

ENGINEERING PRACTICE STUDY

TITLE: Survey on lot control, paragraph 5.6.1.1.1.2 Class S.

22 June 2017

STUDY PROJECT (SEE ATTACHMENT 1)

FINAL REPORT

Prepared by:

Ken Beymer

ENGINEERING PRACTICE STUDY

Survey on lot control, paragraph 5.6.1.1.1.2 Class S.

22 JUNE 2017

PROJECT 5950-2017-041

- I. OBJECTIVES. During the build of a product from start to finish can take many months. Certain materials are used on many different parts, bonding materials are used on many different products like solder.
- II. BACKGROUND. How would paragraph 5.6.1.1.1.2(a) apply to a situation where a rework is being performed, potentially weeks or months after the initial process, and the exact trace of material used, (cement, solder, epoxy) is no longer available as it was consumed?
- III. RESULTS. The document was reviewed and comments were generated. These comments are provided as attachment 1.
- IV. CONCLUSIONS. There are currently no DLA Land and Maritime certified MIL-STD-981 QPL products available. Magnetics currently manufactured to MIL-STD-981 requirements are specified by procuring activities in Source Control Drawings (SCD's). Class S rework criteria can be specified in Source Control Drawings.
- V. RECOMMENDATIONS. EP Study finds no action is needed for rework.

ATTACHMENT 1

PROJECT NUMBER 5950-2017-041	COMPILATION OF COMMENTS	COMMENT NUMBER 1
DOCUMENT MIL-STD-981 (EP STUDY)	COMMENTOR IND NAME OR CODE: Government Working Group Meeting	[] MFR [X] USER [] IND ASSOC
Current Version (Text under change consideration is denoted in blue) 5.6.1.1.1.2 Class S. Lot control for class S devices shall be required for each part design. As a minimum requirement, the lot control shall constrain the inspection lot to consist of a single part number representing one design and processed as a single lot through all manufacturing steps on the same equipment to the same product assurance program and procurement document and identified with the same date and lot code designation. In addition, the lot shall conform to the following: a. Each element, such as cores, magnet wire, finished cases, wire lugs and terminals, potting or molding compound used in the manufacture of the part shall be from a single lot and traceable to the lot. b. Solder for each application shall be of a uniform composition and traceable to the source. c. In general, all single process operations shall not be changed during processing of the lot. d. A lot identifying number shall be assigned at the time the lot is assembled. This unique lot identifying number shall be maintained through acceptance and shall be traceable to the production lot and to the lot date code. e. The manufacturer shall maintain traceability and test records for a minimum of 10 years on each lot date code. The manufacturer shall record when in-process controls and quality conformance inspections start and when they have been completed. The manufacturer shall notify the acquiring activity 30 days minimum prior to the destruction of records. f. All requirements specified in 5.6.1.1.1.1. 5.6.7.3.2 Rejected lots. For class B devices, if an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units and resubmit for reinspection. Resubmitted lots shall be 100 percent inspected. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots. Rework/rescreen of Class S devices shall not be permitted unless approved by the procuring activity. Proposed Change to 5.6.1.1.1.2 a and b: DLA Proposed Changes (Ken Beymer) a. Each element used in the manufacture of the part, such as cores, magnet wire, finished cases, wire lugs and terminals, potting or molding compound shall be reviewed with the procurement agency. Those elements agreed to be critical to the reliability and performance of the device shall be from a single lot and traceable to the lot. In the cases where that is not possible, rework lots shall be designed with a separate date code from the original lot. b. Solder and items (a) designated as con-critical for each application shall be of a uniform composition and traceable to the source. Alternative Wording (NASA) Leave section 5.6.1.1.1.2 as currently stated and edit section 5.6.7.3.2 as follows: 5.6.7.3.2 Rejected lots. For class B devices, if an inspection lot is rejected, the contractor may rework it to correct the defects, or screen out the defective units and resubmit for reinspection. Resubmitted lots shall be 100 percent inspected. Such lots shall be separate from new lots, and shall be clearly identified as reinspected lots. Rework/rescreen of Class S devices shall not be permitted unless approved by the procuring activity. If rework is permitted, the requirements of 5.6.1.1.1.2 shall be met with the following exception. When original material lot(s) used during the assembly of the parts is (are) no longer available, traceable substitute material(s) can be used with procuring activity concurrence. If substitute materials are used, the parts shall be designated with a separated date code.		
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA
[] ESSENTIAL [] SUGGESTED		
RECOMMENDED DISPOSITION		
OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [] DISCUSS		
FINAL DISPOSITION OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE [] WITHDRAW [] MODIFY		

PROJECT NUMBER 5950-2017-041		COMPILATION OF COMMENTS		COMMENT NUMBER 2	
DOCUMENT MIL-STD-981 (EP STUDY)		COMMENTOR IND NAME OR CODE: AEROSPACE		[] MFR [X] USER [] IND ASSOC	
For Class S, all materials shall be from the same individual lots. Therefore, if rework is allowed by the procuring activity, then enough material for each individual starting lot should be procured to cover initial build, rework, and/or flight lot rebuild. If rework is required and not enough material from the original lot is available, then the entire flight lot would have to be rebuilt, unless the procuring activity wished to process a waiver and do otherwise concerning homogeneity. However, one still needs to keep in mind how Group B would be affected if the flight lot did not contain homogeneous materials. Class S magnetic builds should be properly planned such that enough starting material from single lots are procured to cover initial build and rework or even a rebuild. The starting material is not where the cost is. In addition, if you allow the use of non-homogeneous material then how do you chose to perform a meaningful Group B?					
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA		[] ESSENTIAL [] SUGGESTED	
RECOMMENDED DISPOSITION OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [X] DISCUSS					
FINAL DISPOSITION OF COMMENT: [X] ACCEPTANCE [] NON-ACCEPTANCE [] WITHDRAW [] MODIFY					

DESC FORM 155

PROJECT NUMBER 5950-2017-041		COMPILATION OF COMMENTS		COMMENT NUMBER 3	
DOCUMENT MIL-STD-981 (EP STUDY)		COMMENTOR IND NAME OR CODE: Raytheon		[] MFR [X] USER [] IND ASSOC	
If they are doing a rework to spec on a lot, shouldn't their paperwork contain the trace info in it on the original materials used? If trace is lost, I am used to people separating the rework samples into a separate lot. That is only an issue where there is a requirement such as DPA that would eat up all the samples being reworked. I would think for space level parts they should never lose the trace					
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA		[] ESSENTIAL [] SUGGESTED	
RECOMMENDED DISPOSITION OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [X] DISCUSS					
FINAL DISPOSITION OF COMMENT: [] ACCEPTANCE [X] NON-ACCEPTANCE [] WITHDRAW [] MODIFY					

DESC FORM 155

PROJECT NUMBER 5950-2017-041		COMPILATION OF COMMENTS		COMMENT NUMBER 4	
DOCUMENT MIL-STD-981 (EP STUDY)		COMMENTOR IND NAME OR CODE: Raytheon		[] MFR [X] USER [] IND ASSOC	
I have read thru the EP study another time and want to expand on my previous comments. I think the main concern should be to control those piece parts that may have a critical impact upon reliability. These should include cores, epoxy for example. Screw, lugs, etc. I see as less critical. Space hybrids can face the same issues as magnetics. (Both categories include some very custom, high cost parts that may be often reworked.) In the case of space hybrids case, sub-lots are often created and treated as separate entities. I believe that magnetic devices should be treated similarly. I know that this can cause a problem with test such as DPA, but OEM's have learned how to deal with these issues for hybrids and magnetics can be treated the same. On a different level. If someone is doing a rework to spec on a lot, shouldn't their paperwork contain the trace info in it on the original materials used? If trace is lost, I am used to people separating the rework samples into a separate lot. That is only an issue where there is a requirement such as DPA that would eat up all the samples being reworked. I would thing for space level parts they should never lose the trace. That being said I recommend: 5.6.1.1.1.2 Class S. Lot control for class S devices shall be required for each part design. As a minimum requirement, the lot control shall constrain the inspection lot to consist of a single part number representing one design and processed as a single lot through all manufacturing steps on the same equipment to the same product assurance program and procurement document and identified with the same date and lot code designation. In addition, the lot shall conform to the following: a. Each element used in the manufacture of the part, such as cores, magnet wire, finished cases, wire lugs and terminals, potting or molding compound shall be reviewed with the procurement agency. Those elements agreed to be critical to the reliability and performance of the device shall be from a single lot and traceable to the lot. In the cases where that is not possible, rework lots shall be designed with a separate date code from the original lot. b. Solder and items (a) designated as con-critical for each application shall be of a uniform composition and traceable to the source.					
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA	[] ESSENTIAL [] SUGGESTED		
RECOMMENDED DISPOSITION OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [X] DISCUSS					
FINAL DISPOSITION OF COMMENT: [] ACCEPTANCE [X] NON-ACCEPTANCE [] WITHDRAW [] MODIFY					

DESC FORM 155

PROJECT NUMBER 5950-2017-041		COMPILATION OF COMMENTS		COMMENT NUMBER 5	
DOCUMENT MIL-STD-981 (EP STUDY)		COMMENTOR IND NAME OR CODE: Delevan		[X] MFR [] USER [] IND ASSOC	
In reference to EP study on lot control in cases of rework, API Delevan has no objection to the recommendation that more than one lot traceability of a certain material can be used if rework is required. The traceability of all materials shall be recorded on the lot traveler. We suggest para. 5.6.1.1.2(a) be rewritten as follows (includes a time lapse restriction). "Each element, such as cores, magnet wire, finished cases, wire lugs and terminals, potting or molding compound used in the manufacture of the part shall be from a single lot and traceable to the lot. When rework is required within a period of six months after the initial process (application) and materials from the original traceability have been depleted, it is acceptable to use materials from a different traceability as long as they are of a uniform composition compared to the original materials used and are traceable to the source."					
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA	[] ESSENTIAL [] SUGGESTED		
RECOMMENDED DISPOSITION					
OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [X] DISCUSS					
FINAL DISPOSITION OF COMMENT: [] ACCEPTANCE [X] NON-ACCEPTANCE [] WITHDRAW [] MODIFY					

DESC FORM 155

PROJECT NUMBER 5950-2017-041		COMPILATION OF COMMENTS		COMMENT NUMBER 6	
DOCUMENT MIL-STD-981 (EP STUDY)		COMMENTOR IND NAME OR CODE: Gowanda		[X] MFR [] USER [] IND ASSOC	
Class S rework limitations Mil-Std-981 para 5.6.1.1.1.2 second sentence in part reads... 'consist of a single part number representing one design and <i>processed as a single lot through all manufacturing steps</i> on the same equipment to the same product assurance program'... The intent of this wording indicates that any rework/repair separate from the manufacturing operation being performed at the time is not allowed unless the process is to be performed on all parts, not on a selective per part basis. If this be true, then the materials to perform an <u>operation</u> (i.e. epoxy, solder, adhesive) should originate from the same lot – but the same material if used for multiple operations could originate from different lots. For example: The same wire solder composition is used in two different operations: 1) To solder internal connect of magnet wire to stranded lead wire terminals and 2) to solder terminal lugs to the external lead wire ends. The solder could originate from two different lots, but the lot is to be the same for the operation – i.e. Material lot # ABC is the internal solder, while material lot # DEF is external connection. Now if rework was to occur on the external solder connection, then the material would be required to come from the same original lot, Lot # DEF in this example. But other scenarios come up as to the intent of material control – Para 5.6.1.1.1.2 a) identifies 'major' raw material elements. In a truly literal interpretation it could be construed that single material lot control is only applicable to the items listed. Materials not identified – i.e. Tape, Adhesive, Solder, Marking inks, Paints, Labels, Bobbins, etc are exempt from the single lot. This is especially true when the next statement Para 5.6.1.1.1.2 b) specifically identifies solder to be of a 'uniform composition'. Now if single lot requirement of Para 5.6.1.1.1 a) is to apply to solder than one would expect the solder to be of a uniform composition if originating from a single lot – and Para 5.6.1.1.1 b) could be eliminated. But I guess this comes down to the definition of what 'such as' means. I do not believe the intent of Mil-Std-981 Class S is to be so tightly restrictive to disallow 'cosmetic' touch-ups, nor rework/repairs within an operation, but rather attempts to prevent a marked differentiation of product within a production lot as a result of non-uniform production operations. Ultimately I suppose the burden falls upon the manufacturer to identify/justify the departure from the manufacturing process build sheet.					
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA		[] ESSENTIAL [] SUGGESTED	
RECOMMENDED DISPOSITION					
OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [X] DISCUSS					
FINAL DISPOSITION OF COMMENT: [] ACCEPTANCE [X] NON-ACCEPTANCE [] WITHDRAW [] MODIFY					

DESC FORM 155

PROJECT NUMBER 5950-2017-041		COMPILATION OF COMMENTS		COMMENT NUMBER 7	
DOCUMENT MIL-STD-981 (EP STUDY)		COMMENTOR IND NAME OR CODE: Goddard Space Flight Center (GSFC)		[] MFR [X] USER [] IND ASSOC	
I agree with the approach in the alternate wording (NASA's). In the DLA proposed changes, as I read it, the manufacturer need only assert that any element is non-critical, and refuse to agree that it isn't non-critical (a useful double negative there) in order to be allowed to create a rework lot with substitute materials - without necessarily any further consultation with the procuring activity, and no distinction from the original lot. The NASA verbiage is simpler; no need to rotate your mind around double negatives, and absolutely requires customer concurrence if substitutes are used for Class S, and a distinct lot indicator.					
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA	[] ESSENTIAL [] SUGGESTED		
RECOMMENDED DISPOSITION OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [X] DISCUSS					
FINAL DISPOSITION OF COMMENT: [] ACCEPTANCE [] NON-ACCEPTANCE [X] WITHDRAW [] MODIFY					

DESC FORM 155

PROJECT NUMBER 5950-2017-041		COMPILATION OF COMMENTS		COMMENT NUMBER 8	
DOCUMENT MIL-STD-981 Rev C (EP STUDY)		COMMENTOR IND NAME OR CODE: Government Working Group		[] MFR [X] USER [] IND ASSOC	
Per the GWG meeting held on 6/12/2017, the GWG recommends no changes to the existing MIL-STD-981C Class S rework requirements based on the following facts: - o There are currently no DLA Land and Maritime certified M981 QPL products available. Magnetics currently manufactured to M981 requirements are specified by procuring activities in SCDs. - o Class S rework criteria can be specified in SCDs. The GWG also recommends the following change to paragraph 5.6.1.1.1.2b in the next revision of M981: From: b. Solder for each application shall be of a uniform composition and traceable to the source To: b. Solder for each application shall be of a uniform composition and traceable to the solder manufacturer.					
DoD USE ONLY	DEPT	[] A [] N [] AF [] DLA [] NSA [] CNDN [] NASA		[] ESSENTIAL [] SUGGESTED	
RECOMMENDED DISPOSITION OF COMMENT: [X] ACCEPTANCE [] NON-ACCEPTANCE (see reason) [] WITHDRAW [] MODIFY [] DISCUSS					
FINAL DISPOSITION OF COMMENT: [X] ACCEPTANCE [] NON-ACCEPTANCE [] WITHDRAW [] MODIFY					