



# SUPPLIER QUALITY MANUAL

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## 1. QUALITY POLICY

**Taylor Commercial Foodservice, LLC is committed to delivering quality products and services necessary to achieve industry-leading customer satisfaction and required business results. We do this through an ISO-certified Quality/Business Management System which emphasizes excellence in innovation and design, product realization and post sales services.**

Suppliers play an integral role in ensuring the quality and cost effectiveness of Taylor's products and shall comply with all requirements defined in this manual or communicated otherwise.

*Note:* Taylor Commercial Foodservice, LLC will be known as Taylor for purposes of this manual.

## 2. PURPOSE

This manual defines the initial and on-going requirements for supplier quality systems and performance.

## 3. SCOPE

This Supplier Quality Manual applies to all suppliers that provide production material, deliverable software, supplier designed products which are incorporated into a Taylor assembly/equipment, finished goods branded by Taylor and product related services to Taylor facilities. Further the SQM applies to internal suppliers within Middleby Corporation and Taylor (i.e. Taylor owned suppliers and Joint Ventures (JV's)). Individual Taylor plants may have additional plant-specific requirements and will establish specific processes for carrying out these requirements. If a conflict exists between the requirements presented in this manual and individual plant requirements, the more stringent requirements will apply.

## 4. EXPECTATIONS

### 4.1. Purchased Products and Product Related Services Shall Comply with Established Specifications and Requirements, including:

- Drawings that apply to the specific product or service.
- Engineering specifications and/ or reliability requirements that apply to the commodity or specific part.
- Material specifications that apply to the product or service
- Applicable Regulatory / Industry standards.
- Taylor approved changes or deviations.
- Established Commercial Agreements

## 4.2. Suppliers are required to:

1. Demonstrate and maintain compliance to, all documented requirements, including design performance, reliability, process control, and capability.
2. Provide resources to participate in product quality planning.
3. Have a change control system that reacts to changes in a timely and accurate fashion.
4. In all cases, acquire written approval *prior* to implementing any change that may impact form, fit, function, interchangeability or reliability. This shall include manufacturing processes, quality standards for product acceptance, and testing requirements.
5. Have a documented quality system in place which addresses all stages of product / process development, manufacturing and delivery. Suppliers must agree to on-site quality system assessments and validation as requested.
6. Maintain process, product and service documentation sufficient to validate requirements are met.
7. Deploy expectations and controls equivalent to those presented in this document to sub-tier supply chain.
7. Be accountable for quality of all sub-tier suppliers including “directed-buy” sources.
8. Maintain the expertise and resources to meet specifications and perform effective root cause analysis and implement timely corrective and preventive action when necessary.
8. Provide notification of any and all situations that may negatively impact the supplied product’s quality, reliability, and safety; design and/ or production; or any other matter described in this manual.
9. Be accountable for the impact of poor quality on Taylor and its customers.
10. Notify Taylor of any condition or change that has impact on Taylor’s environmental/ sustainability commitments or regulatory requirements.
11. Fully comply with the Taylor Code of Ethics found at [http://www.middleby.com/corp\\_investors\\_codeofethics.htm](http://www.middleby.com/corp_investors_codeofethics.htm) and Supplier Code of Conduct found at: <http://www.taylor-company.com/en/utis/supplier-code-of-conduct>.
12. Maintain a self-audit system which ensures compliance of all the above. Provide these audit results when requested.

## 4.3 Communications

In general the following contact points should be used:

**Primary Contact** – For all issues regarding supply chain and procurement activity contact your buyer

**Product/Part Quality** – For all issues regarding product quality, contact Supplier Quality Assurance (SQA) personnel

## 4.4 Supplier Information

New prospective suppliers to Taylor must provide general information including

DUNS number by factory qualifying for production

A list of key supplier contacts by qualifying factory location

A copy of their 3<sup>rd</sup>. party Quality System certificate

## 5. SUPPLIER QUALIFICATION REQUIREMENTS

Suppliers shall establish and maintain a Quality Management System that ensures production meets all customer requirements and expectations

### 5.1. Quality System

All suppliers shall maintain an effective documented quality system that communicates, identifies, coordinates and controls all key activities necessary to design, develop, produce and deliver a quality product or service.

All suppliers must be certified/ registered to one of the following international quality management standards by a recognized independent certified 3rd party registrar:

- ISO 9001      Quality Management Systems – Requirements
- ISO/ TS16949      Quality Management Systems – Automotive Requirements
- SAE AS9100      Quality Management Systems – Aerospace – Requirements

Exceptions to maintaining 3rd. party registration will be managed on a case by case basis. A Taylor Commercial Foodservice, LLC factory quality manager, with concurrence from all other Taylor Commercial Foodservice, LLC sites using this same supplier location, may waive 3rd. party registration. In such cases a supplier audit must be completed & documented. Suppliers may be required to reimburse Taylor Commercial Foodservice, LLC for the cost of conducting these audits.

Note: Suppliers must notify Taylor Commercial Foodservice, LLC immediately if their third party registration expires or is revoked. Taylor Commercial Foodservice, LLC reserves the right to:

- Verify Supplier quality systems with an on-site audit
- Verify a supplier's compliance to an applicable quality standard
- Disqualify suppliers based on substandard performance. In such cases, full requalification will be required prior to resuming business.

### 5.2. Taylor Quality System Assessment

A QMS survey is the quality systems assessment survey used by Taylor. It consists of a self-assessment and an on-site audit conducted by Taylor. This will be used by Taylor only in situations referenced in section 5.1.

Both the Onsite audit and the QMS Survey criteria are intended to assess a supplier's quality system, process control capability, as well as assist the supplier to identify strengths, weaknesses, and/ or areas requiring improvement.

#### Taylor Commercial Foodservice, LLC QMS Self-Assessment

When required, the self-assessment shall be completed by suppliers independently and evaluated by Taylor. The criteria generally follows ISO 9001 adding specific requirements to ensure effective process control and quality results. Suppliers completing self-assessments shall submit action plans to improve any section not meeting minimum requirements. Taylor reserves the right to perform an on-site QMS audit based on the results of self-assessments.

## QMS Survey

This on-site survey consists of various quality system and process control categories and is intended to provide a fair appraisal of the supplier's quality system, process controls, and commitment to quality at the time of the survey.

From time to time Taylor will revise this survey to incorporate new quality system requirements.

## 5.3 Process Audits

Taylor may conduct a process qualification audit at the supplier's manufacturing facility. This audit focuses on the specific process quality controls that the supplier has in place for the products being manufactured for Taylor, as well as part/ commodity specific process requirements. Additionally, Taylor reserves the right to conduct such an audit at sub-tier suppliers

Such audits shall not relieve the supplier's responsibility to produce and deliver defect-free parts.

## 6. PRODUCTION PART & PROCESS QUALIFICATION REQUIREMENTS

Part Qualification ensures that the part is capable of meeting technical/performance requirements. Process Qualification ensures that the specific manufacturing processes in place will produce a part of consistent and acceptable quality.

All production part sample submissions shall be in accordance with Production Part Approval Process (PPAP) General requirements for each PPAP level can be found in Appendix 1. The Taylor using site will define a PPAP level 1-5 to be submitted. PPAP requests will be made using the PPAP Request Sheet Section 14 or by similar means. NOTE: Commercial Off-The-Shelf items (COTS), when meeting the definition provided in section 13, may not require PPAP submission. Suppliers of COTS should contact their specific Taylor using site(s) to ensure local requirements are adhered to.

PPAP submission should be made as far in advance of production start-up as possible, working to a date agreed to with the Taylor using site.

*NOTE:* Check with Taylor for any specific timing guideline for PPAP submission.

Suppliers shall not ship production parts until a Full or Interim approval is received from Taylor via a signed Parts Warrant (PSW) *Section 14*. In the case where Full approval is not granted, Taylor will advise the supplier of the areas of concern. The supplier must make corrections and resubmit for disposition.

At Taylor's discretion, any or all of the PPAP items may be reviewed on-site at the supplier's facility as part of a process qualification audit.

### **PPAP Warrant Validity**

Unless otherwise specified on the PSW, approval is valid for the life of the contract or until revoked by Taylor.

Additionally, should one of the following conditions occur, the supplier **must notify Taylor prior to production shipment**:

- Correction of a discrepancy found on a previously shipped part.
- Product modified by an engineering change to design records, specifications, or material on an approved Product Change Authorization (PCA).
- Use of an optional process or material than was used in a previously approved part.
- Production from new or modified tools (except perishable tools), dies, molds, patterns, including additional or replacement tooling.
- Production following refurbishment or rearrangement of existing tooling or equipment
- Production following any change in process or method of manufacture to include changes in lubricants, mold release agents, or other process solutions
- Production from tooling and equipment transferred to a different plant location or from an additional plant location
- Change of source for subcontracted parts, materials or services (for example, heat treating, plating)
- Product re-released after the tooling has been inactive for volume production for twelve (12) months or more.
- Following a Taylor request to suspend shipment due to a supplier quality concern
- Any other activity that will result in a change to the supplier's Control Plan (CP)
- Loss or revocation of 3<sup>rd</sup>. party quality system registration.

The supplier will utilize a Supplier Deviation Request (SDR), *Section 14*, to notify Taylor should any of the above events occur. The SDR will be reviewed by Taylor; a full or partial PPAP resubmission may be required. Should resubmission be required, the using site will communicate the level to be submitted.

**Full or Interim approval, in writing, must be granted prior to first production shipment. Violations in these provisions may result in financial penalties to offset the impact to Taylor business or the suspension or loss of business altogether.**

## PPAP Level

Taylor requires part approval to different levels (1-5) depending on the purpose for the PPAP submission.

PPAP Level Definitions:

<b>Level 1</b>	<b>Part Submission Warrant (PSW) only submitted to Taylor</b>
<b>Level 2</b>	<b>PSW with Product Sample(s) First-Article Inspection report and Material Certifications</b>
<b>Level 3</b>	<b>PSW with complete supporting data.</b>
<b>Level 4</b>	<b>PSW with Level 3 and other requirements as defined by Taylor.</b>
<b>Level 5</b>	<b>PSW with product samples and complete supporting data available for review at the supplier's manufacturing location</b>

*NOTE:* Level 3 is the default level unless otherwise specified. PPAP documentation must be retained per submission table (appendix 1) and section 10 "Records"

*NOTE:* Dependent upon program requirements Taylor may require a Run-at-Rate capacity study to be completed. The program Supplier Quality Engineer will provide the specifics should a Run-at-Rate study be required.

## 7. PROCESS CERTIFICATION (ProCert)

Process Certification is Taylor's methodology to achieve and sustain statistically controlled and capable processes for manufacturing, business, support, maintenance, assembly, and test. ProCert follows a prescribed methodology, employing a set of standard quality tools to stabilize process output, reduce its variation and drive continuous improvement.

Suppliers are required to implement ProCert in their manufacturing processes to address all key characteristics defined by Taylor. Other methodologies, similar to ProCert may be used when approved by Taylor, providing they meet the requirements outlined in Appendix 2

*NOTE:* Suppliers will be requested to submit ProCert data to Taylor, specific requirements will be communicated through the assigned Taylor Quality representative.

Suppliers are encouraged to identify additional key characteristics beyond those defined by Taylor. This should take into consideration, finished part characteristics, upstream product characteristics and process parameter controls.

**Suppliers with Design responsibility MUST document a review for any applicable key characteristics in addition to any identified by Taylor**

All identified key characteristics must meet the process certification requirements, or other similar approved methodologies, as defined in Appendix 2 – Process Certification.

All KC's must achieve Milestone 4 (Certified KC's / KPC's) at time of PPAP submission. At a minimum Milestone 3 (Process Control) may be accepted at PPAP providing there is a Taylor approved containment plan in place.

On-going control for all KC's must use Statistical Process Control (SPC) or approved mistake proofs. The type and frequency of SPC or mistake proof shall be documented on the Control Plan and agreed to with the using Taylor site.

All gages used to evaluate and control Key Characteristics must demonstrate adequate repeatability and reproducibility.

### Key Characteristic (KC) (see section 13 for all definitions)

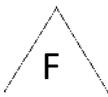
A key characteristic is any feature of a material, process, part, assembly, or test, whose variation within or outside the specified requirement has a significant influence on product fit, performance, service life, manufacturability or other expected deliverable.

Taylor will define the key characteristics which the supplier needs to certify. Key Product Characteristics (KPC's) will be communicated through various methods, including:

- Notations and/ or symbols documented on Taylor engineering drawings and specifications
- Written communication based on known process issues, production problems or field problems. The various symbols used on Taylor documents to signify Key Product Characteristics are shown below:



**SAFETY-** A feature is classified as Critical to Safety if it creates a substantial risk of injury, property damage, illness, product damage, environmental damage, and or contamination, if not produced within its prescribed acceptance limits



**FUNCTION-** A feature will be classified as Critical to Function if it can lead to significant reliability problems, performance issues or probable cause for rendering unit inoperable or not meeting customer requirements, and expectations if not produced within its prescribed acceptance limits.



**PROCESS-** A product feature identified by manufacturing and determined to be of high risk due to number of producers or it's variation within prescribed limits has a significant impact on the ability of the part, component, unit, or options to meet fit, assembly, installation or test requirement

Additionally, some older drawings may contain other symbols to denote key characteristics. Refer to Appendix 2

*NOTE:* KCs identified on the drawing / design documents using symbols X, F and P are called KPCs (Key Product Characteristics). All ProCert requirements for KCs equally apply to KPCs

## 7.1 Alternate Means of Control (AMC)

AMC (Alternate Means of Control) are types of quality controls that might be required when noted on Taylor drawings or Taylor specifications. When drawings/ specifications identify features and/ or conditions that require specific AMC controls, the producer will be provided with detailed instructions from the Taylor ordering entity as to what is the required AMC method as well as how records and objective evidence of compliance is maintained.

Examples of AMC controls may include, but are not limited to

- Traceability- Products, Components, Material
- Over-inspection
- 100% Inspection by a Certified Operator or Inspector
- Certificate of Conformance or Material Certification
- In-process Mistake Proofs

The following are illustrative steps suppliers may be asked to complete as part of AMC:

- Measurement system analysis related to the item identified as requiring AMC
- Documentation of AMC as part of the control plan as well identification of Key Inputs that impact the quality results of the AMC.
- A validation of the control method for AMC
- A verification that the control method associated with the AMC is sustainable

## 7.2 Layered Process Audits

To assure on-going integrity of ProCert efforts, suppliers shall conduct periodic internal process audits to ensure continued conformance with standard work instructions, control plans and process stability / capability. Compliance with implemented process controls and verification of mistake proofs must be included in the audit. (reference Layered Process Audits in section 13 glossary)

## 8. NON-CONFORMING PRODUCT

Under no circumstances shall a supplier ship non-conforming product without first receiving written authorization from Taylor.

The following sections identify and explain key quality requirements that are applicable for non-conforming product.

### 8.1. Warranty

Specific warranty obligations of suppliers are provided in the Commercial Contract in force between the supplier and Taylor.

### 8.2. Supplier Identified Non-conforming Product

The supplier may find products, through their quality control processes or from reports by other customers, which were produced outside of specifications. The supplier is expected to immediately:

- Segregate these products and determine if this error may have occurred, undetected, in earlier production.
- In the following situations notify Taylor utilizing the Supplier Deviation Request (SDR):
  - If the non-conformance affects form, fit or function of the part.
  - If there is likelihood that non-conforming product had 'escaped' the factory.
  - If the non-conforming product will affect deliveries to Taylor.
  - In all cases where a report of non-conforming product is received from a customer, where Taylor is using a similar part.

The supplier is responsible for the segregation and quarantine of nonconforming material. Non –Conforming materials shall not be shipped unless until a deviation is granted. Discrepant material received at Taylor without an approved SDR will be rejected and returned to the supplier with all extra handling and shipping costs incurred by the supplier. No discrepant material will be processed until a deviation is approved by all required Taylor personnel.

## 8.3. Taylor Identified Non-conforming Product

The following paragraphs describe required activities when non-conforming material is discovered by Taylor.

### Non-Conformances Found Prior to Release to Customer

In the event supplier-responsible non-conformances are discovered by Taylor prior to release to the customer, the parts/ components in question will be identified and segregated to preclude further use.

The evaluation, of the non-conformance will determine whether:

- Defects are accumulated and returned to suppliers in accordance with plant procedures.
- Supplier sorts defects at Taylor.
- Supplier reworks defects at Taylor.
- Supplier contracts 3<sup>rd</sup> party to complete inspections at Taylor or at a local off-site location.
- Contingent on contract specifics, Taylor reworks defect and charges supplier for rework costs.

Suppliers are expected to reimburse Taylor for all costs associated with quality escapes including but not limited to a minimum standard charge for processing each escape.

Suppliers whose 6 -month defect rate (PPM) exceeds the supplier gold performing level requirements (reference section 11) may be required to submit a formal improvement plan. In addition, Taylor may require third party inspection to be implemented at the supplier's expense at an independent location or, have supplier representation at the Taylor site to support improvement efforts.

### Field Failure

The warranty obligations of suppliers for non-conforming parts discovered in the field, as well as their disposition, shall be specified in the commercial contract in force between the supplier and Taylor.

If a critical field failure issue has been identified, a determination of the next steps in the process will be made based on several criteria including the failure's criticality, quantity, cost, and other factors. Based on this evaluation Taylor may require:

- Defective parts to be repaired/ replaced in the field by Taylor.
- Defective parts be repaired/ replaced in the field by supplier.
- Product be recalled, and repaired or replaced. In all cases listed above, suppliers are expected to reimburse Taylor for all costs associated with correcting field failures, and for any other costs imposed on Taylor because of such failures.

## 8.4 Non-Conformance / Corrective Action Reports (CAR)

The need for a formal CAR will be evaluated in terms of potential impact upon production costs, quality costs, performance, reliability, safety, and customer satisfaction. Taylor requires suppliers to submit a formal written corrective action plan to address specific non-conformances identified at either a plant or in the field using the electronic Global 8D Corrective Action Reporting system *Section 14*. When Taylor issues a request for corrective action, the supplier will be notified via an e-mail link from our host server.

Supplier response to corrective action requests must include root cause determination, containment action (short-term corrective action), and permanent (long-term) corrective action. As part of the corrective action, a defined implementation plan with implementation dates must be included, as well as disposition of suspect material.

NOTE: it is expected suppliers consider mistake-proof solutions in all corrective actions.

**Containment action (steps D1-D3) shall be communicated to Taylor within 24 hours of receipt of corrective action request.** Failure Analysis, leading to the root cause determination, shall be completed within a reasonable time period agreed to with the Taylor issuing site. The 8D will not be considered complete until proposed corrective and preventive action has been approved by Taylor.

## 9. CHANGE MANAGEMENT

After production (PPAP) approval, suppliers must not make any product or process changes that may impact form, fit, function, interchangeability or reliability without prior written notification and approval from Taylor. This requirement also applies to sub-tier suppliers.

Changes are defined as alteration in the product design, production specification, purchased parts, material or services, manufacturing location, method of manufacture, testing, storage, packaging preservation or delivery.

NOTE: This must include any changes to software, firmware or any programing incorporated into the product sold directly to or through Taylor.

NOTE: Check with Taylor for any specific advance timing guidelines for change notification

For a permanent product change, Taylor reserves the right to requalify the product. Supplier Deviation Request (SDR) forms are used to communicate all requests for deviation and process changes both temporary and permanent.

### 9.1. Supplier Deviation Request (SDR)

Prior to shipping any non-conforming product or product produced by a process different than what was in place at the time of the PPAP, suppliers must submit a written SDR *Section 14* to their Taylor Purchasing contact (Buyer) for approval.

SDR required information:

The current process/ product

1. The proposed deviations/ changes
2. Proposed test plan for qualification and validation
3. The reason for deviations/ non-conformances with supporting data.
4. State whether the change in question is permanent or temporary. "Temporary" changes must include a fixed quantity of parts or time duration which the SDR will be in effect for.
5. Mitigation plans to address any risks due to the process change/ nonconforming product
6. Detailed list of part numbers including part description by using Taylor site(s)

Discrepant material received at Taylor without an approved SDR will be rejected and returned to the supplier at the supplier's expense with all additional handling and shipping costs incurred by the supplier.

Once approved, all material shipped to Taylor must be accompanied by a copy of the approved SDR. Taylor reserves the right to request a written corrective action plan via a Corrective Action Report (CAR).

If approval is not granted, the reason for disapproval will be summarized on the request form and returned to the supplier.

SDRs shall not be used to cover up or replace the lack of proper quality systems or controls at the supplier location. Taylor views excessive use of SDRs for non-conforming material as an abuse and an indicator that a supplier may have a serious breakdown in their quality system.

## 9.2. Product Deviation / Change

In certain instances, it may be necessary for the supplier to deviate from Taylor requirements and specifications. When changes do not affect fit, form or function, an SDR may be submitted for the following:

- Non-conforming material found at the supplier's facility.
- To request substitution of material.

## 9.3. Process Deviation / Change

Process deviations are required for **any** changes to process different than what was in place at the time of the PPAP approval.

Taylor expects suppliers to constantly strive to improve quality and reduce process variation through system improvements. To achieve these goals, suppliers may require process deviations, either temporary or permanent due to design changes or other unforeseen circumstances (such as changes in equipment/ tooling, changes in critical sub-suppliers, etc.).

Taylor may require the supplier to maintain a safety stock of product produced under the original processes for a period while deliberate changes are proven out. This safety stock can normally be used later for production.

Work transitions from one manufacturing plant to another require early notification to Taylor purchasing through the submission of an SDR. Suppliers making such transitions shall manage these moves in compliance with Taylor expectations. Expectations can include, but are not limited to, maintaining a safety stock, pre and post move capability assessment and requalification of the product from the receiving facility.

# 10. TRACEABILITY & QUALITY RECORDS

### **Traceability:**

Items requiring traceability will be identified during the development phase of a project. Where traceability is required, Taylor will work with suppliers to develop an acceptable system. The requirement for traceability will be communicated to suppliers through specifications and drawings. Purchase Orders will incorporate the requirement.

### **Records:**

Supplier's certification, process, test and/ or inspection data shall be provided to Taylor upon request. Records shall be retained by the supplier for a ten (10) year period after delivery of the relevant products. This requirement does not supersede any governmental or regulatory requirements for records retention. Any exceptions should be brought to the attention of Taylor by submitting an SDR.

Certain data may be required to be included with product shipment. This will be agreed to with the using Taylor site quality department.

## 11. GLOSSARY: DEFINITIONS AND ABBREVIATIONS

### **8D**

A problem solving process developed by Ford Motor Company. The name “8D” originates from the fact there are eight disciplines associated with this problem solving format. Taylor has adopted the 8D format to be used for both internal and external problem solving activities.

### **Taylor QMS**

Taylor QMS is a customer-focused, ISO9001-based, data-driven, process-based methodology for achieving higher levels of customer satisfaction and business performance.

### **Capability**

The ability of a process to produce output within specified limits. “Improving process capability” involves taking steps to limit the amount of variation to defined acceptable limits.

### **Capability Index**

The comparison of available tolerance to the portion of the tolerance consumed by a process in a state of statistical control.

### **Cpk**

The capability index, which accounts for process centering and is defined as the minimum of CP Upper ( $C_{pu}$ ) or CP Lower ( $C_{pl}$ ). It relates the scaled distance between the process mean and the closest specification limit to half the process spread.

### **$C_{pl}$**

Measures how close the process mean is running to the lower specification limit.

### **$C_{pu}$**

Measures how close the process mean is running to the upper specification limit.

### **Commercial Off the Shelf items (COTS)**

Standard commercial off the shelf or catalog items selected from a supplier’s standard line of parts.

Where Taylor does not have design control. Taylor does not have a dedicated drawing or purchased part specification. Parts not tooled specifically for Taylor. Parts are used by multiple industries/ customers. Examples include: electronics (capacitors, diodes, resistors), common fasteners (nuts, screws, washers, etc.).

### **Corrective Action Report (CAR)**

A formal request by Taylor to take action to eliminate the cause(s) of an existing nonconformity or other undesirable situation in order to prevent recurrence.

### **Control Plan (CP)**

Methodology for controlling parts and processes to ensure all process outputs remain in a state of control. The plan is used and maintained throughout the product life cycle and is responsive to changing process conditions via written descriptions of the actions that are required at each phase of the process from receiving through shipping.

### **Critical Item**

Any component, material, assembly or complete system which is selected for production and field traceability in order to satisfy safety reporting requirements or to support reliability analysis of high cost / high interest items. For example, a compressor model or certain electronic control modules might be designated as “traceable” items due to their high replacement costs. A furnace gas valve might be designated due to product safety reporting needs.

### **Deliverable Software**

All software intended to be used in Taylor saleable product, including but not limited to software embedded in deliverable hardware and deliverable firmware. Refer to section 9 Change Management.

### **Directed-buy source**

Any sub-tier supplier providing material, components, software or services which has been designated to be used by

***Failure Mode and Effects Analysis (FMEA)***

A preventive analytical technique to methodically study the cause and effects of potential failures in a product or a process. The product or process is examined for all the ways in which a failure can occur. For each potential failure, an assessment is made of its effect on the system and its seriousness, and a review is made of the action being taken (or planned) to minimize the probability of failure or to minimize the effects of the failure.

***Gage Repeatability and Reproducibility (Gage R&R)***

The evaluation of a gauging instrument's accuracy by determining whether the measurements taken with it are repeatable and reproducible. .

***Key Characteristic (KC)***

Any feature of a material, process, part, assembly, or test, whose variation within or outside the specified requirement has a significant influence on product fit, form, function or other expected deliverable, and thus must be controlled within prescribed acceptance limits via Process Certification practices.

***Key Process Inputs (KPI)***

A subset of the process inputs or their characteristics that are key to running the process and producing the right product/ output.

***Key Product Characteristic (KPC)***

KPCs are product features that are indicated on the drawing and or related documentation by engineering as described in 5.1.3. These are typically critical to safety, critical to function, and by exception critical to process features of the product that must be controlled within prescribed acceptance limits via Process Certification

***Layered Process Audits (LPA)***

A system of manufacturing process audits performed by multiple levels of management. Key process characteristics are audited frequently to verify conformance to processing standards and assure performance output is to expected levels.

***Non-conforming product / service***

Non-fulfillment of an intended requirement for reasonable expectation for use, including safety considerations.

***On Time Delivery***

The number of Purchase Order line items delivered on time to the required date and quantity divided by the number of total Purchase Order line items required.

***Part Family***

Group of related products that pass through similar processing steps and over common equipment in a value stream.

***Parts Per Million (PPM)***

A measurement of the defect rate in a product, calculated as:  $PPM = (\text{Total number of defective parts}) \times 1,000,000 / (\text{Total number of parts received})$ .

***Part Submission Warrant (PSW)***

The warrant contains supplier, part information, required documentation, the supplier application warrant and Taylor disposition. The submission approval by Taylor authorizes the supplier to start production.

***Process Capability***

The range over which the natural variation of a process occurs as determined by the system of common causes.

Process capability has three important components:

- Design specification.
- Centering of the natural variation.
- Range or spread of the variation.

The importance of process capability is in assessing the relationship between the natural variation of a process and the design specifications. This relationship is often quantified by measures known as process capability indices. The most common is Cpk.

***Process Certification***

Process Certification (ProCert) is Taylor's methodology to achieve and sustain statistically controlled and capable processes for manufacturing, business, support, maintenance, assembly, and test.

***Production Material and Services***

Includes parts, components or raw material that are directly used in the manufacture of Taylor products; supplier designed products that are incorporated into a Taylor assembly/ product; and finished goods branded by Taylor.

***Production Part Approval Process (PPAP)***

A process which defines the generic requirements for production part approval. The purpose of PPAP is to determine if all customer engineering design record and specification requirements are properly understood by the supplier and that the process has the potential to produce product consistently meeting these requirements during an actual production run at the quoted production rate.

***QMS Audit Survey and on site audit***

A quality management standard whereby suppliers are rated at one of four levels of compliance.

***Repeatability***

Assesses the variation in a measurement system caused by the combined sources of measurement variation of a gage or test equipment when used by one operator or under one set of environmental conditions.

***Reproducibility***

Variation in measurement averages when more than one operator or set of environmental conditions are imposed on the gage or piece of test equipment.

***Run at Rate study***

A formalized production capacity study that verifies proper cycle times, quality expectations and yields have been achieved in accordance with plan.

***Supplier Deviation Request (SDR)***

A form submitted by the supplier that is used to document and request approval for any product or process deviation.

***Work Transitions***

Work Transitions are any movement of production from one manufacturing plant to another.

## 12. REFERENCE MATERIALS

It is the responsibility of the supplier to ensure that they are working to the latest version of specifications referenced within this document as well as Purchase Order requirements.

The publications listed below provide additional information concerning quality assurance processes and techniques discussed in this manual and are available to suppliers through their Taylor contacts.

The following publications are available from the Automotive Industry Action Group (AIAG). These may be ordered on-line at: [http:// www.aiag.org](http://www.aiag.org).

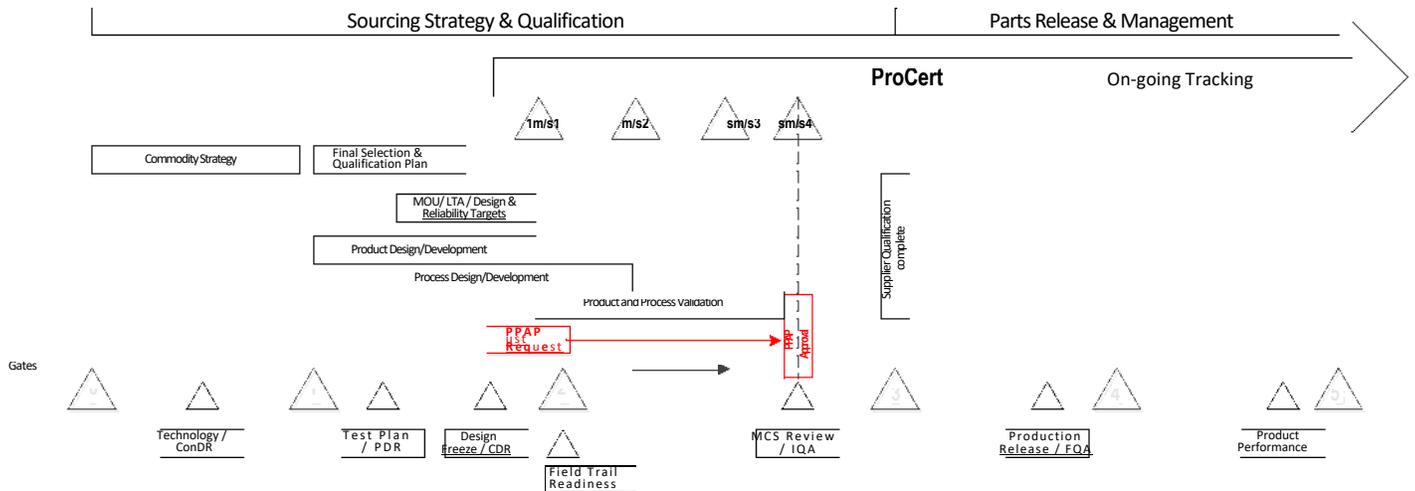
- Advanced Product Quality Planning (APQP) and Control Plan (CP).
- Measurement System Analysis (MSA).
- Potential Failure Mode and Effects Analysis (FMEA).
- Production Part Approval Process (PPAP).
- Statistical Process Control (SPC).

# 13. APPENDICES

## Appendix 1 – PPAP Requirements

Below timeline reflects where PPAPs should be requested and approved in the New Product Development cycle

Phase 0	Phase 1	Phase 2	Phase 3	Phase 4	Phase 5
<i>Program Feasibility</i>	<i>Planning and Specification</i>	<i>Development</i>	<i>Release Preparation / Qualification</i>	<i>Manufacturing Pilot</i>	<i>Full Release</i>



Below Requirements table defines the documentation / data to be submitted to Taylor or retained by supplier.

**PPAP Requirements / Submission Table**

	<u>Level 1</u>	<u>Level 2</u>	<u>Level 3</u>	<u>Level 4</u>	<u>Level 5</u>
1 Engineering Change Documents, if any	<b>R</b>	<b>S</b>	<b>S</b>	*	<b>S</b>
2 Customer Engineering approval, if required	<b>R</b>	<b>S</b>	<b>S</b>	*	<b>S</b>
3 Design FMEA	--	--	<b>S</b>	*	<b>S</b>
4 Process Flow Diagrams	--	--	<b>S</b>	*	<b>S</b>
5 Process FMEA	--	--	<b>S</b>	*	<b>S</b>
6 Control Plan	--	--	<b>S</b>	*	<b>S</b>
7 Measurement System Analysis Studies	--	--	--	*	<b>S</b>
8 Dimensional Results	--	<b>S</b>	<b>S</b>	*	<b>S</b>
9 Material, Performance Test Results	--	<b>S</b>	<b>S</b>	*	<b>S</b>
10 Initial Process Studies	--	--	<b>R</b>	*	<b>S</b>
11 Qualified Laboratory Documentation	--	--	<b>R</b>	*	<b>S</b>
12 Appearance Approval Report (AAR), If applicable	--	--	--	*	<b>S</b>
13 Sample Product	--	<b>S</b>	<b>S</b>	*	<b>S</b>
14 Master Sample	--	--	<b>R</b>	*	<b>S</b>
15 Checking Aids	--	--	<b>R</b>	*	<b>S</b>
16 Records of Compliance	<b>S</b>	<b>S</b>	<b>S</b>	*	<b>S</b>
17 Part Submission Warrant (PSW)	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>	<b>S</b>
18 Other Taylor Requirements	--	--	--	<b>S</b>	<b>S</b>

**S** = shall be submitted to Taylor. A copy shall be retained at the supplier location.

**R** = shall be retained by the supplier location and made available to Taylor upon request

**\*** = **as defined by Taylor Supplier Quality**; shall be retained by the supplier location and submitted to Taylor upon request

## Elements of PPAP defined

### 1. Authorized Engineering Change (note) Documents

If submission is required while a formal change is in process, an approved Supplier Deviation Request (SDR) must be included.

### 2. Engineering Approval

If submission is required before Taylor engineering has approved all Engineering qualification tests, an approved Supplier Deviation Request (SDR) must be included.

### 3. DFMEA

If the supplier is design responsible, a copy of the Design FMEA (DFMEA), reviewed and signed -off by Taylor Engineering must be included. If it is agreed the DFMEA contains supplier control Intellectual Property (IP), the DFMEA may be reviewed with Taylor Engineering and Quality for approval. Where Taylor is design responsible the list of all Key Characteristics should be shared with the supplier, so they can be addressed on the PFMEA and Control Plan. This would typically take place during a design feasibility review meeting.

### 4. Process Flow Diagram

A copy of the Process Flow, indicating all steps and sequence in the fabrication process, including incoming components.

### 5. PFMEA

A copy of the Process Failure Mode and Effect Analysis (PFMEA), reviewed and signed -off by supplier and customer. The PFMEA should address potential failure modes in each step as outlined in the process flow document. [including packaging and labeling]. All KC and KPC's must be included on the PFMEA.

### 6. Control Plan

A copy of the Control Plan, reviewed and signed -off by supplier and customer. The Control Plan follows the PFMEA steps. All KC and KPC's must be identified and included on the Control Plan.

### 7. Measurement System Analysis Studies (MSA)

MSA usually contains the Gage R&R for the Key Characteristics (KCs) and Key Product Characteristics. MSA is required for both variable and attribute features.

### 8. Dimensional Results

A list of every dimension noted on the ballooned drawing/ specification. This list shows the product characteristic, specification, the measurement results and the assessment showing if this dimension is "ok" or "not ok". Taylor will define the quality required for a dimensional layout, typically 3-5 pieces, however this may be adjusted in special circumstances such as multi-cavity tooling.

### 9. Records of Material / Performance Tests

A summary of every required test performed on the part. Requirements are usually agreed to by Supplier & Taylor during the design feasibility meetings. This summary lists each individual test, when it was performed, the specification, results and the assessment pass/ fail. Supporting data to be included as requested, but may be submitted as tests are completed. In addition, this section lists all material certifications (steel, plastics, plating, etc.), as specified on the print/ specification. Actual materials certifications are to be included with the submission.

### 10. Initial Process Studies

Usually this section shows all Statistical Process Control charts affecting the most critical characteristics. The intent is to demonstrate that critical processes have stable variability and that is running near the intended nominal value. All Taylor defined KCs and Supplier defined KPC's must have studies included.

### 11. Qualified Laboratory Documentation

Copy of all laboratory certifications (e.g. ISO 17025, TS) of the laboratories that performed the tests reported on section 10.

### 12. Appearance Approval Report

A copy of the AAI (Appearance Approval Inspection) form signed by the customer. Applicable for components affecting appearance only. Requirements for any Appearance Approval Reports should be defined during the Design Review.

### 13. Sample Production Parts

Taylor will define the number of samples to be submitted with the PPAP. Such samples must be produced as part of the PPAP production run. These samples are to be numbered to correspond to the measurement data submitted with the Dimensional Report (Item 9 above)

**14. Master Sample**

A sample [typically] signed off by customer and supplier, which usually is used to train operators on subjective inspections such as visual or for noise.

**15. Checking Aids**

When there are special tools for checking parts, this section shows a drawing of the template or tool and calibration records, including dimensional report of the tool. (CMM programing information may be requested)

**16. Customer-Specific Requirements**

Taylor customer may have specific requirements to be included on the PPAP package. It is a good practice to ask the customer for PPAP expectations before even quoting for a job.

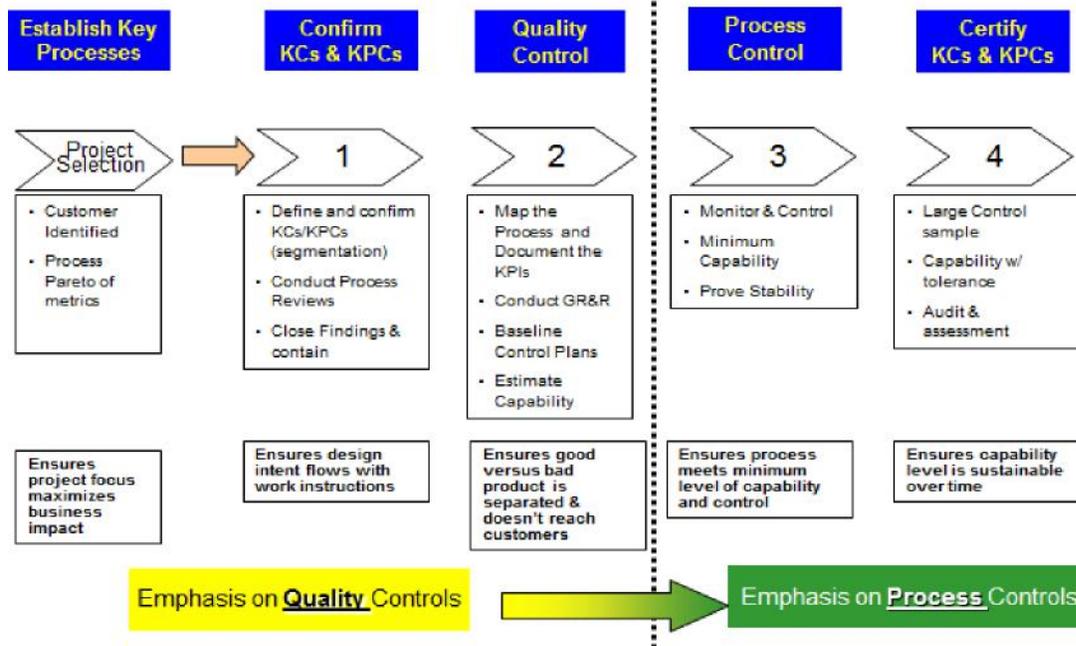
**17. Parts Warrant (PSW)**

This form that summarizes the whole PPAP package. The PSW includes part information, the reason for submission and the level of documents submitted to the customer. A Declaration statement must be signed by an authorized person at the Supplier's site making the submission (typically the plant quality manager). The Taylor using site must disposition the PSW, sign and return to the supplier. The supplier is not authorized until they have received a full or interim approved PSW from Taylor.

If a Level 4 PPAP is requested, the Taylor requestor must specify, in writing, what documentation / data will be required to accompany the PPAP submission. (*Section 14*)

Appendix 2 - ProCert

# ProCert Milestones



## Steps to Certify a Process

The following requirements shall be achieved to consider a process / KC certified.

### 1) Initial steps to implement Process Certification:

- Map the current process steps to identify KPIs and the process KCs that impact the process output and/ or KCs identified by Taylor. Refer to Design and Process FMEA's in this step. Identify current process performance or output for each process step.
- Verify and document that the measurement processes used for all variable and attribute KCs are capable (i.e., repeatability, reproducibility, correlation studies, and total process capability).
- Identify controlling actions to maintain process capability and reaction plans for out of control conditions as they occur at the workstation. These should be documented on the control plan and/ or work instructions.
- Implement a process monitoring method.
- Implement a Preventive Maintenance Plan.
- Perform self-audits.

**2) Variable Measured Characteristics**

A process is considered certified when:

- Measurement equipment is qualified (e.g. R&R studies completed)
- Assignable causes for variation have been identified, documented, and removed.
- Process inputs and KCs are identified, monitored, and controlled.
- A minimum of twenty-five (25) consecutive observations or thirty (30) days of output whichever is greater, capturing variability associated with step to step, piece to piece, set up to set up, time to time, and lot to lot variation, with no nonconformances detected.
- KCs are under statistical control and Cpk of 1.33, or better is demonstrated.
- Routine self-audits being performed

**3) Attribute Measured Characteristics**

A process is considered certified when:

- Measurement equipment is qualified (e.g. R&R studies completed)
- Assignable causes for variation have been identified, documented and removed.
- Process inputs and KCs are identified, monitored and controlled.
- A minimum of forty-five (45) consecutive observations (90% confidence) or (30) days of output whichever is greater, capturing variability associated with step to step, piece to piece, set up to set up, time to time, and lot to lot variation, with no non-conformances detected.
- Routine self-audits being performed

**Key Characteristics**

On some older Taylor drawings / specifications the following symbols may still be used to denote key characteristics.

Business Unit	Legacy Identification Symbols
Refrigeration	  
BSS / Carlyle	
EMEA / Montluel	 
RLCS	
RCS / RCD	( C )
Fire & Security	

# 14. Forms:

For examples of any forms referenced in this manual or to obtain blank forms, or for assistance in completing forms, suppliers should contact their designated Taylor point-of-contact.