United Technologies

Building & Industrial Systems

SUPPLIER QUALITY MANUAL

Exhibit 1

Revision: September 30, 2014

Table of Contents

1. QUALITY POLICY

UTC Building & Industrial Systems is committed to achieve the highest level of quality products and services necessary to ensure delighted customers. We are a world-class provider of quality HVAC, refrigeration, elevators, escalators, building controls, fire prevention, detection & suppression, and security solutions. We do this through excellence in innovation and design, product realization and post sales services through the use of the ACE Operating System.

Suppliers play an integral role in ensuring the quality and cost effectiveness of UTC Building & Industrial Systems products and shall comply with all requirements defined in this manual or communicated otherwise.

2. PURPOSE

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

Note: UTC Building & Industrial Systems will be known as BIS for purposes of this manual.

3. SCOPE

This Supplier Quality Manual applies to all suppliers that provide production material, deliverable software, supplier designed products which are incorporated into a BIS assembly/product, finished goods branded by BIS and product related services to BIS facilities. Further the SQM applies to internal suppliers within United Technologies and BIS (i.e. BIS owned suppliers and Joint Ventures (JV's). Individual BIS 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.
- BIS 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. 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.
4. 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.
5. Maintain process, product and service documentation.
6. 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 perform effective root cause analysis and implement timely corrective and preventive action.
9. 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.
10. Be accountable for the impact of poor quality on BIS and its customers.
11. Notify BIS of any condition or change that has impact on UTC's environmental commitments or regulatory requirements.
12. Fully comply with the UTC Code of Ethics and Supplier Code of Conduct..
13. Maintain a self-audit system which ensures compliance of all the above.

4.3 Communications

In general the following contact points should be used:

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

Product/Part Quality – For all issues regarding product quality, contact Supplier Quality Assurance (SQA) personnel at the using BIS site

Ethics concerns – UTC maintains a contact site for suppliers who have questions or issues related to the Code of Ethics. The following link is accessible for suppliers to make direct contact with an independent ombudsman to assist in resolution of concerns. Visit: http://www.utc.com/Governance/Ombudsman+-+DIALOG

4.4 Supplier Information

New suppliers to BIS must provide general information including

DUNS number by factory qualifying for production

A list of key supplier contacts by qualifying factory location

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

NOTE: **Suppliers to legacy Otis are required to obtain 3rd. party registration by 31 Dec 2015.**

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

Note: Suppliers must notify BIS immediately if their third party registration expires or is revoked.

BIS reserves the right to:

- Verify Supplier quality systems with an on-site audit
- Verify a supplier's compliance to an applicable quality standard
- Conduct a Q+ audit in lieu of, and/or in addition to, third party certification
- Disqualify suppliers based on substandard performance. In such cases, full requalification will be required prior to resuming business.

5.2. BIS Quality System Assessment

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

Both the Q+ Self-Assessment and 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.

Q+ Self-Assessment

When required, the self-assessment shall be completed by suppliers independently and evaluated by BIS. The criteria generally follows ISO 9000 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. BIS reserves the right to perform an on-site Q+ audit based on the results of self-assessments.

Q+ 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 BIS will revise this survey to incorporate new quality system requirements.

5.3 Process Audits

BIS 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 BIS, as well as part/commodity specific process requirements. Additionally, BIS 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 BIS using site will define a PPAP level 1-5 to be submitted. PPAP requests will be made using the PPAP Request Sheet A*ttachment 2* or by similar means.

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

Suppliers shall not ship production parts until a Full or Interim approval is received from BIS via a signed Parts Warrant (PSW) *Attachment 1*. In the case where Full approval is not granted BIS will advise the supplier of the areas of concern. The supplier must make corrections and resubmit for disposition.

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At BIS'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 BIS.

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

- Correction of a discrepancy 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 BIS 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 3rd. party quality system registration.

The supplier will utilize a Supplier Deviation Request (SDR), *Attachment 8*, to notify BIS should any of the above events occur. The SDR will be reviewed by BIS; 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.

PPAP Level

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

PPAP Level Definitions:

Level 1	Part Submission Warrant (PSW) only submitted to the customer.
Level 2	PSW with product samples and limited supporting data.
Level 3	PSW with product samples and complete supporting data.
Level 4	PSW and other requirements as defined by the customer.
Level 5	PSW with product samples and complete supporting data available for review at the supplier's manufacturing location

[NOTE: Level 3 is the default level unless otherwise specified]

See Appendix 1 for more details

6.1 E-3 Requirements (Otis Specific)

In order to ensure that safety components meet regulatory and Otis requirements, the E-3 policy requires the design, qualification, and/or manufacturing control processes of the components listed below to meet a more strict level of requirements. For more information regarding all of the E-3 requirements please contact your Otis representative.

Elevator
- Safety gear (car & counterweight)
- Over-speed governors
- Buffers

Escalator / Moving Walks
- Steps / pallets
- Main drive chains
- Main drive
- Machines

7. PROCESS CERTIFICATION (ProCert)

Process Certification is BIS'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 BIS. Other methodologies, similar to ProCert may be used when approved by BIS, providing they meet the requirements outlined in Appendix 2

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

Suppliers with Design responsibility MUST identify additional key characteristics.

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 at BIS 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 BIS site.

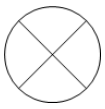
All gages used to evaluate and control Key Characteristics must demonstrate adequate repeatability and reproducibility.

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

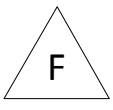
A key characteristic is any feature of a material, process, part, assembly, or test, whose variation within or outside the specified requirement has a significant influence on product fit, performance, service life, manufacturability, information, service or other expected deliverable.
BIS will define 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 BIS engineering drawings and specifications
- Written communication based on known process issues, production problems or field problems.

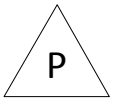
The various symbols used on BIS documents to signify key product characteristics are shown below:



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 requirements.

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 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 BIS.

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 BIS.

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 BIS 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 BIS.
  -In all cases where a report of non-conforming product is received from a customer, where BIS 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 BIS 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 BIS personnel.

8.3. BIS Identified Non-conforming Product

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

Non-Conformances Found Prior to Release to Customer

In the event supplier-responsible non-conformances are discovered by BIS 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 BIS.
- Supplier reworks defects at BIS.
- Supplier contracts 3rd. party to complete inspections at BIS or at a local off-site location.
- Contingent on contract specifics, BIS reworks defect and charges supplier for rework costs.

Suppliers are expected to reimburse BIS 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 10) may be required to submit a formal improvement plan. In addition, BIS may require third party inspection to be implemented at the supplier's expense at an independent location or, have supplier representation at the BIS 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 BIS.

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 BIS may require:

- Defective parts to be repaired/replaced in the field by BIS.
- 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 BIS for all costs associated with correcting field failures, and for any other costs imposed on BIS 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. BIS 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 *attachment 9*. When BIS 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 BIS 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 BIS issuing site. The 8D will not be considered complete until proposed corrective and preventive action has been approved by BIS.

9. CHANGE MANAGEMENT

After production approval, suppliers must not make any product or process changes without prior written notification and approval from BIS. 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.

For a permanent product change, BIS 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 *attachment 8* to their BIS Purchasing contact (Buyer) for approval.
SDR required information:

1. The current process/product
2. The proposed deviations/changes
3. Proposed test plan for qualification and validation
4. The reason for deviations/non-conformances with supporting data.
5. 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.
6. Mitigation plans to address any risks due to the process change/nonconforming product
7. Detailed list of part numbers including part description by using BIS site(s)

Discrepant material received at BIS 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 BIS must be accompanied by a copy of the approved SDR. BIS 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. BIS 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 BIS 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.

BIS 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.).

BIS 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 BIS purchasing through the submission of an SDR. Suppliers making such transitions shall manage these moves in compliance with BIS 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, BIS 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 BIS 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 BIS by submitting an SDR.

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

11. SUPPLIER GOLD PROGRAM

UTC's Supplier Gold Program is a method to differentiate suppliers currently operating with high delivery and quality performance levels. It is a means of recognition for significant continuous improvement efforts and achievements of our suppliers who have achieved world-class levels of performance.

The program tracks four levels of performance. All suppliers in the program are expected to be at the "Performing" or "Gold" levels. Suppliers who are not operating at least to the "Performing" level shall prepare an improvement plan for review with BIS.

	Quality (PPM)	Delivery (OTD)	Customer Satisfaction	Supplier Health Assessment (SHA)
Gold	**0* & 0 Escapes**	**100***	**≥ 6.0**	**≥80% for 4 categories + pass all Gold questions**
Performing	**<500**	**>95%**		
Progressing	**<1,500**	**>85%**		
Underperforming	**≥1,500**	**≤85%**		
*Meet metrics or Best in Class defined as supplier with process and performance that is superior for similar activities within an industry				
Alternate criteria for "Performing" may be established for low-volume suppleirs or specific commodities.				

Additional information may be obtained on the "Suppliers" page at UTC.com

12. ENVIRONMENT, HEALTH & SAFETY

Environment, Health & Safety is of prime importance to BIS.

It is expected that suppliers will comply with the UTC EH&S expectations listed below:

- Provide safe working conditions for all employees, customers and contractors.
- Adhere to all applicable National, Regional, State and Local laws and regulations governing Environment, Health and Safety.
- Operate in a manner that minimizes the impact to the environment.
- Limit the use of natural resources and promote sustainable natural resource practices.
- Extend and communicate these EH&S expectations to suppliers.

Additional information may be obtained on the "Suppliers" page at UTC.com

13. 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. BIS has adopted the 8D format to be used for both internal and external problem solving activities.

ACE
Achieving Competitive Excellence: is the operating system for UTC and BIS. ACE is a customer-focused, process-based methodology for achieving higher levels of customer satisfaction and business performance.

`Capability
The maximum amount of variation inherent in a manufacturing process. "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.

Corrective Action Report (CAR)
A formal request by BIS 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 BIS saleable product, including but not limited to software embedded in deliverable hardware and deliverable firmware.

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

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.

Parts Per Million (PPM)
A measurement of the defect rate in a product, calculated as: PPM = (Total number of defective parts) x 1,000,000 / (Total number of parts received).

Part Submission Warrant (PSW)
The warrant contains supplier, part information, required documentation, the supplier application warrant and BIS disposition. The submission approval by BIS 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 BIS'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 BIS products; supplier designed products that are incorporated into a BIS assembly/product; and finished goods branded by BIS.

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.

Q-Plus (Q+)
A UTC developed 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.

Supplier Deviation Request (SDR)
A form submitted by the supplier that is used to document and request approval for any product or process deviation.

United Technologies Corporation (UTC)

The parent corporation of BIS, other UTC companies include, Pratt & Whitney, Sikorsky, United Technologies Aerospace (UTAS).

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

14. 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 BIS contacts.

- Business Gifts from Suppliers, UTC Ethics Brochure.
- The Giving and Receiving of Business Gifts, UTC Ethics Brochure.

The following publications are available from the Automotive Industry Action Group (AIAG).
These may be ordered on-line at: 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).

The following standards are specific to the elevator / escalator industry. The list is not all inclusive. Suppliers are responsible for insuring they understand and meet all local regulatory standards.

EN 81 – Safety rules for the construction and installation of lifts
EN 115 – Safety rules for the construction and installation of escalators and passenger conveyors
ASME A17.1/B44 – Safety Code for Elevators & Escalators
ASME A17.5/B44.1 – Elevator and Escalator Electrical Equipment
ISO/TS 14798 – Lifts (elevators), Escalators and passenger conveyors-Risk Analysis Methodology
Building Standard Law of Japan (BSLJ) – Japan
GB 7588 Safety Code on Lift Manufacturing and Installation – China
NFPA 70 – National Electrical Code
AS 1735 – Lift Code for Accessibility (Handicap)
ANSI/ICC A117.1 – Standard for Accessible and Usable Buildings and Facilities (Handicap

15. APPENDICES

Appendix 1 – PPAP Requirements

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

PPAP Requirements / Submission Table

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

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

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

*** =** shall be retained by the supplier location and submitted to BIS upon request

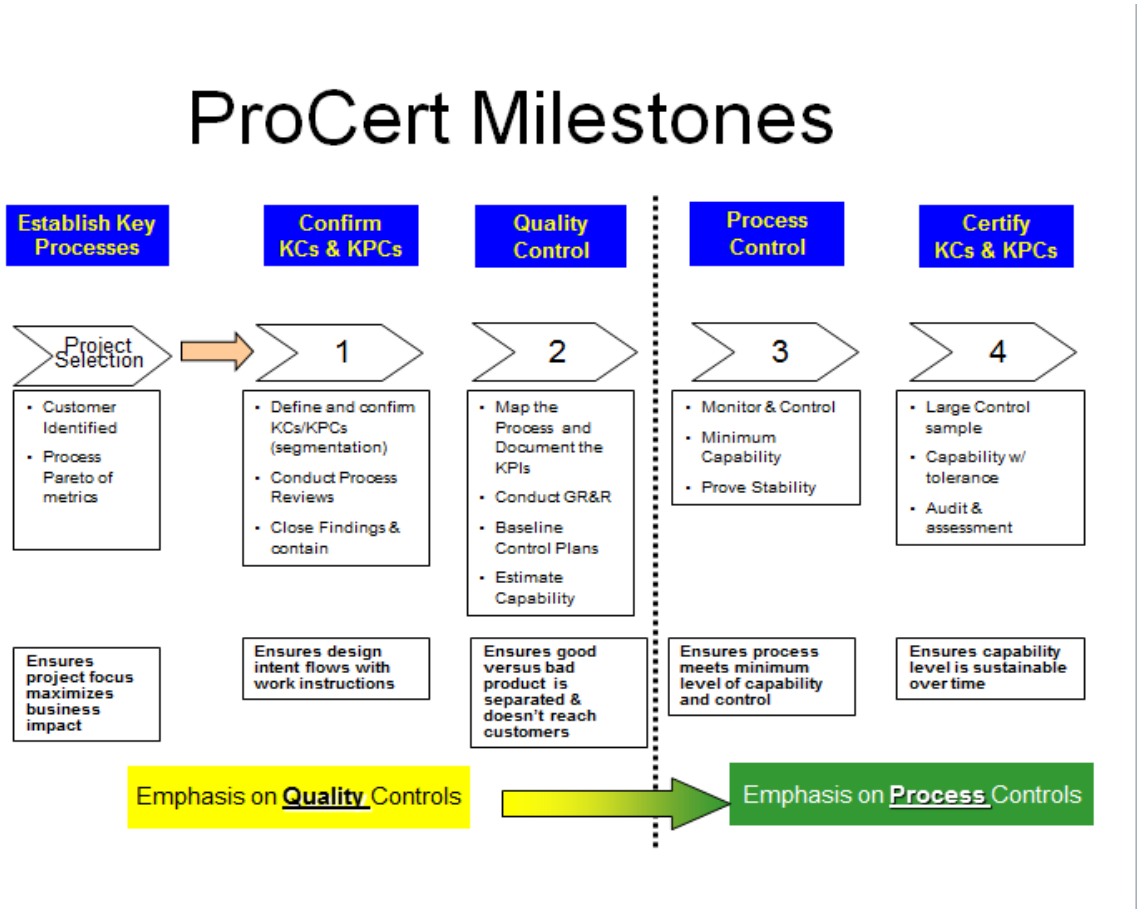
Elements of PPAP defined

1. **Design Records**
   A printed copy of the drawing needs to be provided. If BIS is design responsible, this is a copy of the specification or drawing that is sent together with the Purchase Order (PO). If supplier is design responsible this is a released drawing in supplier's release system. Ballooned drawing/specification: Supplier must number each and every feature and requirement on the design record. Numbering must correspond with the documented inspection results (including notes, standard tolerance notes and specifications, and anything else relevant to the design of the part).
2. **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.
3. **Engineering Approval**
   If submission is required before BIS engineering has approved all Engineering qualification tests, an approved Supplier Deviation Request (SDR) must be included.
4. **DFMEA**
   If the supplier is design responsible, a copy of the Design FMEA (DFMEA), reviewed and signed-off by BIS Engineering must be included. If it is agreed the DFMEA contains supplier control Intellectual Property (IP), the DFMEA may be reviewed with BIS Engineering and Quality for approval. Where BIS 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.
5. **Process Flow Diagram**
   A copy of the Process Flow, indicating all steps and sequence in the fabrication process, including incoming components.
6. **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.
7. **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.
8. **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.
9. **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". BIS 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.
10. **Records of Material / Performance Tests**
    A summary of every required test performed on the part. Requirements are usually agreed to by Supplier & BIS 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.

11. **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 BIS defined KCs and Supplier defined KPC's must have studies included.
12. **Qualified Laboratory Documentation**
    Copy of all laboratory certifications (e.g. ISO 17025, TS) of the laboratories that performed the tests reported on section 10.
13. **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.
14. **Sample Production Parts**
    BIS 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)
15. **Master Sample**
    A sample [typically] signed off by customer and supplier, that usually is used to train operators on subjective inspections such as visual or for noise.
16. **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)
17. **Customer-Specific Requirements**
    BIS 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.
18. **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 BIS 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 BIS.

If a Level 4 PPAP is requested, the BIS requestor must specify, in writing, what documentation / data will be required to accompany the PPAP submission. (*attachment 2, L-4 addendum*)

Appendix 2 - ProCert



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 BIS. 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

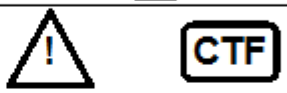
3) Attribute Measured Characteristics
A process is considered certified when:

- 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 BIS 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	
Otis	

16. ATTACHMENTS:

The following are samples of forms referenced in this manual. To obtain blank forms, or for assistance in completing forms, suppliers should contact their designated BIS point-of-contact.

Attachment 1: Parts Warrant (PSW)

Attachment 2: PPAP Request Sheet

Attachment 3: Production Part Approval- Dimensional Test Results*

Attachment 4: Production Part Approval – Material Test Results*

Attachment 5: Production Part Approval – Performance Test Results*

Attachment 6: Appearance Approval Report (AAR)

Attachment 7: Control Plan*

Attachment 8: Supplier Deviation Request (SDR)

Attachment 9: 8D Corrective Action Report (CAR)

*with using plant consent, Suppliers may use their own internal documents/forms, as long as they contain all required information.

Attachment 1

United Technologies
Building & Industrial Systems

PARTS WARRANT (PSW)

Part Name _____ BIS Part Number _____

BIS Drawing No. _____ Supplier Part Number _____

Engineering Change Level _____ Dated _____

Regulations: Safety and/or Government? ☐ Yes ☐ No Purchase Order No. _____ Weight (kg) _____

SUPPLIER MANUFACTURING INFO

_____
Supplier Name & Supplier / Vendor Code

_____
Street Address

_____
City State Postal Code Country

MATERIALS

Product complies with Materials of Concern Requirements ☐ Yes ☐ No

Are polymeric parts identified with proper ISO marking codes ? ☐ Yes ☐ No ☐ n/a

REASON FOR SUBMITTAL

_____ Initial Submittal
_____ Change to Raw Material
_____ Supplier Change
_____ To Correct Discrepancy
_____ Tooling Inactive (more than 1 year)
_____ Drawing Revision Change
_____ Tooling Change: New, Transfer, Reburbished
_____ Change in Part Processing
_____ Parts produced at New Factory Location
_____ Other - please specify

_____

REQUESTED SUBMITTAL LEVEL (Check one)

_____ **Level 1** - Warrant only submitted to customer.

_____ Level 2 - Warrant with sample parts and supporting data submitted as defined by BIS

_____ Level 3 - Warrant with sample parts and complete supporting data submitted to BIS.

_____ Level 4 - Warrant and other requirements as defined by BIS.

_____ **Level 5** - Warrant with sample parts and complete supporting data reviewed at supplier's manufacturing location.

SUBMITTAL RESULTS

The results for ☐ dimensional measurements ☐ material & functional tests ☐ capability ☐ appearance

These results meet all drawing and specification requirements: ☐ Yes ☐ NO (If "NO" - Explain Below)

DECLARATION

I affirm that the samples represented by this warrant are representative of our parts, which were made by a process that meets all BIS requirements.
I also certify that documented evidence of such compliance is on file and available for review. I have noted any deviations from this declaration below.

EXPLANATION/COMMENTS: _____

_____

_____

Supplier Authorized Signature _____ Date _____

Print Name _____ Phone No. _____ Fax No _____

Title _____ Email _____

FOR BIS USE ONLY

PPAP Warrant Disposition ☐ Approved ☐ Rejected ☐ Interim Approval _____

BIS Signature _____ Date _____

Print Name _____ Customer Tracking Number (optional) _____

Attachment 2

United Technologies
Building & Industrial Systems

PPAP Request Sheet

Supplier Information

Supplier Name		Commodity	
Supplier Address		Part Number	
		Part Name	
		Rev. Level	
Supplier Contact		ECN	

PPAP level requested

REQUESTED SUBMITTAL LEVEL (Check one)

- ☐ Level 1 - Warrant only submitted to customer.
- ☐ Level 2 - Warrant with sample parts and supporting data submitted as defined by BIS.
- ☐ Level 3 - Warrant with sample parts and complete supporting data submitted to BIS.
- ☐ Level 4 - Warrant and other requirements as defined by BIS. [See Addendum for Requirements]
- ☐ Level 5 - Warrant with sample parts and complete supporting data reviewed at supplier's manufacturing location.

Number of samples requested for:

Dimensional layout _____

Capability studies _____

Additional Key Characteristics **[for legacy products ONLY where not defined on engineering drawing / specification]**

BIS Authorization

Issued By: _____ Date _____

Supplier Sign-off

I have reviewed and understand the above requirements _____ Date _____

Signature of supplier authorized representative

Attachment 2

United Technologies
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Level 4 PPAP Addendum

Note: BIS to complete this addendum when requesting a Level 4 PPAP Only

Supplier Information

Supplier Name		Commodity	
Supplier Address		Part Number	
		Part Name	
		Rev. Level	
Supplier Contact		ECN	

Level 4 Requirements (If marked "Y" must be submitted)

	Design Record		Material, Performance Test Results
	Engineering Change Documents		Initial Process Studies
	Customer Engineering approval		Qualified Laboratory Documentation
	Design FMEA		Appearance Approval Report (AAR),
	Process Flow Diagrams		Sample Product
	Process FMEA		Master Sample
	Control Plan		Checking Aids
	Measurement System Analysis Studies		Records of Compliance
	Dimensional Results	Y	Part Submission Warrant (PSW)

Attachment 3

United Technologies
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Initial Sample Inspection Report

Part Number	Part Name
Revision Level	Date
Supplier Name	Supplier Location
Name of Inspection facility	Lab Report Attached ☐ Yes ☐ No

ITEM	Dimension/Specification (Nominal & Tolerance) and Material Specifications	Supplier Measurement Device/Technique	Supplier Measurement Results	BIS Measurement Device/Technique	BIS Verification	OK	Not OK
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐
						☐	☐

Supplier Signature:

Title: Date:

Disposition: ☐ Approve ☐ Fail ☐ Deviate ☐ Resubmit

BIS signature: Date:

This document does not contain any technical data controlled by the EAR or ITAR

Attachment 4

United Technologies
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Material Test Results

ORGANIZATION:	PART NUMBER:
SUPPLIER / VENDOR CODE:	PART NAME:
MATERIAL SUPPLIER:	DESIGN RECORD CHANGE LEVEL:
* Customer Specified Supplier / Vendor Code:	ENGINEERING CHANGE DOCUMENTS:
* If source approval is req'd, include the Supplier (Source) & Customer assigned code.	NAME of LABORATORY:

Material Spec. No. / Rev / Date	Specification / Limits	Test Date	Qty. Tested	Supplier Test Results (Data)	OK	NOT OK

Blank statements of conformance are unacceptable for any test results.

SIGNATURE TITLE DATE

Attachment 5

United Technologies
Building & Industrial Systems

Performance Test Results

ORGANIZATION:	PART NUMBER:
SUPPLIER / VENDOR CODE:	PART NAME:
NAME of LABORATORY:	DESIGN RECORD CHANGE LEVEL:
* Customer Specified Supplier / Vendor Code:	ENGINEERING CHANGE DOCUMENTS:
* If source approval is req'd, include the Supplier (Source) & Customer assigned code.	

Test Specification / Rev / Date	Specification / Limits	Test Date	Qty. Tested	Supplier Test Results (Data) / Test Conditions	OK	NOT OK

Blank statements of conformance are unacceptable for any test results.

SIGNATURE TITLE DATE

Attachment 6

United Technologies
Building & Industrial Systems

APPEARANCE APPROVAL REPORT

PART NUMBER	DRAWING NUMBER	APPLICATION (VEHICLES)	
PART NAME	BUYER CODE	E/C LEVEL	DATE
SUPPLIER NAME	MANUFACTURING LOCATION		SUPPLIER CODE / VENDOR CODE

Reason for Submission		PART SUBMISSION WARRANT		SPECIAL SAMPLE		RE-SUBMISSION		OTHER
		PRE TEXTURE		FIRST PRODUCTION SHIPMENT		ENGINEERING CHANGE		

APPEARANCE EVALUATION

SUPPLIER SOURCING AND TEXTURE INFORMATION		PRE-TEXTURE EVALUATION	AUTHORIZED CUSTOMER REPRESENTATIVE SIGNATURE AND DATE
		CORRECT AND PROCEED	
		CORRECT AND RE-SUBMIT	
		APPROVED TO TEXTURE	

COLOR EVALUATION

COLOR SUFFIX	TRISTIMULUS DATA					MASTER NUMBER	MASTER DATE	MATERIAL TYPE	MATERIAL SOURCE	HUE				VALUE		CHROMA		GLOSS		METALLIC BRILLIANCE		COLOUR SHIPPING SUFFIX	PART DISPOSITION
	DL *	Da *	Db *	DE *	CMC					RED	YEL	GRN	BLU	LIGHT	DARK	GRAY	CLEAN	HIGH	LOW	HIGH	LOW		

COMMENTS

ORGANIZATION SIGNATURE:	PHONE NO.:	DATE:	AUTHORIZED CUSTOMER REPRESENTATIVE SIGNATURE:	DATE:

Attachment 7

CONTROL PLAN

Control Plan Number	Key Contacts / Phone	Date (Orig)	Date (Rev)
Part Number / Revision	Core Team	Customer Engineering Approval	
Part Name / Description	Supplier Sign-off	Customer Quality Approval	
Supplier / Plant	Other Approval	Other Approval	

Page of

Part / Process Number	Process Name / Operation Description	Machine, Device, Jig Tools Identification	Characteristics			Special Characteristic	Methods				Control Method	Reaction Plan
			No.	Product	Process		Product / Process Specification / Tolerance	Evaluation / Measurement Technique	Sample			
									Size	Frequency		

United Technologies
Building & Industrial Systems

Supplier Deviation Request Form

Tracking #

A SUPPLIER AND PART INFORMATION

Date	Part Number
Supplier Name	Part Name
Supplier Location	Revision Level
Supplier Contact	PO Number
Telephone #	Quantity
Fax #	Required Date

B DEVIATION INFORMATION

Deviation Request is: ( ) Process Related ( ) 1st Time ( ) Permanent

( ) Product Related ( ) Material Change ( ) Temporary

Current Specification or Process	Proposed Deviation	Reason for Deviation/Corrective Action

C BIS APPROVAL / DISAPPROVAL

	Signature	Approve/ Disapprove	Date	Comments
Purchasing				
Supplier Quality				
Engineering				
Manufacturing				
Other				

D DISPOSITION

Document Change Required? ( ) Yes ( ) No If Yes, PCA #

Comments:

Attachment 9

BIS Global 8D
8D

General Information

Title:
Opened: Last Updated:
8D Status:
D-Step Status:
Business Unit:
Site/Function:
Supplier Responsible:
8D Type:
Keywords:
Cross References:

D0 - Symptoms

D0 - Emergency Response Actions (ERA)

D1 - Team

Name	Role	Email Address	Phone

D2 - Problem

D3 - Interim Containment Actions (ICA)

D4 - Root Cause

D7 - Recommendations

D8 - Recognize Team and Individual Contributions

Attachments

Approval

.