



**PREVOST.
NOVABUS**

Supplier Quality Assurance Manual

Edition June 2010

VOLVO



REVISION RECORD

EDITION	REVISIONS DESCRIPTION
01-2009	First release
06-2010	<p>Integration of Volvo Powertrain, Volvo Buses, Prévost and Novabus in the scope of application.</p> <p>NO MAJOR CONTENT CHANGE:</p> <ul style="list-style-type: none">• Wording clarifications all along the document.• Reworked chapters : Acknowledgement page, Conformity of production (COP) Special characteristics Lot traceability, Record retention,• Added chapter: Laboratory requirements APQP reviews, Software,• Removed: Appendixes, reference to toolboxes



INTRODUCTION

Premium Suppliers for Premium Brands

The VOLVO Purchasing mission is to provide competitive advantages to the Truck and bus brands by selecting, developing and managing suppliers capable of delivering premium quality products in terms of Quality, Delivery, Cost and Features.

In support of the strategy “**PREMIUM SUPPLIERS FOR PREMIUM BRANDS**”, our effort is directed towards selecting the best suppliers based on capability and performance. Once selected, our goal is to work with these suppliers to develop a strong, long-term, structured relationship with them.

Every day at Volvo, we are working to improve our organization, our processes and the skills of our employees to be the best in class. We are committed to Quality excellence, a customer-focused process approach and continuous improvement. We expect and encourage our suppliers to adopt these principles.

We expect our suppliers to be committed to a **ZERO DEFECT APPROACH** and to demonstrate this commitment through:

- Delivering fully conforming parts or products,
- On time delivery,
- Rigorous adherence to approved processes and requirements,
- Pro-active risk management.

VOLVO products have always been characterised by their quality and safety. Maintaining the reputation of selling the highest quality and safest products in the market is a must for us. We expect suppliers to support us in maintaining this reputation by the care they invest in the parts they produce and deliver.

As a VOLVO supplier, it is expected that the requirements in this manual will be passed on to sub tier suppliers to ensure that quality is consistent through the entire supply chain.

This document is intended to serve as a reference to better understand our requirements and your role in the shared responsibility to deliver the highest quality & safety.

With your commitment to participate as a Premium Supplier, we will succeed in our mission to deliver the best products when measured for Quality, deliveries, and features, and at the same time begin a long term and mutually beneficial relationship.

Bruno BLIN
VOLVO 3P
Purchasing
Senior Vice President

Bruno LINSOLAS
VOLVO Powertrain
Purchasing
Senior Vice President

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VOLVO Buses
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Vice President



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GLOSSARY OF TERMS

GLOSSARY

AAR	Appearance Approval Report.
APQP	Advanced Product Quality Planning (AIAG Reference Manual).
BA/BU	Business Area/Business Unit.
BOM	Bill of Materials.
COP	Conformity of Production .
Cpk	Capabilities .
DFMEA	Design Failure Mode & Effects Analysis
ePS	Electronic Purchasing System.
FMEA	Failure Mode & Effects Analysis .
GDP	Global Development Process.
GSC	Global Sourcing Committee.
IR	Inspection Reports.
INDEX Audit	Technology based Audit.
KEP	Key Element Procedure.
KPI	Key Performance Indicator.
LPS	Low Performing Supplier.
NC	Non-Conforming (Parts).
PAA	Product Application Agreement .
PARMA code (or number)	Supplier code in VOLVO informatics system.
PFMEA	Process Failure Mode & Effects Analysis
PHR	Part Handling Review.
PPAP	Production Part Approval Process.
PPM	Parts Per Million.
Product recall	Process involving vehicle brands, Market Companies/Importers, Dealers and final customers to eliminate or reduce safety related product problems.
PSL	Potential Supplier List.
PSW	Part Submission Warrant.
PVR	Part Version Report.
QDCF	Quality Delivery Cost Features
QJ	Quality Journal.
QPM	Quality Performance Measurement.
RFQ	Request for Quotation.
RTS	Review of Technical Specification.
Service campaign	Process involving vehicle brands, Market Companies/Importers, Dealers and final customers to eliminate or reduce product reliability problems.
Shall	Mandatory requirement.
Should	Recommendation.
SOW	Statement Of Work
SPC	Statistical Process Control.
SPR	Significant Production Run
SQAM	Supplier Quality Assurance Manual
SQE	Supplier Quality Engineer .
T-Marked part	Part submitted to vehicle Regulations and certification department.
DEVELOPMENT SUPPLIER	Supplier who collaborates with VOLVO in development.
NON DEVELOPMENT SUPPLIER	Supplier who produce a part according to a drawing given by VOLVO.
SUPPLIER	VOLVO tier 1 supplier

To simplify the text,
VOLVO stands for Volvo 3P, Volvo Powertrain, Volvo Buses, Prevost, Novabus
VEHICLE stands for truck or bus



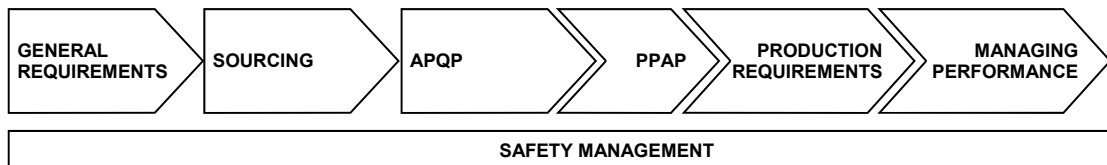
HOW TO USE THIS DOCUMENT

The target of this document is to synthesize and communicate towards our suppliers the **VOLVO quality and safety requirements** to ensure the quality of supplied parts.

Included are **expectations** and **working procedures** to assist our suppliers in reaching premium supplier status

Additional information concerning requirements about environment, logistics, corporate social responsibility, cost management and others is available in the Key Element Procedures on the supplier portal. Suppliers should consider the Key Elements Procedures as part of a comprehensive approach to fulfilling Volvo expectations.

The document is organized in chapters related to our main processes.



Guide to symbols used in this document

Updates and additional information

Text in frame boxes is an overview of the process defined in that section. These may be used for a quick reference

**MANDATORY REQUIREMENTS
ARE HIGHLIGHTED IN THIS FORMAT
FOR EASY REFERENCE**

The latest valid version of this Supplier Quality Assurance Manual is posted on the **VOLVO supplier portal - extranet (login needed) / e-library / Quality section**

http://supplierportal.volvo.com/vsp/ap/en/E-Library/Quality/3P_SQA_Manual/

Additional guidelines, communication kits, or templates for use by operational teams are also posted and updated in the e library / quality section.

A news is usually posted on the supplier portal (extranet) main page to inform about new publications.

Acknowledgement

The acknowledgement page should be signed at the parent company level. Unless requested by Volvo for major content change, it is not requested to sign the acknowledgement at each update.

Supplier feedback

Feedback concerning this document is welcomed and encouraged. Should you have any improvement suggestion about this document, please send an e-mail to the following address: sqam@volvo.com



SUPPLIER ACKNOWLEDGEMENT

To be returned by Supplier via email to: **sqam@volvo.com**

CONFIRMATION:

We hereby confirm that we have received and we understand the Supplier Quality Assurance Manual.

We understand that this manual defines the overall quality targets for the products that are purchased by Volvo 3P, Volvo Powertrain and Volvo Buses as well as the ways of working with Volvo 3P, Volvo Powertrain and Volvo Buses.

We agree to strive to meet these customer requirements, in all our facilities working with Volvo products.

Should any individual supplier agreement exist or be signed in the future, they take precedence over the general targets in the SQAM.

We understand that it is our responsibility to ensure that only the latest revision of this Manual is used by periodically checking the Volvo Supplier portal for revisions and updates.

We understand that it is our responsibility to deploy this Manual in the current and future facilities working with Volvo products.

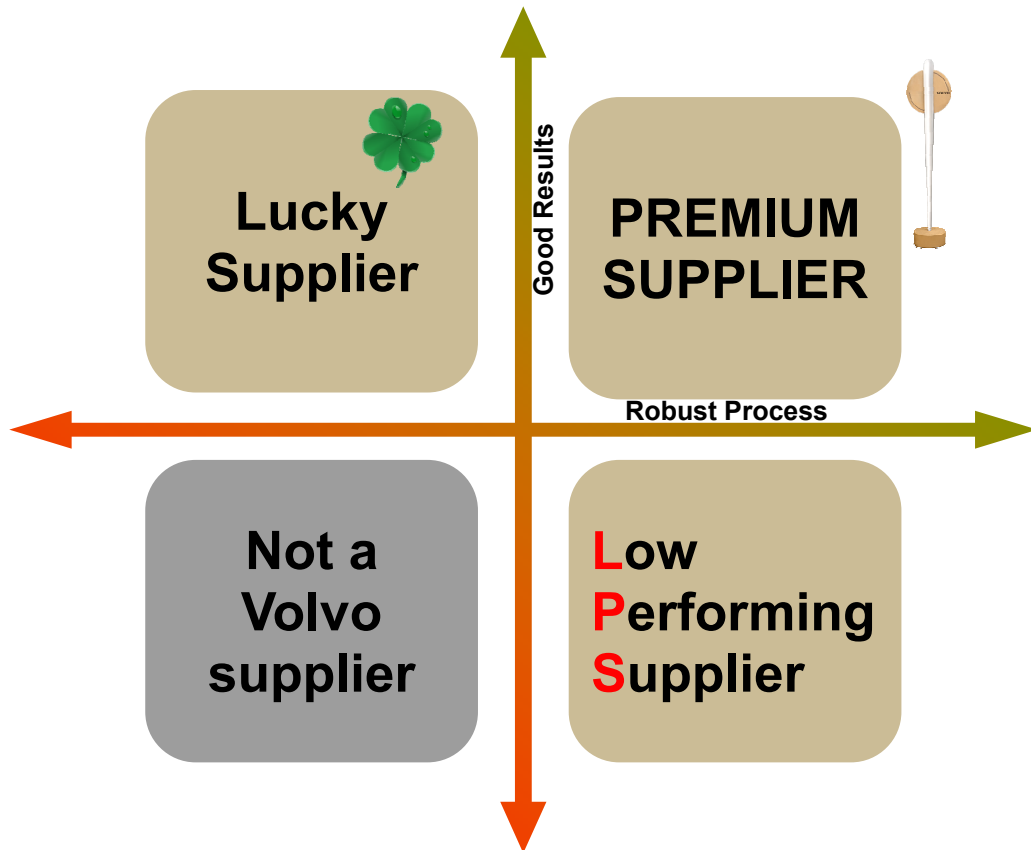
The latest revision can be obtained from the supplier portal / e library:
http://supplierportal.volvo.com/vsp/ap/en/E-Library/Quality/3P_SQA_Manual/

Supplier name and PARMA code	
Supplier Address	
Submitted by (Name)	
Function	
Telephone number	
Email address	
Date, Signature	



GENERAL REQUIREMENTS

Product Quality and Safety, the premium way



GENERAL

Supplying products to the vehicle Industry is a very demanding business. It requires the ability to mass produce complex assemblies employing state of the art technologies.

To achieve this level of performance, the vehicle industry and their suppliers have developed specialized processes and systems to support the demands of this type of production while delivering high levels of quality expected by the vehicle customer.

Volvo has adopted these quality processes and systems, and successful application by our suppliers is key to our shared success.

To remain competitive in this business environment requires constant monitoring of performance against measurable targets.

The final measure of our performance is determined by the final customer. These customers are the businesses and people who rely every day on safe, reliable transportation solutions.

We believe that this level of quality and reliability can only be achieved by robust processes and rigorous monitoring.

This is supported by having a Customer focus mindset ; and, to always be searching for effective continuous improvement :

**Never satisfied,
letting nothing managed by chance,
striving for ZERO defect**



RESULTS EXPECTATIONS

The table below defines the targets for our Premium suppliers.
Our desire is for all suppliers to strive to meet these numbers.

Other detailed objectives for the supplier are defined in the request for quotation.

Measurement	GENERAL TARGET (2012)
<p>PPM - Rejected Part Per Million (Safety critical characteristics excluded)</p> <p><i>Explanation:</i> The PPM value is defined as the number of rejected parts divided by the total quantity delivered multiplied by 1 000 000.</p>	10 PPM
<p>QPM - Quality Performance Measurement. Calculated at supplier manufacturing Parma level</p> <p><i>Explanation:</i> Compound quality grading from 0 point (outstanding) to 100 (worst case). See Chapter "PERFORMANCE"</p>	30
<p>Fault Frequency</p> <p><i>Explanation:</i> The number of Warranty Claims per vehicle within the first 12 months of use. (after zero Km/miles).</p>	<p>0 % for safety features</p> <p>Unless otherwise specified in the technical specifications, fault frequency targets shall be :</p> <ul style="list-style-type: none"> • below 0.0005% for fasteners, brackets and similar parts • below 0.005% for other components
<p>Service campaign</p> <p><i>Explanation:</i> The number of vehicle recalled after zero Km/miles due to a reliability/warranty problem.</p>	0
<p>Safety recall</p> <p><i>Explanation:</i> The number of trucks recalled after zero Km/miles due to a Safety problem.</p>	<p>0</p> <p>This is a MUST (non-negotiable)</p>
<p>Delivery precision</p> <p><i>Explanation:</i> A percentage: The quantity of parts delivered on time divided by the total delivered.</p>	<p>98% as a minimum requirement.</p> <p>100% For delivery in sequence.</p>



MANAGEMENT SYSTEMS EXPECTATIONS

Suppliers shall have effective management systems as defined by VOLVO and 3rd party auditing bodies.

Area	Required level	Reference documentation
Quality system	ISO/TS 16949:2002 or 2009 certified by an accredited 3rd party	
Environmental system	ISO 14 001:2004 certified by an accredited 3rd party	
	Environmental self-assessment	KEP 5 - Environmental Requirements
Supplier Evaluation Model (SEM)	Score over 90% No stopping parameters	KEP 1 – General
Product Safety Management Audit (Only applicable for suppliers delivering components that can affect personal safety)	Score over 90% No stopping parameters	Safety Management Audit documentation
Index Audit (Applicable for specific production processes e.g. foundry, forging...)	Score over 90% No stopping parameters	Index documentation
VOLVO Customer specific requirements	APQP & PPAP + VOLVO Specific Activity & Documentation requirements (RTS, COP, PAA, PHR)	This SQAM
Software (applicable for suppliers delivering with software)	SPICE level 3 certified or equivalent (e.g. CMMI level 3, ISO 15504...) by an accredited 3rd party	Statement of work documentation
Ethics	Corporate Social Responsibility self-assessment	KEP 6 - Corporate Social Responsibility
Logistic evaluation	MMOG self assessment level A	KEP 7 - Logistic
EDI	100% Electronic communication	KEP 1 – General KEP 7 - Logistic

KEP refers to Key Elements Procedure available on the supplier portal from the following page: <http://www.volvogroup.com/suppliers/global/en-gb/supplierselection/ourrequirements/keyelements/Pages/requirements.aspx>

WARRANTY

Reducing field warranty claims remains a top priority with VOLVO customers. Emphasis is on overall final customer satisfaction. When a component requires replacement in the field, a warranty claim is made, and the root cause is identified. If the non-conformance is generated by a supplier, VOLVO warranty departments may call the responsible supplier for replacement and sharing responsibility. Conditions are defined through the Purchasing conditions, purchasing agreement and/or warranty charter

The warranty charter is part of the Request For Quotation.



REQUIREMENTS TOWARDS TIER 2 SUPPLIERS

VOLVO Purchasing requires that all 2nd tier suppliers are 3rd party registered ISO 9001 with a follow-up plan. We encourage our suppliers to have sub suppliers ISO TS 16 949 : 2002 (or 2009) certified.

VOLVO Purchasing reserves the right to directly assess certain 2nd tier processes which have a significant impact on the final quality. This may concern technical processes like surface treatment, forging, casting etc. Please check with your SQE to determine if your tier2 is in this category.

**IN ANY CASE
SUPPLIERS HAVE THE FULL RESPONSIBILITY
FOR QUALITY ASSURANCE OF THEIR SUB SUPPLIERS**

VOLVO Purchasing requires the use of the AIAG Production Part Approval Process (PPAP). In addition, suppliers shall comply with the Section Truck Industry -Specific Instructions. Suppliers shall insure their sub suppliers use the PPAP process. Suppliers have the responsibility for managing PPAP for their sub suppliers.

Once a part is approved, request for sub supplier changes that affect fit, form or function shall be directed to VOLVO Purchasing according to the Product Process Change Notification process (Cf. SQAM p 24).

LABORATORY REQUIREMENTS

Supplier's laboratory shall comply with the requirement of the chapter 7.6 of the TS 16949.

Laboratory and measurements reports shall comply with the requirement of the TS 16949, chapter 4.2.4.

In particular, laboratory and measurement reports shall include :

- The identity and location of the laboratory used
- The reference to the test methods used
- Any deviation of the test method shall be noted
- Measurement results
- All necessary materials and process traceability information on the tested components or samples

SERVICE PART REQUIREMENTS

VOLVO has the same level of requirements for the service parts as for production parts when service parts are identical with the serial parts.

Please refer to contract order.



SOURCING

ENTER THE SUPPLIER BASE



GET A BUSINESS AWARDED

The awarding of business to a supplier is one of the most important decisions made by VOLVO Purchasing. It impacts the ability of our brands to deliver to their customers, remain competitive and deliver future developments through projects. The VOLVO Global Sourcing Process ensures the contribution and coordination of all decisions, for all locations and all brands. It's the first step in building a strong relationship and neither VOLVO nor the supplier can miss such an opportunity.

The supplier has an active role to play in this process:

- In the audit performed by VOLVO.
- In the demonstration of the achievement of future product quality results.
- In the implementation of action plans to reach the requested level.

The following chapter explains the main steps visible from the supplier, what inputs the supplier will receive and what evaluation will be requested.

As part of the VOLVO specifics requirements, please note that prior to business award you will need to pass the SEM and, if required the INDEX audits. Both evaluate the ability of a supplier to meet an acceptable quality level for the type of parts they manufacture and to work with VOLVO.

Once the supplier passes the first steps, to be awarded business the supplier will be required to sign agreements. Among them, we would like to highlight:

- The purchasing agreement .
- PPM agreement .
- The warranty charter.



ENTER THE SUPPLIER BASE

All potential suppliers must have a quality system compliant to ISO/TS 16949 and an Environmental Management system compliant to ISO 14001.

NEW SUPPLIERS must be prepared to meet the VOLVO requirements.

The purpose for the short version of Supplier Evaluation Model is to get an indication of the standard of an existing or potential supplier in a quick and easy way. The evaluation is performed as a "desk-audit".

The Supplier is invited to answer any Request For Information and complete the Short Supplier Evaluation Model (SSEM) collecting general data about the company and its products or services. The Short SEM template is available on the supplier portal.

Specific quality topics include:

- **Quality system:** Application and certification by an accredited 3rd party to the standard adopted within automotive industry: ISO/TS 16949.
- **Quality planning:** Well organized and applied procedure for quality planning including the use of quality methods like FMEA (Failure Mode & Effects Analysis), capability testing, etc.
- **Quality performance:** The quality of a supplier shall result in fault-free deliveries. Targets will be established based on industry best practices and the supplier will be monitored to those targets.
- **Reliability:** Volvo expects our products to meet or exceed the customers' expectations through-out the vehicle life span. The reliability of a complete vehicle is only as good as the weakest component. Volvo expects our suppliers to test their products unto failure and ensure they will meet our minimum useful life.

Other requirements:

- For other requirements such as environment, corporate and social responsibility,...., refer to the Key Element procedures on the supplier portal.

For **CURRENT SUPPLIERS**, prior to award of additional business, VOLVO will check the supplier's scorecard and recent quality performance (PPM, QPM, recent audit scores, quality spills, Low performing Supplier status, etc.) of the supplier. Depending on these results, VOLVO may request a new SEM or ask for further evaluation audits.

The signature of the SQAM Acknowledgment page will be verified at this stage.

SIGN THE CONFIDENTIALITY AGREEMENT

Before being sent a Request For Quotation (RFQ) the supplier must sign the confidentiality agreement.

VOLVO recognizes that its suppliers may be exposed to data and/or knowledge, which is sensitive in nature. The supplier shall treat all data and/or knowledge in strict confidence and report any intentional or non-intentional breach of confidentiality to VOLVO management or executive level personnel immediately.

The Confidentiality agreement template will be sent by the buyer.

RFQ - REQUEST FOR QUOTATION

The supplier must answer every point of the RFQ and return the requested documents. This includes, but is not limited to the RTS, PPM agreement, SOW (when requested) and all justifications.

The quality requirements and targets are highlighted in the quality section of the RFQ. We expect the supplier to fulfil all the quality requirements and VOLVO may audit the evidence for fulfilment of these quality requirements.

For any requirements not fulfilled, an action plan must be presented with the returned RFQ.



AUDIT AT SUPPLIER - SEM (SUPPLIER EVALUATION MODEL)

VOLVO will conduct an audit at each supplier to make a real evaluation of the supplier's potential.

All the suppliers in the VOLVO group have to go through the SEM. The suppliers need to pass the SEM so as to be awarded business.

SEM is an important tool in our selection process. The target is to evaluate the supplier from a holistic point of view, in reference to the best in class practice and lessons learned from our supplier base. Thanks to the SEM we keep homogeneity in our supplier base.

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

- **Company Profile.**
- **Management.**
- **Environment.**
- **Quality.**
- **Logistics.**
- **After-market.**
- **Competence.**
- **Product development.**
- **Finance.**
- **Productivity.**
- **Sourcing.**

The supplier will need to score sufficient points AND HAVE NO STOPPING PARAMETERS.

AUDIT AT SUPPLIER – INDEX

INDEX is a technology based process Audit for production processes using a technology that is critical to the function of the part in the customer application, such as foundry, forging, surface treatment, rubber...

The purpose of indexes is to evaluate the supplier's production line and process's capability to produce parts according to our requirements on specific technologies

Index is a complementary tool to the Supplier Evaluation Model (SEM) in the supplier selection phase of the sourcing process. It can also be used for process improvement or to investigate severe field failures (safety or unplanned stops).

VOLVO may require a New Supplier (i.e. suppliers and/or sub-suppliers) to the VOLVO Group to have an Index assessment for their production process, prior to supplier selection in the sourcing process. This is also applicable for a new process at a current supplier.

The supplier will be graded, similar to the SEM model.

FINAL AGREEMENT

Once the supplier is chosen, all agreements, must be signed and returned to VOLVO including :

- Purchasing agreement.
- PPM agreement (containing PPM approved target).
- Warranty Charter.

The templates are available in the Request for Quotation

PPM AGREEMENT – Parts Per Million

The scope of this agreement can include the full scope of the Supplier's deliveries or a specific part or component.

This agreement is used to set and monitor PPM performance. The current PPM status can be found on the supplier portal (scorecard). Targets are set for a period of 4 years minimum and PPM is measured each month. If the supplier does not meet the agreed PPM target, they shall submit a formal action plan (using the VOLVO 8D format...). This will be validated and followed up by the Supplier Quality Engineer (SQE) until the agreed PPM target is achieved.

The PPM agreement template is available in the Request For Quotation (Not applicable for Volvo Powertrain)



APQP: ADVANCED PRODUCT QUALITY PLANNING



An world class standard to drive quality performance to the highest level

VOLVO supports our brands by proposing and developing products to ensure strong competitive offers for each of our brands.

Remaining competitive in the markets where Volvo participates requires continuous upgrades and improvements to existing product offerings and regular introduction of new products.

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

Volvo organizes all new product introductions into projects. Suppliers must have an effective project planning process capable of supporting these projects.

In 2006, Volvo adopted the AIAG standard for

APQP as the standard planning method for suppliers bringing a product to production.

Suppliers are expected to develop and use a detailed APQP plan for the installation and prove-out of a robust production process.

For selected components and software development, suppliers shall share the status of their APQP with VOLVO during APQP reviews.

The following chapter describes how the APQP is synchronized with the VOLVO Global Development Process (GDP). As well as the VOLVO specifics requirements.



SCOPE

Volvo requires suppliers to use Advanced Product Quality Planning (APQP) as a tool to support process development, integration and prove-out.

The AIAG publication "Advanced Product Quality Planning (APQP) and Control Plan" should be used as a reference in developing these plans. Plans shall integrate VOLVO specific requirements.

We believe that the ultimate quality of delivered parts is determined during the design and development phase of the production process.

Volvo expects suppliers to create product launch plans to support :

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

Suppliers are expected to apply and perform best practice verifications within their field of expertise regardless of any request from VOLVO and to show evidence upon requested.

IT IS THE SUPPLIER'S RESPONSIBILITY TO PERFORM AND DRIVE APQP FOR ALL COMPONENTS.

FOR SELECTED COMPONENTS, APQP IS TRACKED IN DETAIL BY VOLVO.

PPAP IS MANDATORY FOR ALL COMPONENTS.

KEY COMPONENTS DEFINITION

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. At the start of a project, VOLVO identifies a few components as Key Components. Parts selected as key components are subjected to closer control and monitoring.

Key components are chosen by a cross functional project team using the following criteria :

- Safety Critical components.
- Components that must meet Regulatory or Legal requirements
- Parts with critical characteristics.
- The supplier is Design Responsible (Development Supplier).
- Complex part or component
- Component that constitutes vital function or sub-function in a system.
- Expensive part or component
- Part that requires expensive or long lead time tooling.
- Long lead-time part.
- Part or parts with a known or potential quality concern.
- Parts that require extensive validation testing
- ...

RESPONSIBILITIES IN APQP

The **SUPPLIER** is responsible :

- to develop and execute an APQP Plan for successful product launch
- to organize the cross-functional APQP team

VOLVO is responsible :

- To identify the Volvo project team members,
- to assign the SQE who shall coordinate the completion of APQP activities with the project team

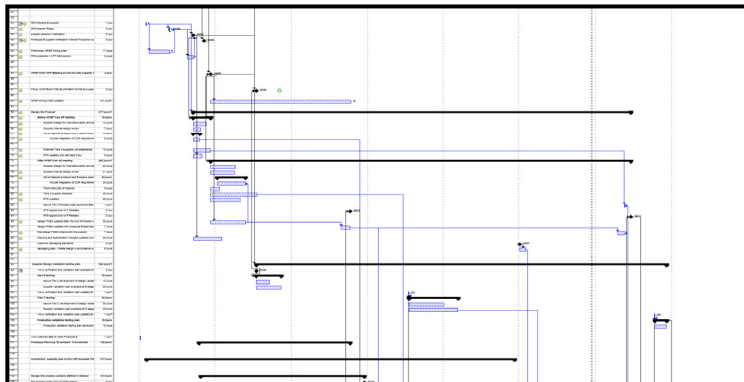


APQP - PLANNING

The first APQ Planning is expected from suppliers with the answer to the Request For Quotation.

The APQ Planning identifies the tasks to be completed, the expected timing and the assigned responsibility for completion. It identifies the critical path of the project

The objective of the planning process is to deliver the project on time, at cost and that the products delivered are at the highest level of quality.



An example of APQP planning, as expected by Volvov, is available on supplier portal.

The APQP timing chart , available on supplier portal, gives an overview of when the generic APQP activities should occur in a project or in relationship with the part release.

It is an help to build the APQP planning, in any case this APQP timing chart doesn't constitutes an APQ Planning according to Volvo Expectations.

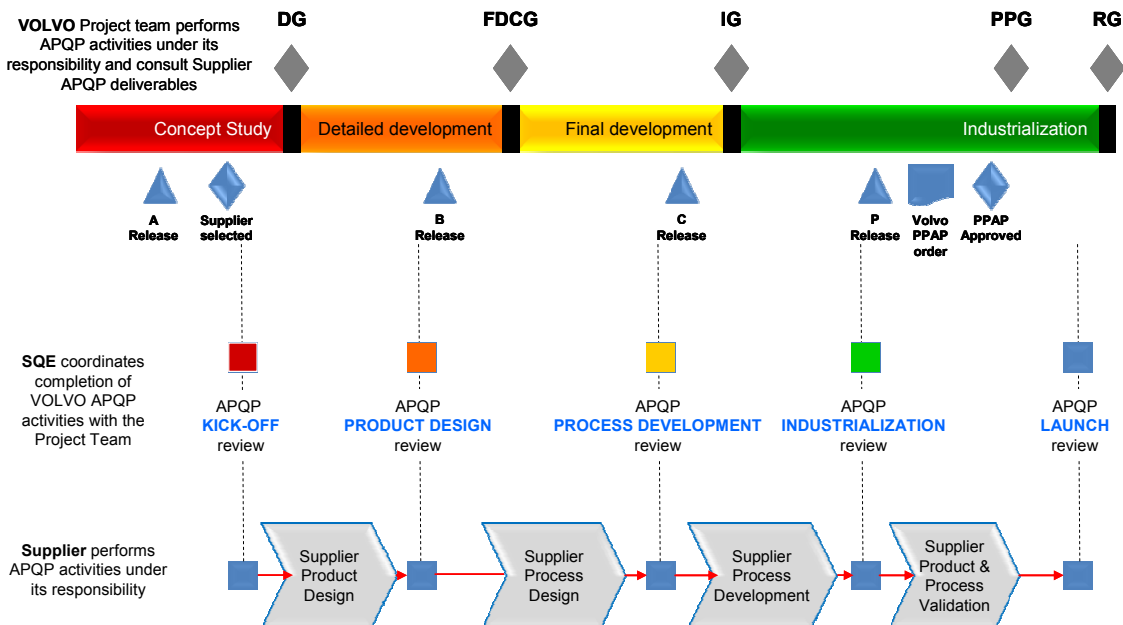
APQP REVIEWS

For selected components, suppliers are requested to report the progress of their APQP plan regularly during the project development .

APQP Reviews are formal meetings where VOLVO reviews supplier's APQP plan. VOLVO and supplier check that the project at component level is on track with respect to deadlines and results.

This reporting is supported by the "APQP review" file that is available on the supplier portal.

This file is owned by the supplier, updated by the supplier and shared with Volvo team during APQP reviews.



This picture illustrates how to match Volvo GDP at part level with supplier APQP plan in case of a development supplier



VOLVO APQP SPECIFIC REQUIREMENTS

Among all the requirements described in the AIAG APQP reference manual, VOLVO request the planning and completion of the following cross-functional activities:

- Review of Technical Specifications
- Product Application Agreement
- Part Handling Review
- Process Audit

REVIEW OF TECHNICAL SPECIFICATIONS (RTS)

The goal of this preventive process is to minimize the need for late design changes or design changes after the PPAP order or Tooling Order has been placed.

The Review of Technical Specification ensures that all the technical information defining the part or component have been thoroughly reviewed, clearly understood by the supplier and are feasible. The RTS process also provides the opportunity to collect and incorporate the supplier's comments and suggestions into the drawing and technical specification.

The RTS template is provided as part of the RFQ documentation. The supplier is to complete the RTS compliance matrix and return with the RFQ. After completion, the RTS is signed by VOLVO and the supplier to signify agreement that all the Technical Requirements, VOLVO Standards and General Specifications applicable to the part have been received, reviewed understood and are feasible.

VOLVO TECHNICAL DOCUMENTATION:

Volvo has developed a simple effective method for the control of drawings and the associated technical information. This system is designed to allow for control of all the technical information from a single document, the Part Version Report or PVR. The PVR contains the parts and drawing revision information along with references to the technical information

PRODUCT APPLICATION AGREEMENT (PAA) (If applicable)

The Product Application Agreement (PAA) is an approval to ensure supplier and Volvo have understood and accepted the installation conditions for a component developed by the supplier.

PAA is a preventive process to anticipate problems coming from the installation/ integration from a part in the truck.

It gives to the Supplier the opportunity to ensure that the parts supplied to Volvo will fit for the application decided by Volvo.

A PAA is based on a physical or virtual review of the installation of the component with the suppliers.

It helps to identify potential gaps or risks between the real product environment and the Volvo technical requirements.

The PAA ensures that the supplier agrees with the environment and applications in which the component he developed will be used.

The PAA process starts from the APQP kick-off review under the lead of the Design Engineer and shall be signed before Industrialisation Gate

THE PAA IS MANDATORY FOR KEY COMPONENT, WHERE THE SUPPLIER IS FULLY OR PARTIALLY RESPONSIBLE FOR THE DEVELOPMENT

THE PAA IS POSSIBLE FOR OTHER PARTS IF REQUIRED BY VOLVO



PART HANDLING REVIEW (PHR)

To ensure that supplier product quality is not compromised during handling, storage shipping or installation after receipt at a Volvo facility, Volvo invites suppliers to participate in a Part Handling Review (PHR). This process requires the supplier to do an on-site visit to the Volvo facilities receiving their product to conduct an audit of installation and handling practices. The purpose of the visit is to share information and gain the supplier's observations and input on the methods used by VOLVO for the receiving, storage, handling, installation, testing and shipping of the supplier's part.

PROCESS AUDIT

One or more process audits at the supplier's facility may be required during the early phases of a new product launch. The respective SQE will communicate this requirement to the supplier during the development of the APQP activities.

PROTOTYPE MARKING

The purpose is to identify part marking methods and requirements for prototype parts so they are clearly identifiable in the production environment and on vehicles. The intention is to insure that prototype parts are identified differently than PPAP approved P release parts.

All suppliers are required to clearly mark prototype parts.

Specific rules for North America are available on supplier portal.

SOFTWARE

For supplier software development, quality assurance is centered around a series of design reviews, called Joint Reviews, or Software APQP Reviews.

There are 5 Joint Reviews in a normal software development project:

- Project Planning Review
- Requirements Review
- Initial Design Review
- Final Design Review
- (SW) PPAP Review

		ELEMENTS																	
		Phase																	
		CS	DD	DD	DD	DD	DD	DD	DD	FD	FD	FD	FD	IC	IC	IC	IC	IC	IC
		Gate																	
		DG						FDCG					IG			PPG		LG	RG
		Joint Review																	
		1-Requirements	2-Project Planning	3-Initial Design				4-Final Design								5-PPAP			
		Delivery Review (Sample)																	
					B					C				P					
		APQP Review																	
		KickOff		Design				Process development					Industrialization			Launch			

As software development occurs mainly in the product design phases of a project, these reviews also occurs during the product design phases, with one exception: the SW PPAP Review.

The supplier software quality assurance system is described in detail in a separate document called the Quality and Process Development Requirements. The software quality assurance system is based on the international standard ISO 15504, often called SPICE. Suppliers delivering software to Volvo shall be certified SPICE level 3 according to the automotive SPICE assessment model (see www.automotivespice.com) .

« Quality and Process development Requirements» is part of the RFQ when applicable.



CONFORMITY OF PRODUCTION - COP

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 on the manufacturing processes. Ensuring compliance to these regulations is referred to as Conformance of Production or COP.

Where such legal requirements exist for individual components or systems, these will be stated within the technical specifications.
 In some cases the supplier may carry the full responsibility for gaining component approval from the appropriate agent. At all times, the fulfilment of all directives and regulations concerning Vehicle Approval and/or Certification system must be accomplished.
 Suppliers must be well acquainted with the systems and applicable legal requirements, which are valid for their supplied components and take full responsibility of the actions required to guarantee the compliance to the requirements.

ALL PRODUCTS SHALL BE IN CONFORMANCE WITH REGULATIONS

VOLVO warrants against introducing changes following the existing approval until new testing and approval has been obtained.

Where applicable, T-marked parts are the parts submitted to the vehicle Regulations and certification department. T-marking will identify the parts influenced by these legal demands on the drawings/technical regulations. T-marked parts are also considered "Key Components". It is mandatory for T-marked parts to be checked and the necessary documentation (test reports, certificates) to be kept at the supplier for a defined period of time, per appropriate documentation retention policies. (These tests have to be included in the control plan)

When significant characteristics for regulatory compliance are identified as per standard STD105-0004, the following requirement applies :

	COP Characteristics level 2R	COP Characteristics level 3R
If process under surveillance, normally distributed and with no risk of unpredictable events (e.g.: chips, burrs, etc.)	<p style="text-align: center;">$C_{pk} \geq 1,33$</p> <p>(or $C_{pm} \geq 1,1$ for unilateral tolerances if applied)</p> <p>AND</p> <p><u>SPC with recordings</u> (storage of values electronically or controlling charts)</p>	<p style="text-align: center;">$C_{pk} \geq 1,33$</p> <p>(or $C_{pm} \geq 1,1$ for unilateral tolerances if applied)</p> <p>AND</p> <p>Cpk analysis conducted at least every 12 months</p> <p>AND</p> <p><u>Characteristic checked regularly</u> (frequency defined on control plan and in accordance to capability studies / minimum of 5 parts per production batch)</p>
If process is not under surveillance and normally distributed	The machines must have 100% automatic check surveillance.	The machines must have 100% automatic check surveillance.



SPECIAL CHARACTERISTICS

Among all special characteristics, 'Critical Characteristics of Design Products – Identification & Grading', STD 105-0001, describes a system to highlight and grade critical characteristics appearing in technical specifications to ensure correct, fail safe application of the product involved.

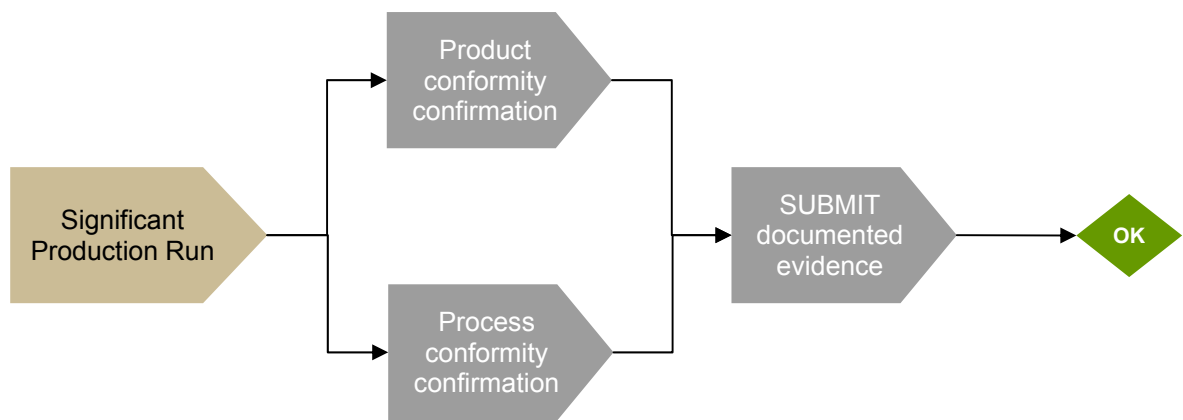
For such characteristics, the following requirement applies :

	Critical Characteristics level 1	Critical Characteristics levels 2 and 3
	$C_{pk} \geq 1,67^*$	$C_{pk} \geq 1,33$
If process under control, normally distributed	(or $C_{pm} \geq 1,3$ for unilateral tolerances if applied) AND Production followed up with SPC (Statistical Process Control) * For electronic components, $C_{pk} \geq 2,0$	(or $C_{pm} \geq 1,1$ for unilateral tolerances if applied) AND Characteristic checked regularly (frequency in accordance to capabilities studies)
If process is not under control and normally distributed	The machines must have 100% automatic check, 100 % control/inspection + traceability	The machines must have 100% automatic check control
Preferred Alternative	Electronic Poka Yoke (Effectiveness verified once per shift)	Electronic Poka Yoke (Effectiveness verified once per shift)

Other specific requirements related to Product Safety are to be found into the last chapter.



PPAP : PRODUCTION PART APPROVAL PROCESS



The Production Part Approval Process (PPAP) demonstrates that a manufacturing process used to produce parts for Volvo 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 follows the AIAG requirements, using exceptions applied for truck and heavy equipment.

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

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



REFERENCE

Suppliers 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 exceptions applied for truck and heavy equipment)

Additional guidelines and PSW template are posted on supplier portal.

Volvo requires its suppliers to follow the Customer Notification and Submission requirements as specified in the AIAG PPAP Manual. This includes:

- All new components
- Changes to an existing part,
- Drawing changes
- Corrections to a prior discrepancy
- Supplier process change
- Material changes or substitutions
- ...

PROCESS

PPAP date information is included in the RFQ.

The supplier is responsible for the PPAP preparation :

- PPAP shall be planned by the supplier as a milestone in APQP
- Supplier must notify the shipment date to its respective Volvo Buyer and SQE
- Suppliers (tier1) are responsible for the planning, approval, corrective action follow-up and retention of their sub-contractor (tier 2 & 3) PPAP submissions

The VOLVO Buyer shall issue a PPAP sample order to the supplier to confirm the date when PPAP are required. (except if there is another clear agreement).

- Under special circumstances (long lead tooling, fast tracked project, ...) the supplier may receive a Sample Order at C release only to anticipate activities to be ready at P release.

PPAP submissions can only be approved on P-drawings (serial production drawings).

THE SAMPLE PART FOR PPAP APPROVAL HAS TO BE PRODUCED DURING A SIGNIFICANT PRODUCTION RUN

- The supplier must notify to the Volvo SQE the planned shipment date (PPAP Due Date).
- Supplier must indicate to the SQE if this PPAP part has been produced off of new, revised or refurbished Volvo Group owned tooling including our T-Purchase Order Number as reference.
- PPAP parts are produced with a requirement of minimum 30 pieces with Cpk studies, of which 5 parts shall have full documentation after order, unless otherwise specified by SQE.
- Unique components for bus with annual forecast below 30 parts, shall on a case by case study be agreed with VOLVO on how to be handled. They can after VOLVO decision be excluded from the PPAP process.

Upon satisfactory completion of all required measurements and tests, the supplier shall record the required information on the Part Submission Warrant (PSW).

- A separate PSW shall be completed for each VOLVO part number unless otherwise specified by the SQE.
- The PSW shall be signed by the authorized supplier representative before submission to VOLVO .

VOLVO SQE will review all PPAP packages and assign a status.

- Fully approved and in compliance with all specifications.
- Interim Approval.
- Not approved.

In the case where an interim approval is given, it must be accompanied by a deviation agreement approved by both the Product Development and SQE together with a plan to become fully approved.

**The PPAP must be fully approved by SQE before production authorization;
Or interim PPAP approval with approved deviation**



SIGNIFICANT PRODUCTION RUN

The Significant Production Run is performed by a supplier as part of the Production Part Approval Process to verify that the production process is capable of meeting program volumes at a targeted quality level.

The Significant Production Run is to be conducted using production tooling/equipment, environment (including production operators), facility, and cycle time.

All suppliers shall perform a SPR for all new part introductions.

The “Significant Production Run” requires that an adequate quantity of parts be produced to allow:

- Overall process stabilization time
- Accurate calculation of manufacturing cycle time
- Determine production through put time from warehouse to shipment.
- Sufficient volume for completion of capabilities studies

The minimum quantity of parts to be produced during the Significant Production Run is specified by VOLVO but can be increased by the supplier. The Significant Production Run depends very much on the tooling and the production processes used for each specific part. Suppliers should ensure enough parts are produced during the Significant Production Run to ensure that the process is fully tested. Samples used for the PPAP must be taken from the parts produced during the run.

The SPR also provides a good opportunity to identify and correct potential manufacturing process bottle-necks. To be fully efficient, the capacity produced during the SPR should take into account the OEE results of actual process and the planned down time.

DOCUMENTATION REQUIREMENTS-LEVEL OF SUBMISSION

Suppliers are required to submit a **Level 4 PPAP package for all components unless other arrangements have been agreed between Volvo and the supplier.**

The supplier shall submit to VOLVO the minimum requirements below:

- Process FMEA.
- Control Plan.
- Dimensional results.
- Material performance test results.
- Appearance approval report if applicable.
- Part Submission Warrant.

Suppliers shall only submit PPAP packages for production-released drawings (P-Drawings), and a copy of this drawing shall be included in the submission package.

The SQE can ask for the submission of additional information. This agreement must be documented prior to submission of the PPAP. Prior to submission, suppliers should contact the responsible SQE to determine if additional documentation is required.

Proprietary documents that cannot be submitted, must be available for review.

Exceptions to PPAP level 4 :

Upon VOLVO request, suppliers shall be required to submit a Level 3 PPAP package for Key Components .

Under special circumstances, the supplier may be allowed to submit a Level 1 PPAP package. Contact the responsible SQE for the special circumstances.



PRODUCTION REQUIREMENTS

PRO ACTIVITY & LESSONS LEARNED

Volvo promotes a culture of continual improvement

Once parts are in serial production, we expect stability and conformity to what have been approved.

Whenever uncertainties happen, quick reactivity to protect the customer is obviously a must. This is also an opportunity to start a PDCA improvement loop.

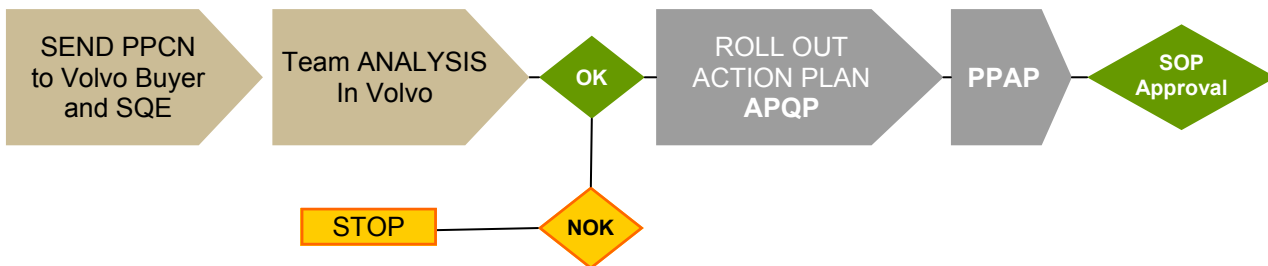
We challenge our suppliers to be best in class on quality, cost and delivery. Suppliers that meet this challenge will be rewarded with increasing business award. However, changes from the supplier cannot be implemented without approval as our processes are integrally connected.

Suppliers who do not adhere to our change control processes will be sanctioned.



**REQUEST FOR
PROCESS OR PRODUCT
MODIFICATION APPROVAL**

IMPLEMENT MODIFICATION



PRODUCT PROCESS CHANGE NOTIFICATION - PPCN

The purpose is to prevent quality & delivery issues for the concerned VOLVO receiving plants, and to protect the final customer from potential field issues during the implementation of supplier modifications.

According to ISO /TS, PPAP and VOLVO Purchasing conditions, a supplier cannot implement a change on a product **or process** that impact conditions of the approved PPAP, **without VOLVO approval.**

This applies, but is not limited to the following cases:

- Transferring of the production line: partly or totally; to a new or existing plant or building; in the same or other country.
- Change of a tier n, part of the process such as surface treatment, machining, paint shop, warehousing...
- New production layout.
- Packaging changes or repackaging operations.
- Tier N change that affect fit, form or function of the product.
- Renewal of current tooling.
- Change of raw material.
- Outsourcing permanently part of the production to a tier2.
- Request for product design changes such as dimensions, functions, appearance.

The supplier desiring or requiring a change shall submit a completed **PPCN** form (Product and Process Change Notification) to the Volvo buyer with a copy to the Supplier Quality Engineer as soon as the modification project is known, at **least 12 weeks** minimum prior to the SOP.

Suppliers may be required to submit additional information to support evaluation of the proposed change.

NO CHANGES CAN BE DONE WITHOUT VOLVO APPROVAL

Actions that can be taken if the supplier introduces changes without VOLVO approval or information:

- Supplier will be notified that such change is not acceptable and all costs related to the uncontrolled changed will be charged back to the supplier.
- Using evidence that the supplier did not follow his own quality system or customer requirements, the 3rd party certification body will be sent a notification letter.
- Supplier can be put on hold for new business (Global Sourcing Committee for decision).

The PPCN form is available on the supplier portal.

The PPCN form has to be submitted at least 12 WEEKS prior to implementing the planned change. THIS TIME HAS TO BE INCREASED FOR HIGH RISK PARTS



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

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

Once approved by VOLVO by an official letter, the supplier can implement the modification project, securing product quality and deliveries and according to the PPAP plan agreed between VOLVO .

The level of PPAP will be determined by the SQE. Authorization to start shipping (with the changes implemented) is only granted via the return of the signed PSW following PPAP approval.

The supplier is responsible for:

- Informing VOLVO Buyer and SQE in advance of their modification project via the PPCN form, **at least 12 weeks in advance.**
- Requesting agreement from VOLVO on their modification project.
- Integrating the Volvo constraint in its planning.
- Implementing the modification project **once approved by VOLVO**, securing product quality and deliveries.

TREATMENT OF NON CONFORMING PARTS

INSPECTION REPORT

In the event non-conforming parts or material have been identified, Volvo notifies suppliers using the INSPECTION REPORT.

It is in the interest of both VOLVO and the supplier, to identify non-conforming parts as quickly as possible.

VOLVO shall take all necessary action to protect the supply of conforming product to the plants. Under normal circumstances, VOLVO expects the supplier to respond and insure that all receiving plants are protected within 24 hours

Suppliers are expected to notify VOLVO immediately if non conforming material is found to have been shipped to VOLVO.

VOLVO has developed a set of guidelines used by Volvo plants in determining the non-conformance quantity for each Inspection Report. These guidelines are referred to as the "Inspection Report Golden Rules" and are available on supplier portal.

If the circumstances require, the supplier may be asked to ship replacement parts and to have staff in place for sorting and replacement. Depending on the type of non-conformance and the material situation, parts will either be scrapped or returned for rework by the supplier. Additional costs associated with the handling and actions within VOLVO, administrative as well as costs for adjusting, sorting, disassembly etc. may be charged back to the supplier according to the Charge Back Policy.

The "Charge Back Policy" is available on the supplier portal / e-library / inbound logistic

It is of vital importance that the supplier 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.

AN 8D IS REQUIRED FOR ALL TECHNICAL NON-CONFORMANCES

unless directed otherwise by the Volvo receiving plant or Volvo SQE

When notified of a technical non-conformance suppliers are requested to react in accordance with the following timeline :

- 24 Hours: Quick response: sorting at VOLVO (*3rd party company for the sorting allowed*).
- 48 Hours: Containment actions fully implemented (selection, temporary action in supplier process) (D3 completed and sent to VOLVO).
- 10 working days: Root cause analysis done for occurrence & non detection, permanent correc-



- tive action defined and implemented (D4&5 sent to VOLVO).
- 20 working days: Effectiveness of permanent corrective action checked and recurrence prevented (D6&7 sent to VOLVO)
- If the resolving time lasts longer than 20 days, the supplier must reach an agreement with SQE.

The Volvo 8D format is to be used. It is attached to the inspection report and available on supplier portal /e library

OTHER CORRECTIVE ACTIONS

Each time a non-conformance or a defect has been documented, the causes for the problem must be investigated and reported. The supplier must answer with the VOLVO 8D format unless supplier's 8D format is approved by the SQE.

The 8 Disciplines (8D) process is a problem solving tool used in responding to customer returns or major quality issues. It provides a guide and defines the steps toward problem resolution including containment of the problem, root cause analysis, problem correction, through to problem prevention. The output of an 8D process is the 8D report. The format of the 8 D report follows the steps of the solving process.

The VOLVO 8D form is also available on the supplier portal.

DEVIATION REQUESTED BY THE SUPPLIER

In the case where the supplier wishes to request a deviation to supply parts that do not fully comply with VOLVO requirements, the supplier must inform VOLVO and request approval.

The minimum information required in writing is:

- Date of request.
- Supplier name, Parma code and contact information.

VOLVO WON'T GIVE APPROVAL TO A DEVIATION RELATED TO SAFETY CHARACTERISTICS.

- Part number and part name.
- VOLVO plant(s) the component is shipped to.
- Description of deviation being requested (specifically, what VOLVO requirement is not being met).
- Number of pieces being affected or date deviation is to expire.

Specific requirements for North America can be found on the supplier portal.

FIRST IN FIRST OUT – FIFO

The suppliers have to secure that no obsolete material is shipped to VOLVO. The suppliers shall perform first in/first out (FIFO) inventory management practices. This means all material should be used and manufactured in the order it was received.

LOT TRACEABILITY

Guidance :

Traceability should be optimized to limit the size of product recalls and facilitate the expertise and analysis of root causes .

Definition :

- "Lot / batch traceability" refers to a one-to-one relation between a lot/ batch traceability number and a certain quantity of produced parts.
- "Serialization" refers to a one-to-one relation between a traceability number (= serial number) and one produced part.

General requirements for all parts :

- All suppliers shall have an effective lot definition and traceability procedure based on risk analysis.
- Suppliers shall ensure that their lot traceability system maintains its integrity through all the supply chain, including not only raw material, but also purchased components/products, sub contracted operations if any.



General requirements for safety related parts :

- All suppliers shall have an effective lot definition and traceability procedure in such a way that the delivered product can be trace back to :
 - the finished part
 - the subcomponents/blanks
 - the raw material.
- the history of the processes applied to the product
 - Rework operation
 - Product and process special characteristics, test records (according to the control plan)
 - influential process parameters
 - influential machine settings
 - maintenance of equipment, jigs, gages and testers
 - the operators and personal qualification
- Risk analysis should be used to minimize the size of batch compared to the risk of product recall.
- The period of storage information is done according to legal requirements . The min request is 15 years from date of manufacturing.
- The marking solution used on the part should support product investigation during parts life (In principle, suppliers should indicate the lot number on actual parts. It should be easily visible when mounted on the vehicle.)

Preferred solution unless otherwise specified on product documentation :

- Serialization
- If bar code is a standard practice, we recommend usage of STD 103-0013
- Recording of the value of safety critical product or process parameters is preferred. Recording OK/notOK is acceptable as long as there is evidence of a 100% effectiveness of the check

RECORD RETENTION

Document type	Examples	Shall be maintained for
APQP and PPAP documentation	Technical specifications, drawings, process flow charts, control plans, FMEA, manufacturing instructions,	the length of time that the part (or family of parts) is active for production and service requirements plus one calendar year unless otherwise specified by VOLVO
Quality performance records	Control charts, inspection and test results, product audits, layout inspection, functional testing,	the length of time that the part (or family of parts) is active for production and service requirements plus one calendar year unless otherwise specified by VOLVO
Quality system records	internal quality system audits, and management reviews	three calendar years.
Product Safety related records		a minimum of 15 years from the date of manufacture.

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

These requirements do not supersede regulatory requirements.



MANAGING PERFORMANCE

On a continual basis, supplier performance is monitored by the following key performance parameters:

- QPM Level.
- PPM Level.
- Production Feedback.
- QJ Problems.
- Field Failure.
- Breakdown Failure.
- Internal campaign.
- Warranty Claims.
- Delivery Precision.
- Unplanned Stop.
- Safety Problem.

SCORECARD PRESENTATION

The scorecard is a tool for monitoring the performance of a supplier. It should be used by suppliers to take proactive actions on their production quality.

This scorecard helps in monitoring the quality trends and can be an ALERT in the case of LOW PERFORMANCE.

Volvo maintains a scorecard of the quality and delivery performance for each supplier that delivers parts to a Volvo facility. The measurements on this scorecard are regularly reviewed to track supplier performance and identify negative trends. This information is available for supplier review over the supplier portal. It is recommended that suppliers review this information on a regular basis. Regular review of their performance data allows suppliers to take action to address problems and trends before Volvo is required to take action with the supplier. The scorecard is updated at the end of each calendar month. The scorecard shows information for a month, but ratings of a supplier's performance are based on a three month rolling average. Information for other periods are available using the 'View Performance Breakdown' page.

In addition to performance information, the scorecard contains other important information for the supplier. This includes information related to:

- Supplier address and company structure
- Supplier Evaluation Audit Results
- Purchasing Contracts
- Quality Certificates
- Environmental Certificates
- REACH Compliance
- Agreements.
- Supplier quality and delivery performance
- Supplier Sales to VOLVO
- VOLVO Buyer
- Supplier Host
- Supplier contact persons for VOLVO Group co-operation
- EDI Capability

PERFORMANCE

Supplier portal - enter password

Supplier Audits

- SEM: Approved, 71% Short, 2004-02-23, No planned audit
- Quality Certification: ISO 9001:2008, Registered, 2007-03-26, Expire: 2010-03-31, No planned certificate
- Environmental Certification: ISO 14001, BVQI, Registered, 2007-02-13, Expire: 2010-02-13, No planned certificate
- Logistic Audit: E 14% Without Self-assessment, Version: GLE V2 R0, (2008-11-18), No planned certificate
- Environmental Evaluation: NO Environment Evaluation
- Index Audits: SMA Criticality 1 Index: 82% Verified, 2007-01-09
- Capacity Audits: No Capacity Audit Round

Performance

Time frames used: Actual (2008-11 - 2009-01), Last Period (2008-10 - 2008-12) View Info

Brand/Consignee

	PPM				OPM				Delivery Precision (%)				Service Level (%)			
	Target	Last	Actual	Trend	Target	Last	Actual	Trend	Target	Last	Actual	Trend	Last	Actual	Trend	
Supplier Total		43	36		15	15	10		99.6	99.4						
Renault Trucks	<50	833	1 237		<50	15	15		>95.0							
Volvo CE	<350				<70				>95.0							
Volvo Parts	<500	0	0		<50	0	0		>95.0	95.2	94.1					
Volvo Truck	<50	23	0		<50	10	0		>95.0	100.0	100.0					

The information provides a picture of how Volvo views the supplier ability and capability.

To gain access to this information, suppliers should contact their Volvo buyer.



REJECTED PARTS PER MILLION (PPM)

The rejected PPM measurement is calculated as the number of nonconforming parts identified divided by the number of parts delivered, normalized over one million parts. Parts per million is calculated at the beginning of the month for the previous month. PPM performance visible on supplier scorecard is based on a rolling three month period.

PPM is a key indicator of the quality of products shipped to a Volvo facility. (0 Km rejections).

PPM reflects the percentage of non-conforming parts, while QPM reflects the impact of the non-conforming parts to the receiving VOLVO facility.

QUALITY PERFORMANCE MEASUREMENT (QPM)

Quality Performance Measurement (QPM) is a tool developed by Volvo to provide an objective method for measuring supplier performance. The QPM has proven to provide a better indicator of supplier performance than by using PPM alone.

QPM is a key indicator of supplier performance that reflects the impact that delivery of nonconforming parts has on VOLVO. It is calculated on a rolling three month period.

Rejected Parts Per Million

number of rejected parts divided by those delivered multiplied by 1 000 000.

PPM (Part Per Million)	Points
- 100	0
101 - 500	5
501 - 2000	10
2001 - 5000	15
5001 -	20

Volume Value

The volume value is a percentage: the value of the non-conforming parts divided by the full delivered value.

Vol Value (%)	Points
Less than 0.01	0
Equal or more than 0.01 less than 0.16	5
Equal or more than 0.16 Less than 0.41	10
Equal or more than 0.41 Less than 1.01	15
Equal or more than 1 .01	20

Inspection Reports

Number of Inspection reports written by VOLVO.

IR Raised (Inspection Report)	Points
- 1	0
2 - 2	5
3 - 4	10
5 - 8	20
9 - 12	30
13 -	40

Non-Conforming Parts

Number of non-conforming parts received by VOLVO.

NCp (Non Conforming Parts)	Points
0	0
1 - 5	5
6 - 25	10
26 - 250	15
251 -	20

The measurement criterion for each measurable is defined in the tables below:

Formula:

$$QPM = PPM \text{ points} + NCp \text{ points} + IR \text{ Raised points} + Vol \text{ Val points.}$$

The QPM is measured on a rolling three-months period

Second week of each month, the QPM value is recalculated using the most recent 3 full months of data.



DELIVERY PRECISION

A supplier's delivery performance score is also available on the Score Card. The supplier's delivery performance is based on timely delivery and delivery of correct quantities. These two measures are compared to the total of the supplier's deliveries to determine the score. The delivery precision indicator is automatically calculated on the scorecard. Questions related to delivery performance should be addressed to the supplier's contact in the Volvo materials group.

CONTINUAL IMPROVEMENT

Suppliers are expected to utilize the lessons learned from each incident to improve their processes or design, and if necessary their underlying business systems.

The goal is to eliminate the possibility of similar incidents, not only by making procedural and processes adjustments on the manufacturing floor, but by removing the environment that allowed the issue to surface. Lasting improvement must involve adjusting the supporting business systems and strategies.

The supplier shall use statistical data to continually refine their process and reduce variation

Analysis of quality incidents, PPM, scrap, downtime, and other readily available metrics, should be grouped and ranked in a customer focused way.

The supplier shall have improvement projects that target two or three of the largest problem areas

The supplier shall demonstrate a positive trend in reducing overall incidents and repeated incidents.

Suppliers shall show evidence that lessons learned for all similar products or processes have been utilized and incorporated; (often referred to as horizontal deployment).

Permanent countermeasures for all defect categories should be implemented for all parts and processes.

In addition, VOLVO very much supports using internal audits as a tool to drive continual improvement.

This is also required by the ISOTS/16949 requirement, that "the supplier is expected to make product and process self Audit on a regular basis".

SUPPLIER PROCESS AUDIT

Process Audits will be performed periodically by VOLVO quality.

The process Audit will be performed under the following circumstances:

- During APQP.
- After the PPAP approval when the supplier is beginning production ramp up.
- New supplier.
- New process.
- New location.
- Poor Performance.
- After a major incident
- Other...

Process audit is a tool for continual improvement and we ask our suppliers to build a robust improvement plan to close the gaps identified during the process audit.

VOLVO reserves the right to perform additional process audits when determined necessary, with reasonable time of notice.

We also expect suppliers to be performing their own process audit in a proactive way.

Volvo template for process audit is available on supplier portal



LOW PERFORMING SUPPLIER - LPS

The goal of the Low Performing Supplier (LPS) process is to:

*Identify, Initiate and Drive Quality improvement activities with VOLVO suppliers.
Drive the responsibility on the supplier to monitor and improve their quality performance.*

The Low Performing Supplier Process (LPS) will be implemented and managed through the monitoring of defined performance parameters.

When a measurement parameter indicates the beginning of a negative performance trend or significant abnormality, the supplier case is considered for elevation into LPS for detailed analysis and action.

Supplier improvement activities will be initiated and managed through a four-stage performance improvement elevation process.

Each stage will have identified actions and entry/exit criterion in order to establish a basis for measuring improvement activity.

The exit criteria are based on results and process improvements.

If the supplier does not meet his exit criteria by the completion date or if the quality situation becomes worse, they will be elevated to the next LPS stage level

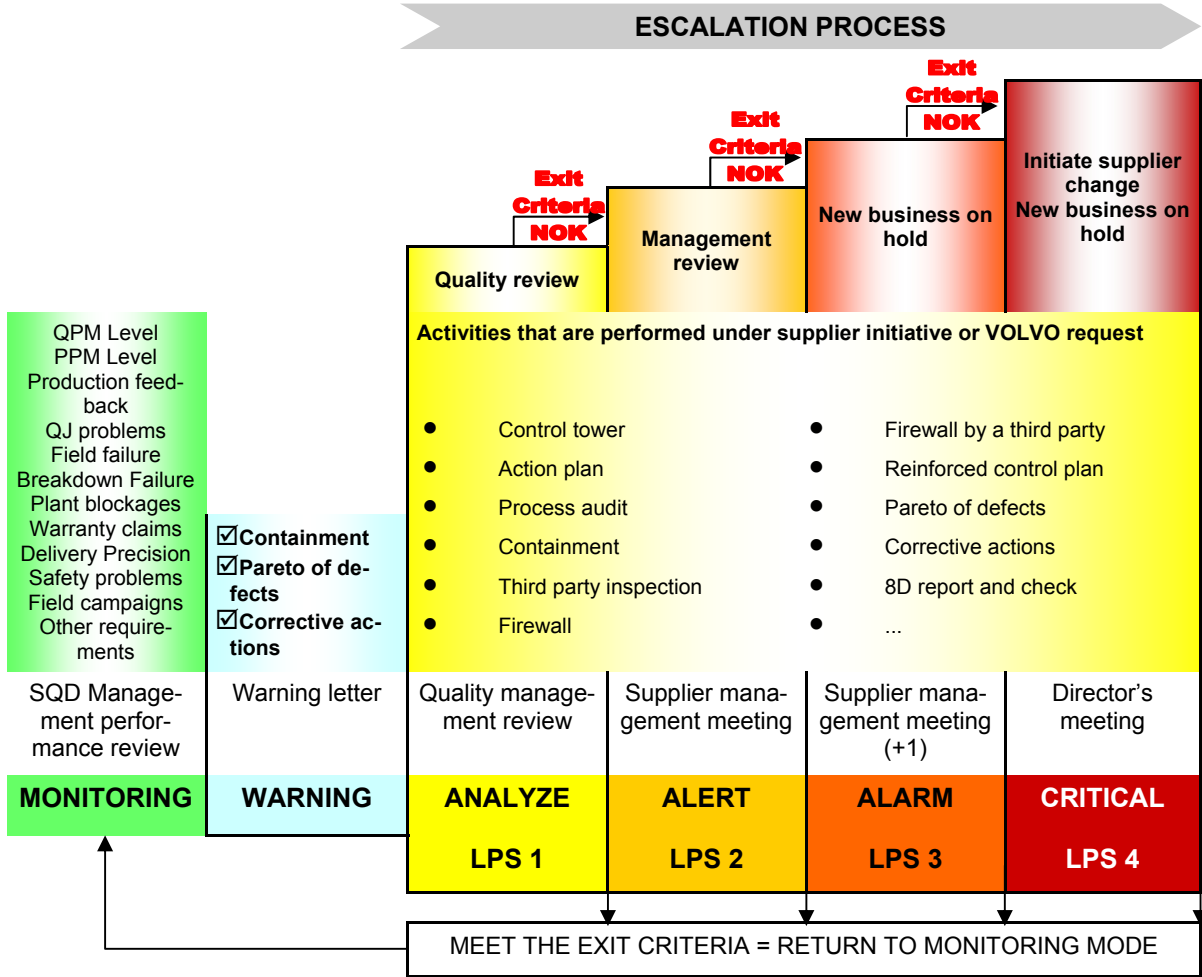
Each time the supplier reaches a higher stage, the actions to be achieved will be those of the stage before, plus some additional actions.

If the exit criterion is met, for a specific stage, the supplier is moved back to the no action required (monitoring) status.

A supplier can be put in the LPS either on an individual part number or multiple part number bases.

The supplier will be tracked by use of their Parma code.

PERFORMANCE





SAFETY MANAGEMENT

Since the company started operating in the 1920s, many unique safety solutions have made the name VOLVO synonymous with safety the world over.

Quality, Safety and Environmental care are VOLVO Corporate values and they form a foundation for us.

Safety relates to how our products are used within society. We strive to minimize the risks of an accident occurring, and if it does, to also minimize the consequences, as the safety and working conditions for the drivers and vehicle operators can impact many others on the road.

Referring to the VOLVO group safety policy, we desire to share with our supply chain the

“ambition” that VOLVO products are characterized by safety.

Suppliers' contribution lies in two main areas:

- The development of new safety features for the final customer.
- The delivery of robust designed and produced products ensuring ZERO defect for the final customer. This is referred as “product safety” and is the subject of this chapter.

More information on VOLVO group safety policy and activities can be found on Volvo.com portal.

<http://www.volvo.com/group/global/en-gb/volvo+group/ourvalues/safety/safety.htm>

The supply of safe and conforming products to the VOLVO Group companies remains the supplier's responsibility and is part of the supplier's contractual commitment. The assistance that may be provided by VOLVO shall not in any way limit the supplier's liability to supply parts which conform to all technical specifications, applicable standards, contractual as well as legal demands.

Safety is related to the effect for the final customer. A Safety Customer Effect is considered when a danger can lead to injuries to the following groups of persons; vehicle & road users, passers-by or maintenance personnel.

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

'Critical Characteristics of Design Products – Identification & Grading', STD 105-0001, describes a system to highlight and grade critical characteristics appearing in technical specifications to ensure correct, fail safe application of the product involved.

Criticality [1] is the way used by VOLVO design to highlight the safety related special characteristics.

Parts identified with criticality [1] are considered safety parts by VOLVO and suppliers of parts identified with criticality [1] are identified as safety parts suppliers.

With regard to all parts identified with a [1], for dimensional, material, test or functional requirements, the following requirements apply and replace the general requirements.

Suppliers have the responsibility to deploy a criticality analysis in their product/process design. For suppliers having design responsibility, safety related special characteristics should be identified from a system or design FMEA and verification/validation plans on drawings and technical documentation.

Safety critical characteristics should be identified within the manufacturing process and associated documentation such as process FMEA, control plans and working documentation for the operators.



Capability requirements for parts identified with [1] characteristics are described below:

	Critical Characteristics level 1
If process under control, normally distributed	<p style="text-align: center;">$C_{pk} \geq 1,67^*$</p> <p>(or $C_{pm} \geq 1,3$ for unilateral tolerances if applied)</p> <p style="text-align: center;">AND</p> <p>Production followed up with SPC (Statistical Process Control) * For electronic components, $C_{pk} \geq 2,0$</p>
If process is not under control and normally distributed	The machines must have 100% automatic check, 100 % control/inspection + traceability
Preferred Alternative	Electronic Poka Yoke (Effectiveness verified once per shift)

In addition to the demands detailed in the table above, the supplier must apply the following requirements on the shop floor;

- Identification of the operations which have a direct or indirect influence on Critical Characteristics [1] on the manufacturing methods documentation.
- Place clear signs at relevant workstations so operators are aware of the characteristic and of the potential Safety Customer Effect if the characteristic is non-compliant.
- Training and authorizations for people working on such workstation.

Thorough documentation is necessary in order to;

- Demonstrate that critical components do not have any safety related defects, either from VOLVO or supplier.
- Demonstrate that both VOLVO and legal requirements are met.
- Limit the number of products subjected to field actions, if any.

The supplier has the responsibility to deploy and verify all the above requirements in their supplier chain.

In the eventuality of a non conformance or a risk for the final customer, supplier shall notify immediately VOLVO, with actions to protect the final customer.

Suppliers shall embed in their quality system the specific requirements for product safety, showing they develop organization, process, and competences to manage the requirements for safety critical features.

During the sourcing process, the Product Safety Management Audit (SMA), verifies the ability of the supplier to handle safety parts.

Safety Management Audit template is available on supplier portal

During the APQP & PPAP routines the SQE verifies the evidence of the completion of those requirements for the concerned products.

Requirements for traceability : (See page 27)

The Volvo logo is centered at the bottom of the page. It consists of the word "VOLVO" in a bold, blue, sans-serif font. The logo is set against a white background, which is framed by a large orange shape on the left and a large black shape on the right, both with thin white and yellow curved lines.