


HARTWELL CORPORATION GENERAL SUPPLIER QUALITY REQUIREMENTS  
QCI 29-14-1 (06/20)

APPROVAL:  Shawn Ricordati, Quality Assurance 06/22/20

Page 1 of 17

1.1 **Quality System Requirements**

1.1.1 **Quality System** – The supplier shall maintain an effective quality system. Suppliers are responsible to provide assurance of compliance with purchase order requirements, and are subject to a quality audit by Hartwell at any time.

1.1.1.1 **Supplier Type** – Suppliers are classified by the following types and unless provided with a specific exception by the Hartwell Quality Assurance Manager must meet the following requirements:

- A (Administrative Services/ HR) providers of non-production services such as consultants, recruiters, training services, employee reimbursements, etc. No Supplier Survey or certification is required.
- C (Calibration Services) – providers of calibration services. Completion of Supplier Lab Survey and certification to ISO17025 or equivalent is required.
- E (Engineering Services) – providers of engineering test services. Lab Survey and certification to ISO17025 or equivalent is required.
- F (Finished Goods) – suppliers which provide “finished” manufactured items or assemblies (not including castings, forgings, or extrusions) and are the producers or distributors of consumable paints, adhesives and compounds. These suppliers typically provide the raw material and may sub-contract any special processing or secondary machining required to produce the finished item or assembly. Completion of a Supplier Survey is required and certification to the appropriate ISO or AS series standard or equivalent is required.
- I (Inspection Services) – providers of product inspection services on behalf of Quality Assurance such as CMM, 3D laser scanning or other non-contact dimensional inspections. Supplier Lab Survey and certification to ISO17025 or equivalent is required.
- M (Machining/ 2<sup>nd</sup> Ops) – providers of planned secondary machining activities such as gun-drilling, grinding or thread-rolling. This also includes suppliers which perform “Farm-out” machining activities where Hartwell provides the raw materials for the order and the supplier provides fabrication services. Note that a Finished Goods supplier may also perform this type of work. Completion of a Supplier Survey is required. No ISO or AS series certification is required unless the supplier provides the raw materials.
- N (Non-Production Supplies/ Services) – providers of products or services not deliverable with production products such as consumable supplies, office equipment and maintenance. No Supplier Survey or certification is required.
- R (Raw Materials) – providers of raw stock (such as sheet, bar, rod, and plate stock) and providers of castings, forgings and extrusions. Completion of a Supplier Survey is required and certification to the appropriate ISO or AS series standard or equivalent is required.
- Special Processors – providers of Special Processing services. Providers of these services must be NAPCAP approved for the process that they are performing. In addition, the supplier may need to be approved by a specific customer

1.1.2 **Changes to Supplier’s Operations** – The supplier must notify Hartwell in writing within 48 hours of any changes in its Quality System approval/ certification status as a result of any action taken by the Government or other Regulatory Agencies or Certification/ Accreditation Bodies. The supplier must notify Hartwell in writing of any change in the company’s key Management or Quality Assurance organizations. The supplier must also notify Hartwell in writing, in advance of any change of ownership, location, **re-location** or transfer of manufacturing operations, or any known change in the organization or procedures that could impact the quality of the products provided to Hartwell.

1.1.2.1 Note that the supplier is not obligated to advise Hartwell of the changes listed in 1.1.2 to their sub-tier suppliers unless specifically stated on the Purchase Order. The supplier is to manage their sub-tiers in accordance with Section 1.1.3.1.

1.1.3 **Quality Responsibility** – Suppliers are responsible for the quality of parts, processes or services supplied including those from approved sources. Verification by Hartwell does not absolve the supplier of providing acceptable product nor preclude subsequent rejection of product supplied. See section 7 for Special Quality and Packaging Requirements.

- 1.1.3.1 Suppliers are to maintain a register of their sub-tier approved sources of supply and outside processors. The supplier is to:
- Flow-down the requirements stated on the Hartwell Purchase Order to their sub-tiers.
  - Flow-down the applicable requirements of this document to their sub-tiers.
  - Monitor the performance of their sub-tiers.
  - Have a system to periodically review and re-approve the sub-tiers.
  - Notify Hartwell of any sub-tier performance or non-conformance that may impact the conformance of the products/ services provided to Hartwell.
- 1.1.3.2 Inspection Sampling – Inspection of products delivered to Hartwell are to be as follows:
- 100% Final Inspection is required for products classified as Assemblies (Section 2.1.2).
  - In-Process or Receiving Inspections - when sampling is used as a means of product acceptance, the sampling plan is justified on the basis of recognized statistical principles and appropriate for use (i.e., matching the sampling plan to the criticality of the product and to the process capability). There shall be a “zero” accept criteria on any sampling.
- 1.1.4 **Contract Review** - The supplier is required review all documents associated to the purchase order including the engineering drawing, specific instructions or special quality requirements stated on the purchase order, and that a current and Hartwell approved First Article for the product configuration per Section 1.1.6 is on file prior to commencement of any work on the purchase order. The supplier is to submit written notification on all documentation discrepancies to their buyer prior to commencement of the purchase order.
- 1.1.5 **Conflicts** – In all cases where a conflict exists between the purchase order, routing instructions or drawing, the purchase order shall take precedence.
- 1.1.6 **First Article Inspection (FAI)** – First Article Inspection Reports (FAIR) in accordance with AS9102 Rev B must be submitted and approved by Hartwell prior to the first shipment for all products except for industry standard hardware and catalogue items as allowed by AS9102. It is the supplier’s responsibility to assure that an approved FAIR has been received and is maintained on file for the configuration/ revision level of the part being provided. Production of additional units without the approval of the first article report will be at the supplier’s risk.

Forms other than those depicted in Appendix B may be used; however, they shall contain all “Required” and “Conditionally Required” information and have the same field reference numbers. Use of forms from a previous 9102 standard revision (e.g., AS9102A) is acceptable, provided the current form instructions are utilized. All forms shall be completed either electronically or in permanent ink. All forms shall be completed in English or in a language specified by the customer. Continuation sheets and insertion of additional rows are acceptable.

Final acceptance of production tooling for all Castings, Forgings, Formed Extrusions and Plastic/ Injection Molded parts is contingent upon acceptance of the First Article Inspection by Hartwell of the applicable characteristics on completed production parts or materials. Preliminary acceptance of pre-production parts used to check general tooling configuration does not constitute acceptance of the First Article. Final acceptance of the tooling and FAI will occur on products that have been fully processed to all of the purchase order requirements. Production of additional units without the approval of the first article report will be at the supplier’s risk.

FAI Forms 1, 2 and 3 shall include:

- a) All information and data required by AS9102 Rev B.
- b) Copies of all certifications and test data associated to materials provided by the Supplier and Special Processing services performed by or on behalf of the Supplier as listed on FAI Form 2.
- c) A “bubble drawing” reflecting the Characteristic Number on Form 3.
- d) Form 3 shall address all dimensional characteristic and Notes listed on the drawing. Features or characteristics not performed by the supplier are to be listed on Form 3 and marked as “NP” (Not Performed) in the Results column.
- e) Assembly FAIs will require copies of the current Detail FAIs (Forms 1 and 2) listed on Form 1 of the Assembly FAI.

- f) Assembly FAIs will require copies of the material and processing certifications for the components used to produce the first article assembly.
- g) Note that if the supplier has a current Detail FAI on file for a component listed on the EBOM it may be listed on the Assembly FAI even if that specific batch of parts were not used in the First Article Assembly. The supplier is not required to create new Detail FAIs if the FAI on file is current per AS9102. However, the supplier must provide copies of the process and material certs for the actual components used in the First Article Assembly.

All assemblies and components produced by the Supplier or furnished by a sub-tier and shall have been manufactured using the same production processes, procedures and equipment which will be used in fulfilling the contract.

The FAIR shall be repeated when:

- a. Engineering changes occur that invalidate the original FAIR results.
- b. A change in the manufacturing source(s), process(es), inspection method(s), location of manufacture, tooling or materials, that can potentially affect fit, form or function.
- c. A natural or man-made event, which may adversely affect the manufacturing process.
- d. There has been a lapse in production of the item for two years.
  - o A lapse of production is the time between the end of the last production run and the start of the next production run. If the time between the end of the last production run and the start of a new production run is two years or greater then a new FAI must be performed and approved on the new production run. If no new production run is initiated and the items being delivered were produced at a time when the current FAI was valid then a new FAI is not required. In this case the supplier should provide a copy of the current FAI and state on the Packing Slip/ Certificate of Conformance the manufacturing date of the products delivered to reflect that they were produced under the previous FAI. For example: In 2013 the supplier received an order for 100 units of a part. The supplier however produced 150 units of which 100 were delivered along with a valid FAI and 50 were placed in inventory for future use. In 2016 the supplier received an order for 50 units. The supplier used the 50 units in their inventory to satisfy the order. The 50 units in their inventory are therefore covered by the previously approved FAI because there was no new production run.

- 1.1.7 **Special Processing and Non-Destructive Testing (NDT)** – Unless otherwise specified on the purchase order, all Special Processing and NDT performed by the Supplier and any sub-tier contractor engaged in special processes (example: Heat Treatment, Chemical Processing/ Plating, Shot Peen, x-ray, welding, magnetic particle and penetrant inspection) shall be performed by a NADCAP approved processor.

If specified on the purchase order the Supplier or its sub-tiers may also be required to be approved by a specific Hartwell customer. See Section 7 for Special Quality Requirements.

Approval of special process sub-tier contractors does not relieve the Supplier of the responsibility for exercising those control measures necessary to ensure that work performed by sub-tier contractors is in accordance with specification requirements. Contractor shall have records of his approval on file, available for review by a Hartwell Quality Representative. The Supplier shall identify the sub-tier contractor(s) that perform special processes, by process specification, and supply this information with each shipment.

- 1.1.8 **Flow down of Requirements** – The supplier will flow down to their sub-tier suppliers or processors the relevant requirements stated on the purchase order and in this procedure. This includes the use of Customer Approved Sources of material or Customer Approved Processors as specified on the Purchase Order and /or controlling engineering drawing.
- 1.1.9 **Sub-contracting** – Sub-Contracting of the manufacturing or assembly of the Hartwell or Customer designed items ordered without the advanced approval of Hartwell Corporation is not allowed. Outsourcing of Special Processing, Non-Destructive Testing or required secondary operations (such as broaching, thread rolling, precision grinding, etc.) is allowed.
- 1.1.10 **Access** – During the performance of an order, the supplier's quality inspection system, parts and manufacturing operations are subject to review, verification and/or analysis by the Hartwell Corporation, authorized Regulatory Authorities and/or Hartwell customers.

- 1.1.11 **Source Surveillance** – All work performed in connection with contracted orders are subject to Hartwell quality surveillance at supplier's plant. Surveillance may include the products and the supplier's systems, procedures and facilities. The supplier shall furnish at no cost such information and assistance as determined necessary by the buyer.
- 1.1.12 **Source Inspection** – All work is subject to inspection at the supplier's plant by Hartwell prior to shipment if specified on purchase order. The supplier shall furnish without cost acceptable facilities and equipment for inspection, and shall provide twenty-four hours advance notice to the buyer when items or processes are ready for source inspection. Evidence of inspection and acceptance by the supplier must be submitted with the items to be inspected. Government or Customer source inspection will not be required unless specified on the Purchase Order.
- 1.1.13 **Traceability** – Material and processes used must be traceable by record to the contractually imposed drawings and functional test configurations used during manufacture. Each unit of product delivered must be uniquely identifiable to the Supplier's traceability records. Such records shall be retained by the Supplier for a period of ten (10) years after the completion of this purchase agreement/order or as otherwise specified by Hartwell.
- 1.1.14 **Shelf Life/ Age Controlled Items** – All Shelf Life/ Age Controlled items are to be delivered with a minimum of 80% of the shelf life remaining on the product at the time of receipt at Hartwell
- 1.1.15 **Counterfeit Materials** – Suppliers are to have in place a system in accordance with AS6174 to detect and prevent the use of counterfeit materials that may be provided or used in the manufacture of products provided to Hartwell.
- 1.1.16 **Foreign Object Damage/ Debris (FOD)** – The supplier is to have in place procedures and processes compliant with NAS412 or AS9146 to prevent foreign object damage (FOD) to aerospace products.
- 1.1.17 **Notification of Escape** – The supplier shall notify Hartwell within 48 hours of any known or suspect non-conforming products or Counterfeit Materials that have been or suspected to have been delivered to Hartwell. This notification must be made in writing to the attention of the Hartwell Quality Assurance Manager.
- 1.1.18 **Quality Records** – All records pertaining to system or contract performance shall be kept on file a minimum of five (5) years. All records pertaining to material or special processing traceability that were not delivered to Hartwell with the product must be kept on file for a minimum of ten (10) years and must be available to Hartwell upon request. ***After this period has elapsed, the supplier shall contact Hartwell for disposition approval (i.e. to either destroy or return the aged records) prior to disposing any records.***
- 1.1.19 **Non-Conforming Product** – Except for as stated in section 3.2.3.2 for Outside Processing Services, the supplier shall not deliver known non-conforming hardware without written authorization of the Hartwell Quality Assurance Department. Authorization by the buyer or engineering alone is NOT acceptable.
- 1.1.20 **Supplier Corrective Action Requests (SCAR)** – Rejections for non-conforming hardware determined to be the liability of the supplier will be recorded and forwarded to the supplier on a Hartwell Corporation SCAR. The supplier shall provide a written response to the SCAR along with the appropriate objective evidence of correction by the "DUE DATE" specified on the SCAR.
- 1.1.21 **Application of Acceptance Authority Media (AAM)** – Suppliers are advised that the products and services they provide to Hartwell are used aerospace products for which our customers and the general public at large rely on the safety performance of these products resulting from the supplier's assurance of product/ service conformity and ethical practices. Suppliers who utilize media to record the status and verification of product or product records used to support product conformance shall comply with the AS/EN/JISQ 9100 requirements and 14CFR Part 21.2 regarding the application of the Acceptance Authority Media (AAM) requirements. Suppliers shall, within its organization and its supply chain, ensure that the use of AAM is clearly defined within its Quality Management System (QMS). Suppliers shall, upon request, be able to demonstrate evidence of communication to its employees and to its supply chain that the use of AAM must be considered as a personal warranty of compliance and conformity.

The Supplier shall maintain compliance to the AAM requirements by assessing its process and supply chain as part of its internal audit activities. The assessment shall include but not be limited to:

- Application Errors (i.e. Omission, Typos, Legibility, etc.)
- Untimely Use (i.e. Documentation is not completed as planned, “Stamp/Sign as you go”, etc.)
- Misrepresentation (i.e. Uncertified personnel, Falsification of documentation, Work not performed as planned, etc.)
- Training Deficiencies (i.e. Ethics, Culture awareness, Proper use of authority media, etc.)

**1.1.22** Notification of Proprietary Product or Process Obsolescence – Manufacturers and Distributors of Proprietary Products such as those classified as “Catalogue” items in Section 2.3 or Processors which perform a proprietary Special Process not controlled by a recognized International Standard are obligated to inform within 30 days Hartwell of any known activity to:

- 
- Discontinue the manufacturing of the ordered item.
  - The supplier shall make procurement of “End of Life” quantities available to Hartwell.
- Discontinue the processing of the service requested
  - The supplier will coordinate the identification of a suitable replacement.
- Change the design/ processing characteristics, (materials, Special Processing, dimensional features, or formulation) of the ordered item or service that will affect the previously advertised/ reported performance of the item or service.
  - The supplier will coordinate and facilitate activities with Hartwell Engineering to validate the changes and assess the impact on approved Hartwell designs.

## 1.2 **General Certification Requirements**

1.2.1 All certifications must be signed by an authorized supplier quality representative. Certifications are to be legible and dark enough to maintain legibility when electronically scanned. Unless otherwise stated on the Purchase Order, certifications for each category of product or service will be in accordance with the appropriate section of this document for the product or service provided by the supplier.

1.2.2 For all categories of hardware, any special process stated on the controlling document required to be processed per a Customer Controlled specification or process (i.e.: BAC or BMS spec/ process) must be performed by a Customer approved processor. Any special process identified per Flag Note of the drawing to be performed by a “Douglas Approved” or “Boeing Approved” source must be performed by a Boeing D1-4426 approved processor regardless of the specification type.

1.2.3 Test Reports – As required per commodity specification, a copy of actual test reports/results shall be submitted with order. These reports shall contain the actual test results with the signature and title/qualification of the authorized individual from the testing agency. Type of tests include, but are not limited to chemical/physical, functional, nondestructive testing, x-ray.

1.2.4 Process Certification – For purchase orders where processing services have been provided by a supplier; each shipment shall be accompanied by a copy of process certificates listing all processes (such as welding, heat treating, surface treatments, finishing, etc.), the specification(s) and revision to which they conform, the performing agency, if other than the supplier, and the identification of material to which it applies by serial number, shipper number, purchase order number, or by other means. The certificate shall include the signature and title of an authorized representative of the seller or the performing agency.

1.2.4.1 Hartwell routinely conducts re-testing/ validation of special process represented as being completed on the supplier’s certifications. These tests may be conducted at any stage of product realization and are not limited to incoming receiving inspection. These tests may include but are not limited to hardness verification, raw material chemical/ physical properties, magnetic particle or penetrant inspection or functional tests. Differences in the results found by Hartwell may be grounds for rejection and replacement by the supplier.

1.2.4.2 Suppliers are to use the revision level of the process standard specified on the Purchase Order. If the revision level of the process standard is not stated on the Purchase Order the supplier is authorized to use the current

released version. In all cases the supplier is to state on the Process Certification the revision level of the standard used in accordance with para. 1.2.4.

- 1.2.4.3 Suppliers producing products for Hartwell or performing planned outside processing operations for Hartwell are to provide certificates of conformance for processing to current specification in accordance with Hartwell drawing HSP1000 Rev AB.

For example: a Hartwell drawing may specify to Passivate per QQ-P-35. Hartwell drawing HSP1000 reflects that QQ-P-35 is obsolete and replaced by AMS2700.

Suppliers are to perform the following review prior to performing any special processing on Hartwell items:

- a) Identify the specification reflected on the Hartwell drawing
- b) Determine if the specification is CURRENT (no cancellation notices released). If the specification is current then go to Step 5, if not then go to Step 3
- c) Review Hartwell standard HSP1000 Table II (Finishes and Processing) and identify the approved CURRENT specification.
- d) Verify that the process being performed conforms to the CURRENT specification.
- e) Perform the processing and certify the product to the CURRENT specification
- f) You MUST contact Hartwell QA if:
  - 1) The OBSOLETE specification does not appear in HSP1000 with an approved CURRENT specification, or
  - 2) Your process does not conform to the approved CURRENT specification listed

- 1.2.5 Control Records - Process or control records, charts, data sheets, etc., identifiable with the processes and materials to which they apply, and showing evidence of acceptance by the supplier's quality control organization, shall be submitted with each shipment. All documents submitted to Hartwell and/or retained by the supplier shall include applicable lot number to provide complete traceability.
- 1.2.6 Statistical Process Control (SPC) – SPC data collection shall be in accordance with AS9103. SPC requirements will appear on the drawing and/or purchase order and shall be submitted with product at time of delivery. It is the responsibility of the supplier to review these requirements and assure that the data is submitted with the product at the time of delivery.
- 1.2.7 Special Quality and Packaging Requirements – The purchase order may be subject to special quality documentation or packaging requirements not reflected on the controlling drawing or specification. The supplier must comply with these requirements stated on the purchase order. See section 7 for specific details.

## 2.0 **Product/ Service Category Definitions**

General quality requirements are applied to specific categories of products or services listed below.

- 2.1 **Hartwell Controlled Items** – Any item reflected on the purchase order controlled by a Hartwell Corporation drawing, routing or raw material specification. See section 3.0 for detailed requirements.
- 2.1.1 The term “Machined Parts” in this document shall be used for detail component items and Extrusions controlled by a Hartwell drawing that are not considered to be a Hartwell Raw Material, Casting, Forging, or Plastic/ Injection Molded part.
- 2.1.2 The term “Assemblies” in this document shall be used for items built to a Hartwell or Customer controlled drawing consisting of multiple machine parts or components. The item is typically built with component parts manufactured or purchased by the supplier and assembled as a complete unit. This may include but is not limited to items such as Lock Assemblies, “Lockwell” Pins, Cable Assemblies, or Strut/ Rod Assemblies.
- 2.1.3 For all items controlled by a Hartwell Corporation drawing, the supplier must assure that they have a copy of the appropriate Hartwell drawing of the same revision level reflected on the Purchase Order.
- 2.1.4 For Outside Processing Services that are controlled by a Hartwell Corporation drawing and associated a Hartwell Corporation Shop Traveler, the supplier must assure that they have a copy of the appropriate

Hartwell blue print of the same revision level as reflected on the Purchase Order. The Purchase order will include the specific instructions for the type of service to be provided and all requirements in which the parts are to be inspected and/or certified.

- 2.1.5 “Hartwell Raw Material” in this procedure refers to raw sheet, coil, rod, bar or plate items purchased by Hartwell to produce Machined Parts. The Hartwell Raw Material Item Number is in an Alpha Numeric format (ie: A1234). The purchase order should include the Hartwell Raw Material Item Number, a description of the size, material type and material specification to be provided. Note that items with a specific requirement for Grain direction will be identified by the presence of the letter “G” next to the dimension in which the grain direction is to flow.
- 2.2 **Standard Hardware** – Any item reflected on the purchase order which is controlled by an international standard or customer specific drawing standard. See section 4 for detailed requirements. Please note that items such as springs, nuts, bolts, washers, and screws controlled by a Hartwell drawing are to be considered “Machined Parts”.
  - 2.2.1 International Standard Items such as MS, NAS, NASM series items. The materials, processing, dimensional and certification requirements are established by and controlled by the specific base standard included in the part number.
  - 2.2.2 Boeing Standard Items controlled by a Boeing drawing specification. The materials, processing, dimensional and certification requirements are established by and controlled by the specific Boeing base standard included in the part number.
- 2.3 **Catalog Items** – Any item reflected on the purchase order which is controlled by the manufacturer. The materials, processing, dimensional and certification requirements are established by and controlled by the specific supplier base standard included in the manufacturer’s catalog. See section 5 for detailed requirements. The specific description of this item, including optional hardware requirements; will be specified in the item description or the item comments reflected on the purchase order.
- 2.4 **Consumables (Paints/ Adhesives/ Compounds)** – Items that are specially mixed per an industry standard specification or supplier controlled formula. These items typically may have shelf or mixed life. These include but are not limited to paints, primers, thinners, accelerators, sealants, adhesives, chemical bonding solutions (i.e.: Loctite) and lubricants.
- 2.5 **Calibration Service Providers** – Outside service providers that perform Calibration Services on Hartwell instruments. See section 8.0

Use the following table to identify the specific requirements in this document for the product or service being provided. Please note that all items regardless of category need to meet requirements stated in Sections 1 and 2.

Part/ Requirement Category		General Drawing Guidelines	General Certification Requirements	General Inspection Standards	Specific Certification Requirements			
					Manf/ Dist Cert	Raw Mat'l Certs	Special Processing	
Hartwell Controlled Drawings/ Specs	Machine Parts	3.1	1.2	3.2	3.2.3	3.4.2	3.2.3.2	
	Castings/ Forgings	3.1	1.2	3.5.1/ 3.5.2	3.5.4	3.4.2	3.5.4/ 1.2.4	
	Plastic/ Injection Molded Parts	3.1	1.2	3.6.1	3.6.2	3.6.2	-	
	Assemblies	3.1	1.2	3.3	3.3.3	3.3.3.1	3.3.2	
	Outside Processing Services	3.1	1.2	3.2	3.2.3.2	-	3.2.3.2	
	Raw Materials	3.1	1.2	3.4.1	3.4.2	3.4.2	1.2.5	
Non-Hartwell Controlled Drawings/ Specs	Standard Hardware	International Standard	-	1.2	-	4.1.1	4.1.1	4.1.1
		Boeing Standard	-	1.2	-	4.1.2	4.1.2	4.1.2
	Catalog Items		-	1.2	-	5.1	5.1	5.1
	Consumables		-	1.2	-	6.1	6.1	6.1
Services	Calibration Services		See Section 8					
	Inspection or Test		Certified test reports in accordance with the requirements specified on the Purchase order including the test method used and the revision level of the test standard used					

### 3.0 Hartwell Drawing Controlled Items

#### 3.1 General Drawing Guidelines

- a. General tolerances are found in the title block. Specific or special tolerances are listed by the dimension call-out or note area requirement.
- b. A Pointed Flag note is a call-out that is directed to a specific feature of the part and may have limited application.
- c. General notes (non-Pointed) are intended to be performed to, or incorporated into all parts represented on the drawing (100% application).
- d. Any deviation from drawing requirements must be submitted for engineering approval, through the Purchasing Department.
- e. Engineering Releases (ER) are revisions to drawings that have not been incorporated into drawing. ER's have control numbers and carry revised status.
- f. It is the responsibility of the Hartwell Purchasing Department to identify on the purchase order and to furnish the latest revision drawings and/or ER's on initial run. It is the supplier's responsibility to maintain a document control system, review subsequent purchase orders and request current drawings and ER's as required.
- g. Drawing dimensions shown are after any required finish (plating, anodize, electro-polish and paint) and before dry film/ solid film lube application unless otherwise specified.
- h. Hartwell specification HSP1000 may be used to identify obsolete specifications and their replacements.

3.1.1 Unless otherwise specified on the Hartwell drawing or Purchase Order all Machined Parts and Outside Processing Services shall meet the requirements listed in 3.2.

3.1.2 Unless otherwise specified on the drawing all Assemblies shall meet the requirements listed in 3.3

3.1.3 Unless otherwise specified on the Hartwell drawing all Castings shall meet the requirements specified in 3.5.



3.1.4 Unless otherwise specified on the Hartwell drawing all Forgings shall meet the requirements specified in 3.5.

3.1.5 Unless otherwise specified on the Hartwell drawing all Plastic/ Injection Molded items shall meet the requirements specified in 3.6.

3.1.6 Special Quality and/or Packaging Requirements are specified in section 7

**3.1.7 The use of Non-Conventional Machining is NOT ALLOWED unless specifically approved by Hartwell Engineering and reflected on the purchase order. This includes, but is not limited to:**

- **Electrochemical Machining (ECM)**
- **Electrochemical Grinding (ECG)**
- **Electrical Discharge Machining (EDM)**
- **Laser Beam Machining (LBM)**
- **Spark Erosion Grinding (SEG)**
- **Abrasive Water Jet Machining (AWJM)**

**3.1.7.1 Use of any of these methods to perform "rough" profile cutting of materials in preparation for final machining of the features may be used if the rough-cut process and final machining process are reviewed and approved by Hartwell Engineering and Quality Assurance.**

### 3.2 Machined Parts - General Inspection Standards

3.2.1 Unless specified on the drawing or purchased order Machine Parts shall meet the following:

- a) Dimensions apply after finish (plating, anodize, electro-polish and paint) and before dry film/ solid film lube application.
- b) Machined surfaces shall have a 125 micro-finish or better. All surfaces shall also be free of tool/chatter marks, rings, grooves, etc.
- c) Sharp corners shall be broken with a .005" to .015 radius.
- d) Unspecified fillet radii shall be .005"-.015".
- e) Parts shall be completely free of burrs unless prior arrangements have been contracted and stated on purchase order.
- f) Centerlines shall be +/- .010"
- g) Concentricity shall be .010" T.I.R.
- h) Hole diameter tolerances shall be as follows:
  - ii. .0010 thru .1499 = + .002/ - .000
  - iii. .1500 thru .2499 = + .003/ - .000
  - iv. .2500 thru .5000 = + .004/ - .000
  - v. .5001 and above = + .005/ - .001
  - vi. (for any letter, fraction or number drill callout Ref: Hartwell Spec HSP151)
- i) Springs made from "Music Wire" must meet the wire size diameter +/- 0.0002 (two tenths)
- j) Springs made from other materials must meet the wire size diameter +/-0.002 (two thousandths)

### 3.2.2 Special Processing and Finishes

- a) Unless otherwise stated on the Purchase Order, All special processes are to be performed by NADCAP approved sources.
- b) Any special process per BAC specifications or identified per Flag Note of the drawing to be performed by a "Douglas Approved" source or "Boeing Approved" source must be performed by a Boeing D1-4426 approved processor regardless of the specification type.
- c) Passivation **and Electro-Polish** – (Note that Assemblies are excluded from this requirement)
  - 1) Parts must be glass bead blasted prior to passivation to produce a satin or bright finish.
  - 2) **Unless otherwise specified on the PO, Hartwell products are to be inspected and tested as Class 1 parts.**
  - 3) Parts made of 300 Series Stainless or 440 series materials may be tested using any method authorized by AMS 2700 (**Passivation**) or **ASTM B912 (Electro-Polish)**.

- 4) All other material types MUST be tested AND certified for corrosion resistance using Salt Spray Corrosion resistance test per ASTM B117 only.
- d) Anodize – (Note that Assemblies are excluded from this requirement)
  - 1) Unless specified on the drawing or purchase order, Class 1 (non-dyed) is to be used.
  - 2) **Unless specified on the PO Type I and Type II parts are to be HOT WATER SEALED**
  - 2) Unless specified on the drawing or purchase order, Type III (hard anodize) is NOT TO BE SEALED
- e) **Rockwell Hardness Testing – No Rockwell test impressions allowed on the visible top surface of the part or on the outer diameter of cylindrical rollers or bushings. No more than 3 impressions per square inch on other surfaces.**

### 3.2.3 Machine Parts – Certification Requirements

#### 3.2.3.1 Machined Parts produced to Hartwell controlled drawings shall require

- 1) A signed Manufacturer's Certificate of Conformance stating the following:
  - a) Item number
  - b) Revision level
  - c) Quantity delivered
  - d) Hartwell Purchase Order number
  - e) Raw material used (type, spec and lot number)
  - f) Special Processing (type performed, spec and cert number)
- 2) A copy of the Raw material certifications used to produce the product
  - a) – Note that ALL raw material certs must meet the requirements specified in sec 3.4.2
- 3) A copy of the special processing certifications
  - a) – All special processing certs must meet the requirements specified in sec 3.2.3.2
- 4) Copies of any additional documents, test reports or data collection charts specified on the Hartwell Drawing or Purchase order
- 5) First Article Inspection Report per AS9102 required prior to first shipment. See sec. 1.1.6.

#### 3.2.3.2 Outside Processing Services

Machined Parts processed to Hartwell controlled drawings and Routings shall require

- 1) A Packing Slip stating the total number of parts delivered and should be segregated to identify:
  - a) The number of parts processed and found acceptable
  - b) The number of parts processed and found discrepant
  - c) The number of parts not processed and the reason why processing was not performed

NOTE: Any items found to be discrepant must be clearly identified and separated from conforming product.

- 2) A signed Certificate of Conformance stating the following:
  - a) Item number
  - b) Revision level
  - c) Quantity Accepted/ Certified (do not include non-conforming parts)
  - d) Hartwell Purchase Order number (or sub-tier order number)
  - e) Processing Service Performed (description of service)
  - f) Specification and revision to which the service is certified (if required)
  - g) Any additional process data/ test results required by the controlling specification or Purchase order instructions **including the corrosion resistance test method used for Passivation or Electro-Polish.**

Note – The supplier may provide a single Packing Slip/ Certificate of Conformance document as long as the data meets the requirements of 1 & 2 above.

### 3.3 Assemblies – General Inspection Standards

#### 3.3.1 Unless specified on the drawing the final configuration of the assembly shall meet the following requirements:

- a) Machined surfaces shall have a 125 micro-finish or better. All surfaces shall also be free of tool/chatter marks, rings, grooves, etc.

- b) Sharp corners shall be broken with a .005" to .015 radius.
- c) Unspecified fillet radii shall be .005"-.015".
- d) Parts shall be completely free of burrs unless prior arrangements have been contracted and stated on purchase order.
- e) Centerlines shall be +/- .010"
- f) Concentricity shall be .010" T.I.R.
- g) Hole diameter tolerances shall be as follows:
  - .0010 thru .1499 = + .002/ - .000
  - .1500 thru .2499 = + .003/ - .000
  - .2500 thru .5000 = + .004/ - .000
  - .5001 and above = + .005/ - .001(For any letter, fraction or number drill callout Ref: Hartwell Spec HSP151)

### 3.3.2 Special Processing and Finishes

- a) Unless otherwise stated on the Purchase Order, All special processes are to be performed by NADCAP approved sources.
- b) Any special process per BAC specifications or identified per Flag Note of the drawing to be performed by a "Douglas Approved" source or "Boeing Approved" source must be performed by a Boeing D1-4426 approved processor regardless of the specification type.

### 3.3.3 Assemblies – Certification Requirements

Assemblies produced to Hartwell controlled drawings shall require

- 1) A signed Manufacturer's Certificate of Conformance stating the following:
  - a) Item number
  - b) Revision level
  - c) Quantity delivered
  - d) Hartwell Purchase Order number
  - e) Manufacturer's Batch/ Traceability number
  - f) Item Serial Numbers (if required)
  - g) A statement indicating that the items provided meet the process, material and functional requirements specified on the Hartwell drawing
- 2) Copies of any functional or inspection reports specified by the Hartwell drawing or Purchase order.
- 3) First Article Inspection Report per AS9102 required prior to first shipment. See sec. 1.1.6.
  - a) Assembly FAIs will require copies of the current Detail FAIs (Forms 1 and 2) listed on Form 1 of the Assembly FAI.
  - b) Assembly FAIs will require copies of the material and processing certifications for the components used to produce the first article assembly.
  - c) Note that if the supplier has a current FAI on file for a detail component it may be listed on the Assembly FAI even if that specific batch of parts were not used in the First Article Assembly. The supplier is not required to create new Detail FAIs if the FAI on file is current per AS9102. However, the supplier must provide copies of the process and material certs for the actual components used in the First Article Assembly.

- 3.3.3.1 Unless specified on the Purchase Order or in the case of a submitted First Article Report, the supplier is not required to provide copies of the Raw Material Certifications used to produce the Assembly. The supplier must however state on the Manufacturer's Certificate of Conformance that the materials used to produce the product comply with the requirements reflected on the Hartwell Drawing. In addition the supplier must retain the raw materials and/ or special process certifications in accordance with this procedure.

### 3.4 **Hartwell Raw Materials – General Inspection Standards**

- 3.4.1 Unless specified in the Purchase Order, Hartwell Raw materials shall meet the following requirements: Material should be clearly identified as to the lot or batch represented on the packing slip (preference is for physical repeated marking of the material type and heat lot number)

- a) If Grain Direction is specified, the material should be clearly marked to identify the direction of the grain.
- b) Material is to be to the size specified on the purchase order within accepted industry standard tolerances for the material type and size
- c) Bar stock cut from plate shall be squared and meet a + 0.125/ - 0.000 dimensional tolerance to the size specified on the Purchase Order.

### 3.4.2 Hartwell Raw Materials – Certification Requirements

**3.4.2.1** The Certificate of Conformance from the form that is providing the material to Hartwell must include the following information:

- The material part number listed on the Hartwell PO. This includes the Hartwell Alpha-Numeric Raw Material Code (i.e.: S259-D).
- The material specification and revision level that the materials are certified to as reflected on the mill certifications.
- The name of the material manufacturer as designated on the mill certifications.
- The “Country of Origin” or “Melt Country” as designated on the mill certifications.
- The “Heat Lot” or lot traceability designator of the material(s) as reflected on the mill certifications
- The quantity of material delivered for each “Heat Lot”. Note that the qty should be stated in the same unit of measure as reflected on the PO.
- For castings and forgings – a listing of the special process performed including:
  - The specification number and revision
  - The firm performing the special process
  - The Certificate of Conformance or test report number of the process or inspection that is included in the document package

3.4.2.2 ALL raw material certifications MUST certify the materials to the specification listed on the Hartwell drawing or Purchase Order. Only those materials which have been officially superceded by a new specification may be certified to the alternate specification. Refer to Hartwell specification HSP1000 to identify obsolete specifications and their authorized replacements.

3.4.2.3 Raw materials purchased to a Hartwell controlled raw material number or products (castings, forgings or extrusions) produced to a Hartwell or customer controlled drawing shall require one copy of the mill certs to accompany order. Mill Certs shall show at minimum, heat lot, size, type, specifications, all chemical and physical analysis required by the specification and original melt country of origin. Certifications are to be legible and dark enough to maintain legibility when electronically scanned.

3.4.2.4 Raw materials that do not have an original melt country of origin in accordance with DFARS 225.003 (10) must be tested by an independent certified US Test Laboratory to demonstrate compliance with all requirements listed in the specification. A listing of Qualifying Countries may be found at the following website.

[http://www.acq.osd.mil/dpap/dars/dfars/html/current/225\\_0.htm#225.003](http://www.acq.osd.mil/dpap/dars/dfars/html/current/225_0.htm#225.003)

### 3.5 **Castings/ Forgings – General Inspection Standards**

3.5.1 Casting General Requirements – Unless specified on the drawing the casting shall meet the following requirements:

- a) Cast surfaces shall be a C-12 (125 micro-finish) or better.
- b) Each casting shall be subject to 100% visual inspection for any type of irregularities.
- c) Gated areas shall be smooth and blended evenly to the existing cast surface. They shall be dimensionally sound and free of tooling or sanding marks.
- d) Homogenization as appropriate is required prior to solution anneal.
- e) Castings shall be thoroughly cleaned.
- f) All specification requirements for stamping shall be followed.
- g) PSA part risk is to do with tool design only. This does not include straightening, workmanship or process errors.
- h) Cosmetically critical surfaces may be specified and must be in compliance with HSP255

3.5.2 Forging General Requirements – Unless specified on the drawing the forging shall meet the following requirements:

- a) Surfaces shall be a C-25 (250 micro-finish) or better, free of imbedded scales and pitting.
- b) Flash shall be removed flush to + .050 to adjacent surfaces.
- c) Forgings shall be thoroughly cleaned and uniform in quality, condition and appearance.
- d) PSA part risk is to do with tool design only. This does not include straightening, workmanship or process errors.

3.5.3 Special Processing – Castings and Forgings

- a) Unless otherwise stated on the Purchase Order, All special processes are to be performed by NADCAP approved sources.
- b) Any special process per BAC specifications or identified per Flag Note of the drawing to be performed by a “Douglas Approved” source or “Boeing Approved” source must be performed by a Boeing D1-4426 approved processor regardless of the specification type.

3.5.3 Castings and Forgings – Certification Requirements

Castings/ Forgings produced to Hartwell controlled drawings shall require

- 1) A signed Manufacturer’s Certificate of Conformance stating the following:
  - a) Item number
  - b) Revision level
  - c) Quantity delivered
  - d) Hartwell Purchase Order number
  - e) Raw material used (type, spec and lot number)
  - f) Special Processing (type performed, spec and cert number)
- 2) A copy of the Raw material certifications use to produce the product
  - a. – Note that ALL raw material certs must meet the requirements specified in sec 3.4.2
- 3) A copy of the special processing certifications
  - a. – All special processing certs must meet the requirements specified in sec 1.2.4
- 4) Copies of any additional documents, test reports or data collection charts specified on the Hartwell Drawing or Purchase order

### 3.6 **Plastic/ Injection Molded Items – General Inspection Standards**

3.6.1 Plastic/ Injection Molded items produced to Hartwell controlled drawings shall require

- a) Plastic components shall have a 125 micro-finish or better. All plastic components shall be free of tool marks, rings, grooves, etc.
- b) Sharp corners shall be broken to a .005R to .015R.
- c) Molded fillet radii shall be .005 to .015.
- d) Plastic parts shall be completely free from burrs and flash unless prior arrangements have been contracted and stated on purchase order.
- e) Each plastic part shall be 100% visually inspected for surface defects and irregularities. Attention shall be given to the presence of discontinuities such as cracks, evidence of shrinkage, potential stress risers such as tool marks, recesses or inadequate filling, sharp corners, knit lines, etc.
- f) Gating marks shall be smoothly blended to the surface or contour with no sanding marks present.
- g) PSA part risk is to do with tool design only. This does not include workmanship or process errors.

3.6.2 Plastic/ Injection Molded Parts – Certification Requirements

Plastic/ Injection Molded items produced to Hartwell controlled drawings shall require

- 1) A signed Manufacturer’s Certificate of Conformance stating the following:
  - a) Item number
  - b) Revision level
  - c) Quantity delivered

- d) Hartwell Purchase Order number
- e) Raw material used (type, spec and lot number)
- f) Special Processing (type performed, spec and cert number)
- 2) A copy of the Raw material certifications use to produce the product
- 3) A copy of the special processing certifications (if required)
- 4) Copies of any additional documents, test reports or data collection charts specified on the Hartwell Drawing or Purchase order

#### 4.0 **Standard Hardware**

##### 4.1 Certification Requirements

##### 4.1.1 **International Standard Hardware**

To prevent the procurement and distribution of counterfeit parts, all parts produced to industry standard specifications (AS, NAS, MS, etc.) shall require:

If purchased from the manufacturer

- 1) A signed Manufacturer's Certificate of Conformance stating the following:
  - a) Item number
  - b) Quantity delivered
  - c) Hartwell Purchase Order number
  - d) Manufacturer's Batch/ Lot number

Or if purchased from a Distributor

- 2) A signed Certificate of Conformance from the Distributor stating the following:
  - a) Item number
  - b) Quantity delivered
  - c) Hartwell Purchase Order number
  - d) The Manufacturer's cert number
  - e) A copy of the manufacturer's cert with matching cert number. Certifications are to be legible and dark enough to maintain legibility when electronically scanned.

##### 4.1.2 **Boeing Controlled Standard Items**

To prevent the procurement and distribution of counterfeit parts, all parts produced to Boeing specifications (BAC series) shall require:

Parts produced to Boeing Aircraft (BAC) specifications must be packaged and labeled by the approved manufacturer or an approved distributor listed in the Boeing D1-4426. ***The maintaining of inventory and*** the re-packaging of these products by a Broker (Non D1-4426 listed distributor) is NOT allowed. Material delivered by the Broker MUST be in the ORIGINAL packaging as received from the approved manufacturer or distributor.

Parts produced to Boeing Aircraft (BAC) specifications must be produced by a Boeing approved producer listed in Boeing's D1-4426 and shall require:

- 1) Manufacturer's Certificate of Conformance stating the following:
  - a) Item number
  - b) Quantity delivered
  - c) Hartwell Purchase Order number
  - d) Manufacturer's Batch/ Lot number matching the product packaging label
  - e) Melt country of origin of the raw materials used (if DFAR material is required)

Or if purchased from an Approved Distributor (Distributor must also be listed in the D1-4426)

- 2) A signed Certificate of Conformance from the Distributor stating the following:
  - a) Item number
  - b) Quantity delivered
  - c) Hartwell Purchase Order number
  - d) The Distributor's batch/ lot control number

- d) The name of the approved Manufacturer (must be listed in D1-4426)
- e) The Manufacturer's cert number and batch number
- f) A copy of the manufacturer's cert with matching cert and batch number
- g) Melt country of origin of the raw materials used (if DFAR material is required)

Note that the product may be re-packaged by an authorized (D1-4426 listed) distributor. The product must be delivered in packaging reflecting the Manufacturer or Distributor's name and lot traceability information.

Or if purchased from a Broker (Non D1-4426 listed distributor)

NOTE – BAC hardware supplied by a Broker must be delivered in the original D1-4426 approved Manufacturer's or Distributor's packaging. The maintaining of inventory and the re-packaging of BAC hardware by a Non D1-4426 supplier (Broker) is not allowed.

- 2) A signed Certificate of Conformance from the Broker stating the following:
  - a) Item number
  - b) Quantity delivered
  - c) Hartwell Purchase Order number
  - d) The name of the approved Manufacturer or Distributor (must be listed in D1-4426)
  - e) The Manufacturer or Distributor's cert number and batch/ lot control number
  - f) A copy of the Manufacturer's or Distributor's cert with matching cert and batch/ lot number
  - g) Melt country of origin of the raw materials used (if DFAR material is required)

## 5.0 **Catalog Items**

- 5.1 Packaging Requirements: Rubber or Elastomeric products such as gaskets, seals, O-rings or quad rings are to be packaged in a manner to prevent product deterioration in accordance with ARP5316 (Aerospace Recommended Practice for Storage of Elastomer Seals and Seal Assemblies Which Include an Elastomer Element Prior to Hardware Assembly.) Each package is to be identified with:
  - a) The part number
  - b) The manufacture name and/ or identification (Cage Code)
  - c) Quantity in package
  - d) The batch/ lot control number
  - e) The cure date (Quarter and Year)
  - f) The expiration date (Quarter and Year) or the shelf life expressed in years (i.e. Shelf Life = 10 years)
  - g) The packager name and package date (Month and Year) if different than the manufacturer data

## 5.2 Certification Requirements

To prevent the procurement and distribution of counterfeit parts, all parts produced to supplier catalog specifications shall require:

- 1) A signed Manufacturer's Certificate of Conformance stating the following:
  - a. Item number
  - b. Quantity delivered
  - c. Hartwell Purchase Order number
  - d. Manufacturer's Batch/ Lot number
  - e. The cure date (Quarter and Year)
  - f. The expiration date (Quarter and Year) or the shelf life expressed in years (i.e. Shelf Life = 10 years)

Or if purchased from a Distributor

- 2) A signed Certificate of Conformance from the Distributor stating the following:
  - a) Item number
  - b) Quantity delivered
  - c) Hartwell Purchase Order number
  - d) The Manufacturer's name and cert number

- g. A copy of the manufacturer's cert listed on the distributor C of C including Manufacturer's Batch/ Lot number, the cure date (Quarter and Year, and the expiration date (Quarter and Year) or the shelf life expressed in years (i.e. Shelf Life = 10 years)

## 6.0 Consumables (Paints/ Adhesives/ Compounds)

- 6.0.1 All Shelf Life/ Age Controlled items are to be delivered with a minimum of 80% of the shelf life remaining on the product at the time of receipt at Hartwell.

### 6.1 Certification Requirements

Items Procured in this category shall require:

- 1) A signed Certificate of Conformance stating the following:
  - a) Item number and Description
  - b) The specification or supplier catalog description the materials are certified to
  - c) Quantity delivered
  - d) Hartwell Purchase Order number
  - e) Manufacturer's Batch/ Lot number
  - f) The mix or cure date and the expiration date of the batch. Note that cure dates can be expressed in alphanumeric format (i.e. 1Q16), or a calendar date. The expiration date may be stated as the amount of time (years, days, months), or a specific calendar date, or in alphanumeric format (i.e. 1Q26).
  - g) A copy of any test reports required by the controlling specification

## 7.0 Special Quality and Packaging Requirements

- 7.1 The Purchase Order may specify Special Quality Requirements that are in addition to the drawing requirements or the certification requirements stated in sections 3, 4 and 5 that must be met by the supplier.

- 7.2 The supplier must comply with the specific requirements stated on the purchase order. These Special Quality Requirements include but are not limited to:

- a) Specialty Metals (DFAR Clause for qualifying countries)
- b) Raw Material Certification Requirements
- c) Special Packaging or Identification requirements
- d) Serialization Requirements
- e) SPC Data Collection
- f) Customer or NADCAP Approved Sources
- g) Age Control or Shelf Life identification
- h) Hartwell/ Customer furnished Tooling control

## 8.0 Calibration Service Providers Requirements

- 8.1 Firms which provide calibration services for Hartwell instruments and equipment are to maintain on file records of eye examinations for calibration technicians. These eye examinations are to be performed annually and are to be available for review upon request. Vision tests may be substituted for the options listed in 8.2 providing the equivalence is verified and documented by a licensed optometrist or ophthalmologist.

- 8.2 Eye examinations are to meet these minimum Near Vision requirements:

- Snellen 14/18, (20/30), or
- Jaeger 2

- 8.3 Calibration certifications are to include:

- The calibration procedure used to perform the task.
- The "as received" condition of the device.
- Any significant out of tolerance conditions found.
- The actions/ adjustments or work performed to resolve any identified issues.



- The standards used to perform the calibration including the device name, unique identification number and the calibration due date of the device.
- All calibration standards must be traceable to NIST or equivalent.
- The calibration results after any work has been performed.
- The name of the person performing the calibration.
- The name/ identification of the person certifying the calibration.