



AEROSPACE STANDARD

AS8030™

Issued

2018-08

Requirements for an Electronic Materials and Processes Management Plan

RATIONALE

This standard was created to define consistent electronic materials and processes management requirements for developing electronic materials and processes management plans.

FOREWORD

This document defines the requirements for developing an Electronic Materials and Processes Management Plan (EMPMP), hereinafter also called the Plan, to ensure customers and regulatory agencies that all of the electronic materials and processes in the equipment of the Plan owner are selected and applied using controlled processes compatible with the end application: aerospace, defense, and high performance (ADHP) equipment. This is accomplished by documenting and implementing the processes required in Section 3 of this document.

In this document, electronic materials and processes are defined as “materials used in electrical or electronic assemblies” and “processes used for the build and test of electrical or electronic assemblies”. This excludes all materials related to electronic components on a printed wiring assembly (PWA) except for lead material and finish.

The organization that requires the Plan has the responsibility of defining the Plan owner and for flowing down the Plan requirements. Individual requirements of Section 3 can be accomplished by the Plan owner or can be flowed down to their sub-tiers (e.g., assembly manufacturer); however, the Plan owner remains responsible for meeting all applicable requirements of this document.

The Plan documents the processes that the Plan owner has available to address the requirements of this document. For each electrical or electronic assembly, the Plan owner selects which of their documented process will be used, based on the application requirements.

NOTE: Appendix A not subject to copyright restrictions.

SAE Technical Standards Board Rules provide that: “This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is entirely voluntary, and its applicability and suitability for any particular use, including any patent infringement arising therefrom, is the sole responsibility of the user.”

SAE reviews each technical report at least every five years at which time it may be revised, reaffirmed, stabilized, or cancelled. SAE invites your written comments and suggestions.

Copyright © 2018 SAE International

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of SAE.

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790
Email: CustomerService@sae.org
<http://www.sae.org>

SAE WEB ADDRESS:

Full document details: SAE AS8030

SAE values your input. To provide feedback
on this Technical Report, please visit
<http://standards.sae.org/AS8030>

Documents
Document Sharing Hub

TABLE OF CONTENTS

1.	SCOPE.....	3
2.	REFERENCES.....	3
3.	TECHNICAL REQUIREMENTS.....	5
3.1	Material Requirements.....	5
3.1.1	Material Application Requirements	5
3.1.2	Material Selection Requirements	6
3.1.3	Material Life-Cycle Management Requirements.....	8
3.1.4	Subcontractor Management.....	9
3.2	Process Requirements.....	9
3.2.1	Process Application Requirements.....	9
3.2.2	Corrosion Considerations.....	9
3.2.3	Cleanliness Prior to Application	10
3.2.4	Process Records.....	10
3.2.5	Cleaning and Storage	10
3.2.6	Rework	10
3.2.7	Repair.....	10
3.2.8	Acceptance	10
3.2.9	Process Control.....	10
3.2.10	Printed Wiring, Wiring Harness, and Electronic Box Assemblies	10
3.2.11	Process Selection Requirements.....	11
3.2.12	Process Life-Cycle Management Requirements	11
4.	ADMINISTRATIVE REQUIREMENTS.....	11
4.1	Plan Content and Organization	11
4.2	Plan Compliance Demonstration	11
4.3	Plan Focal Point.....	12
4.4	Plan References.....	12
4.5	Plan Applicability	12
4.6	Plan Implementation	12
4.7	Plan Modifications	12
4.8	Plan Terms, Definitions, Abbreviations, Initials, and Acronyms.....	12
5.	PLAN TERMS, DEFINITIONS, ABBREVIATIONS, INITIALS, AND ACRYONYMS	12
6.	NOTES.....	14
6.1	Revision Indicator.....	14
APPENDIX A	COMPLIANCE MATRIX.....	15

1. SCOPE

This document applies to the development of Plans for integrating and managing electronic materials and processes for equipment in the military and commercial aerospace markets; as well as other ADHP markets that wish to use this document.

Examples of electronic materials and processes, as described in this document, include soldering alloys, plating finishes, bulk metals, chassis materials and finishes, materials used for mechanical parts, etc.

It is critical for the Plan owner to review and understand the properties and configuration control of all “as-received” or “off-the-shelf” electronic materials with respect to the application capabilities in order to identify risks, and where necessary, take additional action to mitigate the risks.

The technical requirements are in Section 3 of this standard, and the administrative requirements are in Section 4.

2. REFERENCES

For dated references, only the revision cited applies. For undated references, the latest revision of the referenced document (including any amendments) applies.

1. Standard for Preparing a COTS Assembly Management Plan, TechAmerica EIA-933.
2. Design Assurance Guidance for Airborne Electronic Hardware, RTCA DO-254, Radio Technical Corporation of America.
3. SAE International Aerospace Recommended Practice, “Guidelines for Development of Civil Aircraft and Systems,” SAE Standard ARP4754, Rev. Dec. 2010.
4. Environmental Conditions and Test Procedures for Airborne Equipment, RTCA DO-160, Radio Technical Corporation of America.
5. Corrosion Prevention and Deteriorating Control in Electronic Components and Assemblies, MIL-HDBK-1250.
6. Environmental Engineering Considerations and Laboratory Tests, MIL-STD-810.
7. Moisture/Reflow Sensitivity Classification for Nonhermetic Solid State Surface Mount Devices, J-STD-020, IPC/JEDEC®.
8. Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices), ANSI/ESD-S20.20.
9. General Guidelines for Electronic Equipment, MIL-HDBK-454.
10. Physics of Failure Reliability Predictions, ANSI/VITA 51.2-2016, VITA.
11. SAE International Aerospace Recommended Practice, “Guidelines for Preparing Reliability Assessment Plans for Electronic Engine Controls,” SAE Standard ARP5890, Rev. May 2018.
12. Reliability Prediction of Electronic Equipment, MIL-HDBK-217.
13. Configuration Management Standard, EIA-649, TechAmerica.
14. SAE International Aerospace Standard, “Quality Management Systems - Requirements for Aviation, Space, and Defense Organizations,” SAE Standard AS9100, Rev. Sept. 2016.
15. Quality Management System – Requirements, ISO 9000.
16. Performance Standard for Aerospace and High Performance Electronic Systems Containing Lead-free Solder, GEIA-STD-0005-1, TechAmerica.

17. Process Management for Avionics - Aerospace and Defence Electronic Systems Containing Lead-free Solder - Part 1: Preparation of a Lead-free Control Plan, IEC/TS 62647-1, International Electrotechnical Commission.
18. SAE International Technical Report, "Standard for Mitigating the Effects of Tin Whiskers in Aerospace and High Performance Electronic Systems," SAE Standard GEIA-STD-0005-2, Rev. May 2012.
19. Process management for avionics – Aerospace and Defence Electronic Systems Containing Lead-Free Solder - Part 2 - Mitigation of Deleterious Effects of Tin, IEC TS 62647-2, International Electrotechnical Commission.
20. Requirements for Using Solder Dip to Replace the Finish on Electronic Piece Parts, GEIA-STD-0006.
21. Acceptability of Printed Boards, IPC-A-600.
22. Standard Series for PCB Design Design, IPC-2220.
23. Generic Performance Specification for Printed Boards, IPC-6011.
24. Standard for Preparing a DMSMS Management Plan, ANSI/TechAmerica STD-0016, TechAmerica.
25. Requirements for Soldered Electrical and Electronic Assemblies, IPC J-STD-001.
26. Electrostatic Discharge Control Program for Protection of Electrical and Electronic Parts, Assemblies and Equipment (Excluding Electrically Initiated Explosive Devices), MIL-STD-1686.
27. Printed Board Handling and Storage Guidelines, IPC-1601.
28. Standard for Foreign Object Debris/Foreign Object Damage Prevention, MSFC-STD-3598.
29. Marking and Labeling of Components, PCBs and PCBAs to Identify Lead (Pb), Lead-Free (Pb-Free) and Other Attributes, IPC J-STD-609.
30. Requirements and Acceptance for Cable and Wire Harness Assemblies, IPC/WHMA-A-620.
31. Foreign Object Damage/Foreign Object Debris (FOD) Prevention, NAS 412.
32. General Standard for Parts, Materials, and Processes, MIL-STD-11991.
33. Dissimilar Metals, MIL-STD-889.
34. SAE International Aerospace Standard, "Counterfeit Materiel; Assuring Acquisition of Authentic and Conforming Material," SAE Standard AS6174, Rev. July 2014.
35. Requirements for Handling Electrostatic-Discharge-Sensitive (ESDS) Devices, JESD625, JEDEC®.
36. Generic Requirements for Surface Mount Land Pattern and Design Standard, IPC-7351.
37. Qualification and Performance Specification for Rigid Printed Boards, IPC-6012.
38. Qualification and Performance Specification for Flexible Printed Boards, IPC-6013.
39. Reliability Program Standard for Systems Design, Development, and Manufacturing, GEIA-STD-0009.
40. Handling, Packing, Shipping and Use of Moisture/Reflow Sensitive Surface Mount Devices, IPC J-STD-033.
41. Qualification and Performance Specification for High Frequency (Microwave) Printed Boards, IPC-6018.
42. Acceptability of Electronic Assemblies, IPC-A-610.
43. Identification Marking of U.S. Military Property, MIL-STD-130.

- 44. SAE International Aerospace Standard, "Identification Marking Methods," SAE Standard AS478, Rev. Nov. 2017.
- 45. Repair and Modification of Printed Boards and Electronic Assemblies, IPC-7721.
- 46. Rework, Modification and Repair of Electronic Assemblies, IPC-7711.
- 47. Acceptance Requirements for Optical Fiber, Optical Cable, and Hybrid Wiring Harness Assemblies, IPC-A-640.
- 48. Acceptability Standard for Manufacture, Inspection, and Testing of Electronic Enclosures, IPC-A-630.

3. TECHNICAL REQUIREMENTS

A Plan **shall** be created to document processes used by the Plan owner to accomplish the requirements herein. These requirements apply to all electronic assemblies, including COTS, custom, and subcontracted assemblies.

Wherever IPC documents are specified, the designer **shall** specify a Class. Class 3 **shall** be the default for ADHP applications but other Classes may be specified based on the end item application.

3.1 Material Requirements

3.1.1 Material Application Requirements

The Plan **shall** ensure that requirements for materials are derived from the system level requirements to satisfy all the requirements for deliverable equipment, allocated to the material level.

3.1.1.1 Life Cycle Stresses

The Plan **shall** ensure that the electronic materials satisfy the application design requirements, reliably throughout manufacturing, operating, storage, and transportation stresses listed below, using appropriate risk mitigations when required.

(Refer to RTCA DO-254 and ARP4754 for guidance on design and development of aerospace electronic Systems, including allocation of System requirements.)

	Stress	Application Consideration	Guidance Standards
3.1.1.1.1	Temperature limits	Material usage outside the temperature limits specified by the material manufacturer is discouraged. Damage can occur when specified maximum or minimum temperature limits are exceeded during manufacturing, operation, storage, or transport.	RTCA DO-160
3.1.1.1.2	Temperature variation	Temperature cycling over long periods of time can cause damage due to mismatches of coefficients of thermal expansion between the material and other materials in an assembly.	
3.1.1.1.3	Heat dissipation and cooling	Proper heat dissipation and cooling methods may be required to prevent damage to the material assemblies.	

	Stress	Application Consideration	Guidance Standards
3.1.1.1.4	Mechanical shock	Mechanical stress limits may be exceeded when materials are exposed to mechanical shock. Variations in mechanical fit from production or temperature cycling may increase susceptibility to mechanical shock.	MIL-STD-810
3.1.1.1.5	Mechanical vibration	Damage can occur due to long term exposure to certain mechanical vibration profiles. Variations in mechanical fit from production or temperature cycling may increase susceptibility to mechanical vibration.	MIL-STD-810
3.1.1.1.6	Moisture and corrosion	Damage can result from exposure to moist and/or corrosive environments, particularly when elevated temperatures are experienced. Galvanic corrosion can occur when two different metals are in contact in a corrosive environment.	IPC J-STD-020 IPC J-STD-033 MIL-HDBK-1250 MIL-STD-889
3.1.1.1.7	Electrostatic discharge	Handling of materials can induce electrostatic discharge that can cause component damage.	ANSI/ESD-S20.20 JESD 625
3.1.1.1.8	Other relevant stresses	As applicable from system use environment or customer specifications.	

3.1.2 Material Selection Requirements

3.1.2.1 Specification

The Plan **shall** ensure that the specification of all materials is defined, uniquely identified, and documented to the extent required to ensure that they satisfy the application requirements.

3.1.2.2 Availability

The Plan **shall** ensure that availability and level of obsolescence risk are considered as major materials selection criteria.

(Refer to SAE GEIA STD-0016 for guidance on obsolescence management.)

3.1.2.3 Standardization

At each level of design authority, the Plan **shall** minimize distinct part numbers and part manufacturers to the extent practical to meet performance requirements, and reduce logistics, sustainment, and production costs.

3.1.2.4 Qualification

The Plan **shall** define the material qualification process, qualification plan, test procedures, sampling plan, criteria of acceptance, and test results to ensure all materials meet the application and/or customer requirements.