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BOSCH

**Bosch Chassis Systems (CBxx)
Work Instruction**

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WIG 11-001 CBxx SPECIFIC REQUIREMENTS

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1. INTRODUCTION

1.1 Purpose

The purpose of this document is to clarify for OEM suppliers to Bosch Chassis Systems (CBXX), the specific requirements for new product introduction and volume production components. This document supplements the requirements of the ISO 9001-2000 Quality system, as a minimum.

Bosch Chassis Systems (CBXX) has a continuing requirement for “zero defect” supply policy. Suppliers are expected to implement a robust system that ensures this goal is achieved. Suppliers shall have strategic plans in place to target a minimum 50% reduction on end year YTD PPM results each year.

1.2 Document Format

This document is split into four sections:-

Section 1: Introduction

Section 2: CBXX Specific Requirements

Section 3: Product Capability Requirement

Section 4: Commercial Requirements

1.3 Notation

This procedure is applicable to all the PBR companies which change name to Bosch Chassis Systems (CBXX)

1.4 Disclaimer

Vehicle manufacturers and CBXX’s requirements set out in the “CBXX Specific requirements (WIG 11-001)” and related documents may vary from time to time. Therefore, it is the Supplier’s responsibility and accountability to check the issue level of the “CBXX Specific Requirements (WIG-11001)” and referenced document on the PBR web site on the 28th of each month to ensure compliance to the latest revisions are adhered to. These requirements are mandatory and not negotiable. Suppliers’ not in compliance to CBXX requirements may be placed on New Business Hold (restricted from quoting and/or from being awarded new business and/or maintaining current business) or have all current business resourced to an alternative source.

PBR Web Site:

<http://www.pbr.com.au>

PBR Supplier Requirements:

http://www.pbr.com.au/supplier/current_suppliers.shtml

The image displays three screenshots of the PBR website illustrating the navigation process:

- 1 - Click on "SUPPLIERS"**: The first screenshot shows the PBR homepage with the "SUPPLIERS" link in the top navigation bar circled in red.
- 2 - Click on "Current Suppliers"**: The second screenshot shows the "Suppliers" page with the "Current Suppliers" link in the left sidebar circled in red.
- 3 - Supplier Requirements**: The third screenshot shows the "Supplier Contact Documents" page with a red diagonal box overlaid containing the text "3 - Supplier Requirements".

2. QUALITY REQUIREMENTS

2.1 Supplier Accreditation

ISO/TS16949 / ISO9001-2000 / ISO14001

Third Party Certification to ISO/TS16949 or ISO 14001 is not mandatory but highly recommended; however, all OEM Suppliers must be Third Party Certified to the latest edition of ISO 9001-2000. OEM Suppliers are strongly encouraged to obtain ISO TS 16949 and ISO 14001 third party accreditation.

Suppliers must submit scanned copies of third Party Certification (ISO/TS16949, ISO9001-2000, ISO 14001 etc.), every 3 years when they have had their plant recertified.

CBXX Specific Requirements - FG11-004

“New suppliers” or “Current suppliers on Down Rated or New Business Hold status” upon request are required to submit a self assessment to CBXX Specific Requirements using assessment for FG11-004 within 10 working days along with a corrective action plan where non conformities and improvements are identified.

Special Process

Suppliers which use “Special Process” for components manufactured for CBXX must submit a self assessment against the following applicable AIAG Special Process System Assessment(s) on an annually basis and following any process and/or equipment changes.

- **AIAG CQI-9 Special Process: Heat Treat System (*)**
- **AIAG CQI-11 Special Process: Plating System**
- **AIAG CQI-12 Special Process: Coating System**

(*) Suppliers which use heat treatment process are also required to comply with the Ford's Heat Treat Standard (W-HTX). The current W-HTX Standard will continue to be applied to brazing, sintering, normalizing, and annealing, processes as they are not included in the CQI-9 application. The 54 question CQI-9 Heat Treat System Assessment (HTSA) will replace the current 20 question Heat Treat System Survey (HTSS) previously used with the W-HTX Standard. The assessment results are to be reported on the AIAG CQI-9 Special Process: Heat Treatment Assessment form.

Once a new supplier has been audited and approved to manufacture and supply components/raw materials, CBXX reserves the right to audit suppliers, their sub-suppliers and sub-contractors against ISO/TS16949, ISO9001-2000, CBXX Specific Requirements, AIAG CQI-9 Special Process: Heat Treatment Assessment, Ford Heat Treat System, AIAG CQI-11 Special Process: Plating System Assessment, AIAG CQI-12 Special Process: Coating System Assessment or CBXX Specific Requirements within 1 weeks notice to confirm compliance.

2.2 Control Characteristics (∇)

Critical characteristics (CCs) are identified on product drawing with an inverted delta (or designated car company symbol where applicable) placed adjacent to the feature. Any additional characteristic identified by the supplier and/or specified by CBXX Supplier Quality Engineer or CBXX Plant Quality Manager/Nominee(s) during APQP, Pre-launch or production which require special process control during prototype build, pre-launch and production will be required to be identified by an inverted delta and carried through to all process documentastion.

Critical characteristics (refer WIG 30-002) affect items such as;

- Fit, Form or Function
- Product Safety
- Compliance with government regulations
- Etc.

Initial Process Studies (General) (AIAG PPAP manual section 2.2.11.1)

Designation of characteristics for demonstration of process capability

Where the part does not have any designated special characteristics on the drawing or nominated by CBXX Supplier Quality Engineer, the supplier shall control part quality through the designation of appropriate control characteristics, including them in the Control Plan and demonstrating process capability on those supplier-designated control characteristics.

Demonstration of process capability (Capability Index)

The supplier shall demonstrate process capability per 2.2.11.3 of PPAP 4th Edition using the Ppk process capability index.

Where process capability index calculation software is used, it is to be validated using standard input data sets and checked using corresponding expected output results.

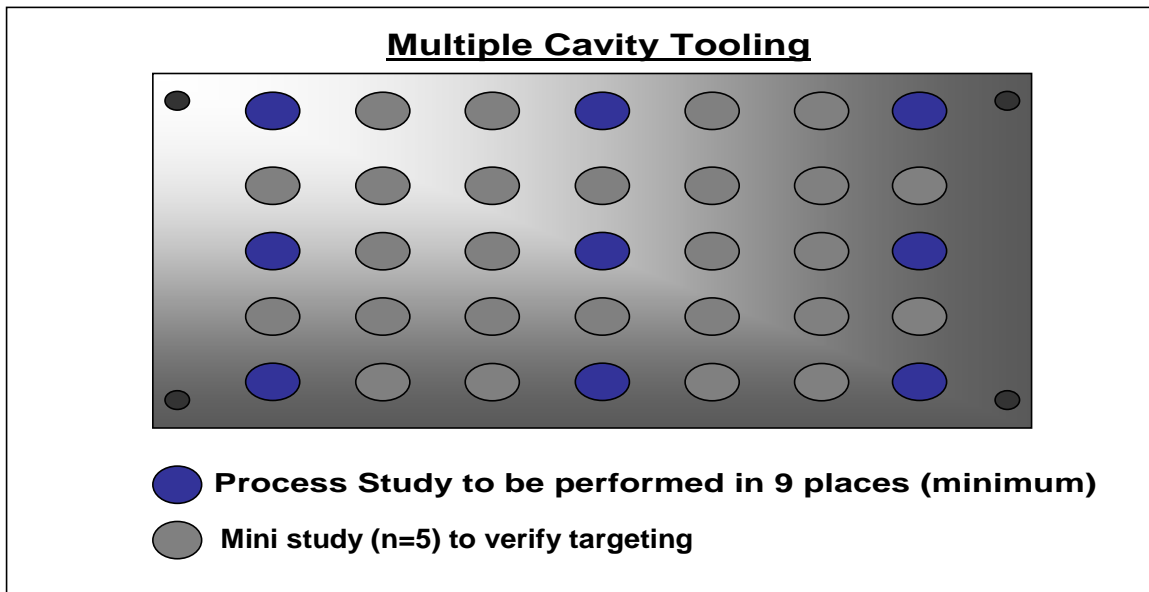
Demonstration of process capability (Calculation of Ppk)

The Ppk index of the initial process study must be calculated using a data set that is statistically stable, in control and normal. Stability, control and normality are determined using a data set of at least 25 subgroups (typical sub-group size is 5) per the guidance in the AIAG published SPC manual. For example, for a 5 sample sub-group X bar R control chart, 125 measurements would be required.

Note: If the data collected are not normally distributed, either transform the data to a normal distribution, or determine if the data match another known distribution, such as Weibull, before calculation of Ppk.

The initial process study data set of 25 subgroups is to be developed to include the expected inherent variation of the manufacturing process (e.g., the actual manufacturing environment, including all shifts, expected operating patterns.)

Where multiple cavity tooling is utilised (rubber, phenolic, plastic, ferrous/non-ferrous castings etc.), the initial process study shall be performed on all cavities. Where tooling exceeds 9 cavities, the initial process study shall be performed on a minimum 9 cavities (as shown below) and a mini study shall be performed on the balance of cavities to confirm the parts are on targetted values to achieve process cabability (unless waiver is granted in writing by CBXX Supplier Quality and Development Manager).



Demonstration of process capability (When the Ppk data set requirements are not met)

If part size or other factors prevent the collection of 25 subgroups covering the expected inherent variation of the manufacturing process, the process is classified as unstable and 100% inspection is required. Later demonstration of process stability and acceptable capability will remove the need for 100% inspection.

Inverted Delta parts

For parts designated as inverted delta (parts with Critical Characteristics), the supplier shall prevent the shipment of non-conforming product to CBXX.

Note: this is typically accomplished by using error and/or mistake proofing techniques integrated into the supplier's manufacturing and material handling processes.

Parts without inverted delta designation

The error proof approach described for inverted delta designated parts above is also recommended for all parts, not just parts designated with inverted delta.

Actions to be taken when acceptance criteria are not satisfied (PPAP 2.2.11.6)

The modified control method shall include techniques to incorporate mistake proofing methods into the manufacturing process to prevent the shipment of non compliant product to CBXX facilities.

Note: examples of mistake proofing methods include the modification of manufacturing processes to detect and discard non compliant product (e.g., poke-yoke), or a gauge to ensure product compliance to specification where the process does not meet the capability requirements. This is not the addition of a temporary manual inspection process at the end of the line.

The supplier shall continue to determine sources of variation, improve the process with permanent corrective actions, and improve the process to meet the capability requirements.

**The following are examples of measurement equipment mistake proofing methods
For Variable Gauges**

Two sided tolerances: Tolerances used for 100% inspection gauges can be reduced by the extent of the gauge R&R as a percent of tolerance of the gauge(s) being used in the 100% inspection methodology. The typical practice is to remove half the gauge R&R as a percent of tolerance from the upper specification limit and the other half from the lower specification limit.

Example: A variable gauge is used to check a product characteristic of 600 microns +/- 40 microns (this equates to 80 microns specification tolerance spread). Additionally, this variable gauge has a gauge R&R as a percentage of tolerance of 20%. The upper limit compensated for gauge capability would be 632 microns ($600+40- 80 \times 0.2/2$) (Upper Specification – (Specification tolerance spread x (% tolerance Gauge R&R)/2)) and the lower limit compensated for gauge capability would be 568 microns ($600-40 + 80 \times 0.2/2$) (Lower Specification + (Specification tolerance spread x (% tolerance Gauge R&R)/2)). This example assumes the gauge error is equally distributed. Continue process variation reduction efforts until a Ppk greater than 1.67 is achieved, or until Supplier Development approval is received.

One-sided tolerances: For a "less than" tolerance specification (e.g. length less than 20 mm) subtract three gauge R&R standard deviations from the tolerance specification. For a greater than tolerance specification (e.g. plating thickness greater than 10 microns) add three gauge R&R standard deviations to the tolerance specification.

"Greater than" example: A variable gauge is used to check the length of a product characteristic. The product specification is greater than 150 microns. The gauge R&R standard deviation is 2 microns. The specification compensated for gauge error would be greater than 156 microns ($150 + 3 \times 2$) (Specification + 3 x gauge R&R standard deviation).

"Less than" example: A variable gauge is used to check the length of product characteristic. The product specification is less than 150 microns. The gauge R&R standard deviation is 2 microns. The specification compensated for gauge error would be less than 144 microns ($150 - 3 \times 2$).

If business reasons exist to deviate from the recommendations listed above, contact Supplier Development to obtain concurrence.

Continue process variation reduction efforts until an acceptable process capability is achieved, or until Supplier Development approval is received.

Measurement System Analysis studies are conducted on measuring equipment used to check all CC's and features identified by the supplier / Supplier Development as a minimum.

Where measurement analysis studies are performed using software, the software is to be validated using standard input data sets and checked using corresponding expected output results (refer to the AIAG published SPC manual).

The supplier shall report the number of distinct categories. All variable gauge R&R studies should have a minimum of 5 distinct categories (See Measurement Systems Analysis Reference Manual published by AIAG, refer to "ndc" in the index). Gauge R&R as a percent of study < 10% is acceptable (the parts used for the Gauge R&R study must be representative of a production run). If Gauge R&R as a percent of study is greater than 10%, but less than 30%, contact Supplier Development to determine if the Gauge R&R is acceptable. If Gauge R&R as a percent of study > 30%, it is unacceptable and the supplier shall implement a corrective action plan to improve measurement capability.

2.3 Customer Interface Points

Customer Interface points are identified by CBXX Supplier Quality Engineer or the CBXX Plant Quality Manager.

Customer interface points are items such as;

- Product Fitment Characteristics
- Labelling/Barcoding

The supplier must ensure adequate controls (automation, mistake proofing, SPC etc.) are in place and approved by CBXX via the Control Plans and PFMEA.

2.4 Control Item

The following controls are must be included in the Control Plan:

Fasteners, Springs, Pressings, Forgings, Turned Components

Material Analysis - Heat-Treated Parts

Prior to release of metal from an identified mill heat, a sample from at least one coil or bundle of wire, rod, strip, or sheet steel is analysed and tested to determine its conformance to specifications for chemical composition and quenched hardness.

A sample from each additional coil or bundle in the heat is tested for either chemical composition or quenched hardness. The results are documented and referenced to the steel supplier's mill heat number. It is the supplier's responsibility to ensure all materials and components conform with drawing specifications.

Material Analysis - Non Heat-Treated Parts

The identification of each coil or bundle of wire, rod, strip, or sheet steel is visually checked to determine that the mill heat number agrees with the steel supplier's mill analysis document and applicable specifications. Each batch/lot of coils or bundles is tested for hardness or other applicable physical properties. It is the supplier's responsibility to ensure all materials and components conform with drawing specifications.

Cast Iron, Cast Aluminium, Rubber, Plastic, Phenolic Components

Material Analysis - Non Heat-Treated Parts

The identification of each raw material batch/heat lot is visually checked to determine that the batch number agrees with the supplier's analysis document and applicable specifications. Each batch/heat lot of raw material is tested for Tensile, Yield, Elongation, Hardness or other applicable physical and chemical properties. It is the supplier's responsibility to ensure all materials and components conform with drawing specifications.

Lot Traceability

Lot Traceability is maintained by the Supplier. CBXX reserves the right to request Raw Material certification with each batch delivery within 24 hours notice.

2.5 Heat Treatment

Suppliers providing heat-treating services must demonstrate compliance to both Ford's Heat Treat Standard (W-HTX) and AIAG CQI-9 Special Process: Heat Treatment Assessment for all CBXX heat treated components. This heat treat management system provides for continual improvement, emphasizing defect prevention and the reduction of variation and waste in the supply chain.

All heat treat processes are to be assessed using the CQI-9 HTSA; this includes assessment of all heat treat processes listed in CQI-9 HTSA as well as brazing, annealing, sintering, and normalizing.

2.6 Control/Reaction Plans and FMEA's

CBXX Supplier Quality Engineer approval of all new or revised Control / Reaction plans and FMEA's is obtained unless waiver is granted in writing. These documents are included with the PPAP submission for the product or service. FMEA's are to be reviewed at a minimum annually or as issues arise.

The supplier shall institute a plan for mistake/error proofing of the manufacturing process to eliminate or reduce the opportunity of manufacturing defective product. The supplier shall verify the effectiveness of these systems on new and current products/family group of products.

Reaction Plans;

Reaction Plans for nonconforming or defective product and/or process instability are required for each component and are to be contained or if a separate document, referenced within the suppliers control plans.

Reaction Plans shall; 1) specify the corrective actions necessary to avoid producing defective or nonconforming products; 2) specify the corrective actions to avoid operating outside of identified process parameters, and 3) designate the person responsible for each reaction plan.

Corrective actions should normally be the responsibility of the people closest to the process (i.e. operator, jobsetter, or supervisor) and be clearly identified in the plan. The reaction plan must provide provisions for documenting the corrective actions taken.

In all cases, suspect and nonconforming products must be clearly identified, quarantined and disposition made by the responsible person designated in the reaction plan.

It is the supplier's responsibility to ensure Control / Reaction plans and FMEA's are revised after corrective actions have been implemented to address newly identified potential failure mode(s) and root cause(s) on new and current products/family group of products.

2.7 Engineering Specification (ES) Test Performance Requirement

The goal of ES testing is to confirm that the design intent is met. ES test failures is cause for the Supplier to stop production shipments immediately, pending analysis of the process and corrective action. The Supplier immediately notifies CBXX of test failures, suspension of shipments, and identification of any suspect lots shipped. After the root cause(s) of ES test failures are determined, corrected, and verified, the Supplier may resume shipments. Suspect product is not shipped without sorting or reworking to eliminate the cause of failure.

When the root cause of test failures cannot be determined, the Supplier immediately notifies CBXX Supplier Quality Engineer and Product Engineering. Supplier stops production pending further instructions.

2.8 Set Up Verification

Set up verification using statistical confirmation is recommended for all CCs.
Refer TS16949 Sections **3.1.12**, **7.3.2.3** and **8.2.3.1**.

2.9 Process Change

2.9.1 Process change to previously approved products/ processes is not permissible without a prior written approval from CBXX Supplier Quality Engineer. The Supplier Change Request (SCR) form FG 11-013 is to be completed and submitted to CBXX Supplier Development to seek approval to proceed. Process change request will not be considered unless adequate supporting process/product statistical / validation data is provided to support the process change intent. Process changes will be approved via a PPAP submission unless waived by the CBXX Supplier Quality and Development manager.

2.9.2 Process change requests will not be implemented until customer approval is obtained for current model and/or until next model change.

2.9.3 Suppliers are not permitted to raise internal deviation / concerns to supply product to CBXX without the above approval.

2.10 Design Changes

2.10.1 Supplier cannot make any changes to tooling design, product drawing specifications, material standards (MS), related standards or performance requirements without written approval from CBXX Product Engineering prior to PPAP submission. The Supplier Change Request (SCR) form FG 11-013 is to be completed and submitted to CBXX Supplier Development to seek approval to proceed. Design change requests will not be considered unless adequate supporting product statistical / validation data is provided to support the design change intent, unless waived by the CBXX Supplier Quality and Development manager.

Suppliers are not permitted to raise internal deviation / concerns to supply product to CBXX without the above approval.

2.10.2 Design change requests will not be implemented until customer approval is obtained for current model and/or until next model change.

2.10.3 Vehicle manufacturer and/or CBXX may at time request change to design, drawing specifications and/or performance requirements. CBXX will formally communicate any change via Request For Quotation (RFQ).

2.10.4 The supplier shall demonstrate its use of an effective process for controlling and managing the receipt, release, despatch, storage, accessibility and changing of tooling design records (math data, drawings, specifications etc).

2.11 Advance Product Quality Planning

The supplier shall establish and implement an advance product quality planning processes in line with TS16949 principles and should reference current AIAG Advance Product Quality Planning and Control Plan (APQP), Production Part Approval Process (PPAP), Measuring System Analysis (MSA), Failure Mode and Effects Analysis (FMEA), TS16949 and Statistical Process Control (SPC).

The supplier should convene an internal cross functional team to prepare for production of new or changed products. The supplier should arrange for an APQP Kick-Off meeting through the Supplier Development Engineer and/or Buyer to review the design for manufacturability and capability; establish a timing program; resolve quality, capacity, equipment, tooling and gauging issues prior to PPAP approval.

It is the suppliers responsibility and accountability to implement the APQP process with their sub-supplier/contractors. Sub-supplier/contract's PFMEA and Control Plans to be reviewed and approved during the APQP meeting with CBXX (raw material suppliers exempted).

The supplier must provide computer simulation analysis to verify the development of tooling prior to the manufacture of tool(s). Eg. In the case of casting, Magma Software Simulation (unless waived by CBXX Supplier Quality and Development manager).

Suppliers are required to provide CBXX with a program timing chart once CBXX has provided the Key milestones at the APQP Kick-Off meeting. It will be the supplier's responsibility to maintain and submit the timing chart along with the CBXX APQP workbook on a weekly basis (unless otherwise agreed too by CBXX Supplier Quality Engineer).

The following are the phases of development that shall be reviewed during the APQP process;

Milestone	– Key Dates
Customer Requirements	
Phase I	– Process/Layout Design & Development
Phase II	– Equipment Purchase and Commissioning
Phase III	– Tooling & Gauge Design & Development
Phase IV	– Tooling & Gauge Manufacture
Phase V	– Process Development
Phase VI	– Dimensional Verification
Phase VII	– Process / Product Validation
Production Approval	

The supplier's timing chart shall include the following level of detail (but not limited to) for each phase. Microsoft Office Project is the preferred program to be used to monitor progress of program. Sub-suppliers/contractors timing chart must also be include for review. The sub-supplier/contractor's timing chart shall include the same level of detail for Phases I to VII.

Refer Appendix C: Example for Cast Iron Foundry Supplier timing program

Refer Appendix D: Example for General Supplier timing program

Outcome of development / trial runs must be reviewed with your Supplier Development Engineer during APQP to ensue that the process paramters and controls have been verified.

- Extreme trials (max – avg – min) on all process paramenters to ensure mechanical / chemical / physiscal properties and integrity of the component will always be met (trials to be agreed with by your Supplier Development Engineer);
 - ✓ Mechanical Properties (chemistry)
 - ✓ Temperature
 - ✓ Time
 - ✓ Cycle
 - ✓ Etc.
- Dimensional results of tooling / pattern
- Capability of critical and nominated fetures
- Mistake proofing verified
- Frequency and method of inspections
- Adequacy of gauging
- Work Instuctions, SOPs, Reaction Plans, Record Sheets etc.

Supplier must submit a development program (e.g. Extreme trials) to validate the tooling (i.e. runner/gate) and all extremes (worse case) of each process parrameter and normal operating conditions (temperature, time, chemistry etc.) which is to be approved by Supplier Development prior to Phase 1. Trial results are to be reviewed during APQP with the CBXX Supplier Quality Engineer. No deviation to these requirements is permissible unless approved by the Supplier Quality and Development Manager.

The following table is used to categorise suppliers based on their level of technology and experience. These categories are used to determine the level of testing required for validation of the tooling and casting process (Destructive / Non-Destructive Testing Development Requirements- Phase V table).

Ferrous and Non - Ferrous Casting Tool / Process Development Classification	
Development of tooling layout, process parameters via Magma Software Simulation	
Category A	Class
Supplier has the experience to conduct a development program with Magmasoft to validate extreme conditions (casting integrity, microstructure, mechanical properties etc.)	A
Supplier has limited evidence of effective use in Magmasoft, but is able to conduct a development program with Magmasoft to validate extreme conditions (casting integrity, microstructure, mechanical properties etc.) or has less than 2 years experience using the simulation software	B
<u>New Supplier</u> that has manufactured similar brake components and has the experience to conduct a development program with Magmasoft to validate extreme conditions (casting integrity, microstructure, mechanical properties etc.)	C
<u>New Supplier</u> that has not manufactured similar brake components and has the experience to conduct a development program with Magmasoft to validate extreme conditions (casting integrity, microstructure, mechanical properties etc.) or has less than 2 years experience using the simulation software	D
Category B	Class
Supplier has the ability to run Magmasoft using set parameters to verify runner system only	B
Supplier has limited evidence of effective use in Magmasoft and has the ability to run Magmasoft using set parameters to verify runner system only or less than 2 years experience using the simulation software	C
<u>New Supplier</u> has manufactured similar product and has the ability to run Magmasoft using set parameters to verify runner system only	D
<u>New Supplier</u> has limited evidence of effective use in Magmasoft and has the ability to run Magmasoft using set parameters to verify runner system only or less than 2 years experience using the simulation software or has not manufactured similar product	E
Development of tooling layout, process parameters based on experience / foundry knowledge	
Category C	Class
Supplier that has experience in manufacturing similar / family group products	D
<u>New Supplier</u> that has experience in manufacturing similar / family group products	E
Category D	Class
Supplier that has no experience in manufacturing similar / family group products (new product type)	E
<u>New Supplier</u> that has no experience in manufacturing similar / family group products (new product type)	F

Note: Magmasoft is a simulation package used and recognized by CBXX. Any other simulation package used will need to be approved by CBXX. If no approval is granted then the supplier must default to Category C or D.

Destructive / Non-Destructive Testing Development Requirements - Phase V				
Class	Requirement	Minimum Sample Size Per Cavity for Each Capability Run		
		X-Ray	Sectioning (refer 2.12.4)	Proof Machining (refer 2.12.4)
A	a) 100% X-Raying and Magnetic Partical / Liquid Penetrant Checks of all trial batch runs until compliance to MS1019/MS1169 is achieved. b) Once compliance to MS1019 is achieved, conduct 3 minimum Capability Runs to demonstrate process capability.	20	3 per cavity on areas where highlighted by Magmasoft and critical areas	3 per cavity on areas where highlighted by Magmasoft and critical areas
B	a) 100% X-Raying and Magnetic Particle / Liquid Penetrant Checks of all trial batch runs until compliance to MS1019/MS1169 is achieved. b) Once compliance to MS1019/MS1169 is achieved, conduct 3 minimum Capability Runs to demonstrate process capability.	30	5 per cavity on areas where highlighted by Magmasoft and critical areas	5 per cavity on areas where highlighted by Magmasoft and critical
C	a) 100% X-Raying and Magnetic Particle / Liquid Penetrant Checks of all trial batch runs until compliance to MS1019/MS1169 is achieved. b) Once compliance to MS1019/MS1169 is achieved, conduct 3 minimum Capability Runs to demonstrate process capability.	50	10 per cavity on areas where highlighted by Magmasoft	5 per cavity on areas where highlighted by Magmasoft
D	a) 100% X-Raying and Magnetic Particle / Liquid Penetrant Checks of all trial batch runs until compliance to MS1019/MS1169 is achieved. b) Once compliance to MS1019/MS1169 is achieved, conduct 3 minimum Capability Runs to demonstrate process capability.	75	10 per cavity in critical areas and areas deemed critical by the supplier where the casting may be subject to porosity	10 per cavity in critical areas and areas deemed critical by the supplier where the casting may be subject to porosity
E	a) 100% X-Raying and Magnetic Particle / Liquid Penetrant Checks of all trial batch runs until compliance to MS1019/MS1169 is achieved. b) Once compliance to MS1019/MS1169 is achieved, conduct 3 minimum Capability Runs to demonstrate process capability.	100	10 per cavity in critical areas and areas deemed critical by the supplier where the casting may be subject to porosity	10 per cavity in critical areas and areas deemed critical by the supplier where the casting may be subject to porosity
F	a) 100% X-Raying and Magnetic Particle / Liquid Penetrant Checks of all trial batch runs until compliance to MS1019/MS1169 is achieved. b) Once compliance to MS1019/MS1169 is achieved, conduct 5 minimum Capability Runs to demonstrate process capability.	100	10 per cavity in critical areas and areas deemed critical by the supplier where the casting may be subject to porosity	10 per cavity in critical areas and areas deemed critical by the supplier where the casting may be subject to porosity

In the case of Rotor development, sample size of proof machining will be set at 50% of the x-ray requirement.
Eg. X-Raying and Magnetic Particle / Liquid Penetrant Checks N= 100, Proof Machining N= 50.

Refer section 2.12.4 Ferrous & Non-Ferrous Castings additional PPAP Requirements for X-Ray preferred method, sectioning and proof machining requirements.

The supplier must maintain design control of the runner system. The issue number of the runner/gate design shall be identified on the PPAP and traceability to this design shall be maintained. No deviation is permissible unless approved by the Supplier Development / Quality Manager (refer section 2.9).

Magmasoft Expectations

Simulation - Expected Outcomes:

- Mould / Runner Fill Characteristics
- Metal front velocity to be controlled and not to exceed a maximum value dictated by region.
- Metal should be low velocity / limited splashing within cavity
- Mould design to follow best practice methods E.g. Bottom filling if possible
- Design for a progressively moving solid front of metal to minimize cold shuts and inclusions
- Remove high velocity metal fronts [high velocity metal front may result in sand erosion / turbulence / gas, sand and oxide inclusions / splashing / jetting]

Solidification Characteristics

- Solidification simulation results to have demonstrated correlation with actual results
- Correlated proof of either/all of the following
- Eutectic cell count [Grey Cast iron]
- Nodule count [Ductile Cast Iron]
- Microstructure
- Porosity

Then solidification results for the below will be accepted as concept affirming:

- Porosity
- Hot spots
- Solidification times
- Avoid hot spots [Hot spots may result in shrinkage / hot tears]
- Sand properties - Core sand / Green sand – moisture

Process Variables Simulation:

- Once a solution has been established for a product the process variable that may affect the process are simulated.
- Simulation setting the process controls at the 'target' levels
- Simulation at worst case level
- If time is available simulate at Max. / min. levels for process variables

Reference documents;

- Manufacturing Feasibility Study (refer AIAG Advance Product Quality Planning and Control Plan)
- Supplier APQP Workbook (FG 11-017)
- GP-9/Ford, Run @ Rate
- Applicable Customer Specifics

Dimensional Standards.

For characteristics refer to the specific tolerances for draft angles, draft effect, linear tolerances, angular tolerances, corner radii, fillet radii, parting line fins, and lettering specified on the part drawing or to any reference noted on the part drawing.

Casting critical dimensions (specified during APQP) - dimensional layout of critical dimensions from each batch/lot run will be performed on each cavity.

Full dimensional layouts shall be conducted after every 50,000 shots [maximum]. If the supplier demonstrates that the interval can be extended with, no significant dimensional deterioration, the interval may be re-negotiated with the Supplier Development Engineer or the CBXX Plant Quality Manager. Measurements can be taken from the as-cast parts or directly from the pattern.

2.12 Production Part Approval Process (PPAP)

2.12.1 PPAP Prototype/PV Samples;

The AIAG 4th edition PPAP Warrant Form shall be used in conjunction with the Supplier PPAP Submission Checklist (FG 11-011). An exact facsimile is acceptable for suppliers that prefer the use of a computer generated form.

Refer AIAG 4th edition PPAP Manual (TS 16949) for all other document requirements. Prototype Control Plan, Dimensional report requires a minimum of 6 samples to be measured and tagged, all critical features must be 100% inspected (variable or attribute gauging) or capability study performed and all results recorded.

The Supplier must submit Prototype / PV PPAP submissions to the level indicated on Supplier PPAP Submission Checklist (FG 11-011), unless otherwise advised in writing by the CBXX Supplier Quality Engineer. Where Cad Models have been supplied and no 2D drawing available, the supplier must contact CBXX engineering to identify key dimensions to be inspected.

2.12.2 PPAP New Product;

Level 3 PPAP is submitted in accordance with AIAG 4th edition PPAP requirements to CBXX by the milestone date noted on the RFQ, unless otherwise advised in writing by the CBXX Supplier Quality Engineer or Buyer.

The AIAG 4th edition PPAP Warrant Form shall be used in conjunction with the Supplier PPAP Submission Checklist (FG 11-011). An exact facsimile is acceptable for suppliers that would refer to use a computer generated form.

Refer AIAG 4th edition PPAP Manual (TS 16949) for all other document requirements.

Dimensional report requires a minimum of six samples to be measured and all individual results recorded.

All critical features must be reported in Ppk. Minimum requirement is 1.67Ppk.

2.12.3 Annual PPAP Recertification;

Annual PPAP Recertification is where an existing product is evaluated for "conformance to specifications" by the supplier.

Level 3 PPAP is submitted in accordance with AIAG 4th edition PPAP requirements to CBXX upon request to level 3 within 5 working days, unless otherwise advised in writing by the CBXX Supplier Quality Engineer or Buyer.

All critical features must be reported in Ppk. Minimum requirement is 1.33 Cpk.

The AIAG 4th edition PPAP Warrant Form shall be used in conjunction with the Supplier PPAP Submission Checklist (FG 11-011). An exact facsimile is acceptable for those suppliers who would prefer to use a computer generated form.

Refer AIAG 4th edition PPAP Manual (TS 16949) for all other document requirements.

2.12.4 PPAP Requirements Raw Material Suppliers (only)

The AIAG 4th edition PPAP Warrant Form shall be used in conjunction with Raw material Certification.

2.12.5 PPAP General Requirements;

- Website References:
 - www.aiag.org [customer specific requirements, general information, training]
 - www.iaob.org [customer specific requirements]
 - www.gmsupplypower.com, click on “Quality” under Documents, select Supplier Training [GM training and information]
 - www.powerway.com [Chrysler PPAP data entry]
 - <https://web/gpr.ford.com/sta/> [Ford supplier portal]
 - www.gmw3059.com [GM IMDS global regional contact list, FAQs]
 - www.mdsystem.com [IMDS system information, substance list]
- IMDS reporting status is required and is on the warrant (refer section 2.15)
 - Design record includes IMDS and polymeric materials
- Polymeric materials are to be ID'd as specified in ISO 1149.
- Production Trial Run has to be at the contracted rate and must pass for PPAP approval
Minimum quantity is 300 parts
Minimum time period for study is four hours, unless otherwise approved by supplier development
- Marked prints, even if signed, cannot be used for PPAP unless there is an approval SCR or Deviation by CBXX
- Dimensional report requires a minimum of six samples to be measured and all individual results recorded (for multi cavity tooling only one sample per cavity).
 - Samples must be taken from Start, Middle and End of batch/lot run
 - If 1 or more samples fail to meet drawing or technical requirements, or capability is not achieved on critical characteristics, the supplier must correct the tooling/process prior to PPAP submission. If the process/tooling cannot be corrected by the PPAP submission date requested by CBXX purchasing, the supplier must request in writing for approval to submit for an Intrim Approval PPAP prior to submitting along with an action plan and timing chart to correct the process/tooling. Any PPAP that does not conform to the drawing or technical requirements which is submitted without written approval from CBXX Supplier Quality Engineer will be rejected.
 - Level of documentation is at the discretion of the CBXX Supplier Quality Engineer.
- **ANY** change to the process or part requires customer notification and approval
However, not all changes will require PPAP to the customer
ALL presses, lines, etc. to be used must be PPAPed.
ALL replacement multi cavity tools require PPAP with full dimensional layout of one piece per cavity

Eg. Production Part Approval Dimensional Results

Item	Dimensional /specification	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Pass	Fail
1	14.7-15.30mm	14.95	14.99	14.97	14.95	14.96	15.00	✓	
2	9.80-10.1mm	9.85	9.97	9.90	9.85	9.87	9.90	✓	
3	R5.0 max	4.7	4.7	4.78	4.7	4.7	4.7	✓	

For multi-cavity tooling, dimensional reports a minimum of one sample per cavity is measured and results recorded.

Item	Dimensional /specification	Cavity 1	Cavity 2	Cavity 3	Cavity 4	Cavity 5	Cavity 6	Pass	Fail
1	14.7-15.30mm	14.95	14.99	14.97	14.95	14.96	15.00	✓	
2	9.80-10.1mm	9.85	9.97	9.90	9.85	9.87	9.90	✓	
3	R5.0 max	4.7	4.7	4.78	4.7	4.7	4.7	✓	

2.12.6 Ferrous & Non-Ferrous Castings additional PPAP Requirements;

**Ferrous & Non-Ferrous Castings
PPAP, Pre-Launch & Recertification X-Ray Requirements**

Minimum Sample Size of Castings to be X-Rayed and Magnetic Partical / Liquid Penetrant Checks per Cavity			
Development Level	PPAP / PPAP Recertification	Pre-Launch (Per Batch/Lot)	Production (Per Batch Lot)
If any of the following criteria's have not been complied with, the supplier will perform inspection levels to an increased sample size; <ul style="list-style-type: none"> • APQP Development Phase V program not approved by Supplier Development • Outcome of trials and corrective actions not reviewed at APQP meetings • Capability trials not conducted prior to PPAP 	100	20 @ Start of Run 20 @ Middle of Run 20 @ End of Run	1 @ Start of Run 1 @ Middle of Run 1 @ End of Run
If all the following criteria's have been meet, the supplier will perform inspection to a reduced sample size; <ul style="list-style-type: none"> • APQP Development Phase V program approved by Supplier Development • Outcome of trials and corrective actions reviewed during APQP meetings • Capability trials all complied with Material Standards (MS) 	50	5 @ Start of Run 5 @ Middle of Run 5 @ End of Run	1 @ Start of Run 1 @ Middle of Run 1 @ End of Run

Preferred Method:

Real Time (Fluoroscope) - casting to be focused and viewed into all sections

Alternative Method:

Film - casting to be x-rayed in all planes/sections (multiple x-rays/cavity)

PPAP & PPAP Recertification:

- Results must be recorded on PPAP submission.

Eg

X-Rays	Cavity 1	Cavity 2	Cavity 3	Cavity 4	Cavity 5	Cavity 6	Pass	Fail
Sample Size	50	50	50	50	50	50	✓	

- Samples must be taken from Start, Middle and End of batch/lot run
- If 1 or more samples fail Material Standards (MS) compliance the supplier must correct runner system/gating
- If 1 or more samples fail Material Standards (MS) compliance and the supplier cannot improve the runner/gate in time for the PPAP submission date, the supplier must apply in writing for approval to must submit an interim PPAP along with an action plan to rectify the problem with a timing chart

Pre-Launch & On-Going Production;

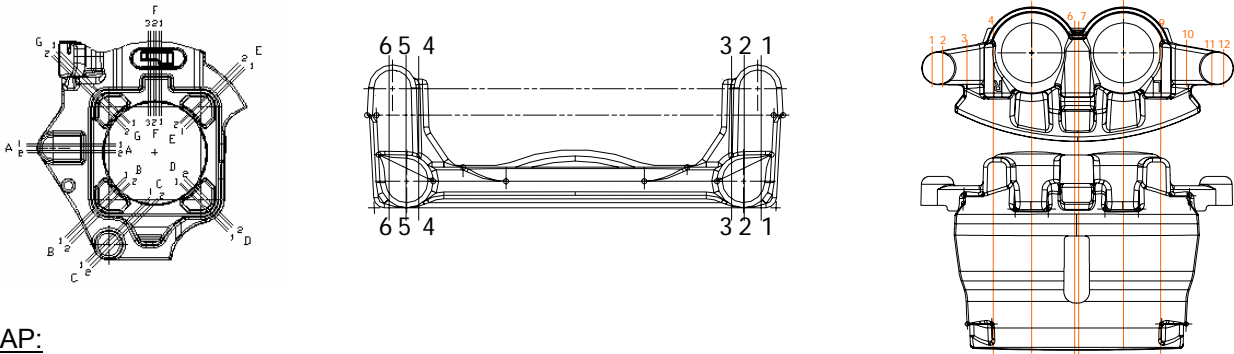
- Samples must be taken from Start, Middle and End of batch/lot run
- If 1 or more samples fail to comply, the supplier must contain and 100% sort the affected batch
 - If the supplier cannot contain the problem then the supplier must inform CBXX and submit an improvement plan to rectify root cause(s). No change is permissible after PPAP submission without CBXX approval
 - Supplier cannot exit pre-launch X-Ray requirement unless zero defect is achieved (refer 2.13)

Minimum Sample Size of Castings to be Sectioned per Cavity

Development Level	PPAP / PPAP Recertification	Pre-Launch (Per Batch/Lot)	Production (Per Batch Lot)
If any of the following criteria's have not been complied with, the supplier will perform inspection levels to an increased sample size; <ul style="list-style-type: none"> APQP Development Phase V program not approved by Supplier Development Outcome of trials and corrective actions not reviewed at APQP meetings Capability trials not conducted prior to PPAP 	10	X-Rayed Casting with Defect	Only on samples detected with defect on X-ray
If all the following criteria's have been meet, the supplier will perform inspection to a reduced sample size; <ul style="list-style-type: none"> APQP Development Phase V program approved by Supplier Development Outcome of trials and corrective actions reviewed during APQP meetings Capability trials all complied with Material Standards (MS)	5	X-Rayed Casting with Defect	Only on samples detected with defect on X-ray

Position of sectioning must be in critical areas (eg. machined areas, mounting boss surfaces / bores / holes, faces, etc) and areas deemed critical by the supplier where the casting would be subject to porosity (shrinkage, inclusions, gas) or sunk. Sectioning position to be agreed by CBXX during APQP and documented on PPAP.

Example



PPAP:

- Results must be recorded on PPAP submission. Eg. If production annual volume is 1,000,000

Sectioning of Castings	Cavity 1	Cavity 2	Cavity 3	Cavity 4	Cavity 5	Cavity 6	Pass	Fail
Sample Size	5	5	5	5	5	5	✓	

- Samples must be taken from Start, Middle and End of batch/lot run
- If 1 or more samples fail Material Standards (MS) compliance the supplier must correct runner system/gating
- If 1 or more samples fail Material Standards (MS) compliance and the supplier cannot improve the runner/gate in time for the PPAP submission date, the supplier must apply in writing for approval to must submit an interim PPAP along with an action plan to rectify the problem with a timing chart (This is not a preferred case)

Pre-Launch:

- Samples must be taken from Start, Middle and End of batch/lot run
- If 1 or more samples fail to comply, the supplier must contain and 100% sort the affected batch
 - If the supplier cannot contain the problem then the supplier must inform CBXX and submit an improvement plan to rectify root cause(s). No change is permissible after PPAP submission without CBXX approval

Supplier cannot exit pre-launch X-Ray requirement unless zero defect is achieved (refer 2.13)

Note: Where real time X-Ray equipment is rated ≥ 300 Kva with sensativity percentage better than or equal to the level specified in the table below, sectioning is only required on casting identified with internal defects.

Thickness of material	<6.35	6.35 to 9.51	9.51 to 12.7	12.7 to 19.1	19.1 to 25.4	25.4 to 38.1	38.1 to 50.8	50.8 to 63.5	63.5 to 101.6	101.6 to 152
Wire size that can be detected when placed under the material	0.2	0.25	0.33	0.41	0.51	0.64	0.81	1.02	1.27	1.60

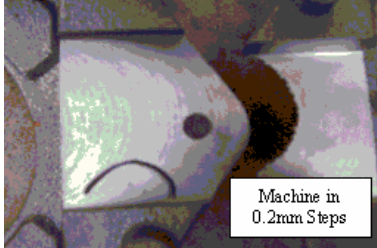
thickness section										
Sensitivity %	3	3.9 to 2.6	3.5 to 2.6	3.2 to 2.1	2.7 to 2.0	2.5 to 1.67	2.1 to .591	2.0 to 1.6	2.0 to 1.3	1.6 to 1.05

**Minimum Sample Size of Castings to be Proof Machined per Cavity
- Pistons, Rotor, Rear of Caliper Piston Pot, other product requested by Supplier Quality -**

Development Level	PPAP	Annual Recertification
If any of the following criteria's have not been complied with, the supplier will perform inspection levels to an increased sample size; <ul style="list-style-type: none"> APQP Development Phase V program not approved by Supplier Development Outcome of trials and corrective actions not reviewed at APQP meetings Capability trials not conducted prior to PPAP 	10	10
If all the following criteria's have been meet, the supplier will perform inspection to a reduced sample size; <ul style="list-style-type: none"> APQP Development Phase V program approved by Supplier Development Outcome of trials and corrective actions reviewed during APQP meetings Capability trials all complied with Material Standards (MS) 	3	3

Position of proof machining must be in critical areas (eg. machined areas, mounting boss surfaces / bores / holes, faces, etc) and areas deemed critical by the supplier where the casting would be subject to porosity (shrinkage, inclusions, gas) or sink. Proof machining will in the same position agreed with CBXX during APQP for sectioning of castings and documented on PPAP. Proof machining will be in 0.2 - 0.5mm increments in order to verify casting integrity. Samples chosen for proof machining will be selected from X-Rayed samples exhibiting signs of internal defect and samples taken at random.

Example



PPAP:

- Results must be recorded on PPAP submission. Eg. If production annual volume is 1,000,000

Proof Machining	Cavity 1	Cavity 2	Cavity 3	Cavity 4	Cavity 5	Cavity 6	Pass	Fail
Sample Size	3	3	3	3	3	3	✓	

- Samples must be taken from Start, Middle and End of batch/lot run
- If 1 or more samples fail Material Standards (MS) compliance the supplier must correct runner system/gating
- If 1 or more samples fail to comply, the supplier must contain and 100% sort the affected batch
 - If the supplier cannot contain the problem then the supplier must inform CBXX and submit an improvement plan to rectify root cause(s). No change is permissible after PPAP submission without CBXX approval
 - Supplier cannot exit pre-launch X-Ray requirement unless zero defect is achieved (refer 2.13)

The above sampling plans is mandatory which must be reported, any deviation from these requirements must be agreed in writing from CBXX Supplier Quality and Development manager.

Suppliers are not permitted to make any changes to gating position/size, hot/cold risers and/or runner system after PPAP approval. Any change must be requested in writing in line with section 2.9 Process Change requirements.

2.12.7 PPAP Documents and Master Sample Retention

2.12.7.1 Document Retention

Copies of complete PPAP documents package are retained by the Supplier for the life of the product (contract/service) plus one calendar year.

2.12.7.2 Master Sample Retention

Master samples are clearly identified and kept for the life of the product (contract/service) plus one calendar year. Master samples are approved by CBXX SD and are stored in a manner that preserves the original "Approved" condition. Any requests for deviation from this requirement are directed to CBXX Supplier Quality Engineer.

2.13 Pre-Launch Controls (Refer GM's GP-12 Procedure)

GP-12 Early Production Containment is in addition to the Pre-Launch Control Plan. The supplier must perform an additional off line inspection of critical characteristics, interface points and features agreed with the supplier development engineer as an enhancement to the supplier's production control plan which raises the confidence level to ensure that all products shipped will meet CBXX's requirements. The pre-launch control plan and GP-12 will also serve to validate the production control plan. The Pre-Launch Control Plan and GP-12 should take into consideration all known critical conditions of the part as well as potential areas of concern identified during PPAP and the program launch.

The purpose of GP-12 is to:

- Validate the supplier's production control plan
- Protect our assembly and manufacturing plants from quality non-conformances during critical periods
- Document the supplier's efforts to verify control of its processes during start-up, acceleration, after revisions to the manufacturing process, or when manufacturing runs are separated by 3 months or more
- Ensure that any quality issues that may arise are quickly identified, contained, and corrected at the supplier's location
- Increase involvement and visibility of supplier's top management

The supplier must submit the GP-12 checklist for approval prior to PPAP being signed off during APQP. The supplier shall submit a weekly report (or as agreed by Supplier Development) on number of parts inspected, actual rejects and a pareto chart along with an action plan to address open issues. GP-12 will be instigated at PPAP and remain in force for a minimum period of 3 months after SOP date. An exit meeting must be held with Supplier Development before a supplier can exit GP-12. The supplier must provide data to show that zero defect have been achieved for minimum period of 1 months full volume production. If a defect was found during the last month of the GP-12 period, the supplier will be required to extend GP-12 for an additional month until zero defect is achieved. CBXX will not approve any supplier to exit GP-12 unless it has shown that the process is robust and capable.

2.14 Run @ Rate

All suppliers must perform a Run @ Rate upon request. The default Run @ Rate procedure used for CBXX will be GM GP-9 unless otherwise advised. Where CBXX Customers request that suppliers perform Run @ Rate, the supplier shall use the customer's Run @ Rate format (GM GP-9, Chrysler, Ford, Etc.) which can be found on the CBXX web site www.pbr.com.au in the **Supply section** under **Supplier Development** in **Customer Requirements** or can be requested through your Supplier Development Engineer. Refer to your CBXX Supplier Quality Engineer who will advise you on which customer format to use. All suppliers must also ensure their sub-suppliers/suppliers also perform a Run @ Rate to the same procedure, and submit upon request.

Line/Equipment Type	Minimum Quantity	Preferred
Dedicated Line/Equipment <i>(where product will run daily)</i>	1 shift @ LCR, including model changeovers if applicable and at forecast model mix.	1 shift @ LCR, including model changeovers if applicable and at forecast model mix.
Shared Line/Equipment <i>(where product run daily)</i>	1 shift @ LCR, including model changeovers and at forecast model mix for all products planned for the facility	1 shift @ LCR, including model changeovers and at forecast model mix for all products planned for the facility
Shared Line/Equipment <i>(where product run less than daily)</i>	As a minimum run quantity use ½ of the Planned Run Quantity (PRQ) or batch size. Parts still to be run in the time planned or allocated, inclusive set up and tool changeover times model mix for all products planned for the facility.	Use the Planned Run Quantity (PRQ) or batch size. Parts still to be run in the same time planned or allocated, inclusive set up and tool changeover times model mix for all products planned for the facility.

2.15 Substances and Material Reporting

2.15.1 IMDS Material Reporting

To allow OEM vehicle manufactures to comply with the EU-directive on End-of-Life Vehicles (200/53/EC), requiring the reporting of substances of concern and recycled content information.

Suppliers are required to register IMDS for all components and reference it on the PPAP Warrant form submission on products or assemblies which are supplied to customers unless otherwise stated by CBXX.

CBXX is registered to the Material Data System database at www.mdssystem.com and require Suppliers to also register and input substances of concern and recycling content onto the IMDS database for all CBXX components prior to submission of PPAP.

Please note that there is legal liability the all components are registered on the Material Data System database system.

Training information is available at www.mdssystem.com

2.15.2 Material Safety Data Sheet (MSDS)

MSDS are used internationally to provide the information required to allow the safe handling of substances used at work. MSDS assist employers to demonstrate their general duty of care to employees by providing them with information on the hazardous substances that they are working with and the hazards associated with those substances. The MSDS provides information on:

- (a) Identification:
 - (i) Product name,
 - (ii) Physical description and properties,
 - (iii) Uses, and
 - (iv) Composition;
- (b) Health hazard information;
- (c) Precautions for use; and
- (d) Safe handling information.

Suppliers are required to submit Material Safety Data Sheet on hazardous materials with PPAP and/or upon request by CBXX. The supplier is also required to immediately provide an updated Material Safety Data Sheet to the buyer if the information is updated or product(s) covered are changed.

2.16 Ongoing Process and Product Monitoring

The table below is to be used to decide disposition on product produced by a process for which SPC is in use. After process stability has been demonstrated and capability has been calculated, the most recent point on the control chart and the historical process capability index (Cpk) are used to determine appropriate actions.

**Actions on the Process Output
Based on the Historical Process Capability (Cpk)**

The most recent point Indicates that the Process	Less than 1.33	1.33-1.67	Greater than 1.67
Is in control	100% inspect.	Accept product.	Accept product
Has gone out of control in an adverse direction. All individuals in the sample are within specification.	100% inspect	100% inspect since the last in control point	Accept product. Continue to reduce Process variation
Has gone out of control and one or more individuals in the sample are outside specification	100% inspect	100% inspect product produced since the last "In Control" sample	100% inspect product produced since the last "In Control" Sample.

When data from control charts indicate a high degree of capability (2.0 Cpk or greater), the supplier may request a revision to the testing and inspection requirements for control item features after Pre-Launch (GP-12) has been lifted. Such revisions are effected by obtaining CBXX Supplier Quality Engineer, which is communicated in writing. Approval is obtained prior to implementing the change. The same approach is used to replace finished product inspection/testing with upstream controls.

Where CBXX Supplier Quality Engineer has agreed in writing to remove SPC on Control Characteristics 2.0 Cpk or greater and stability has been proven the supplier shall perform (and provide evidence upon request) statistical evaluation/analysis quarterly to verify stability and capability is still maintained at 2.0 Cpk or greater. If is not stable and capability drops below 2.0 Cpk the supplier shall reintroduce SPC.

SPC charts all control characteristics (including quarterly statistical analysis features 2.0 Cpk or greater) must be submitted to CBXX upon request and during PPAP recertification.

2.17 Machinery, Equipment and Tooling (including gauges, fixtures/sub-contractors) Preventative Maintenance

Machinery, Equipment and Tooling Capacity must allow for up to 30% increase on the quoted volume (this consists of 15% for MCR and an additional 15% for Spare Parts sales).

The Supplier must insure all CBXX Tooling with full fire and comprehensive extended coverage Insurance for full replacement value to the extent that such insurance is not otherwise maintained in accordance with this agreement.

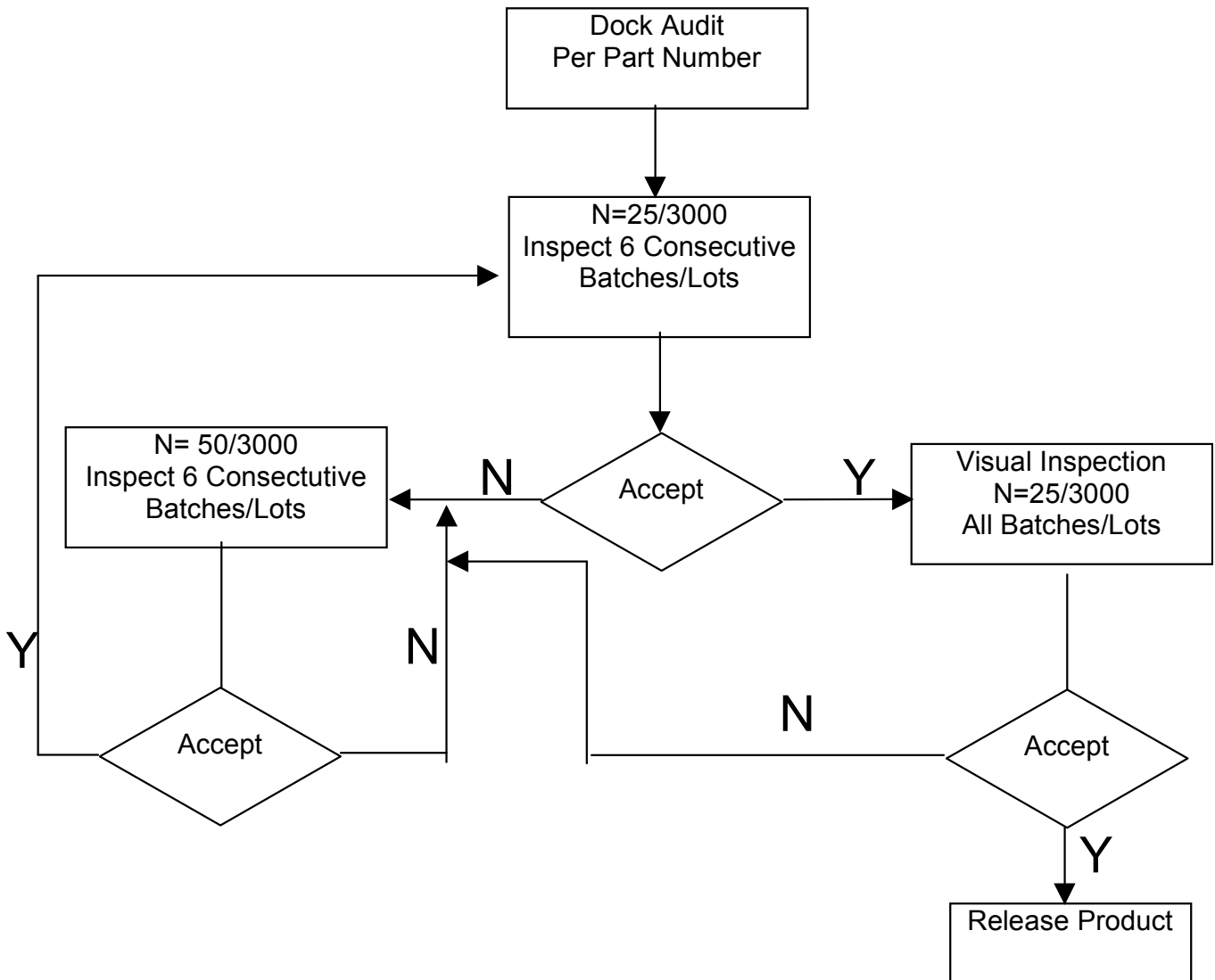
Unless otherwise agreed by the Buyer, the Supplier, at its expense, shall furnish, keep in good condition, and replace when necessary all machinery, equipment, tooling, jigs, dies, gauges, fixtures, moulds, patterns and other items necessary for the production of materials, components and assemblies. The cost of changes to tooling, dies, patterns or moulds necessary to make design and specification changes requested by the Buyer shall be paid for by the Buyer.

No Payment of tooling will be made unless the PPAP and Run @ Rate has been Approved by the CBXX Supplier Quality Engineer. The tooling will be paid over two payments (unless otherwise agreed by the Buyer).

- 70% on full PPAP approval
- Balance on full Run @ Rate approval

2.18 Dock Audits

Supplier dock audits are performed on selected batches/lots prior to release. Each batch/lot is inspected prior to despatch for critical and significant characteristics, contamination, correct identification and packaging. The following switching rule are to apply unless otherwise approve by CBXX Supplier Quality Engineer in writing.



Note: Any batches/Lots rejected are 100% inspected and breakpointed prior to release.

2.19 Breakpoint

Suppliers are required to advise of "Breakpoint Notice" via electronic mailing system (e-mail) and labelling of each container shipped into CBXX.

"Electronic Breakpoint Notice" form FG 11-012 or an exact facsimile must be used to notify your CBXX Supplier Quality Engineer, Expeditor, Plant Quality, Inward Goods and Manufacturing key personal via e-mail of each breakpoint prior to shipment. All details described on the "Electronic Breakpoint Notice" form FG11-012 must be completed by the supplier.

CBXX will maintain a Breakpoint Distribution List at www.pbr.com.au in the Supplier Development section of Supply for each CBXX plant location(s).

It is the supplier responsibility to ensure the "Electronic Breakpoint Notice" has been transmitted successfully. In cases where the electronic e-mail transmission fails, a hard copy must be faxed to your Supplier Development Engineer and followed up with verbal communication.

Listed below are the responsibilities of Suppliers with reference to the identification of sorted and/or reworked product, new or modified components, raw material, sub-assemblies, assemblies, tooling, processes or parts approved under concession/deviation or PPAP Interim approval into CBXX.

- 2.19.1 Advance notice is given in writing to the CBXX Supplier Quality Engineer, Expeditor, Plant Quality, Inward Goods and Manufacturing key personal prior to the dispatch of break point parts to CBXX.
- 2.19.2 The break point label is placed on every individual container of parts within a delivery lot. The label is clearly marked with the name of the appropriate CBXX Supplier Quality Engineer. Returnable containers (eg. soccobel / crinkle cut / cevol / 590 bins etc...) have breakpoint labels tied on. Any labels that are glued on are removed at the supplier's
- 2.19.3 When applicable, the CBXX Warrant, Concession/Deviation or SCAR number is to be recorded on every break point label in the space provided.
- 2.19.4 First weeks delivery lot of production components to exhibit breakpoint labels for new or modified components / raw material / sub assemblies / assemblies / tooling / processes.
- 2.19.5 All delivery lots of production components to exhibit breakpoint labels for product under 100% sorted and/or reworked under normal containment or Containment Levels I or II.
- 2.19.6 The break point label design is as per industry or customer directed standard.
- 2.19.7 Break point labels must be highly visible.
- 2.19.8 Breakpoint labels detail must include;
 - Supplier Name
 - CBXX Part number
 - Part Description
 - Drawing Issue Number
 - Batch/Lot/Date Code Number(s)
 - Reason for breakpoint (Full description in simple clear English)
 - Where applicable, reference the Deviation/Concession, Quality Concern No. or PPAP Warrant number

2.20 Boundary Samples

Boundary samples are only accepted in extreme and special conditions where all other attempts to achieve the desired output have been exhausted. Boundary samples are approved by CBXX Supplier Quality Engineer in conjunction with the Supplier and tagged appropriately.

2.21 Managing Supply Chain

Suppliers are expected to ensure that quality and capacity requirements of components and materials, purchased from their suppliers and subcontractors are maintained through a rigorous supplier selection process and on-going monitoring. For more information, reference Sections 7.4.1.2 and 7.4.3.1 of the TS16949 manual.

CBXX reserves the right to audit all sub suppliers and sub contractors.

2.22 Packaging and Labelling/Barcoding

2.22.1 Packaging

All packaging is approved by the CBXX Materials representative at contract stage. It is the suppliers responsibility to ensure only product in adequate packaging is despatched to CBXX.

2.22.2 Labelling/Barcoding

Suppliers should apply a bar code label to each container unless otherwise agreed to by CBXX. The bar code label should be Code 3 of 9 format and the following fields should be bar coded:

- Supplier Name
- CBXX Part Number
- Date of Manufacture
- Part Description
- Traceability (Eg. Date Code \ Date of Manufacture \ Work Order \ Batch Number \ Lot Number \ Reference Number)
- Supplier Part Serial Number and ID (optional)
- Total Quantity

The following items should be on the label but do not have to be bar coded:

- Supplier Name
- Date of Manufacture

There is no specification for label size, only that the bar code is has the ability to be scanned successfully when it reaches our dock. This will require that the labels are a thermal transfer or dot matrix generated bar code which will be water, humidity, solvent and ultraviolet resistant. For pallet loads the font of the part number should be large enough to be read from 8 feet/2.5 metres away.

Any containers (e.g. soccobel / crinkle cut / cevol / 590 bins etc...) with more that one product identification label and/or breakpoint label will be rejected. Any containers with old labels will also be rejected. The supplier must ensure that the PFMEA, Control Plans and Final Product Inspection Audits incorporates these requirements.

2.22.3 Supplier Engineering Samples

The supplier is required to use a Supplier Engineering Sample label in order to identify and contain controlled shipments between the Supplier's plant and CBXX. The Supplier Engineering Sample label must be affixed onto all containers and attention to the originator for the following situation;

- Prototype Product
- Process Improvement Trials
- PPAP Approved Samples
- Samples Prior to PPAP Approval
- Special Batch: _____

This Package Contains
ENGINEERING SAMPLES
DELIVER TO
CBAB / CBTA Plant
Company Address

Attention: _____ Department: _____
(Name of Person Who Placed The Order)

Product Build: _____

Program Name: _____

Prototype Product
 PPAP Samples Prior To PPAP Approval
 PPAP Approved Samples
 Process Improvement Trial
 Special Batch: (details)

Documentation Enclosed Yes No

Supplier/ Plant: _____
Contract Name: _____ Part Number : _____
Issue No : _____ Part Name: _____
Order No: _____ RFP No : _____
Invoice No: _____ Batch/ Lot No : _____
Quantity : _____

DO NOT USE FOR PRODUCTION

FG 11-014 Issue 2

Colour of label – Fluorescent Orange

Contact Prototype Manager or Purchasing to order labels. It is the supplier's responsibility to control stock level of labels.

2.23 Continuous Improvement

Suppliers must have a philosophy of total quality commitment, with subsequent planning and actions that drive for perfection (perfect planning, perfect execution, perfect communications and perfect parts). This is demonstrated through consistent delivery of quality products to CBXX and our customers. Our suppliers are expected to have Zero Incidents, Zero Disruptions, and Zero Unplanned Downtime, provide product with Zero Defects, Flawless Delivery Performance and On Time Responsiveness to quality issues. This commitment starts with top leadership and is driven through all levels and aspects of their operations.

In direct support of CBXX's commitment to excellence and desire to exceed our customer's expectations in Quality, Delivery & Price, it is a requirement that all suppliers implement and maintain a three year strategic plan on Continuous Improvement in all areas of processes and operations to meet the above requirements and be made available by November of each year. CBXX Supplier Development Engineer will supplier's progress against these plans.

The strategic plan must include a yearly "Protect the Customer" and "VA/VE" program. The program will consist of;

- First Time Quality tracking methods, with appropriate alarms and actions defined. This data should be utilised to continue to drive continuous improvement in the supplier's processes and operations.
- Review Customer Interface Points for adequate mistake proofing measures and/or controls. Contact your CBXX Supplier Quality Engineer to determine the Customer Interface Points.
- Process FMEA review:
 - Walk the process and review all potential failure modes, mistake proof measures and/or controls in place for adequacy
 - Review the adequacy of the FMEA (does it cover all steps of the operations/processes?)
 - Review historical concerns on component and family groups to ensure potential failure modes and control measures are included
 - Pareto analysis is required on all RPN values. Review and reduce the top RPN values based on an 80% / 20% principle via process improvement and/or mistake proofing measures. Suppliers should target an RPN value of ≤ 60 .
- Review all critical features (∇) for process capability and stability and target ≥ 1.67 CpK
- 100% attribute gauging to be fully mistake proofed to prevent operator error and placement of non-conforming product into gauged stillage/container/pack.
- All suppliers are encouraged to run VA/VE sessions jointly with your CBXX Supplier Quality Engineer to identify process improvements and/or design changes to improve the quality of the product(s) and reduce the current piece price cost structure to support ongoing annual productivity requirements and pass on additional savings in order to remain and/or work towards being globally competitive.

Suppliers must also ensure their key sub-suppliers implement similar plans to ensure the total supply chain is protected and remains globally competitive. Suppliers are expected to ensure the quality, capacity and pricing of materials and components coming from their sub-suppliers, through supplier selection, on-going monitoring and development meet the above requirements.

2.24 Corrective Action

When a supplier quality concern is identified, they are required to immediately place their operations into containment to protect CBXX and its customers from receiving any defective material. Suppliers

may be requested to instigate containment measures within CBXX's premises or at a specified location until breakpoint shipment of certified product is received. If the supplier cannot supply immediate labour when there is a line stoppage, CBXX will instigate containment using CBXX and/or contract labour which will be charged back to the supplier (refer section 4.1).

Containment level I (C1) and II (C2) will be enforced by Plant Quality or CBXX Supplier Quality Engineer when a Supplier's process is deemed to be out of control or labour cannot be provided by the supplier (refer 2.24.2).

Problem solving techniques are an essential requirement in addressing and reporting quality concerns. Suppliers are required to use SP12-001 concern resolution workbook unless otherwise approved in writing by CBXX Plant Quality Manager or CBXX Supplier Quality Engineer.

2.24.1 Issuance of a Supplier Corrective Action Request

2.24.1.1 A Quality Concern report is issued for each non conformance that has been verified as a supplier fault. If additional suspect material/product are found prior to the closure of the original Quality Concern report, which can be traced back to this original concern, a new Quality Concern report is not be issued. The quantity stated on the original Quality Concern report is adjusted to reflect the additional quantity suspect and containment level. If, however, the previous Quality Concern report has been closed off as permanent corrective action implemented and verified then a new Quality Concern report is issued.

The Quality Concern will be logged into the CBXX Global Quality database and tracked via the "Quality Concern Number".

2.24.1.2 Issue a Quality Concern report for verified non conformance from one of the following categories:

- a) Quality: Current Production (Impacts PPM)
 - Run @ rate (Impacts PPM)
 - Pilot (PPAP Approved) (Impacts PPM)
 - Pre pilot
- b) Special 'Quality Spill'
- c) Packaging
- d) Late delivery of prototype

2.24.1.3 Issue a Quality Concern report if:

- a) Material/product does not meet design specification.
- b) Material/product is incorrectly identified (i.e. mixed stock, incorrect label, etc.).
- c) Material/product is contaminated (i.e. rust, swarf, etc.).

If an incident is considered to be a minor issue by the Plant Quality Manager/Nominee, the Quality Concern Report will be downgraded as an "Incident Report Only" for tracking purposes/ information with no action required. However, if this minor issue is raised again after the supplier was notified, a Quality Concern report will be issued for follow up of corrective actions.

2.24.1.4 Issue a Quality Concern Report if Packaging:

- a) Material/product is improperly secured in container.
- b) Container is improperly secured in carrier vehicle.
- c) Container has been improperly handled.
- d) Identification is missing / incorrect
- e) Material/product/container is contaminated.
- f) There is a discrepancy in the number of pieces shipped verses label.

2.24.1.5 Issue a 'Quality Spill' – Containment Level I (C1) or Containment Level II (C2) if the following circumstances exist:

- a) A verified 'quality' problem has been identified AND
- b) It fits the definition of a 'quality spill' which is a major special cause product deficiency that requires CBXX to:
 - stop shipment, production or scheduling of its products,
 - requires the correction of product already built at CBXX or the customer,
 - or the supplier has failed to contain an existing quality issue still open.

If a quality concern is considered to be a major issue by the Plant Quality Manager/ Nominee, the Quality Concern report will be upgraded to a Quality Spill "C1 or C2". Downtime and Non standard Production costs incurred as a result of the Spill are documented on a Cost Recovery Notice (CR) refer section 4.1 and borne by the supplier

If a supplier sends an employee or contract labour to sort suspect product at a CBXX plant, they must first ensure the labour rate of the employee or contractor labour is paid at CBXX's minimum award rate while they are working at CBXX to prevent union disputes.

Any contract labour arranged by CBXX will incur in-direct labour fees associated with the concern. CBXX labour rate will incur over head cost recovery.

2.24.2 Containments Level I (C1) and II (C2)

C1 or C2 containment is a mandatory requirement when enforced by CBXX for a supplier who has shipped non conforming material/product resulting from an out-of-control process. Tightened inspection controls are put in place after normal inspection has failed to control the process or at the discretion of the Plant Quality Manager/Supplier Development pending the severity of the quality concern at hand. The tightened inspection controls are in addition to normal process controls at the suppliers' location. The data collated from the tightened inspection process is critical as both a measure of the effectiveness of the secondary inspection process and the corrective actions taken to eliminate the initial non conformance. C1 or C2 becomes part of the corrective action process at the supplier.

C1 containment is defined as a tightened inspection control process established by the supplier at the supplier's location.

- a) C1 is an additional 100% inspection to normal containment previously implemented by the supplier
- b) Where destructive methods are employed to inspect product, frequency and sample size will be increased and approved by CBXX Plant / Quality Supplier Development
- c) C1 containment must be conducted by independent people
- d) C1 containment must be conducted in an alternative location away from normal production
- e) Supplier shall submit data collated to verify the effectiveness of containment

C2 containment is the same activity but carried out by an impartial third party approved by CBXX and all costs paid by the supplier. In special cases, the C2 activity may be required to be performed outside the supplier's facilities at the third party's location or at the facility deemed appropriate by CBXX.

- a) C2 is an additional 100% inspection to normal and / or C1 containment previously implemented by the supplier
- b) Where destructive methods are employed to inspect product, frequency and sample size will be increased and approved by CBXX Plant Quality / CBXX Supplier Quality Engineer.

The key points of this process:

- Determination by CBXX management that current controls by the supplier are not sufficient to insulate CBXX from the receipt of non conforming material/product
- CBXX will determine the level of containment required.
- Communication to the supplier of implementing action (C1 or C2) will be identified on the Quality Concern report.
- If C1, an entry meeting with supplier management may be required providing full explanation of the containment process to be implemented and the roles and responsibilities of the involved parties.
- If C2, a detailed definition of an effective containment area is required if the process is to be performed at the supplier's location.
- A joint review of the corrective action plan and approval by CBXX is essential regardless of which Containment Level Process is involved.
- The supplier must collate data from C1 and or C2 in order to measure the effectiveness of the containment.

2.24.3 Suppliers Responsibilities:

The supplier is directly responsible for subcontracted parts/ materials, as well as those products at their own facility. The supplier immediately notifies CBXX of a suspect or nonconformance which has been shipped. It is to the supplier's advantage to be proactive in this regard.

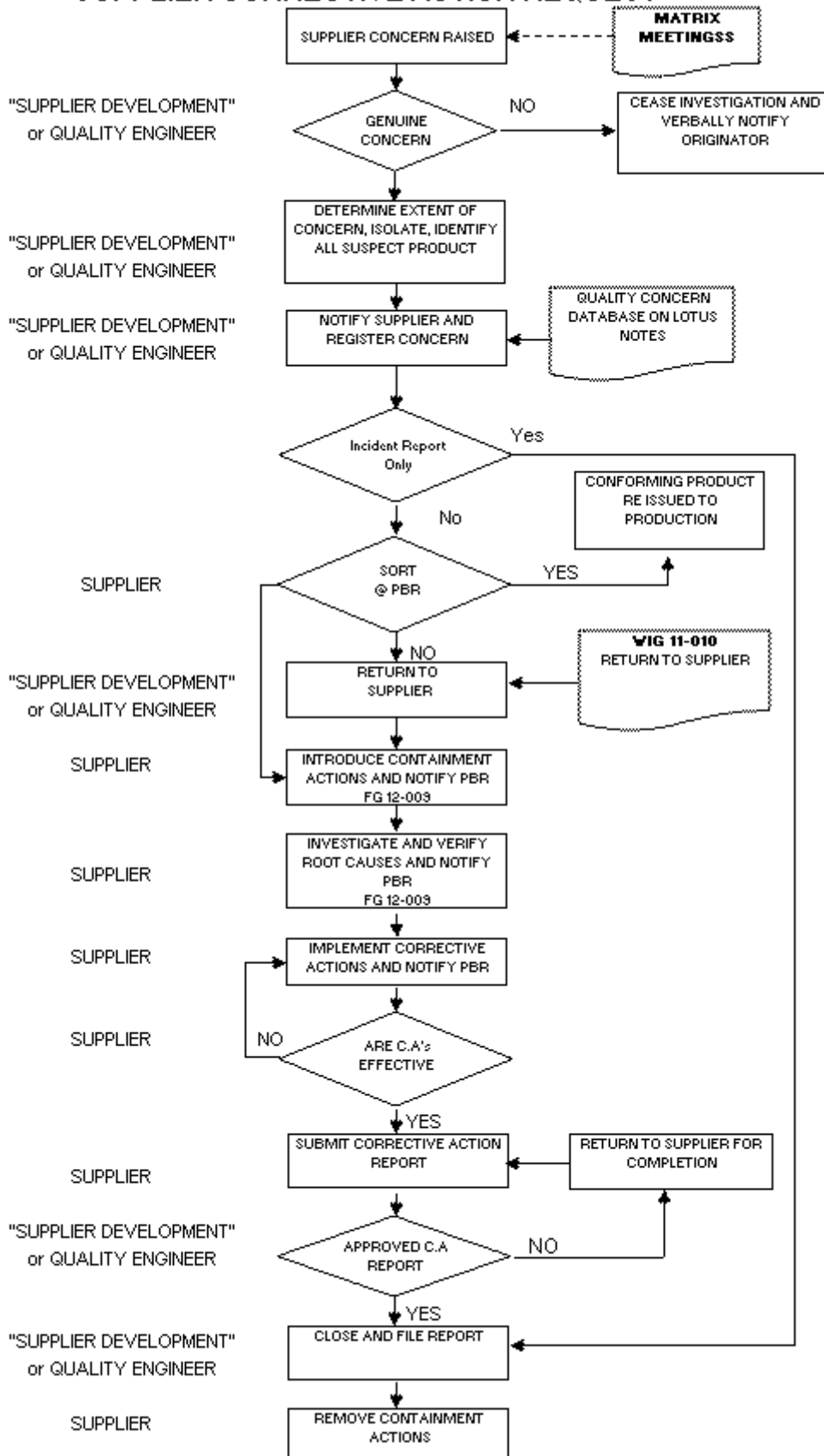
Upon receipt or notification of a Quality Concern report.

2.24.3.1 Initial response is provided in writing within 24 hours .The response will be in the 8D format (ref SP 12-001). The suppliers initial response include the following:

- a) Short term containment actions which will be taken by the supplier to prevent further shipments of nonconforming parts / materials and ensuring no disruption to CBXX production.
- b) Disposition of the nonconforming part and materials at CBXX.
- c) Problem description "Is / Is Not Statement", Quality Alert (FG 12-007), Containment method and Verification of containment must be supplied in 3D report within 24 hours (attach any SOP or Work Instruction on method of inspection).
- d) Name, title and phone number of suppliers representative who provided the above information.
- e) Breakpoint date of next conforming shipment resulting from immediate containment / corrective action.

- 2.24.3.2 A final response is forwarded in writing within 14 calendar days of issuing a Quality Concern report. The response must include the following:
- a) Systematic Problem Solving Report (ref SP 12-001) outlining the Root Cause of the problem specifying the process failure(s) that caused the nonconformance (if undetermined, the status of the analysis is specified). Suppliers are required to determine and address the cause for Detection and Systemic failures in the root cause analysis.
 - b) Process corrective action plan including a statement indicating that the Process Control Plan and Process Failure Modes and Effect Analysis (FMEA) for the part / material has been updated to reflect the required changes.
 - c) The effective date of the changes must be noted. If corrective action cannot be implemented within 14 calendar days see 2.24.3.4
- 2.24.3.3 If the final response is rejected by CBXX, a new response is submitted.
- 2.24.3.4 If the root cause analysis indicates that the process failure(s) cannot be determined within 14 calendar days or that the permanent corrective action(s) required to prevent recurrence of the problem will take longer than 14 calendar days to implement, then the Quality Concern report is left at open status and the following information is supplied:
- a) Systematic Problem Solving report outlining the Root cause of the problem specifying the process failure(s) that caused the non conformance (if undetermined, it specifies the status of analysis).
 - b) Process control plans updated making the containment actions part of the standard production procedure until final corrective actions is implemented.
 - b) Proposed process corrective action plan including a statement indicating that the process Control Plan and Process Failure Modes and Effects Analysis (FMEA) for the part / material will be updated to reflect the required changes.
 - d) Reason for delaying implementation of the corrective action beyond 14 calendar days
 - e) Name, title and phone number of suppliers representative responsible for overseeing the implementation of corrective action.
 - f) The projected date for implementation of the process corrective action. Subsequent extensions of the date are requested through CBXX Purchasing.
 - g) Once corrective action has been identified and implemented the supplier maintains containment for a minimum period of one month volume production to verify the adequacy of corrective actions taken to prevent recurrence.
 - h) After completion of the process corrective action the Supplier responds as per final response. Refer section 2.24.3.2
- 2.24.3.5 If the response is rejected by CBXX, then the supplier submits a new response.
- 2.24.3.6 If the Supplier believes a Quality Concern report was issued in error they must notify Supplier Development to review the quality issue. If the Quality contact their CBXX Supplier Quality Engineer and if they agree that the Quality Concern report was raised in error then the Quality Concern report will be cancelled. Any costs associated with second or third part containment arranged by CBXX will be paid by CBXX. Any cost associated the supplier's first party or third party containment arranged by the supplier will be paid by the supplier.

SUPPLIER CORRECTIVE ACTION REQUEST



2.25 Record Retention

Documents are maintained for 15 years and are retrievable within 24 hours.

2.26 Quality Audits

The following audits maybe performed by CBXX SD.

- Parts / Process Audit
- Quality System Audit to ISO 9001-2000, ISO/TS 16949, QS9000, WIG 11-001
- Audit of Suppliers

If the results of an audit conducted by CBXX Supplier Quality Engineer are unsatisfactory, the Supplier forwards an improvement plan to the CBXX SD within 5 working days. Generally, CBXX recognizes the 3rd party audits performed to maintain ISO/TS 16949, QS9000 accreditation.

2.27 Customer Performance Ratings of Suppliers

Quality ratings are utilized by CBXX to maintain and improve the supply performance and Quality of the scheduled part(s) and to provide a reliable, fair and consistent source of information by which Suppliers are rated equally. These ratings (refer Monthly Supplier Performance Rating WIG 11-005) are an aid for CBXX management to determine the future potential of the suppliers as an ongoing source.

Supplier's on Down Rated or New Business Hold status shall develop and submit action plans within 2 weeks of notification (via MSPR report) to CBXX Supplier Quality Engineer and Buyer along with a timing chart on an agreed frequency until such time as the supplier as obtained a minimum Approved status. All action will be reviewed via the SQIM review meeting unless otherwise agreed by the Supplier Quality and Development / Purchasing Managers.

3. PRODUCT ENGINEERING CAPABILITY

A supplier may be selected to take responsibility for all or part of the product design and development process. To be eligible for full design responsibility a supplier will be required to meet the following requirements. A reduced level of responsibility may be agreed to if only part of the requirements can be met.

3.1 Product Design and Development Process - General

The supplier shall demonstrate that its design and development process

- is fully documented
- is driven by customer requirements
- is consistent with the AIAG APQP methodology
- covers all phases from prototype to production support
- is subject to effective continuous improvement including appropriate metrics.

3.2 Project Management

The supplier shall demonstrate its use of an effective method of product engineering resource and time management.

3.3 Requirements Management

The supplier shall demonstrate its use of an effective process for managing product requirements including customer, internal and regulatory requirements.

3.4 Engineering Change Control Process

The supplier shall demonstrate its use of an effective process for managing requests for engineering changes from the initial request through to the implementation of the change.

3.5 Product Engineering Approval of Manufacturing Processes

The supplier shall demonstrate the effective participation of Product Engineering in the approval of manufacturing processes and changes to those processes.

3.6 Design Standards

The supplier shall demonstrate an effective method of appropriately standardising the design elements of its product(s).

3.7 Design Records – Drawings, specifications, etc.

The supplier shall demonstrate its use of an effective process for controlling and managing the receipt, release, despatch, storage, accessibility and changing of design records (math data, drawings, specifications etc). The supplier shall preferably be able to directly interchange 2D or 3D math data with CBXX in native Pro/E format.

3.8 Design FMEA

The supplier shall demonstrate its effective use of DFMEA as an integral part of the design and development process including an appropriate review process.

3.9 Training

The supplier shall demonstrate its use of a comprehensive process to ensure that all product engineering personnel are appropriately trained for their respective positions and duties.

3.10 Problem Solving / Concern Resolution

The supplier shall demonstrate its use of a robust, disciplined approach to resolving concerns.

3.11 Robust Test Process

The supplier shall demonstrate its use of a robust process for testing its product which ensures that

- the appropriate parts are tested to the correct procedures in the required time
- the test outcomes are appropriately evaluated against the specified requirements
- the test outcomes are fully reported in a timely manner
- test failures or non-conformances are appropriately managed
- tested parts are stored for an appropriate period.

3.12 Test Equipment

The supplier shall demonstrate the availability of suitable test facilities for all its verification and validation test requirements. This includes aspects of capacity, manning resources, accuracy, repeatability, reliability, etc.

3.13 Prototypes

The supplier shall demonstrate its use of a robust process to manage the production and supply of prototype product, to specification and on time, for its internal or customer use.

3.14 Manufacturing Process Support

If Product Engineering is required to provide support services to other departments (e.g. metallurgy services, chemical analysis, periodic process validation etc), the supplier shall demonstrate its use of an effective process for managing the provision of these services.

3.15 Field Returns

The supplier shall demonstrate its use of a process for receiving and evaluating parts returned as warranty claims or field concerns. The process shall include the reporting requirements and how the outcome of the evaluation is used.

3.16 Benchmarking

The supplier shall demonstrate its use of a process for utilising benchmarking as an integral part of the design and development process.

3.17 VAVE

The supplier shall demonstrate its use of a process for utilising VAVE as an integral part of the design and development process.

3.18 Safety

The supplier shall demonstrate its use of a process for ensuring workplace safety in all product engineering areas.

3.19 Environment

The supplier shall demonstrate that its design and development process recognises and satisfies the requirements for material recycling and control of restricted substances in its products.

3.20 Confidentiality

The supplier shall demonstrate its use of an effective method of maintaining the confidentiality of direct and indirect customer information.

4. COMMERCIAL REQUIREMENTS

4.1 Cost Recovery

When material/product provided by the Supplier does not meet specification, all costs in connection with the material/product being out of specification are the responsibility of the supplier.

In the case of all other matters or concerns in relation to material/product provided by the Supplier, the matter is determined by agreement between the parties.

When material/ product provided by the Supplier is delivered late to schedule and results in down time at CBXX, all costs in connections with this down time are the responsibility of the Supplier.

- Ref: WIG 11-009 Cost Recovery.

4.2 Supplier Warranty

4.2.1 Components and Assemblies

General

CBXX has specified drawings, standards, test procedures, performance requirements and acceptance criteria requirements for all CBXX products. These documents define performance based upon known conditions as defined by the vehicle manufacturer, CBXX and Supplier (where design responsible).

Friction Specification and Corner Assemblies

CBXX has specified and provided dynamometer test procedures for each of the lining performance and NVH characteristics, as well as defined the design level of the corner components interfacing with the friction material. These documents define performance based upon known conditions as defined by the vehicle manufacturer, CBXX and Supplier (where design responsible).

4.2.2 In the unfortunate event of a product field failure, if it is conclusively determined which individual system component caused the degradation in the system performance, then the supplier of that component will be responsible for all warranty costs if that component was faulty or the supplier had design responsibility for it. If it cannot be determined conclusively which individual component caused the degradation of the system performance, but the degradation was attributable to or interaction of a number of components within the total system, then costs borne by CBXX will be shared by the suppliers of those components in accordance with the Supplier Share Ratio Guide (Appendix A) and negotiated agreement stipulated on the Supplier Share Ratio Agreement (Appendix B) on a case by case basis. Note that the nature of CBXX's Customers' warranty system means that some of these warranty costs may be incurred by CBXX even in the event when the root cause of the problem cannot be clearly established by the Customer, CBXX and the Suppliers

4.2.3 The Supplier Share Ratio Agreement (Appendix B) will be calculated and mutually agreed upon between the Supplier and CBXX at least every six - nine month period (or as specified by the Customer) based on warranty information and return parts analysis results.

4.2.4 The Shared Ratio Agreement will be determined based on the following methods;

Domestic: Warranty parts recovery is based on "eligible parts return method" comprising all current model parts (in general 100% of parts are returned).

Export: Warranty parts recovery is based on the "random sampling method". If required, the customer will collect enough warranty return parts to estimate overall field warranty condition. Due to cost and logistics concern, Suppliers are expected to use local parts to analyse claims for similar complaints.

It would be ideal to collect all warranty parts from the field, but it is not practical to do so for export product, thus, the warranty share ratio will be investigated by analysing a random sample of returned parts collected through the Customer's warranty parts return system or through analysis of equivalent domestic parts. Based on these results, the warranty liability will be determined. If more parts are required for further evaluation, this will be requested at the supplier's cost.

4.2.5 Definition of Costs

Costs typically associated with warranty claims include but are not limited to Parts Labour Customer's Costs, dealer handling charges to rectify customer's concerns on vehicle brake system performance

4.2.6 The Supplier will provide statistically valid data which demonstrates that the supplier of subject component(s), for this application will support the achievement of CBXX and the vehicle manufacturers warranty and customer satisfaction targets.

It is anticipated that this data will be drawn from field applications where the vehicle/chassis configurations closely resemble that of the vehicle in products, or from field results (up to agreed vehicle volumes) from similar vehicle applications.

4.3 Insurance

4.3.1 Product Liability Insurance (USA Only)

The supplier must take out and keep current policies of Product Liability Insurance to the minimum value of US\$10 Million for any single occurrence and provide CBXX with a certificate of insurance setting out the minimum value, the policy number and the date of expiration of each such policy. The Supplier must cause and require that its insurer provide a 30 day notice of cancellation to CBXX and or immediately notify CBXX in writing if any policy of insurance required under this clause lapses or is cancelled.

4.3.2 Product Liability, Product Guarantee, Financial Loss & Product Recall Insurance (Australia / Asia Only)

The supplier must take out and keep current policies of Product Liability, Product Guarantee, Financial Loss & Product Recall Insurance to the minimum value of US\$10 Million (US\$5 Million for low volume contracts and/or as agreed by the CBXX Buyer) for any single occurrence and provide CBXX with a certificate of currency of insurance setting out the minimum value, the policy number and the date of expiration of each such policy. The Supplier must cause and require that its insurer immediately notify CBXX in writing if any policy of insurance required under this clause lapses, or is cancelled.

4.4 Premium Freight

If the Supplier's acts or omissions result in Supplier's failure to meet CBXX's delivery requirements and CBXX requires more expeditious method of transportation for goods than the transportation method originally specified by the Buyer, the Supplier shall ship the goods as expeditiously as possible at the supplier's sole expense.

4.5 Pricing/Payments

Suppliers will be expected to be globally competitive, which will be benchmarked by CBXX Buyers. Suppliers are expected to globally benchmark their suppliers and sub-contractors annually to ensure components and materials are purchased at a competitive price.

Suppliers are expected to have a continuous cost reduction improvement process in order to manage their costs. With this in place, it is expected that no increases will be passed on to CBXX. In addition, suppliers are expected to work with CBXX buyers towards annual price reduction, via long term and life of contract agreements.

Suppliers are expected to actively participate and lead in Lean Thinking and/or VAVE programs with CBXX. When required, CBXX can provide assistance in cost reduction issues, through various workshops.

Suppliers who provide prototype/pre-production components and/or materials are expected to provide those at nominal production prices.

Suppliers agree to provide service parts (P&A) at production pricing during the life of the program and for at least 3 years after the OE supply ceases.

Suppliers agree to provide production parts to support this program for a minimum of 10 years after OE supply ceases.

4.6 Currency

It is CBXX's policy that all prices and payments should be made in the local currency of the plant the supplier will be/is shipping into. Suppliers should quote in the currency requested by the CBXX Buyer. For exceptions to this policy contact the CBXX Buyer.

4.7 Machinery, Equipment and Tooling (including gauges, fixtures etc and sub- contractors) Capacity Requirements

Machinery, Equipment and Tooling Capacity must allow for up to 30% increase on the quoted volume (this consists of 15% for MCR and an additional 15% for Spare Parts sales).

The Supplier must insure all CBXX Tooling with full fire and comprehensive extended coverage Insurance for full replacement value to the extent that such insurance is not otherwise maintained in accordance with this agreement.

Unless otherwise agreed by the Buyer, the Supplier, at its expense, shall furnish, keep in good condition, and replace when necessary all machinery, equipment, tooling, jigs, dies, gauges, fixtures, moulds, patterns and other items necessary for the production of materials, components and assemblies. The cost of changes to tooling, dies, patterns or moulds necessary to make design and specification changes requested by the Buyer shall be paid for by the Buyer.

No Payment of tooling will be made unless the PPAP and Run @ Rate has been Approved by the Supplier Quality Engineer. The tooling will be paid over two payments (unless otherwise agreed by the Buyer).

- 70% on full PPAP approval
- Balance on full Run @ Rate approval

4.8 Confidentiality

Meaning of Proprietary Information.

In this Clause 2.33, “**Proprietary Information**” means:

- ◆ In the case of CBXX, confidential business information and technical information relating to the brake products and systems developed or acquired by CBXX and relating to their manufacture and sale. This technical information includes, but is not limited to, data, processes, know-how, designs, sketches, photographs, plans, drawings, specifications and similar types of information.
- ◆ In the case of the Supplier, confidential business and technical information disclosed by that party to CBXX in connection with its performance of this agreement, but does not include information which is independently created by CBXX.

Obligations of Confidentiality.

Each party acknowledges that the Proprietary Information of the other party is confidential, is the valuable property of the other party and is provided solely for and is to be used only for the purpose of the performance of this agreement by the parties.

A party is not under any circumstances authorised to reproduce in any manner or form any Proprietary Information of the other party without written permission of that other party.

Each party must keep confidential all Proprietary Information of the other party except to the extent a party is required by law to disclose Proprietary Information of the other party, or as may be expressly permitted pursuant to this agreement. A party may disclose Proprietary Information of the other party to its employees who have a need to know for the purposes of this agreement (and only to the extent that each such employee has a need to know). A party must not disclose Proprietary Information of the other party to its external advisers, related bodies corporate or any third party without the prior written consent of the other party. Each party must ensure that any person to whom it discloses Proprietary Information of the other party under this clause is made aware of and strictly complies with that party's obligations under these provisions relating to confidentiality and must take all steps to prevent or stop any suspected or actual breach of those obligations by any such person.

The parties intend that ownership of any specification, technical or scientific information, know-how, process, trade secret, drawing and in general all intellectual property rights patentable or non-patentable relating to a product or process or otherwise that is developed jointly by the parties will be the subject of a separate agreement, failing which it will be the property of CBXX.

At the expiration or earlier termination of this agreement, each party must immediately return to the other party or destroy (as directed by that other party) all Proprietary Information (or any part of it or copies of it) of that other party. A party must not retain any of the Proprietary Information or any part of it in any form whatsoever.

Each party will keep the other party indemnified and hold the other harmless against any and all losses, damages, costs, expenses, claims or action as a result or arising out of any breach of the obligations of a party under this Clause 2.33, whether the breach was by itself or any servant, employee, related body corporate or agent.

The obligations of the parties under this Clause 2.33 shall continue in force notwithstanding completion or termination of this agreement for any reason or the destruction or return of Proprietary Information.

4.9 Production Control & Logistics

Lean manufacturing is the balanced use of people, equipment and materials that gives the lowest lifecycle cost. Lean thinking looks to eliminate all waste. CBXX is expanding this philosophy beyond our factory floors to our suppliers. In order to become a Lean Enterprise through the complete value chain.

The supplier who is awarded the production business is required to take the key steps involved in “Lean Thinking” by identifying what is value to the customer, mapping the value stream, eliminating waste from the stream, making the process flow, changing to demand pull processes and repeatedly reviewing the value stream in pursuit of perfection.

All of the steps in the entire value stream need to be mapped. That is, all of the specific actions to bring the product (goods, service or both) from design, development through to delivery of the finished product or service to the customers.

Ideally, the entire value stream should include raw materials and component suppliers, all internal and external processes and distribution to customers.

Reduce cost by eliminating waste in all aspects of the value stream.

- ◆ Product Design
- ◆ Specification
- ◆ Raw Materials
- ◆ Components
- ◆ Process
- ◆ Packaging
- ◆ Inventory
- ◆ Transport
- ◆ Overhead Allocation

Seeking perfection throughout the entire value chain through repeated improvement activities or events is a fundamental principle of Lean Thinking. It has been proven that no matter how many times an activity has been improved and made more lean, teams can always find more ways to remove more waste by revisiting and eliminating further effort, time, space and errors while making the process more flexible and responsive to customer pull.

4.10 VA/VE Suggestion Scheme

The VA/VE Suggestion Scheme is a program that aims to improve quality, product performance, safety, service, cost that benefits the entire value chain, including CBXX suppliers, CBXX, automotive customers and the ultimate consumers who can cost-effectively purchase vehicles with improvements in ride, handling, safety, and convenience.

Suppliers are required to submit VA/VE opportunities in writing to CBXX Supplier Development on a minimum annual basis using the Supplier VA/VE Suggestion form FG11-015 for initial evaluation. Other necessary information may include test data, drawings/sketches, more detailed discussion of rationale and/or financial assumptions and calculations.

Once the VA/VE suggestion is approved to proceed by Supplier Development, the supplier shall raise a Supplier Change Request (SCR) FG11-013 to seek CBXX management approval to proceed with the development and track the progress.

VA/VE activities are included in the Commercial section of the Monthly Supplier Performance Rating (MSPR) system (refer WIG 11-005 in the Suppliers section of the CBXX website).

4.11 General Information

24-Hour Contact – Suppliers must provide 24-hour service by providing contact names and phone numbers where they can be contacted during off-hours and weekends.

Routine Contact – A regular contact point must be established and available during all operating hours of the receiving location.

Emergency Contact – The supplier location must provide and maintain a communication matrix for the receiving location to use, should extraordinary situations occur. This includes emergency contact capability during unsheduled work hours and organisational structure for resolution of any delivery, quality or unresolved issues.

Language – all international contacts must be proficient in reading, writing and speaking English.

Supplier's Planned Down Time – Supplier must provide annually a list of planned Plant down times for holidays, vacations, etc. to CBXX.

Union Affiliation and Contract Expiration –If the supplier is unionised, they are expected to manage all employee and industrial related issues in a manner that will not impact the supply of materials, components, assemblies and services to CBXX.

Inquiries – all suppliers must respond to all inquires in writing or via E-mail on or before the due date stated on the inquiry.

Appendix A

Involvement Ratio								
Cause	Drawing Type	Supplier Share Ratio Guide			items	Supplier	CBXX	Customer
Customer					A	0%	0%	100%
If the Supplier did not follow the planned schedule and thus it caused insufficient design study or evaluation					B	60%	20%	20%
Plan	Other cases except for those mentioned above. Customer could not claim the responsibility on CBXX or the Supplier			C	0%	0%	100%	
Specification, which caused the problem, was shown on drawing and Customer approved.					D	0%	0%	100%
Satisfied	Specification for problem area was not shown on drawing. Customer could not find discrepancy.			E	20%	10%	70%	
Problem area was on drawing CBXX and Customer approved.					F	20%	30%	50%
Satisfactory Level of Customer Specification	Not Satisfied	Problem area not shown on drawing. Customer could not find the problem.			G	80%	10%	10%
Except for details below.					H	25%	25%	50%
Design	Items without required specification.		Supplier know-how clearly caused problem.		I	80%	10%	10%
Satisfied.					J	0%	0%	100%
Satisfactory level of evaluation method/ standard.			Not Satisfied.		K	80%	10%	10%
Except for details below.					L	25%	25%	50%
Design Problem	Supplier (Approved drawing)	Evaluation	No evaluation standard is available	Supplier know-how clearly caused problem.	M	80%	10%	10%
Manufacturing		Supplier's manufacturing cause should be supplier 100% responsibility.			N	100%	0%	0%
Other parts Problem		If the problem was induced by another part in the same vehicle, supplier has no responsibility.			O	0%	0%	100%
Vehicle assembly Problem		If the problem was caused at Customer vehicle assembly process, Customer has all liability.			P	0%	0%	100%
Cause not known		When the problem cause can not be determined, Supplier and Customer should share the cost. However, if the new facts are identified through field investigation or warranty data analysis, this share ratio will be reviewed.			Q	25%	25%	50%
Customer Drawing		If Supplier cannot duplicate the problem phenomenon, then the supplier will have some responsibility.			R	12.5%	12.5%	75%
No Fault Found (NFF)	Approval Drawing	However, if the new fact is fact is identified through field investigation or warranty data analysis, this share ratio can be reviewed.			S	20%	20%	60%

SUPPLIER SHARE RATIO AGREEMENT

We accept the proposal by CBXX to have an agreement for warranty.

This agreement resulted from an assessment of returned warranty parts to determine share ratio responsibility.

By signing this agreement, we agree to credit CBXX any warranty claim raised against our Company at the agreed share ratio (percentage) only.

If the component has been incorrectly assigned, that is, the component(s) are not manufactured by your company, a claim redirection should be forward with remittance advice.

PLEASE NOTE: Field Service programs are excluded from this process.

The percentage is calculated at:		%
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Start Date:	/ /	Review Date:	/ /
	dd/mm/yyyy		mm/yyyy

Supplier Representative:

Company Name:	-----	Vendor Code:	-----
Name:	-----	Position:	-----
Signed:	-----	Date:	_ _ / _ / _ _

CBXX Representative:

Name:	-----	Position:	-----
Concur:	-----	Date:	_ _ / _ / _ _

Project Name — Example for Cast Iron Foundry Supplier

Milestones

Key Dates

Pilot Build @ Supplier
"Air freight samples to Machine Supplier (eg. Chiron, Topper)"
PPAP @ Supplier
Air freight PPAP samples to CBXX or Machining Company
Run @ Rate at Supplier
S.O.P at Supplier
Pilot Build @ CBXX
Run @ Rate at CBXX
S.O.P at CBXX for machining
S.O.P at CBXX Assembly

Customer Requirements

Customer Requirements

Customer Specific Requirements
Design Review
Review Critical Characteristics
Review CBXX Casting Requirements
Product/Process Quality (A4 Check Sheet)

Phase I

Design & Development Process

Equipment & Fixtures
 Design Review / Selection
 Process Capacity Review (GP-9 C2 Sheet)
 Capability Review (Pp, PpK)
 Floor Plan (A5 Check Sheet)
Process Flow Layout
 Location(s) of Manufacture
 Process Flow Chart (A6 Check Sheet)
 Pre-launch Flow Chart
 Production Flow Chart

Phase II

Equipment & Fixtures Commissioning

New Equipment, Tooling & Test Equipment (A3 Check Sheet)
Equipment Design Review
 Mistake Proofing
 Process FMEA (A7 Check Sheet)
 Preliminary PFMEA (QS9000 3rd edition)
 PFMEA (QS9000 3rd edition)
Equipment Supplier
 Order Equipment
 Verify Equipment Capability/Cycle Time (GP-9 C2 Sheet)
 Verify Capability (Pp, PpK)
Commission Equipment
 Installation
 Try-out

Phase III

Tooling & Gauge Design & Development

Tooling

- Design Review
- Design Change Request
- CBXX Model Update
- CBXX complete 2D Drawings
- "Develop concept, Pattern/Tooling Layout Design"
- Pattern Layout / Tooling Design Review
- Computer Simulation Analysis (e.g. for cast iron Magma)
 - Simulation Trail 1
 - Verify Development of Tooling/Pattern
 - Verify Process Parameters / Extremes
 - Layout design improvement
 - Simulation Trail 2 (if required)
 - Verify Development of Tooling/Pattern
 - Verify Process Parameters / Extremes
 - Layout design improvement
 - Simulation Trail 3 (if required)
 - Verify Development of Tooling/Pattern
 - Verify Process Parameters / Extremes

Gauging

- Critical Characteristic Review
- Identify all features (Critical/Non Critical) to be gauged
- Design Variable/Attribute
- Design Gauge Fixtures (e.g. CMM)

Control Plan

- A8 Check Sheet
- Pre-launch Control Plan
- GP-12
- Production Control Plan

Phase IV

Tooling & Gauge Manufacture

Tooling

- Pattern / Tool Design
 - PFMEA
 - Mistake Proofing
- Select Toolmaker
- Pattern / Tool Manufacture
- Pattern / Tool Assembly
- Pattern / Tool Inspection
- Pattern / Tool Modification
- Pattern / Tool Verification

Gauging

- Gauges & Fixture Design
- Select Source to Manufacture Gauges / Fixtures
- Gauge & Fixture Manufacture
- Calibrate Gauges
- Gauge R&R

Phase V

Process Development

Develop Process Parameters

- Core Making
 - Sand Mix Controls
 - Core Moulding Controls
- Sand Controls
- Melt Controls
- Metal Treatment
- Auto/Manual Pour
 - Magnesium Fade
 - Silicon Pick-up
 - Inoculation
- Chemistry and Physical Properties
- Moulding Line Controls

Verify Process Parameters

- Core Making
 - Core hardness
 - Core Tensile
- Moulding Line Controls
 - Core Placement
 - Mould Harness
- Casting Integrity
 - Verify Runner/Gate System
 - X-Ray Castings
 - Dissection Castings
 - Proof Machining / Dye Penetrate
 - Pattern / Tooling Runner/Gate Modification (if required)
 - Redevelop Concept, Pattern/Tooling Layout Design
 - Pattern Layout / Tooling Design Review
 - Computer Simulation Analysis
 - Verify Development of Tooling/Pattern
 - Verify Process Parameters / Extremes
 - Verify Runner/Gate System
 - X-Ray Castings
 - Dissection Castings
 - Proof Machining / Dye Penetrate
- Process parameter
 - Chemistry
 - Mechanical & Physical Properties
 - Cast Tensile Bar
 - Nodularity
 - Hardness
 - Casting Tensile bar
- Surface Finish
 - Shot Blast Parameters (Surface finish)
 - Compliance to MS1019 and Customer Acceptance Standards
 - Damage
 - Surface Defects
 - Mismatch
 - Flash Allowance
- Process Control
 - Work Instructions
 - Standard Operating Procedures
 - Check on Checks
 - Technical Specifications
 - Reaction Plans
 - Record Sheets
 - GP-12 Record Sheet

Phase VI

Dimensional Verification

Dimensional Check
Pattern / Tooling Modification (if required)
Dimensional Verification

Phase VII

Process / Product Validation

Casting Integrity
 X-Ray Castings
 Dissection Castings
 Proof Machining / Dye Penetrate
 Chemistry
Chemical and Mechanical Physical Properties
 Chemistry
 Tensile – Cast Bar
 Tensile – Casting
 Hardness
 Nodularity
Dimensional verification
"Capability Studies (Critical Feature, Hardness)"
Surface Finish
Capacity Review (GP-9 C2 Sheet)

Production Approval

PPAP / Run @ Rate

PPAP
 PPAP Production Run
 Lever 3 PPAP Approval by Supplier
 PPAP Level 3 Submission
 IMDS
 MSDS
 Ship PPAP samples to CBXX
 PPAP Approval Date By CBXX
Run @ Rate (GP-9)
Pre Production Build Plan
S.O.P

Project Name — Example for General Supplier

Milestones

Key Dates

- Pilot Build @ Supplier
- "Air freight samples to Machine Supplier (eg. Chiron, Topper)"
- PPAP @ Supplier
- Air freight PPAP samples to CBXX or Machining Company
- Run @ Rate at Supplier
- S.O.P at Supplier
- Pilot Build @ CBXX
- Run @ Rate at CBXX
- S.O.P at CBXX Assembly

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 - Capability Review (Pp, PpK)
 - Floor Plan (A5 Check Sheet)
- Process Flow Layout
 - Location(s) of Manufacture
 - Sub-supplier(s)
 - Sub-Contractor(s)
 - Process Flow Chart (A6 Check Sheet)
 - Pre-launch Flow Chart
 - Production Flow Chart
- Sub-Suppliers/Contractors
 - Design / Equipment Selection
 - Process Capacity Review (GP-9 C2 Sheet)
 - Capability Review

Phase II

Equipment & Fixtures Commissioning

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- Equipment Design Review
 - Mistake Proofing
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- Pattern / Tool Verification

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- Select Source to Manufacture Gauges / Fixtures
- Gauge & Fixture Manufacture
- Calibrate Gauges
- Gauge R&R

Phase V

Process Development

Develop Process Parameters (to be agreed by SDE)

Speeds, Feeds, Cycle Time, Temperatures etc. for each process
Other applicable parameters

Verify Process Parameters

Speeds, Feeds, Cycle Time, Temperatures etc. for each process
Other applicable parameters
Process Control
Work Instructions
Standard Operating Procedures
Check on Checks
Technical Specifications
Reaction Plans
Record Sheets
GP-12 Record Sheet

Phase VI

Dimensional Verification

Dimensional Check
Pattern / Tooling Modification (if required)
Dimensional Verification

Phase VII

Process / Product Validation

Process Parameters
Chemical and Mechanical Physical Properties
ES-Testing
Dimensional verification
"Capability Studies (Critical Feature, Hardness)"
Capacity Review (GP-9 C2 Sheet)

Production Approval

PPAP / Run @ Rate

PPAP
PPAP Production Run
Lever 3 PPAP Approval by Supplier
PPAP Level 3 Submission
IMDS
MSDS
Ship PPAP samples to CBXX
PPAP Approval Date By CBXX
Run @ Rate (GP-9)
Pre Production Build Plan
S.O.P