

Q228 Inspection Requirements
SSME Program Only- 11/22/02

Purpose

The purpose of this code is to define inspection requirements for Space Shuttle Main Engine (SSME) program hardware. The requirements of paragraph 4.20 Statistical Techniques imposed by Quality Clause: Q002, Q004, Q005 or Q006, of the Buyer's Purchase Contract are hereby deleted in their entirety, and are replaced with the provisions and requirements contained herein.

Requirements

1. Basic - Seller and its sub-tier supplier(s) shall maintain verifiable objective evidence that each finished detail, sub-assembly, and final assembly characteristic, of products comprising this contract were inspected 100%. Note: Seller is responsible for managing the flow of Q228 requirements to their sub-tier supplier(s).
2. Conditions – Conditions for sampling are as follows:
 - o Critical Characteristics: Sampling of characteristics identified as Critical by the Buyer is prohibited.
 - o Primary Characteristics: Sampling of characteristics identified as Primary by the Buyer is permitted but requires Buyer's approval and must meet sampling plan criteria (see below). Use of a sampling plan conforming to ANSI/ASQC Z1.4 or Z1.9 with an AQL of 0.65 or better is preferred.
 - o All Other Characteristics: Sampling of all other characteristics is permitted provided that a) the sampling plan conforms to ANSI/ASQC Z1.4 or Z1.9 with an AQL of 2.5 or better, or b) approval is obtained from Buyer. In addition, all sampling plans must meet the criteria listed below.
3. Sampling Plan Criteria - All sampling plans must meet the following criteria:
 - o Sufficient data must be available to demonstrate that the processes that produce the characteristics proposed for sampling are in control. Statistical process control (SPC) data shall be used to demonstrate control of applicable processes. The systems that control these processes must be documented in the seller's work instructions.
 - o Part specific sampling plan(s) must be generated for all characteristics to be sampled.
4. Sampling Plan Approval
 - o For all sampling plans that require the Buyer's approval, the Seller shall submit the proposed plan with supporting rationale and include the Seller or sub-tier(s) name, plan number, revision, and date to the Buyer's Purchasing Agent.
 - o Buyer approval of Seller's sampling plan shall be evidenced by the signatures of applicable representatives of NASA and the Buyer's Quality Engineering and Reliability departments.
5. Record Retention
 - o The sampling plan and associated data shall be maintained as part of the supplier's quality system, and shall be subject to verification by the Buyer. In addition, complete records, by serial or lot number, of all sample data will be kept on file as specified by requirements of the Buyer's contract, including those characteristics and units which are rejected as a result of sampling inspections.

Definitions

FMEA/CIL – Failure Modes & Effects Analysis (FMEA) and Critical Items List (CIL). The FMEA identifies component failure modes, categorizes each failure mode according to its worst case failure effect, identifies possible failure mode causes, and assesses the failure effect on engine, vehicle, and mission. The CIL provides the rationale for the retention of the design, and inspection & tests for the component in question.

Critical Characteristic – Inspections and Tests defined in the SSME FMEA/CIL that represent the final level of verification(s) necessary to minimize the probability of failure. Critical characteristics are those features that, if nonconforming, are likely to cause hazardous or unsafe conditions which could result in loss of life, vehicle, or mission.

Primary Characteristic – Inspections and Tests defined in the SSME FMEA/CIL which represent component or detail level verification(s) necessary to minimize the probability of failure. Primary characteristics are those features, that if nonconforming, are likely to result in loss of performance of the SSME, resulting in hazardous or unsafe conditions.

AQL - The acceptable quality level (AQL) is defined as the maximum percentage or proportion of nonconforming units in a lot or batch that, for purposes of acceptance sampling, can be considered satisfactory as a process average. The AQL is a nominal value expressed in terms of percent nonconforming specified for a single quality characteristic.