	NUMBER **SOP 20-005**
STANDARD POLICIES AND PRACTICES	PAGE **1** OF **6**
SUBJECT **SAMPLING INSPECTION**	EFFECTIVE DATE: **October 15, 2012** REVISES POLICY DATED: **April 15, 2012**

APPROVALS	
Management Systems Representative ***Signature on File***	Production Management – Machine Cell ***Signature on File***
Production Management – Test ***Signature on File***	Production Management – AF Assembly ***Signature on File***

1.0 PURPOSE:

To define the general sampling inspection requirements, the acceptance sampling procedure and the sampling inspection plans authorized for use in verification of Airframe product conformance.

2.0 POLICY STATEMENT:

The requirements defined within this document shall be employed for verification of Airframe machined or fabricated component, sub-assembly and assembly characteristic conformance, to defined Engineering specifications, where statistical sampling is used as the method of product acceptance. Eaton Industrial Corporation (EIC) sampling inspection plan meets/exceeds the requirements found in Boeing D1-8007 and ANSI/ ASQC Z1.4.

3.0 RESPONSIBILITIES:

Quality is responsible for developing and maintaining sampling plans in accordance with this procedure.

4.0 APPROVAL REQUIREMENTS:

4.1 Quality Systems Management shall approve all revisions to procedural requirements and sampling plans defined in this document.

4.2 Where specifically required, statistical sampling procedures and sampling plans shall be submitted for approval by Customer representatives.

4.3 Supervisors of personnel who are responsible to perform statistical sampling of Airframe product components, sub-assemblies and assemblies shall review and indicate concurrence with the sampling plans to be applied.

5.0 DEFINITIONS/GENERAL:

5.1 Definitions:

5.1.1 Acceptance number - Maximum number of defective units in the sample that will permit acceptance of the inspection lot. In this plan, the acceptance number is always zero.

5.1.2 Initial Reliability Requirement (IRR) – The degree of confidence that a part will successfully function after completion of all manufacturing steps, or, the expected rate at which defect free parts are produced. Characteristics that do not meet the minimum defined IRR will not be eligible for sample inspection.

5.1.3 Inspection - The act of measuring, examining, testing, or gauging a part characteristic and comparing the results to specified requirements in order to determine conformity.

5.1.4 Inspection by attributes - Each characteristic of each part inspected is determined to be either conforming or non-conforming and is recorded as acceptable or rejected. Degrees of conformance or nonconformance are not addressed by the sampling plans contained herein.

5.1.5 100% Inspection - The Process of performing inspection on each characteristic of every part within the lot using appropriate inspection techniques.

5.1.6 Classification of characteristics - The act of placing specific part features into categories. Categories in this procedure are:

- Critical Characteristic - A characteristic that, by judgment and experience indicates if not maintained would cause an unsafe condition in the product. All critical classification characteristics shall be 100% inspected.
- Major Characteristic - A characteristic, other than critical, that if not maintained would reduce suitability of product and could cause an unsafe condition in the product.

- Minor Characteristic - A characteristic that, if not maintained, would not reduce the suitability of product and would have no adverse effect on safety.

Attachment A to this specification depicts the scheme for Classification of Characteristics and lists corresponding codes for Critical, Major, and Minor characteristics.

5.1.7 Defect - A defect is defined as a non-conforming characteristic.

5.1.8 Defective - A unit of product that contains one or more defects.

5.1.9 Homogeneous lot - A group of parts manufactured at approximately the same time that are expected to share similar quality levels for selected characteristics.

5.1.10 Lot - A collection of units of product bearing identification and treated as a unique entity from which a sample is to be drawn and inspected to determine conformance with the acceptability criteria.

5.1.11 Lot size - The number of units of product in a lot.

5.1.12 Random sample - A sample selected in such a way that each unit of the population has an equal chance of being selected.

5.1.13 Reject - To refuse to accept. Rejection in an acceptance sampling sense means to decide that a lot has not been shown to satisfy the acceptance criteria based on the information obtained from the sample. Rejected lots may be immediately submitted for Material Review disposition upon completion of sampling inspection or may be screened 100% for any detected defects. In this case, all defective units will be submitted for material review.

5.1.14 Sample - Part of a population selected according to some rule or plan.

5.1.15 Sample size - The number of units selected as representative of a population.

5.1.16 Sampling plan - The instructions given to personnel responsible for performing sampling inspection. Sample Inspection Plans authorized for use are defined in attachments to this Standard Operating Practice.

5.2 General

5.2.1 Application of acceptance sampling plans and procedures contained herein is limited to verification of major and minor characteristics during Receiving Inspection and Manufacturing In Process Inspection processes.

5.2.2 Statistical sampling will not apply to critical characteristics (Inspection Code “A”) that require 100% inspection and/or test.

Requirements for characteristic inspection define by Engineering drawings, Acceptance Test Procedures and/or Specifications will take precedence over the requirements established herein.

5.2.3 When required by contract, customer approval of this document will be obtained prior to its use on material produced or procured for those customers. When specified by contract, other sampling plans will be applied in-lieu-of the plans contained herein.

5.2.4 Training - All personnel responsible for performance of statistical sampling will be provided initial training in the use of sampling plans and procedures contained herein with the objective of ensuring proper application of statistical sampling practices. Personnel training will address, at minimum: definition and documentation of part specific sampling plans, including establishing characteristic initial reliability; application of statistical sampling; and documentation of sampling inspection records. Personnel competence to implement and perform statistical sampling will be evaluated at least annually during the internal audit process and determination of the need for refresher training will be assessed. Documented evidence of training will be maintained in accordance with procedure QC-18, “Competence, Awareness and Training”.

5.2.5 Audit - Acceptance sampling plans and procedures will be audited to ensure ongoing compliance at a frequency of no less than once a year.

5.2.6 Characteristic Classification Codes (RE: Attachment A) are defined based on historical quality data for characteristic types demonstrating that process output meet the minimum required initial reliability required by this sampling procedure. During the inspection planning process for parts not previously manufactured, the Quality Engineering function will utilize these characteristic classifications to define the level of inspection required to ensure compliance to initial reliability requirements. Where new characteristic types or manufacturing processes are implemented, capability studies will be defined and performed to establish initial reliability prior to implementation of statistical sampling of less than 100% inspection.

6.0 PROCEDURE:

6.1 Part specific sampling plans will be developed and documented in accordance with SOP 10-002, “Airframe Machine Shop In Process Inspection”, or SOP 10-010, “Inspection Planning and Record “IPR” – Preparation and Use”, and will be used in conjunction with the requirements established by this procedure. All characteristics defined by design drawings will be subject to verification through the application of 100% inspection, sampling inspection or in accordance with approved statistical process control planning.

6.1.1 Where 100% or sampling inspection is applied, product characteristics will be assigned a characteristic classification code, designating the required quality level (IRR), in accordance with **Attachment A,** “Classification of Characteristics”.

6.1.2 The classification code for each characteristic will be defined on inspection planning.

6.2 The nature of observations of each characteristic subject to sampling inspection, including the number accepted and the number rejected (which together equals the sample size), will be recorded and records of sampling inspection results will be maintained for a minimum of 7 years after completion of inspections.

6.3 Samples will be randomly selected to ensure each unit of the lot to be inspected has an equal opportunity for selection.

6.3.1 Samples selected from lots of completed units will not have all samples selected from the top layer of a multi-layer transport container and will be selected in a manner provides an approximately equal portion of the sample parts from each layer of a multi-layer lot.

6.3.2 Samples will exclude all previously identified and segregated non-conforming parts from both the lot quantity and the sample.

6.3.3 In process sampling inspection, performed by delegated personnel during manufacturing processes, will be applied to units defined by a random number generator prior to beginning manufacture of the lot. Sample sizes will be in accordance with the sampling plans defined by this document.

6.4 Sampling inspection will be performed by Receiving Inspection or manufacturing personnel delegated in accordance with approved Standard Operating Practices.

6.4.1 Equipment selected to perform inspections will be appropriate to the characteristic measured and provide the necessary accuracy and consistency.

6.4.2 Personnel will thoroughly perform sampling inspection in accordance with defined characteristic classifications defined by inspection planning and record results in accordance with SOP 10-002 (machined components) or SOP 10-010 (Receiving Inspection).

6.4.3 Personnel will report all minor deviations as defects and no judgment as to the acceptability of minor defects will be made.

6.5 Production lots subjected to sampling inspection will be isolated in nature and each lot will be evaluated individually. General rules regarding switching between normal, tightened, and reduced inspection will not be applied.

6.5.1 Product characteristics rejected based on sampling inspection of completed lots will be subject to review of historical quality data to determine if the rejection indicates a reduction in the required quality level (IRR) or is isolated in nature. Characteristics evidencing a reduction in the required quality level will be subject to 100% inspection until appropriate corrective action has been taken and verified to have restored the required quality level.

6.5.2 Product characteristics rejected based on sampling inspection during manufacturing will be subject to 100% inspection of units produced since the last accepted sample and all subsequent units until appropriate corrective action has been taken and verified to have restored the required quality level.

CLASSIFICATION OF CHARACTERISTICS

CHARACTERISTIC	CLASSIFICATION	CODE
ANY FEATURE MARKED WITH CC	CRITICAL	A
Linear and Diametric Tolerance		
0.0000 thru .0010 total tolerance	Critical	A
Greater than .0010 and less than .0080	Major	B
.0080 and greater ; "min" & "max" dims	Minor	C
Squareness, Parallelism, Concentricity		
.0005 or less	Critical	A
Greater than .0005 and less than .0040	Major	B
.0040 and greater	Minor	C
Angle Tolerance		
0 deg, 30 min total tolerance	Major	B
Greater than 0 deg, 30 min	Minor	C
Surface Finish		
8 or better - visual comparison with one measured piece	Critical	A
9 thru 32 - visual comparison with one measured piece	Major	B
Greater than 32 - visual comparison with one measured piece	Minor	C
Machined / Tapped Threads (excluding Standard Hardware)		
Visual - Broken taps, burrs, etc.	Critical	A
All gauged characteristics	Major	B
Internal thread minor diameters	Major	B
All depths or lengths of threads	Minor	C
Spring - loads	Minor	C

CLASSIFICATION OF CHARACTERISTICS

CHARACTERISTIC	CLASSIFICATION	CODE
Visual for Defects		
Valves and functional end items	Critical	A
Spares	Major	B
True Position		
.006 Dia, or less	Major	B
.007 Dia, and greatest	Minor	C
Castings		
Mold mismatch	Major	B
Core shift, Visual	Major	B
Hardness test	Minor	C
Tooling-Controlled Items		
Rubber Molding	Minor	C
Floats	Minor	C
Plastic Injection Molding	Minor	C
Gaskets, Stampings, Nameplates	Minor	C
Tests		
End items	Critical	A
Spare pressure vessels	Critical	A
Actuator/Solenoid Acceptance tests	Critical	A

SAMPLE INSPECTION PLANS

TABLE 1
(Classification Code "B" - Major Characteristics)
97% Reliability

Lot Size	Sample Size
Up to 17	ALL
18 to 37	17
38 to 44	18
45 to 68	19
69 to 101	20
102 to 183	21
184 to 949	22
950 and up	23

TABLE 2
(Classification Code "C" - Minor Characteristics)
92% Reliability

Lot Size	Sample Size
Up to 6	ALL
7 to 12	6
13 to 32	7
33 and up	8

Note: The above lot sampling tables are based on an equal sharing of sampling risk between the producer and the consumer. They are based on acceptance on zero criteria, that is, no rejectable conditions are permitted in the sample. If one rejectable characteristic is found in the sample, the lot must not be accepted.

References:

- Boeing D1-8007, "Approval Guide for Supplier Statistical Sampling Plans"
- ANSI/ASQC Z1.4 (Corresponds to MIL-STD-105)