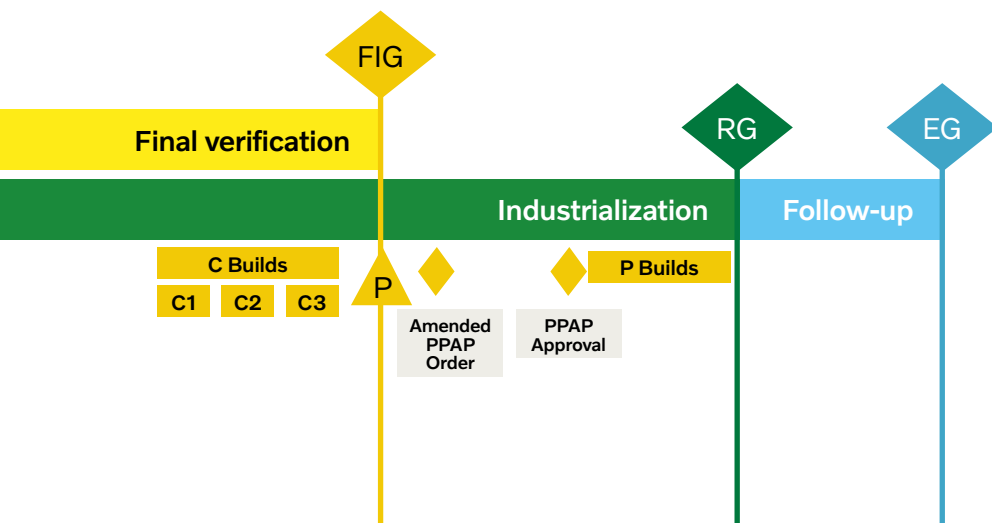
Supply partners are required to develop a prototype control plan to support the production, inspection and testing activity of parts manufactured according to the release stage of their technical documentation. The proto-

### CPOT-IPD timing



type control plan should include all product features and characteristics of the product and include any additional requirements from a Measurement Point plan (MP), or a Dimensional Control Plan (DCP) the supply partner may have received from Volvo Group Engineering for some components. The objective of this control plan is to ensure that the parts produced are fully conforming to the specifications.

Prototype parts, where the part or any of the features of the part fall under the requirements for Conformity of Production, Safety Critical or special characteristics, must meet the requirements as defined in the related section of this manual. The section of the capability requirements chart “Process not under statistical control or capability not achieved” shall be applied. All special features must be clearly identified in the prototype control plan.



Prior to shipment, supply partners of prototype parts are required to complete:

- **A- or B-release level prototypes:**  
100% measurement/verification evaluation prior to shipment
- **C-release level prototype (CPOT):**  
Measurement/verification of 100% of the characteristics/dimensions/features on 5 pieces of the shipment  
Measurement/verification of 100% of any applicable Special Characteristics of all parts of the shipped quantity ([SC], [CC], [2R], [3R])

All exceptions to these requirements (number of samples/features measured) must be agreed prior to the “Signing” of the RTS and must be documented in the RTS. Exceptions for functional requirements must be identified in the Verification Report as “RTS not measured” characteristic. The evidence of inspection, verification and measurements must be recorded in a Verification Report and copies of the records forwarded to Volvo Group prior to shipment.

For any prototype parts not achieving full compliance to the technical specification, shipment is not authorized unless approved by Volvo Group

Shipments of prototype parts must be clearly identified using an orange label with the word PROTOTYPE. CPOT parts must be marked using a red label including CPOT-IPD. The label must be prominently displayed on the exterior of the shipping skid or container. Specific details related to shipment guidelines, the prototype identification label and documentation requirements can be obtained by visiting the Volvo Group Supplier Portal or by contacting the Buyer that placed the order for those prototype parts (Prototype order or Quantity order).

Prototype parts must be clearly identified with the part number, the part version and marking that allows the part to be identified as a prototype after installation, in the production environment and on vehicles. The intention is to ensure that prototype parts can be easily differentiated from PPAP approved P-release parts. Prototype specific identification should be appropriate to the part and agreed between the supply partner and Volvo Group Engineering.



Supply partners will receive a PPAP sample order, a tooling order for production tooling (depending on the business arrangement), and a specific purchase order defining the quantity of CPOT parts required for the current issue.

CPOT-IPD (In Plant Delivery) is the date defined by the project, when CPOT parts are required to be delivered and received at the respective Volvo Group facility. The exact “In Plant Delivery” date will be communicated in the purchase order for the CPOT parts.

Acceptance and use of CPOT parts by Volvo Group does not imply production approval. Compliance to the CPOT requirements does not replace the requirements for conducting the PPAP. Demonstration of process capability is not required for CPOT parts, however, the CPOT process provides an excellent opportunity to evaluate capability of the tooling prior to the SPR.

Unique requirements related to prototype parts specific to a Volvo Group facility, business unit or region are available on the Volvo Group Supplier Portal or by contacting the Buyer.

## **6.8 Substance of concern & Material and Substance content reporting (MDS)**

The Volvo Group works actively to eliminate harmful substances from our products and to comply with regulations such as REACH, ELV, SCIP, RoHS, California Prop 65 and more.

**ALL VOLVO GROUP SUPPLY PARTNERS ARE REQUIRED TO FOLLOW THE VOLVO STANDARDS STD 100-0002/3/5 REGARDING CHEMICAL SUBSTANCES.**

All applicable standards are listed in the Part Version Report or technical requirement of the part.

Supply partner is expected to proactively work together with the Volvo Group in phasing out substances of concern wherever possible to reduce our dependency on these materials and enable a circular society.

Supply partner should inform Volvo about applicable authorization plans related to manufacturing operations.

Volvo Group is recommending supply partners to have no substances of concern highlighted in applicable standards in products as well as in the manufacturing process

### **Material and Substance content reporting (MDS)**

To ensure compliance regarding content of chemical substances the supply partner shall submit a Material Data Sheet (MDS) consisting of a declaration of all included materials and substances and their weight. The MDS shall be submitted to the Volvo Group via IMDS and or for Volvo CE via CDX.

The MDS is a living document and shall always reflect the true content of the delivered parts or components.

**WHEN REPORTING THE FOLLOWING IDS SHOULD BE USED:**

**IMDS ID 46569 FOR VOLVO GROUP**

**IMDS ID 221483 FOR VOLVO CE**

**CDX ID 3618 FOR VOLVO CE**

**THE REQUIREMENT TO REPORT MDS ON REQUEST APPLIES FOR ALL PARTS AND MATERIALS DELIVERED TO THE VOLVO GROUP, REGARDLESS OF DESIGN DATE OR APPLICATION OF THE PART OR MATERIAL.**

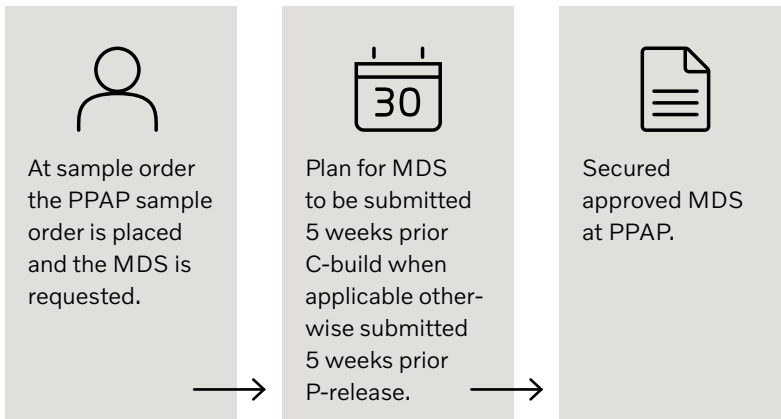
Reminder : MDS submission is expected to be done on the real manufacturing location parma and one submission per manufacturing location is expected.

## APPROVED MDS IN IMDS/CDX IS A REQUIREMENT FOR PPAP APPROVAL.

The Material Data Sheet (MDS) is requested when the Sample Order is sent to supply partner and must be submitted by supply partner 5 weeks prior C-build (when applicable), in other cases 5 weeks prior P-release, this to secure MDS approval for PPAP.

The submitted MDS is approved by the MDS checker. Additional information is available in the Volvo Group Standard STD 100-0006 and in the Sustainability section in the Library on the Volvo Group Supplier Portal.

### PPAP and Material Datasheet MDS submission



## 6.9 Pre-launch control plans

Supply partners are expected to use pre-launch control plans to increase the level of quality controls applied during ramp up and early production stages of new part launches. A pre-launch control plan is defined by increased frequency, levels of inspection and increased controls during the early stages of production. The purpose is to protect the customer from problems until process controls can be refined and start-up problems can be identified and resolved. Documents should be developed prior to C builds and maintained through early production. The level of controls within the control plan should be adjusted once the production process has been stabilized and process control can be assured. Additional information regarding Volvo Group expectations and requirements for control plan development can be obtained from the SQE-SDE.

Supply partners may be required to implement a separate inspection activity at process start-up that is independent of the inspections and controls required by the control plan. The purpose is to verify the effect of the control plan and determine the capability of the production process. The application of this additional control may be required by the SQE for early production when a supply partner's performance indicates that current controls are not adequate to identify and address problems prior to reaching the customer.

Shipments of products that have been through additional process controls should display prominent notification on each shipping unit (box, package or skid).

## 6.10 Service parts requirements

Customers of Volvo Group products expect the same quality on service parts, including repair and maintenance, as they expect from the original equipment. Volvo Group requires that the criteria of this manual apply fully to the production and delivery of service parts or products. This includes, but is not limited to, the planning for product realization (APQP), approval process for new or changed parts (PPAP), changes to production process (PPCN), safety parts requirements, and responsiveness to corrective action requests.

## 6.11 Functional safety requirements

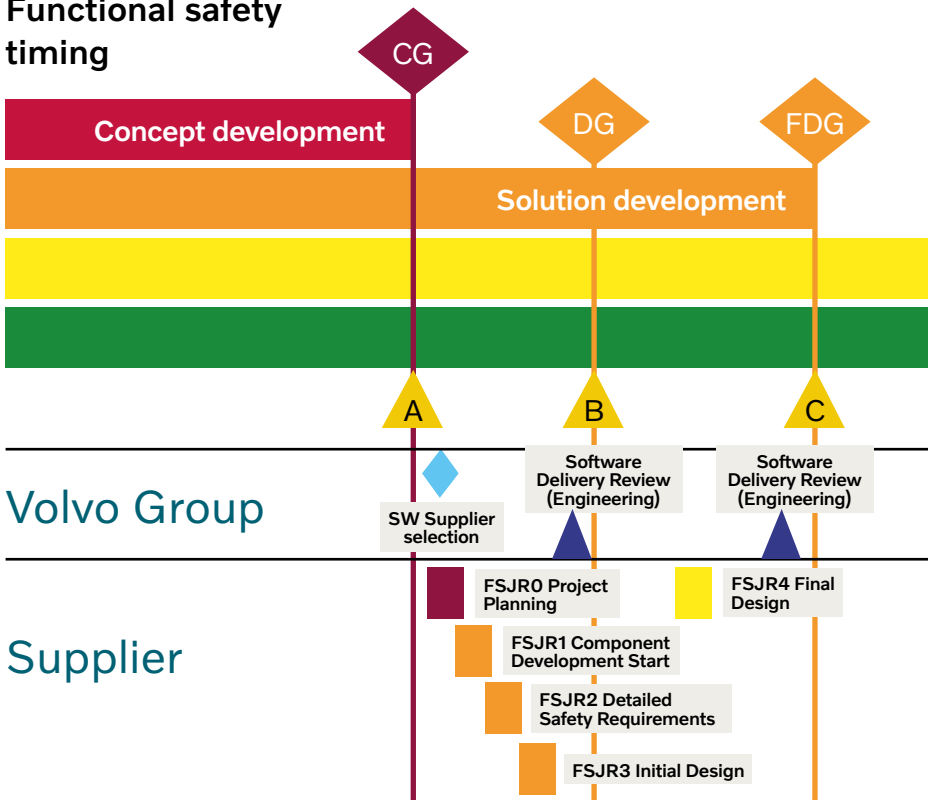
The process used for ensuring functional safety is centered on Functional Safety Joint Reviews that to a large degree are coordinated with the Software APQP reviews.

There are six Functional Safety Joint Reviews in a normal development project:

- FSJR0 Project Planning
- FSJR1 Component Development Start
- FSJR2 Detailed Safety Requirements
- FSJR3 Initial Design
- FSJR4 Final Design
- FSJR5 PPAP

The functional safety requirements applicable to supply partner projects are described in a separate requirement document called Functional Safety Quality and Development Process Requirements (FS-QDPR). This FS-QDPR is based on the automotive functional safety standard ISO 26262. ISO 26262 standard is mandatory for development of functional safety related electronics and software.

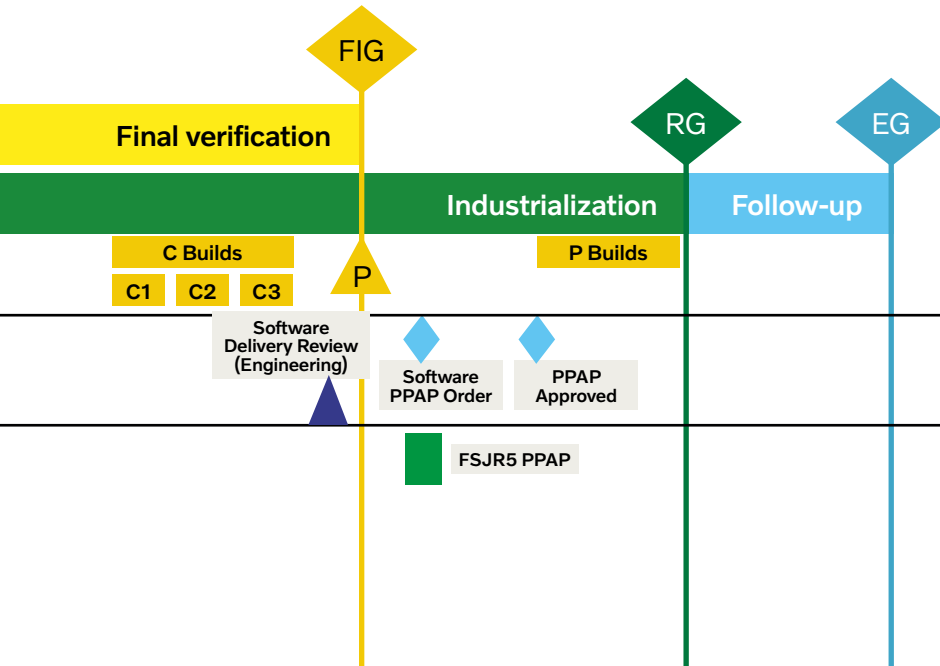
## Functional safety timing



## 6.12 Cybersecurity requirements

Volvo Group has a proactive policy towards cybersecurity and privacy to (among other purposes) assess the impact of cyber incidents and ensure compliance with the requirements of security and privacy acts and regulations. A supply partner has a duty to

- Designate a contact point person within its organization where more information about cyber incident or breach can be obtained (e.g., an Information Security Officer)
- Notify Volvo Group without undue delay, but in no event later than 3 business days from discovery of cyber incident or breach



The process used for ensuring Cybersecurity is integrated into the Software APQP reviews (refer to chapter 4.5).

The cybersecurity requirements applicable to supply partner projects are described in a separate requirement document called Cybersecurity Quality and Development Process Requirements (CS-QDPR). This CS-QDPR is based on the automotive cybersecurity standard ISO/SAE 21434. ISO/SAE 21434 is mandatory for development of cybersecurity related electronics and software.

## **6.13 System or organizational changes**

Volvo Group has experienced disturbances to production or deliveries because of changes at supply partner's facilities. It is required that supply partners notify Volvo Group of pending changes to systems (ERP/ MRP), ownership, management, or management structure.

Supply partners should notify the Buyer or SQE-SDE when these types of changes are pending. While notification of these types of changes is not required under the PPAP and PPCN requirements, supply partners are invited to use the PPCN form to notify Volvo Group of pending changes.

## **6.14 Product Requalification (IATF 16949 section 8.6.2)**

The supply partner is required to verify annually that its supplies meet Volvo specifications, including dimensions, materials, reliability, regulatory and environmental requirements in accordance with production control plan (requalification). The supply partner evaluates documents and archives the results. These must be made available to Volvo on request. Any deviation to the Volvo Specifications needs to be communicated to Volvo. Any deviation on the Product Requalification requirement must be agreed in writing between the supply partner and Volvo.



# 7. Production requirements

Supporting processes

Product or  
Process  
Change  
Notification

Requesting  
deviations to  
specifications

Lot traceability

First In First  
Out inventory  
control

Sub-tier supply  
partners  
requirements

Packaging

Laboratory  
requirements

Record  
retention

While the production operations ultimately determine the quality of product, ensuring consistent quality also depends on the capability of supporting processes.

The processes described in this section do not directly determine or improve product quality, but failure of these processes has the potential to adversely affect product quality.

## 7.1 Product or Process Change Notification

In accordance with the IATF 16949 standard, the PPAP guidelines, and Volvo Group Purchasing conditions, a supply partner cannot implement a change to a product or production process after PPAP approval, without prior approval from the Volvo Group.

All proposed changes to the product, production process, material or supply partners after PPAP must be submitted to Volvo Group for approval using the Product or Process Change Notification (PPCN) process. Requests for change must be submitted at least 12 weeks prior to the introduction of the change.

**AFTER SUCCESSFUL PPAP NO CHANGE MAY BE MADE TO THE SUPPLY PARTNERS' PRODUCT OR PROCESS WITHOUT WRITTEN APPROVAL FROM VOLVO GROUP**

The purpose of this requirement is to prevent quality and delivery issues resulting from unapproved, untested changes or modifications after PPAP approval. This applies, but is not limited to, the following cases:

- Transferring of the production line: partly or totally; to a new or existing location, plant or building
- New production layout or changes to production line
- Change of a sub-tier supply partner
- Changes of a process at a contract supply partner, (surface treatment, machining, etc.)
- Packaging changes or repackaging operations
- Change at sub-tier supply partners that affect fit, form or function of the product
- Renewal of non-consumable tooling
- Change to the raw material
- Outsourcing all or part of production to a sub-tier supply partner
- Request for change to product design including dimensions, tolerance, function, appearance

The supply partner desiring a change shall submit a completed Product or Process Change Notification (PPCN) electronic form to the Buyer with a copy sent to the SQE as soon as the modification project is known, and at least 12 weeks prior to the intended start of production.

If the change is impacting a process covered by an index (see 3.6) Request for change must be submitted at least 26 weeks prior to the introduction of the change. As a rule, supply partners should notify the Volvo Group of required changes as early as possible and obtain agreement on the implementation timing. Supply partners may be required to submit additional information to support evaluation of the proposed change (Product Validation Testing, Dimensional or Functional Reports). PPCN supplier guide is available on the Volvo Group Supplier Portal.

**REQUESTS FOR CHANGE MUST BE SUBMITTED USING THE PPCN ELECTRONIC FORM A MINIMUM OF 12 WEEKS PRIOR TO THE PROPOSED CHANGE**

Since Volvo Group functions as a global company with manufacturing functions on most continents, supply partners must be prepared to support the impact of a change request at all impacted Volvo Group facilities. Supply partners making a process or product change must be capable and willing to provide information and resources required to secure product quality and uninterrupted deliveries.

Introduction of changes without Volvo Group approval may result in any or all of the following actions:

- All costs related to correcting the situation created by an unauthorized change will be charged back to the supply partner pursuant to the agreement with Volvo Group
- The supply partner's third-party certification body will be formally notified that the supply partner is not following quality system or customer requirements

- Supply partner will be required to complete corrective action and demonstrate effective controls to prevent recurrence
- Supply partner may be placed on hold for new business

After receipt by the Volvo Group, the request is submitted to a team for analysis. Based on the impact on Volvo Group and the risk associated with the change, the PPCN may have one of the following decisions:

- Authorize the supply partner modification
- Ask to adapt the content of the supply partner modification
- Ask the supply partner to delay the implementation until extra actions/verifications are performed (actions include, but are not limited to, audits, safety stock, testing, etc.)
- Ask the supply partner to cancel the proposed modification

Once approved by Volvo Group, supply partners will be notified by an official letter. Upon receipt of the approval letter, supply partners should implement the modification project according to the agreed implementation plan.

The level of PPAP documentation required to support the introduction of the change will be determined by the SQE. Authorization to start shipping (with the changes implemented) is only granted via the return of the signed PSW and/or SSW following PPAP approval.

## 7.2 Requesting deviations to specifications

In the case where the supply partner wishes to request a deviation to supply parts that do not fully comply with Volvo Group requirements, the supply partner must inform Volvo Group and request approval. The request must be approved prior to shipment.

Supply partners to Volvo Group Trucks and Volvo Penta may request a deviation using the Global Deviation Request form, available in the Quality section of the Library on the Volvo Group Supplier Portal. The completed form is submitted by email to the functional mailbox address listed on the deviation form with a copy to the SQE or if agreed to the Volvo Group Plant Supplier Quality (SQP). Supply partners to VBNA must complete

the template and follow the process defined as specific for Nova Bus in the Library on the Volvo Group Supplier Portal.

Requests for approval are reviewed by the Volvo Group responsible Design Engineer and the SQE. If the deviation is approved, the supply partner will be e-mailed a copy of the notice of approval.

All shipments made under a deviation shall be identified on the exterior of the shipping container. Specific labelling type shall be agreed between the supply partner and the SQP(s) at each affected Volvo Group facility and/or the SQE and shall include the deviation approval number.

In addition to the agreed labelling, the supply partner shall inform the affected SQP(s) about the first delivery of material under deviation (shipment date, delivery note numbering). Shipments under deviation may be subjected to additional inspection upon arrival at the Volvo Group facility.

Supply partners requesting a deviation must complete an 8D response identifying the cause, corrective action, and measures taken to prevent recurrence.

**VOLVO GROUP WILL NOT APPROVE DEVIATIONS TO SAFETY CRITICAL [CC] CHARACTERISTICS, REGULATORY REQUIREMENTS [2R] [3R] CHARACTERISTICS OR ELECTRONIC COMPONENTS**

## 7.3 Lot traceability

Lot control and traceability should be established to limit the size and impact in the event of the need for product recalls or campaigns. The control system must be capable of linking production quantities to production processes to support root cause analysis activity.

When lot control is utilized, the system must establish and maintain one-to-one relationship between a lot/batch traceability number and a certain

quantity of produced parts. If a traceability number, other than the serial number, is used for identifying serialized parts, a one-to-one relationship between the traceability number and the serial number must be maintained.

The extent of definition and control shall be based on risk analysis of the product and the potential impact to customers. Supply partners are responsible to ensure that the lot traceability system maintains its integrity through the entire supply network, including raw material, purchased components/products, and sub-contracted operations.

The following requirements apply to safety critical parts. Supply partners shall have an effective system of traceability that ensures delivered product can be traced from a finished product in the customer application back to specific lots, sub-components, parts, blanks and raw material.

In addition to component/materials traceability, the system must be capable of providing the production history of a lot or serial number. This history must include:

- Rework operations or activity
- Product and process special characteristics
- Test records
- Process parameters influencing conformance
- Machine settings influencing conformance
- Maintenance activity of machines, equipment, jigs, gauges and test equipment
- Qualification records for personnel performing the work, calibrations/verifications and maintenance related to CC parts

If product is controlled in lots or batches, a risk analysis related to severity of non-conformance and probability of occurrence must be conducted and used in establishing the lot sizes to minimize the impact of product recall. Record retention: see 7.8.

## 7.4 First In First Out inventory control

Supply partners are responsible to have inventory control systems that positively identify and control obsolete material to prevent inadvertent shipment to the Volvo Group. Where feasible, supply partners shall maintain First In First Out (FIFO) inventory management practice. The system for FIFO control must ensure controls extend to rework/repair, test activity and off-site (sub-contract) processes.

## 7.5 Sub-tier supply partners requirements

Volvo Group requires that all sub-tier supply partners are third party registered to ISO 9001. Volvo Group strongly encourages our supply partners to support IATF 16949 certification of their sub-tier supply partners. Supply partners have full responsibility for the quality, quality assurance and corrective action of products delivered from sub-tier supply partners for use in Volvo Group products.

Volvo Group reserves the right to have access to sub-tier supply partners and processes that could have significant impact on final product quality. Access to sub-tier supply partners or approval of sub-tier supply partners by Volvo Group, does not change or reduce the supply partner's responsibility for quality of products supplied by those sub-tier supply partners.

**THE PRODUCTION PART APPROVAL PROCESS,  
DOCUMENTED BY A PART SUBMISSION WARRANT IS  
REQUIRED FOR PRODUCTS FROM SUB-TIER SUPPLY  
PARTNERS**

Volvo Group requires supply partners to use the Production Part Approval Process (PPAP) and that this requirement is applied to sub-tier supply partners of products to be used in Volvo Group products. Supply partners have the responsibility for managing the PPAP at their supply partners and maintain evidence of compliance. "Catalogue Parts" may be eligible to have this requirement waived. Exemption requires a formal waiver from Volvo Group prior to shipment of parts exempted from this requirement.

Contact the SQE-SDE for additional information related to obtaining a waiver for this requirement.

Once a part is approved, changes at sub-tier supply partners that affect fit, form or function must be documented and approved by Volvo Group using the Product Process Change Notification process.

## **7.6 Packaging**

In support of the Volvo Group commitment to protecting the environment, Volvo Group has developed a process for returnable packaging and integrated logistics system. Supply partners are expected to package components according to packaging instructions that are agreed to and approved between Volvo Group and the supply partner before shipment to Volvo Group. Supply partner should verify the agreed upon internal packaging will effectively protect the parts during shipping and handling. Supply partners are required to provide appropriate storage and protection for Volvo Group packaging while under their control.

## **7.7 Laboratory requirements**

Compliance to ISO/IEC 17025 may be used to demonstrate the organization's in-house laboratory conformity to this requirement, but it is not mandatory. Compliance to ISO/IEC 17025 is a requirement for supply partners delivering Electrical Electronic (EE) components.



## 7.8 Record retention

Document type	Examples	Maintenance interval
PPAP documentation	Drawings, process flow charts, control plans, FMEAs, PSWs, manufacturing instructions, etc.	Duration of production and service activity plus 1 year (unless otherwise specified by Volvo Group)
Quality records	Inspection records, functional test results, material certifications, torque, records other test results (cleanliness etc.)	3 years from date of production
Quality system documents	Internal quality system audits, product audits, management reviews	3 years from date of creation
Product safety related records:	Inspection records, test results, material certifications, torque records, traceability records	Minimum 10 years after product phase-out or end of production. Any additional applicable legal requirements related to storage must be maintained
Conformity of Production parts	Inspection records, test results, material certifications, torque records	10 years from date of product manufacture

The above time periods shall be regarded as minimum. Retention periods longer than those identified above may be specified by an organization in its procedures.

These requirements do not supersede regulatory requirements.



# 8. Performance measurements and corrective actions

Responding to problems



Volvo Group recognizes that the performance of the supply base has a direct and immediate impact on organizational performance. In response to this, Volvo Group has developed a system for the measurement and evaluation of supply partner performance. The indicators resulting from this process are compiled every month and are reviewed and evaluated at all levels of the Volvo Group organization. These measurements are available for review on the supply partners Scorecard on the Volvo Group Supplier Portal.

Even under ideal conditions and careful preparation, problems may occur. If a supply partner suspects non-conforming components have been shipped and will reach a Volvo Group facility, we expect immediate notification from our supply partner with relevant information to minimize or limit any potential impact. In addition to performance, Volvo Group measures a supply partner based on their cooperation in aggressively seeking to resolve problems. Supply partners are evaluated on the promptness of the initial response when notified of a problem, the timeliness of subsequent actions, and the effectiveness of actions taken to resolve the problem.

Volvo Group invites supply partners to work as partners in the problem-solving process.

Volvo is expecting supply partners to work on all product process non conformances in their operations whether they are related to Volvo product or not, ensure horizontal and vertical deployment (all similar part-process) and ensure feedback loop to the operators to avoid reoccurrence.

## 8.1 Non-conforming material

It is in the interest of both Volvo Group and the supply partner, to identify and address non-conforming parts as quickly as possible. Supply partners shall take all necessary actions to respond to non-conforming product that reaches a Volvo Group facility (production site, warehouse etc). Every effort is taken to investigate and document non- conformances and to notify the supply partner immediately.

**In the event non-conforming parts or material have been identified at a Volvo Group facility, supply partners will be notified using an Inspection Report (IR). The IR is sent using a web based portal along with an email to the supply partners' quality contact.**

Volvo Group has developed guidelines for determining the quantity of parts charged as non-conforming related to a specific IR. Any questions regarding the quantity rejected related to a specific IR and the effect on supply partner's performance (ref. 8.4) scores should be directed to the "Issuer" noted in the IR.

All costs (sorting, handling, shipping, rework and inspection report costs) associated with addressing a non-conformance will be the supply partner's responsibility. These costs may include any secondary costs incurred by Volvo Group resulting from a non-conformance, such as the costs associated with tear down, reassembly, re-testing, and logistics support. Under normal circumstances, supply partners are expected to respond immediately to any non-conformance and ensure that all receiving plants are protected within 24 hours. Supply partners are required to notify Volvo Group immediately if it is suspected that non-conforming material has been shipped to a Volvo Group facility.

Depending on the type of non-conformance and material status, supply partner parts may be sorted, reworked or adjusted. Supply partner approval is requested before any rework or adjustment will be performed, except in circumstances where support of production need requires immediate action. Supply partners should be prepared to take any or all of the following actions after non-conforming material are identified at a Volvo Group facility:

- Expedited replacement of non-conforming material
- Provide resources to perform required sorting or rework
- Provide third party sorting resources
- Authorize Volvo Group to begin third party activities on the supply partner's behalf
- Provide instructions and acceptance criteria required to support inspection, sorting, or rework
- Provide product specific gauging

Volvo Group has agreements with third party sorting companies who can provide sorting activities on behalf of the supply partner. All costs associated with these third-party activities are the supply partner's responsibility. Supply partners have the option to use this service or to contract a third party to do sorting or rework on their behalf. Third parties selected by the supply partner must be approved by Volvo Group prior to starting any sorting or rework at a Volvo Group facility.

If not used by Volvo Group under deviation, after rework or after repair, non-conforming parts or material will be "returned to supply partner" or "scrapped at Volvo Group" based on supply partner's direction.

## 8.2 Corrective action response

Volvo Group expects supply partners to use the 8 Disciplines (8D) process as common problem-solving process for quality issues. Each time a non-conformance or a defect has been documented, the causes for the problem must be investigated and reported in the 8D connected to the IR. Supply partners should submit their corrective action response in the system as soon as possible, and no later than the due time. Responses shall include all supporting documentation including but not limited to revised process control plans.

In addition to the cause and corrective action conducted during the 8D process, supply partners should conduct root cause analysis for all major issues. Root cause analysis requires evaluation of the weaknesses within the organization processes or systems that allowed the problem to occur. Root cause generally requires management action to address the underlying systems or processes.

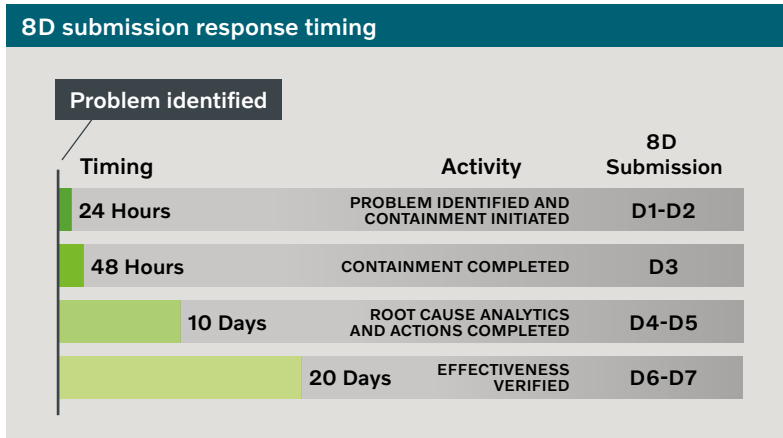
### AN 8D RESPONSE IS REQUIRED FOR ALL NON-CONFORMANCES

It is of vital importance that the supply partner starts the problem-solving process upon notification. It is critical that appropriate actions occur immediately to contain the problem and avoid any further disturbances to production or potential quality hazard. When notified of non-conformance supply partners are requested to react in accordance with the following timeline:

- **Immediately:** Acknowledge receipt of IR and initiate containment activities.
- **24 Hours:** Begin containment activities to include sorting internally, in-transit and at Volvo Group facilities, (third party allowed). Problem analysis started. Identify other Volvo Group sites at risk.
- **48 Hours:** Containment completed, and short-term corrective action fully implemented.
- **10 working days:** Cause analysis complete for both occurrence and non-detection, permanent corrective action defined and implemented. (Timing starts after confirmation and acceptance of non-conformance.)

- **20 working days:** Effectiveness of permanent corrective action checked, and recurrence prevented.

If the resolving time lasts longer than 20 days, the supply partner must reach an agreement with either the SQE-SDE or the concerned SQP.



In addition to correction of the documented problem, supply partners shall apply the lessons learned to all similar products or processes (horizontal deployment). Permanent countermeasures for all defect categories should be implemented for all parts and processes.

### 8.3 Supply partner scorecard

Volvo Group maintains a scorecard of the quality and delivery performance for each supply partner that delivers parts to a Volvo Group facility. The measurements on this scorecard are regularly reviewed to track supply partner performance and identify negative trends. This information is available for supply partner review over the Volvo Group Supplier Portal. It is recommended that supply partners review this information on a regular basis. Regular review of their performance data allows supply partners to take action to address problems and trends before Volvo Group is required to act with the supply partner.

The scorecard is a tool for monitoring supply partners performance. The scorecard is made available to supply partners to allow them to be proactive in addressing production quality issues. The scorecard can also assist in reviewing performance for negative quality trends.

The supply partner's performance is calculated for a calendar month and the scorecard is updated during the first half of the following month. Information about the latest update can be found under "information/sources". The scorecard shows information for the prior three months, with the ratings calculation based on a three-month rolling

average. Information for other periods is available using the "View Performance Breakdown" page.

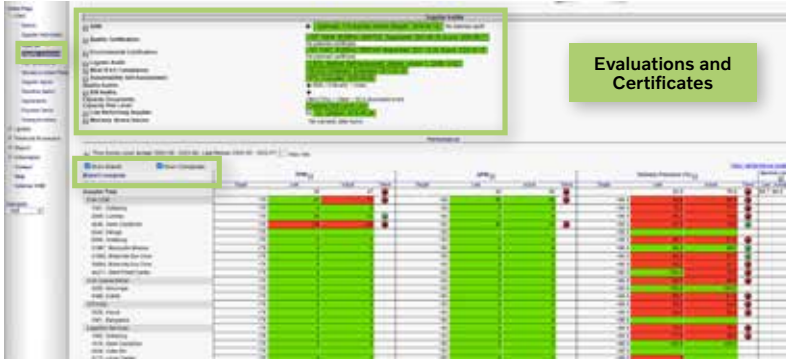
In addition to performance information, the scorecard contains important information related to:

- Supply partner address and company structure
- SEM Audit Results
- Purchasing Contracts
- Quality Certificates
- Environmental Certificates
- REACH Compliance
- Supply partner quality and delivery performance
- EDI Capability
- Supply partner sales to Volvo Group
- Volvo Group Buyers
- Volvo Group SQEs
- Supply partners contact persons for Volvo Group cooperation

The information in the scorecard provides a picture of how Volvo Group views the supply partners ability and capability. The information in the scorecard is routinely used in making sourcing decisions.

To access this information, supply partners should contact the Volvo Group Buyer.





## 8.4 PPM and Quality Performance Measurement

PPM and QPM are measuring the performance of the parts delivered to Volvo plants. It does not concern the field quality issues.

PPM measurement is calculated as the number of non-conforming parts identified divided by the number of parts delivered, normalized over one million parts. PPM performance visible on the supply partner scorecard shows PPM for the past three months.

The Quality Performance Measurement (QPM, not in use at VCE, see end of section 8.4) has proven to provide a better indicator of supply partner performance than by using PPM alone. QPM is a key indicator of supply partner performance that reflects the impact that delivery of non-conforming parts has on the Volvo Group over the prior three months. The QPM is calculated and updated on the supply partner scorecard on the second week of each month.

The QPM measurement includes the PPM, the actual number of parts rejected, the number of Inspection Reports written and the value of rejected parts compared to the value of parts delivered compensates for anomalies inherent in the PPM calculation. Example: If a supply partner had 1 part from a shipment of 10 pieces rejected during a three-month period, the resulting PPM for that period would be 100 000. The related QPM for this same three-month period would be:

**PPM: 20 + NCp: 5 + IR: 0 + V/V: 20 = QPM: 45**

Measurement criteria:

Parts Per Million		Non-conforming parts		Inspection Reports		Volume value	
PPM	Points	NC parts	Points	IRs raised	Points	Vol val %	Points
1-100	0	0	0	0-1	0	<0,01	0
101-500	5	1-5	5	2	5	0,01≤x<0,16	5
501-2000	10	6-25	10	3-4	10	0,16≤x<0,41	10
2001-5000	15	26-250	15	5-8	20	0,41≤x<1,01	15
5001 -	20	251 -	20	9-12	30	1,01≤x	20
				13 -	40		

Explanation of terms:

- Parts Per Million:**  
 The number of parts rejected, divided by the number of parts delivered multiplied by 1 million
- Inspection Report:**  
 The number of IRs issued to a supply partner during the three-month window
- Non-conforming parts:**  
 Refers to the total number of parts returned during the months being evaluated.
- Volume value:**  
 The percentage calculated by dividing the cost of returned material for a three-month period by the total value of products delivered during that same period. This calculation compensates for the situation where supply partners may have many rejects of very low value products while successfully supplying high value products but at a lower volume.

**Formula for calculating QPM:**

QPM = PPM points (T/R type reports) + NCp points (T/R type reports) + IRs Created points (T/R/A/P type reports) + Vol val points (T/R type reports)

VCE uses SFTT as a key quality indicator. SFTT measures the number of inspection reports compared to the quantity of delivered orders, which is more suitable for higher variety of items with lower volumes for each one of them.

The SFTT calculation goes as follows:

$$\text{SFTT} = 1 - \left( \frac{\text{Number of inspection reports}}{\text{Number of delivered orders}} \right) \%$$

## 8.5 The Volvo Group process audit

Volvo Group routinely conducts process audits as a prevention activity as well as to support corrective actions. Process audits may be performed under any of the following circumstances:

- During APQP
- During production ramp up
- New supply partner evaluation
- Introduction of a new process
- Move production to a new location
- Poor quality performance
- After a major incident

Periodically Volvo Group Supplier Quality will conduct an in-depth audit of the process steps that have a direct impact on the quality of delivered products. Supply partners are required to develop a robust improvement plan to close the gaps identified during the process audit.

In addition to the situations listed, the production processes of components that have been identified as critical to the safe, reliable function of a vehicle may be subjected to annual audits. These audits are to ensure that the production processes used during the “Significant Production Run” remain unchanged and capable of delivering consistent quality products.

Volvo Group reserves the right to perform process audits whenever it is deemed necessary. Supply partners will be given reasonable advance notice of a pending audit. A copy of the process audit template used by Volvo Group in conducting the audit is available for review on Volvo Group Supplier Portal.

One or more process audits may be required during the development and launch phases of the introduction of a new product or process. The SQE will communicate this requirement to the supply partner during the development of the APQP activities. In addition to audits conducted by Volvo Group, supply partners are expected to routinely conduct internal audits of their production processes. Records of any findings from internal audits and actions taken in response to findings should be available for review during the Volvo Group process audit.

## **8.6 Continuous improvements**

Supply partners are expected to use the lessons learned from each incident to improve production process, product design, or underlying business systems. The goal is to eliminate the possibility of similar incidents, not only by making procedural and process adjustments on the manufacturing floor, but by removing the environment that allowed the issue to surface. Lasting improvement requires correcting the systems and strategies that support the production process.

In addition to responding to identified non-conformances, supply partners should use statistical data to continually evaluate and refine their processes. This evaluation should include analysis of quality out of control indications, high PPM, scrap, downtime, and warranty failures. The clear objective of this analysis must be reduction of variation with the finished product. The supply partner shall have on-going, active improvement projects that target the largest problem areas and be able to demonstrate a positive trend in reducing incidents and repeat occurrences.

## **8.7 Low Performing Supplier process**

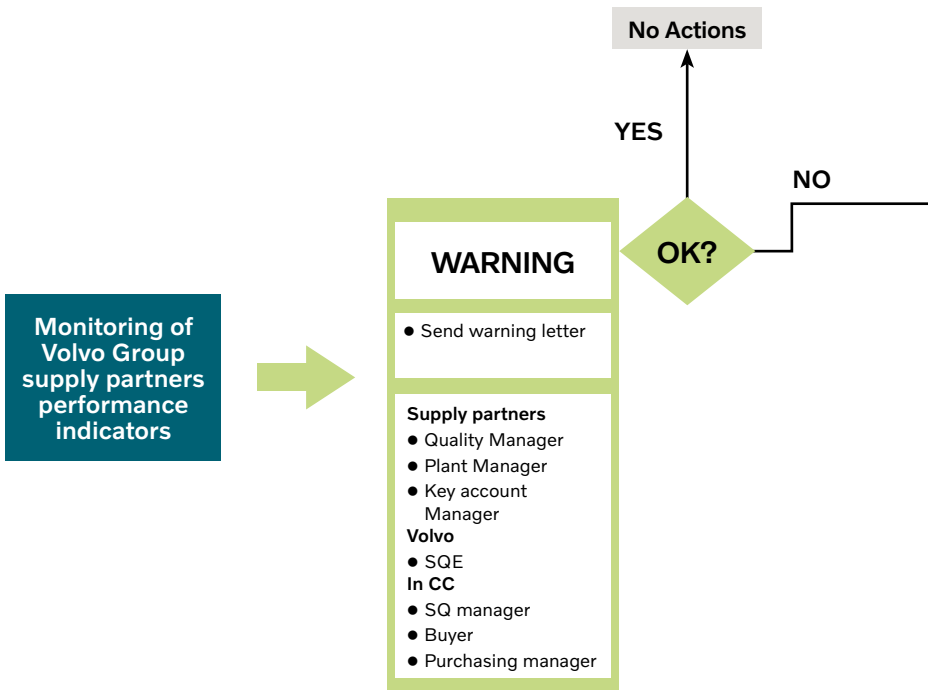
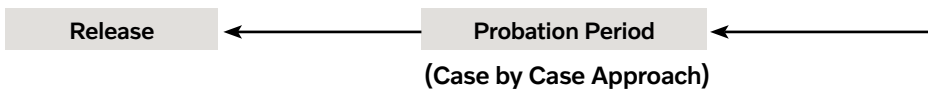
Volvo Group monitors supply partner performance monthly. When any of the monitored measurement parameters indicate negative performance trend or significant abnormality, the supply partner is considered for elevation into the Low Performing Supplier process (LPS).

Supply partners will be notified of the potential inclusion in the LPS process by a warning letter sent to the supply partners' Quality department. The letter will include the reason or reasons a supply partner is being considered for entry into the LPS process.

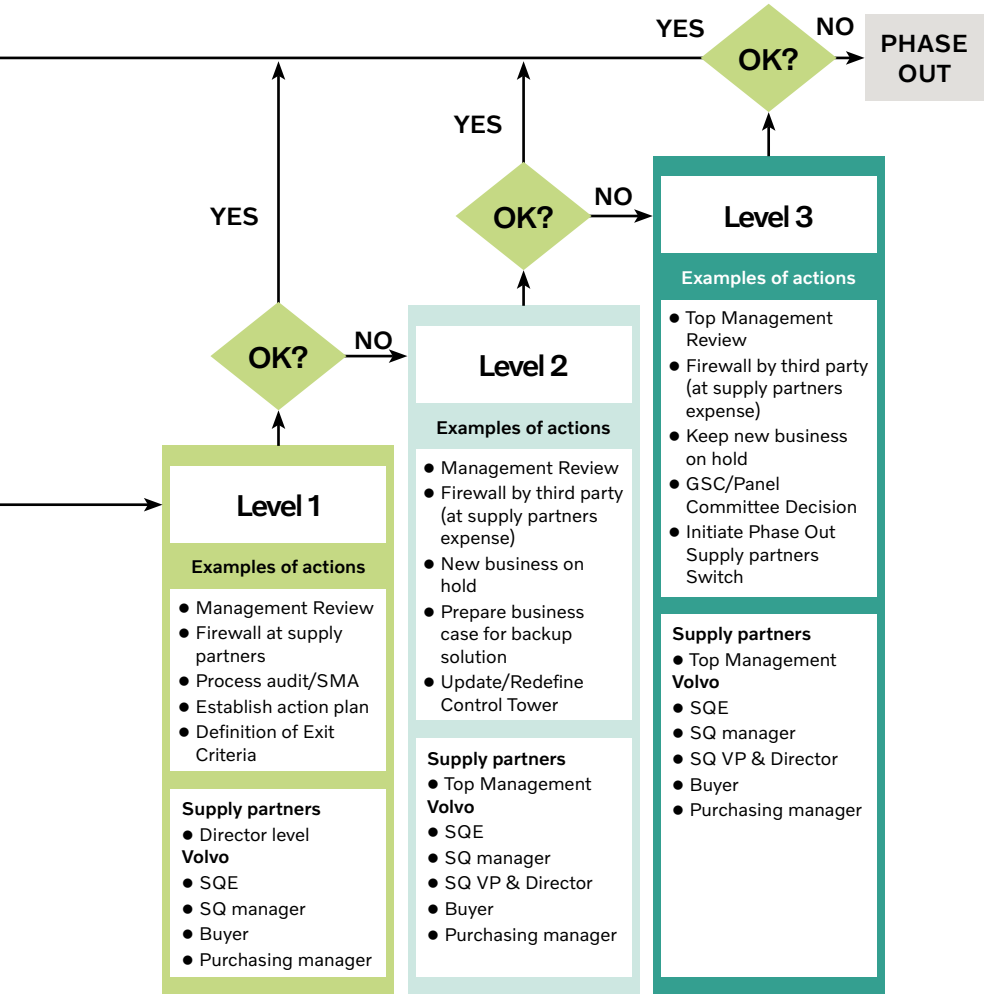
The LPS procedure provides a clearly defined guide to the analysis, actions and monitoring that will take place while a supply partner is engaged in this process.

Supply partner improvement activities are initiated and monitored through a three-stage elevation process. Each stage has defined criteria for entry and exit and identified actions to be completed during the stage. Exit criteria are based on improved performance results and implementation of process improvements. Supply partners that do not meet the criteria for a stage by the target completion date are elevated to the next LPS stage level.

Each time the supply partner is elevated to a higher stage, the actions required will be those of all previous stages, plus the additional actions required by the new stage. At any time that the exit criterion is met for a specific stage the supply partner is moved to the “Monitoring” status. A supply partner can be placed in the LPS based on performance for an individual part number, multiple part number bases or organizational performance. Supply partner performance is tracked based on the Volvo Group assigned Parma code.



# ESCALATION PROCESS



## 8.8 Field quality issues

It is in Volvo Group's and our supply partner's best interest to solve customer product issues (CPI) as quickly as possible. Therefore, when a customer quality issue is identified as potentially related to supply partners delivered parts, the supply partners may receive a notification letter regarding the pending investigation. If it is determined that a formal investigation and problem-solving activity is required, supply partners will be invited to join a formal Kick-Off meeting. During this meeting the scope of the problem is defined, the plan for investigation, and the timing for resolution is presented. Supply partners are invited to participate in the investigation and expected to provide all needed support required for timely resolution of the problem.

Volvo expects the supply partners to share all knowledge and findings in relation to the problem and use the 8D methodology as the problem-solving tool.

Volvo Group expects the following outcome from the pre- investigation

- Parts analysis
- Initial cause analysis
- Estimated failure occurrence
- Proposed containment action

Following the pre-investigation Volvo Group will decide the most appropriate solving process.

When the failure is related (directly or indirectly) to a supply partners part that is found to deviate from the technical specifications for the part (e.g., manufacturing process deviation, for Penta called Service Request (SR))

- The solving process will be led by the supply partners and Volvo Group will monitor progress of the implementation and verification of the solution
- An 8D report is required
- Expected solving lead time is the same as for Inspection Reports (ref. 8.1)



For critical and complex cases

- The supply partners will be notified by an official letter of the opening of a Customer Product Issue (CPI)
- The CPI will be led by Volvo Group, the supply partners are expected to take an active part in the cross-functional work
- Expected solving lead time is communicated in the notification letter
- For VCE, TFR stands for Technical Failure Report. TFR is a field issue that has been reviewed by the Product Maintenance team and certainly requires immediate attention to get solved

## 8.9 Warranty

Responding to field warranty claims remains a top priority at Volvo Group. When Field Failures are determined to be the result of a supply partner's product, supply partners will receive a notification letter. It is expected that supply partners will fully participate in the investigation, root cause analysis and corrective action when field failures are identified. Supply partners should have an established process for the handling, analysis, investigation, reporting and corrective action of customer field returns. Volvo Group has developed and conducts a warranty specific process audit of supply partner's capability to manage customer field returns.

If the non-conformance is generated by a supply partner, a Volvo Group warranty department may call the responsible supply partner for immediate correction or replacement of products. The conditions defining response and responsibility are included in the Purchasing conditions, purchasing agreement and/or warranty charter. A copy of the warranty charter is included as part of the Request for Quotation.

# Glossary

<b>8D</b>	8 Disciplines, a problem-solving method
<b>AIAG</b>	Automotive Industry Action Group
<b>APQP</b>	Advanced Product Quality Planning
<b>CAS</b>	Capacity Assessment Sheet
<b>[CC]</b>	Critical Characteristic
<b>CDX</b>	Compliance Data Exchange
<b>CG</b>	Concept Gate
<b>COP</b>	Conformity of Production
<b>CPI</b>	Customer Product Issue
<b>Cpk</b>	Capability Analysis Index
<b>CPOT-IPD</b>	Conforming Part Out of Tool-In Plant Delivery
<b>C Builds/P Builds</b>	Physical build to confirm product design and verify production solution, based on C/P release
<b>DCP</b>	Dimensional Control Plan
<b>DG</b>	Development Gate
<b>DVP</b>	Product Development Process
<b>ECHA</b>	European Chemicals Agency
<b>EDI</b>	Electronic Data Interchange
<b>EE</b>	Electrical Electronic
<b>EG</b>	End Gate
<b>E-Library</b>	A library of documents and procedures on the Volvo Group Supplier Portal
<b>ERP</b>	Enterprise Resource Planning
<b>Fault Frequency</b>	Measure of product failures occurring on product after delivery to customer
<b>FDG</b>	Final Development Gate
<b>FIFO</b>	First In First Out
<b>FIG</b>	Final Industrialization Gate
<b>FMEA</b>	Failure Modes Effects Analysis
<b>IATF</b>	International Automotive Task Force IDM Identity Manager
<b>IMDS</b>	International Material Data System
<b>Index Audit</b>	An audit conducted on a technology related production process
<b>IR</b>	Inspection Report
<b>Key Element Procedure</b>	A series of guideline procedures for companies doing business with Volvo
<b>LPS</b>	Low Performing Supplier
<b>MP</b>	Measurement Point Plan
<b>MRP</b>	Material Resource Planning
<b>OEE</b>	Overall Equipment Effectiveness
<b>OR</b>	Only Representative
<b>PAA</b>	Part Application Agreement
<b>PHR</b>	Part Handling Review
<b>Poka Yoke</b>	A Japanese term for error proofing

<b>PPAP</b>	Production Part Approval Process
<b>PPCN</b>	Product or Process Change Notification
<b>Ppk</b>	Performance Analysis Index
<b>PPM</b>	Part Per million
<b>Product Audit</b>	Audit of samples taken from production process
<b>PSW</b>	Part Submission Warrant
<b>PVR</b>	Part Version Report
<b>QDCF</b>	Quality Delivery Cost Feature
<b>QDCFTSR</b>	Quality Delivery Cost Feature Technology Sustainability Risk Management
<b>QDPR</b>	Quality and Development Process Requirements
<b>QPM</b>	Quality Performance Measurement
<b>REACH</b>	Registration, Evaluation, Authorization and Restriction of Chemicals
<b>RFI</b>	Request for Information
<b>RFP</b>	Request for Proposal
<b>RFQ</b>	Request for Quote
<b>RG</b>	Release Gate
<b>RTS</b>	Review of Technical Specification
<b>SAQ</b>	Sustainability Assessment Questionnaire
<b>[SC]</b>	Significant Characteristic
<b>SEM</b>	Supplier Evaluation Model
<b>Service PPAP</b>	Service Production Part Approval Process
<b>SMA</b>	Safety Management Audit
<b>SOW</b>	Statement of Work
<b>SPC</b>	Statistical Process Control
<b>SPI</b>	Supply partner product Issue
<b>SPICE (CL3)</b>	Software Process Improvement and Capability Determination (Capability Level 3)
<b>SPR</b>	Significant Production Run
<b>SDE / SQE</b>	Supplier Development / Supplier Quality Engineer
<b>SQP</b>	Plant Supplier Quality
<b>SREC</b>	Supplier Request for Engineering Change
<b>SSEM</b>	Short Supplier Evaluation Module
<b>SSW</b>	Software Submission Warrant
<b>Stopping Parameter</b>	Issue in SEM where failing score eliminates supply partners from consideration for business
<b>STD</b>	Standard
<b>SW</b>	Software
<b>SWTP</b>	Software Test Plan
<b>SWTR</b>	Software Test and Verification Report
<b>SWVD</b>	Software Version Description
<b>TR</b>	Technical Requirements
<b>VBNA</b>	Nova Bus and Prevost Bus

# Revision record

Edition	Revisions description
01-2009	<b>First release</b>
03-2019	<p><b>Key changes:</b></p> <ul style="list-style-type: none"> <li>• Replace ISO/TS 16949 with IATF 16949</li> <li>• Replace KEP 5 &amp; 6 with Volvo Group Supplier Code of Conduct</li> <li>• Addition of QCDFTSR acronym and definition</li> <li>• Expanded definition of safety critical parts</li> <li>• Digital shape model compliance added to customer specific requirements</li> <li>• Cleanliness audit added to index audit list</li> <li>• Sustainability audit requirement added</li> <li>• Revise the software and safety reviews and graphic</li> <li>• DSM, COP and RTS requirements added to PPAP documentation documentation</li> <li>• Functional safety Requirements added</li> </ul>
12-2022	<p><b>Major revision, here below listed the Key Changes:</b></p> <p><b>1. Safety management :</b></p> <p>    <b>1.5 :</b> Clarification of the supply network management requirement</p> <p><b>2. Basic requirements :</b></p> <p>    <b>2.1 :</b> replace target : QPM 50 by requirement : Zero QPM</p> <p>    <b>2.2 :</b> Management System requirements :</p> <p>        Quality system :</p> <p>            Trucks : IATF 16949:2016 only</p> <p>        Supplier Evaluation Model :</p> <p>            Volvo Group Trucks: Score <math>\geq 80\%</math> and no stopping parameter</p> <p>            Other Volvo brands: Score <math>\geq 70\%</math> and no stopping parameter</p> <p>        Product Safety Management Program :</p> <p>            Score <math>\geq 80\%</math> and no stopping parameter</p> <p>        Index Audit :</p> <p>            Score <math>\geq 70\%</math> and no stopping parameter</p> <p>        Volvo Group Customer Specific Requirements :</p> <p>            Annual product requalification (as per IATF 16949:2016, section 8.6.2)</p> <p>        Automotive requirements, Compliance to :</p> <p>            Cybersecurity Quality and Development Process Requirements (CS-QDPR)</p> <p>            ISO21434 Road vehicles – Cybersecurity</p>

Edition	Revisions description
12-2022	<p>Software :</p> <p>ASPICE CL3 or ISO33000 CL3. Capability level 3 proven by assessment reports by an accredited 3rd party</p> <p>Cybersecurity :</p> <p>ISO27001 certification or Based on ISO27000, develop a cybersecurity management system including but not limited to :</p> <ul style="list-style-type: none"> <li>• IT policy including cybersecurity specific areas</li> <li>• Self assessment and testing of resistance towards internal and external threats</li> <li>• Execute internal training on cybersecurity</li> <li>• Develop mitigation plan in case of attack</li> </ul> <p><b>3. Sourcing</b></p> <p><b>3.4 :</b> Request for Quotation : Adding some requested supporting documents when answering RFQ : Capacity Assessment sheet Questionnaire Predefined special characteristics Potential Tier 2 supply partner list</p> <p><b>3.6 :</b> Index Audit : Adding electrical-electronic index audit</p> <p><b>3.7 :</b> Sustainability assessments and Corporate Social Responsibility (CSR) Adding requirements to perform Sustainability Assessment Questionnaire (SAQ)</p> <p><b>4. Advanced Product Quality Planning :</b></p> <p><b>4.1 :</b> APQP is expected both for SW and HW development.</p> <p><b>4.5 :</b> Software APQP : Introduction of requirements in case of Agile driven development methodology. Clarification of requirement: For Embedded Software : SW PPAP is a prerequisite to the full (SW+HW) component PPAP.</p> <p><b>5. Production Part Approval Process :</b></p> <p><b>5.2 :</b> Process : Introducing requirements for phase PPAP.</p> <p><b>6. Volvo Group Specific Requirements :</b></p> <p><b>6.4 :</b> Special Characteristics : Clarification of requirements for parts having special characteristics.</p>

Edition	Revisions description
12-2022	<p><b>6.8</b> : Substance of concern &amp; Material and Substance content reporting (MDS) : Clarification of requirement.</p> <p><b>6.12</b> : cybersecurity requirements : Defining Volvo requirement related to cybersecurity based on ISO/SAE21434. New section.</p> <p><b>6.14</b> : Product requalification connected to IATF 16949 section 8.6.2 : Adding an annual product requalification requirement. New section.</p> <p><b>7. Production requirements :</b></p> <p><b>7.1</b> : Product or Process Change Notification : If the change impact a process covered by an index , supply partners to submit the PPCN at least 26 weeks prior introduction of the change.</p> <p><b>7.3</b> : Lot traceability : Clarification of requirements for safety critical parts.</p>

# Concluding words

“The transport industry is in a middle of a large transformation and is confronted by many new challenges. It's no longer possible to think and act in a strict sequential manner, instead we must think and act in eco-systems and networks. We will learn from each other, challenge each other and questioning our way of working, always striving to become better. The days of one-size fits all are gone.

In an open and transparent way, we need to question status quo and discuss inefficiencies. We all need the right mindset and attitude, striving for the best solutions, proactively work with risks and rapidly correct issues - always with our customers' best in mind.

We look forward to an exciting and rewarding journey together, supporting our mission in driving prosperity through transport and infrastructure solutions. Together we will shape the world we want to live in.”

**Andrea Fuder**

Chief Purchasing Officer  
Volvo Group

**Martin Ranäng**

Head of Supply Network Quality,  
Volvo Group