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MILITARY STANDARD
STANDARDIZATION AND CONTROL PROGRAM
FOR
PARTS, MATERIALS AND PROCESSES
USED IN
INTERCONTINENTAL BALLISTIC MISSILE
WEAPON SYSTEMS

AMSC No. F4426

AREA MISC

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MIL STD-1836 (USAF)

**DEPARTMENT OF THE AIR FORCE
BALLISTIC MISSILE OFFICE
Air Force Systems Command**

Standardization and Control Program for Parts, Materials and Processes Used in Intercontinental Ballistic Missile (ICBM) Weapon Systems.

1. This Military Standard is approved for use by the Ballistic Missile Office (AFSC), Department of the Air Force and is available for use by all Departments and Agencies of the Department of Defense.
2. Beneficial comments (recommendations, additions, deletions) and any pertinent data which may be of use in improving this document should be addressed to: HQ BMO/AWD, Norton AFB, CA 92409-6468 by using the self-addressed Standardization Document Improvement Proposal (DD Form 1426) appearing at the end of this document or by letter.

MIL STD-1836 (USAF)

FOREWORD

A parts, materials and processes (PMP) standardization and control program is necessary for Intercontinental Ballistic Missile Weapon Systems and associated support equipment. The program defined in this standard is intended to minimize the different parts, materials and processes used in the system, to standardize specification requirements, and to assure the proper selection, and application control of PMP used in the system. The objective of the program is to minimize life cycle costs through the enhancement of interchangeability, the improvement of reliability and quality, and the reduction of maintenance and repair.

Program contractors, subtier contractors, and vendors will be required to comply with the requirements of this standard. The requirements of this standard should be tailored to meet the needs of each procurement in each program phase.

This standard is arranged so that all requirements are identified in the main body of the standard. Appendices are included to amplify or expand upon specific requirements found in sections 4 and 5 and should not be construed as constituting separate requirements for pricing purposes.

MIL STD-1836 (USAF)**CONTENTS**

Paragraph		Page
1.	SCOPE	1
1.1	Purpose	1
1.2	Applicability	1
2.	REFERENCE DOCUMENTS	2
2.1	Government documents	2
2.1.1	Specifications, standards, and handbooks	2
2.2	Other Government documents, drawings, and publications	2
2.3	Order of precedence	2
3.	DEFINITIONS	3
3.1	Definition of terms	3
3.1.1	Absolute maximum rating or maximum rating	3
3.1.2	Advanced state-of-the-art device	3
3.1.3	Associate contractor	3
3.1.4	Change request	3
3.1.5	Contracting activity	6
3.1.6	Controlled document	3
3.1.7	Contractor	3
3.1.8	Contractor-controlled item	3
3.1.9	Critical document	3
3.1.10	Critical process, material or tool	3
3.1.11	Deliverable hardware	3
3.1.12	Design application data	3
3.1.13	Destructive physical analysis (DPA)	3
3.1.14	Equipment category	3
3.1.15	Flow chart	4
3.1.16	High risk item	4
3.1.17	Hybrid microcircuit	4
3.1.18	Inspection lot	4
3.1.19	Item quality	4
3.1.20	Key program milestone	4
3.1.21	Long lead time item	4
3.1.22	Long term availability	4
3.1.23	Major change	4
3.1.24	Material	4
3.1.25	Major change	4
3.1.26	Microcircuit	4
3.1.27	Nominal operation	5
3.1.28	Non-Preferred PMP	5
3.1.29	Non-operational equipment	5
3.1.30	Off-the-shelf item	5
3.1.31	Operational equipment	5
3.1.32	Parameter drift screening (PDS)	5
3.1.33	Part	5
3.1.34	PCCB-controlled item	5
3.1.35	Process	5
3.1.36	Process baseline	5
3.1.37	Process baseline control (PBC)	5

MIL STD-1836 (USAF)

3.1.38	Product assurance program plan	5
3.1.39	Program parts control board (PPCB)	5
3.1.40	Program PMP lists	6
3.1.41	Responsible contractor	6
3.1.42	Subcontractor	6
3.1.43	Supplier	6
3.1.44	Supplier process change request (SPCR)	6
3.1.45	Worst case operation	6
3.2	Definitions of acronyms used in this standard	6
4.	GENERAL REQUIREMENTS	8
4.1	Parts, materials and processes standardization and control (PMPSC) program	8
4.2	PMPSC organization and management	8
4.2.1	Operating policies and procedures	8
4.2.2	Subcontractor PMPSC	8
4.3	Program reviews, technical interchange meetings and audits	8
4.3.1	Subcontractor PMPSC program reviews and audits	8
4.4	Program parts control board (PPCB)	8
4.4.1	PPCB membership	8
4.4.2	PPCB technical support	9
4.4.3	Changes to PPCB controlled specifications	9
4.5	Responsible contractor assignments	9
4.6	Off-the-shelf and government furnished equipment (GFE)	9
4.7	Hybrid microcircuits	9
4.8	Compliance with requirements	9
5.	DETAILED REQUIREMENTS	11
5.1	Selection of parts, materials and processes (PMP)	11
5.1.1	Selection requirements	11
5.1.2	PMP characterization	11
5.1.3	Prohibited PMP	11
5.2	Control of PMP selection	11
5.2.1	Contractor-selected PMP list (CPMPL)	11
5.2.2	Approval for non-preferred PMP	11
5.2.2.1	Approval for electrical, electronic, and electromechanical (EEE) parts	11
5.2.2.2	Approval for mechanical parts, materials and processes	11
5.3	Application of PMP	12
5.3.1	Derating of EEE parts	12
5.3.2	Design application data	12
5.3.2.1	Submission to contracting activity	13
5.4	PMP controls and qualification	13
5.4.1	Contractor controlled specifications and drawings	13
5.4.2	PMP qualification	13
5.4.3	Parameter drift screening (PDS)	13
5.4.3.1	PDS planning	13
5.4.3.2	Exceptions to PDS	13
5.4.4	Destructive physical analysis (DPA)	14
5.5	EEE parts in-process controls	14
5.5.1	Process baseline controls (PBC)	14
5.5.2	In-process inspection	15
5.5.3	Failure analysis	15
5.6	Supplier selection, approval and surveillance	15

MIL STD-1836 (USAF)

5.6.1	Selection of suppliers	15
5.6.2	Supplier approvals	15
5.6.3	Supplier surveillance	16
5.7	Product and data monitoring	16
6.	NOTES	18
6.1	Intended use	18
6.2	Data requirements	18
6.3	Subject term (key word) listing	18

TABLES**Table**

I	ICBM parts selection-EEE and PMP selection order of preference	19
II	Electrical, electronic and electromagnetic parts	20
III	Mechanical parts	21
IV	Materials	22
V	Processes	23

APPENDICES**Appendix**

A	Requirements for the program parts control board	A-1
B	Requirements for hybrid microcircuit design, development and manufacture	B-1
C	Requirements for the approval of non-preferred EEE parts	C-1
D	Requirements for parameter drift screening	D-1
E	Requirements for process baseline control	E-1
F	Requirements for resident engineering supplier surveillance	F-1

MIL STD-1836 (USAF)

1. SCOPE

1.1 Purpose. This standard establishes the criteria and requirements for the implementation of a parts, materials and processes standardization and control (PMPSC) program for Intercontinental Ballistic Missile (ICBM) Weapon Systems.

This standard applies to all categories of parts, materials and processes (PMP) with emphasis placed on the selection, standardization, application, and control of electrical, electronic and electromechanical (EEE) parts.

1.2 Applicability. This standard applies to program contractors and subtier contractors involved in the design, development, test and production of ICBM weapon systems, subsystems and support equipment to the extent specified in the procurement documentation.

MIL STD-1836 (USAF)**2. REFERENCE DOCUMENTS****2.1 Government documents.**

2.1.1 Specifications, standards, and handbooks. Unless otherwise specified, the following specifications, standards, and handbooks of the issue listed in that issue of the Department of Defense Index of Specifications and Standards (DoDISS) specified in the solicitation form a part of this standard to the extent specified herein.

The following documents of the issue in effect on the date of the invitation for bid, request for proposal or contract form a part of this standard to the extent specified herein.

SPECIFICATIONS**Military**

MIL-S-19500	Semiconductor Devices, General Specification for
MIL-M-38510	Microcircuits, General Specification for
MIL-HDBK-339	Custom Large Scale Integrated Circuit Development and Acquisition for Space Vehicles

STANDARDS**Military**

DOD-STD-100	Engineering Drawing Practices
MIL-STD-750	Test Methods for Semiconductor Devices
MIL-STD-883	Test Methods and Procedures for Microelectronics
MIL-STD-976	Certification Requirements for JAN Microcircuits
MIL-STD-1580	Destructive Physical Analysis

2.1.2 Other Government documents, drawings, and publications. The following other Government documents, drawings, and publications form a part of this standard to the extent specified herein.

ICBM PMP Standards Manual, Volumes 1 and 2 issued by the Ballistic Missile Office, Air Force Systems Command, Norton Air Force Base, CA 92409-6468

AFSC Pamphlet 800-27, Part Derating Guidelines

(Copies of specifications, standards, drawings, and publications required by contractors in connection with specific procurement functions should be obtained from the contracting activity or as directed by the contracting officer.)

2.3 Order of precedence. In the event of a conflict between the text of this standard and the references cited herein, the text of this standard shall take precedence.

MIL STD-1836 (USAF)**3. DEFINITIONS**

3.1 Definition of terms. The following definition of terms as used in this standard shall apply:

3.1.1 Absolute maximum rating or maximum rating. The maximum value of an electrical or environmental stress which is permitted to be applied to an item. Application of stress beyond the maximum rating may permanently impair the item.

3.1.2 Advanced state-of-the-art device. A device which is designed, fabricated or tested utilizing an unproven technology. Such devices are considered "advanced state-of-the-art" until a satisfactory history of production and performance has been established.

3.1.3 Associate contractor. A specific contractor designation made by the contracting activity. This term is normally used when there are two or more contractors on a program neither of which is subordinate to the other.

3.1.4 Change request. A specific written request by the contractor to deviate from the program requirements.

3.1.5 Contracting activity. The government contracting office or agency acquiring the equipment, system or subsystem for which this standard is being contractually applied.

3.1.6 Controlled document. A manufacturer's document that has been approved and is under formal change control by both the supplier and the contractor.

3.1.7 Contractor. An organization which has contracted with the contracting activity to design, develop or produce items of equipment.

3.1.8 Contractor-controlled item. An item of PMP controlled by drawings and specifications generated and maintained by a contractor or under a contractor's direction.

3.1.9 Critical document. A manufacturer's document that controls a critical process, material or tool used in the production of an item.

3.1.10 Critical process, material or tool. Any manufacturing process, material or tool which, if changed, may significantly affect an item performance characteristic which is not otherwise adequately controlled by the item specifications.

3.1.11 Deliverable hardware. An item of hardware produced by a contractor or subtier contractor which is subject to delivery to the contracting activity or a higher tier contractor.

3.1.12 Design application data. A set of data describing the characteristics and properties of an item and instructions in the proper application of the item.

3.1.13 Destructive physical analysis (DPA). A DPA is a systematic, logical, physical disassembly of an item, performed to identify anomalies that impact reliability.

MIL STD-1836 (USAF)

3.1.14 Equipment category. The equipment category determines the quality level of PMP used in the equipment (See table I). As used in this standard, equipment categories are defined as follows:

- a. Operational equipment is airborne vehicle equipment (AVE), operational support equipment (OSE), and launch essential/mission critical (LE/MC) equipment.
- b. Nonoperational equipment is support equipment (SE), maintenance support equipment (MSE), depot support equipment (DSE), airborne instrumentation (ABI), and test support equipment (TSE).
- c. Safety equipment is a special category of nonoperational equipment.

3.1.15 Flow chart. A diagram detailing the sequential relationship among process steps used in the production of an item.

3.1.16 High risk item. Any item with an uncontrolled variable, either known or suspected, which if present could prevent the item from meeting equipment performance requirements or the contractor from meeting schedule requirements.

3.1.17 Hybrid microcircuit. A single packaged enclosed circuit consisting of elements mounted on a single substrate. The elements are a combination of microcircuits and/or semiconductors and/or discrete parts.

3.1.18 Inspection lot. A quantity of items or material submitted at one time for inspection to determine compliance with the acceptance requirements prescribed in the applicable controlling drawings.

3.1.19 Item quality. Determined by design, conformance to qualification requirements, and quality control provisions.

3.1.20 Key program milestone. A major event in a program schedule such as contract award (CA), preliminary design review (PDR), critical design review (CDR), functional configuration audit (FCA), and physical configuration audit (PCA).

3.1.21 Long lead time item. An item where the lead time for procurement (i.e., the time period between placement of a purchase order and item delivery) exceeds the normal time allowed for procurement to support program schedules.

3.1.22 Long term availability. A projection as to the future availability of the item for procurement during the production and service life of the equipment.

3.1.23 Major change. Any change which could, in any way, impact the functional performance, interchangeability, or environmental capability of an item, including nuclear hardness and reliability.

3.1.24 Material. An element, mixture or compound used in a manufacturing operation which may or may not become a part of the manufactured item (examples are listed in table IV).

3.1.25 Minor change. Any change that does not fall within the definition of a major change.

MIL STD-1836 (USAF)

3.1.26 Microcircuit. A small circuit having a high equivalent circuit element density, which is considered a single part composed of interconnected elements on or within a single substrate to perform an electronic circuit function. (This excludes printed wiring boards, circuit card assemblies, and modules composed exclusively of discrete electronic parts.)

3.1.27 Nominal operation. Operation of a part at steady state or average value of applied stress as recommended by the part manufacturer.

3.1.28 Non-preferred PMP. Any part, material or process which is not listed as "1st" order-of-preference in table I.

3.1.29 Non-operational equipment. Equipment used exclusively for maintenance, test and/or evaluation.

3.1.30 Off-the-shelf item. An item which has been developed and produced to military or commercial standards and specifications, is readily available for delivery from an industrial source and may be procured without change to satisfy a military requirement.

3.1.31 Operational equipment. Equipment which is essential for the operation of the system in the operational environment.

3.1.32 Parameter drift screening (PDS). A 100% screening procedure whereby all parts are subjected to non-destructive and non-degrading electrical, mechanical and/or environmental stresses, either separately or in combination, for the purpose of removing individual parts or entire lots which exhibit anomalous behavior.

3.1.33 Part. One piece, or two or more pieces joined together which are not normally subject to disassembly without destruction of designed use.

3.1.34 PPCB-controlled item. An item of PMP described by drawings and specifications which are under change control by the PPCB and are listed on the IPL, PPL and NCL of the ICBM PMP Standards Manual.

3.1.35 Process. An operation, treatment or procedure used during the fabrication of an item (examples are listed in table IV).

3.1.36 Process baseline. The complete set of manufacturing documentation which has been established and approved for use in the production of an item.

3.1.37 Process baseline control (PBC). The control and documentation of selected supplier processes, materials, tests and inspections used in the production of parts and materials. (See Appendix E.)

3.1.38 Product assurance program plan. A supplier document which describes the methods and procedures utilized to assure compliance with applicable specifications and quality standards.

3.1.39 Program parts control board (PPCB). A board established and managed by the procuring activity to control the standardization, procurement, and application of PMP.

MIL STD-1836 (USAF)

3.1.40 Program PMP lists. Lists of PMP prepared and maintained by the procuring activity and included in the ICBM PMP Standards Manual. Program lists include the following.

- a. Program preferred list (PPL). PMP which are preferred for program applications.
- b. Interim preferred list (IPL). A list of items that are candidates for addition to the PPL but has not met all of the criteria for approval.
- c. Limited approved list (LAL). Non-preferred PMP which have been approved for limited use in specific applications by one contractor or subcontractor.
- d. Non-preferred controlled list (NCL). Non-preferred PMP which have been approved for limited use in specific application(s) by two or more contractors.
- e. Prohibited item list (PIL). PMP which are prohibited from use on the program because of known weaknesses.

3.1.41 Responsible contractor. A contractor which has been designated by the Government procuring activity specific responsibilities associated with PPCB controlled PMP specifications.

3.1.42 Subcontractor. An organization which has contracted with a program contractor to design, develop or produce equipment.

3.1.43 Supplier. The organization which manufactures a part or material or provides a service for a contractor, subcontractor, or subtier contractor.

3.1.44 Supplier process change request (SPCR). A notice prepared by the supplier detailing a proposed change to a controlled process.

3.1.45 Worst case operation. Operation of a part with worst case timing and/or maximum electrical stress and/or maximum adverse environment.

3.2 Definitions of acronyms used in this standard. The following acronyms listed in this Military Standard are defined as follows:

ABI	airborne instrumentation
AFLC	Air Force Logistics Command
AFSC	Air Force Systems Command
ALCC	Airborne Launch Control Center
ASMS	Advanced Strategic Missile Systems
AVE	airborne vehicle equipment
BMO	Ballistic Missile Office
C	Celsius or centigrade
CA	contract award
CDR	critical design review
CDRL	contract data requirements list
CPMPL	contractor-selected parts, materials and processes list
DESC	Defense Electronics Supply Center
DID	data item description
DISC	Defense Industrial Supply Center
DoD	Department of Defense

MIL STD-1836 (USAF)

DODISS	Department of Defense Index of Specifications and Standards
DPA	destructive physical analysis
DSE	depot support equipment
EEE	electrical, electronic and electromechanical
ER	established reliability
ESS	environmental stress screening
FAR	Federal Acquisition Regulation
FCA	functional configuration audit
FRACA	failure reporting analysis and corrective action
FSC	Federal Supply Classification
GFE	Government furnished equipment
GSE	Government supplied equipment
HCI	hardness critical item
ICBM	intercontinental ballistic missile
IFSS	In-flight safety systems
IRSS	instrumentation and range safety system
IPL	interim preferred list.
JAN	Joint Army Navy
LAL	limited approved list
LE	launch essential
LTPD	lot tolerance percent defective
MC	mission critical
MSE	maintenance support equipment
NCL	non-preferred controlled list
NPPAR	non-preferred part approval request
OSE	operational support equipment
PBC	process baseline control
PCA	physical configuration audit
PCO	procuring contracting officer
PDA	percent defective allowable
PDR	preliminary design review
PDS	parameter drift screening
PIL	prohibited item list
PMP	parts, materials and processes
PMPSC	parts, materials and processes standardization and control
PPCB	Program Parts Control Board
PPL	program preferred list
QPL	qualified part/product list
RPIE	real property installed equipment
SCD	source control drawing
SEM	scanning electron microscope
SE	support equipment
SE/TA	system engineering/technical assistance
SID	selected item drawing
SOW	statement of work
SPCR	supplier process change request
TI	technical interchange
TSE	test support equipment

MIL STD-1836 (USAF)**4. GENERAL REQUIREMENTS**

4.1 Parts, materials and processes standardization and control (PMPSC) program. The contractor shall plan and implement a PMPSC program in accordance with the requirements of this standard as tailored by the contract (see note 6.2). The contractor shall integrate the PMPSC task with other design, development and production tasks and program activities.

4.2 PMPSC organization and management. The contractor shall establish and maintain a centralized PMPSC organization with the responsibility for managing the performance of all PMPSC tasks. This organization shall assure the effective integration of all PMPSC efforts, provide direction to its internal organization and subcontractors performing PMPSC tasks. This organization shall be the focal point for all technical liaison on PMPSC matters with other program contractors and the contracting activity. The contractor shall designate a single individual within this organization to be the focal point for PMPSC program management interface with the contracting activity.

4.2.1 Operating policies and procedures. Where the contractor's operating policies, procedures, instructions and manuals are not consistent with the requirements of this standard, the contractor shall develop supplementary documentation or modify existing documentation as necessary to comply with these requirements.

4.2.2 Subcontractor PMPSC. The contractor shall apply the requirements of this standard to all equipment designed, developed or produced by subcontractors. The requirements of this standard may be tailored for application to a subcontractor subject to the approval of the procuring activity. The contractor shall assure that all PMPSC subtasks applicable to subcontracted equipment are implemented and performed in accordance with the requirements of this standard.

4.3 Program reviews, technical interchange meetings and audits. The contractor's PMPSC personnel shall participate in contracting activity, contractor and subcontractor program reviews, technical interchange (TI) meetings and audits as required to assure that the contractor and subtier contractors are performing in compliance with PMPSC requirements. The contractor's PMPSC organization shall follow up decisions, action items and agreements made relative to PMPSC to assure their timely implementation and the continued effectiveness of the PMPSC program.

4.3.1 Subcontractor PMPSC program reviews and audits. The contractor shall conduct program reviews and audits of subcontractor PMPSC activities on a periodic basis. Results of these reviews and audits shall be recorded and be available to the procuring activity for detailed examination at the contractor's facility during the term of the contract. The contracting activity reserves the right to have representative(s) attend as an observer, program reviews and audits with subcontractors. The contractor shall notify the procuring activity of such reviews and audits at least 10 working days prior to their scheduled date.

4.4 Program parts control board (PPCB). The contractor shall participate in the PPCB as defined in Appendix A and the following subparagraphs.

4.4.1 PPCB membership. The contractor shall provide a technically and administratively qualified representative (and an alternate representative) to serve as a working member on the PPCB. The contractor representative shall be a person directly associated with the contractor's PMPSC organization and shall have the authority to

MIL STD-1836 (USAF)

commit the contractor to PPCB actions and decisions which are within the scope of the applicable contract(s).

4.4.2 PPCB technical support. The contractor shall provide technical support required by the PPCB. The technical support shall include, but not be limited to, providing information on contractor's PMP from the following areas:

- a. Product assurance (e.g., reliability, maintainability, quality, receiving inspection, standardization).
- b. Parts technology and applications.
- c. Procurement.

4.4.3 Changes to PPCB controlled specifications. The contractor shall originate, process and implement changes to PPCB controlled specifications in accordance with Appendix A (see 6.2).

4.5 Responsible contractor assignments. When assigned by the contracting activity as the responsible contractor for a PPCB controlled item, the contractor shall perform specific PMPSC subtasks for all contractors using the item. The assignment of responsible contractors will be made by Government Contracting Activity letter and will include responsibility for the following:

- a. Design application data (see 5.3.2).
- b. Engineering data packages, specifications and drawings including general specifications (see 5.4.1).
- c. PMP qualification (see 5.4.2).
- d. Supplier process baseline controls (see 5.5.1).
- e. Supplier selection and approvals (see 5.6.1 and 5.6.2).
- f. Supplier surveillance (see 5.6.3).
- g. Coordinate lot quality conformance and acceptance testing (radiation hardness testing).
- h. Master purchase agreement.

4.6 Off-the-shelf and government furnished equipment (GFE). The contractor shall implement this standard for all PMP used in any design modification of GFE or off-the-shelf equipment. The requirements of this standard do not apply to unmodified GFE and unmodified off-the-shelf equipment.

4.7 Hybrid microcircuits. Hybrid microcircuits shall be considered electronic parts within the context of this standard, and all of the requirements applicable to microcircuits shall apply. The requirements of Appendix B shall apply to the design, development and manufacture of hybrid microcircuits.

4.8 Compliance with requirements. Compliance with the requirements of this standard shall not relieve the contractor, subcontractor, or subtier contractors of the

MIL STD-1836 (USAF)

responsibility for complying with any other requirements set forth in applicable system/equipment specifications. In case of conflict of requirements, this document shall take precedence.

MIL STD-1836 (USAF)**5. DETAILED REQUIREMENTS****5.1 Selection of parts, materials and processes (PMP).**

5.1.1 Selection requirements. The selection of PMP for specific design application(s) shall be the responsibility of the contractor; however, the item selected may be subject to contracting activity approval (see 5.2). The contractor shall select PMP in accordance with the requirements specified below:

- a. Technical suitability. PMP selected must be technically suitable in every respect for their applications. Factors such as function, environment, reliability, physical characteristics, safety and interchangeability shall satisfy the design requirements. The use of a standard, specification, or other document does not, in itself, assure the suitability of an item for any specific application.
- b. Selection order of preference. PMP shall be selected in the order of preference stated in table I.

5.1.2 PMP characterization. The contractor shall assure that PMP selected for use in contractor-designed equipment has the inherent capability to meet both the functional and environmental requirements of the application. Where a PMP capability has not been established by prior testing or usage, the contractor shall perform characterization tests and/or evaluations to assure that the item has the inherent capability to function satisfactorily in the application.

5.1.3 Prohibited PMP. The selection and use of a PMP which has a known weakness is prohibited. A list of prohibited items is included in the ICBM PMP Standards Manual. The procuring activity may allow the use of a prohibited item provided the contractor demonstrates by tradeoff studies that an acceptable alternative is not available and that suitable protection against the inherent weakness of the item is incorporated into the equipment design or operating procedures.

5.2 Control of PMP selection.

5.2.1 Contractor-selected PMP list (CPMPL). The contractor shall develop and maintain a CPMPL to identify the PMP selected for use in contractor-designed equipment (see 6.2). The list shall be maintained current during design and development and shall identify those PMP which are not intended for the final design. The CPMPL shall include the PMP categories identified in tables II, III, IV, and V.

5.2.2 Approval for non-preferred PMP. Preferred PMP are identified as "1st" order-of-preference in table I. The contractor shall obtain contracting activity approval to use non-preferred PMP as indicated in the following subparagraphs.

5.2.2.1 Approval for electrical, electronic, and electromechanical (EEE) parts. For non-preferred EEE parts, the contractor shall submit a non-preferred parts approval request as detailed in Appendix C (see 6.2).

5.2.2.2 Approval for mechanical parts, materials and processes. For non-preferred mechanical parts, materials and processes, the contractor shall substantiate the need to use the non-preferred item at the time of selection and have the information available for contracting activity review upon request. The contractor, with the contracting activity approval, may use non-preferred mechanical parts, materials and processes.

MIL STD-1836 (USAF)

The contractor shall identify non-standard parts and state in the CPMPL why a standard part cannot be used.

5.3 Application of PMP

5.3.1 Derating of EEE parts. The contractor shall derate all EEE parts for use in contractor-designed equipment in accordance with AFSC Pamphlet 800-27. Derating level shall be as follows:

Equipment Category	Derating Level	
	Minimum	Maximum
LE/MC	II	I
AVE/OSE	II	I
ABI Safety	II	I
MSE TSE DSE	III	II

5.3.2 Design application data. The contractor shall prepare and maintain design application data for EEE parts, mechanical parts, materials and processes PMP. The use of design application data is mandatory for the design of critical and essential equipment. The PMP Application Guide shall include the following as applicable to each item:

a. EEE parts

- (1) Major electrical and physical characteristics.
- (2) Application restrictions, if any, and handling precautions.
- (3) Design and construction information.
- (4) Critical characteristic operating curves at 25 degrees C and temperature extremes as a minimum, e.g., secondary breakdown curves.
- (5) Maximum allowable stress, including electrical and environmental stresses.
- (6) Derating, including electrical and thermal derating.
- (7) Failure mode and failure rate information.
- (8) Degradation of characteristics with age.
- (9) Nuclear radiation characteristics. Include qualification level.

MIL STD-1836 (USAF)

b. Mechanical parts, materials and processes.

- (1) Functional description
- (2) Dimensional description, chemical composition, and limitations
- (3) Physical, mechanical, and electrical properties
- (4) Environmental control, limitations and restrictions
- (5) Mechanism or mode of degradation of characteristics with age and nuclear environment
- (6) Special safety, handling and application precautions
- (7) Reference specifications and standards.

5.3.2.1 Submission to contracting activity. The contractor shall append the PMP Application Guide to the Parts, Materials and Processes Standardization and Control Program Plan (see 6.2).

5.4 PMP controls and qualification.

5.4.1 Contractor controlled specifications and drawings. Where adequate specifications or drawings do not exist for contractor-selected PMP, the contractor shall prepare specifications and drawings (see 6.2).

5.4.2 PMP qualification. The contractor shall assure that PMP used in equipment delivered to the contracting activity is fully qualified to the specification or drawing. All unqualified PMP selected by the contractor shall be raised to full qualification status. The qualification of each item shall be documented and be available for procuring activity review upon request. The documentation shall identify the qualification requirements, acceptance and failure criteria, sample size, cause of each failure, and corrective action(s) taken. Qualification by similarity requires approval of contracting activity.

5.4.3 Parameter drift screening (PDS). The contractor shall define and implement PDS for EEE parts used in LE/MC equipment in accordance with Appendix D. PDS for program preferred parts and military parts, approved for use in critical or essential equipment by the contracting activity, shall be in accordance with the controlling part drawing.

5.4.3.1 PDS planning. The contractor shall prepare a PDS plan (see 6.2).

5.4.3.2 Exceptions to PDS. The contracting activity may allow exceptions or modifications to PDS requirements for specific parts when requested by the contractor. The contractor shall support the request for exceptions or modifications to PDS requirements by tradeoff studies which consider, as a minimum, the following:

- a. Part failure mechanisms and the ability to detect these failure mechanisms by parameter drift screening.
- b. Part failure history.

MIL STD-1836 (USAF)

- c. Criticality of application requirements.
- d. Ability of factory and field tests to detect defective parts.
- e. Cost of failure of an equipment in the factory and in the field.
- f. Quantity of parts required.
- g. Cost of implementing PDS.
- h. Alternate screening methods.

5.4.4 Destructive physical analysis (DPA). The contractor shall perform DPA on samples from each lot of microcircuits and discrete semiconductor devices used in LE/MC equipment. DPA may also be necessary on other hardware to satisfy other program requirements. The contractor shall have documented procedures for performing DPA defining methods of analysis and accept/reject criteria for each item. As a minimum, DPA for microcircuits shall be in accordance with MIL-STD-883, Method 5009 and for semiconductors MIL-STD-750, Method 2075. MIL-STD-1580 shall be used as a guide for other parts. DPA may be performed by either the contractor or a qualified independent laboratory, or with permission from the contracting activity, the part manufacturer. After DPA samples and analysis shall be retained by the contractor for the duration of the program and available for examination by the procuring activity upon request.

5.5 EEE parts in-process controls. The contractor shall assure that materials and processes used to fabricate EEE parts are appropriate for the part and its application.

5.5.1 Process baseline controls (PBC). The contractor shall define and implement PBC for selected EEE parts excluding MIL-SPEC parts used in LE/MC and safety equipment in accordance with Appendix E. A contractor will not be responsible for PBC on parts and materials selected from the PPL and IPL unless assigned as the responsible contractor for the part or material. Parts and materials which fall into one or more of the following categories shall be subject to PBC:

- a. Semiconductor devices and other items which may be susceptible to performance degradation when exposed to nuclear radiation environments anticipated in the application.
- b. Items which are difficult to produce because variations in materials, processes or tooling may significantly impact item characteristics.
- c. Items which have stringent performance requirement relative to the inherent state-of-the-art capability of the item.
- d. Items which are stressed in excess of the electrical thermal derating curve (see section 5.3.1) or have failure modes that are significantly accelerated by the stress.
- e. Items which have an unknown or unsatisfactory performance reliability history; especially prohibited items that have been approved for use by the procuring activity.
- f. Other items designated by the contracting activity.

MIL STD-1836 (USAF)

5.5.2 In-process inspection. The contractor shall require in-process inspection for selected parts and materials used in critical and essential equipment. The contractor will not be responsible for in-process inspection for parts and materials selected from the PPL and IPL unless assigned as the responsible contractor for the part or material. The following in-process inspection is mandatory for microcircuits and transistors used in LE/MC and safety category equipments:

- a. **Scanning electron microscope (SEM) inspection.** SEM inspection shall be required for contractor-controlled monolithic microcircuits and transistors. The SEM inspection for microcircuits shall be in accordance with MIL-STD-883, method 2018, and for transistors, in accordance with MIL-STD-750, method 2077.
- b. **Wire bond strength testing.** Wire bond strength testing shall be required for all contractor-controlled monolithic microcircuits and transistors. The bond testing for microcircuits shall be in accordance with MIL-STD-883, method 2011, test condition D, with a sampling frequency in accordance with MIL-STD-976. The bond testing for transistors shall be in accordance with MIL-STD-750, method 2037, with a sampling frequency in accordance with MIL-S-19500, Appendix D. The contractor shall develop and require similar bond testing for hybrid microcircuits. In all bond testing, the number of bonds sampled shall assure an LTPD of 10 or less with no more than one bond failure. The bond sample shall encompass all bonds in all devices included in the bond strength test. One hundred percent non-destructive bond pull is acceptable as an alternative.

5.5.3 Failure analysis. The contractor shall perform failure analysis, and corrective action (FRACA) on failures occurring during the manufacture and test of parts and materials used in critical LE/MC and safety equipment. All EEE part failures shall be reported to the procuring activity (see 6.2). For parts, the contractor shall require, as a minimum, that:

- a. All EEE parts failing post-burn-in electrical test or any subsequent lot acceptance or screening test because of opens, shorts, or inoperability for any reason shall be analyzed to determine the failure mechanism, the cause of the failure and corrective action(s) required.
- b. A sufficient quantity of failed parts from each lot that fails any specified lot acceptance criteria (e.g., Percent Defective Allowable, Lot Tolerance Percent Defective, Acceptance Number) shall be analyzed to establish the cause(s) of lot failure, identify necessary corrective action(s) and determine lot disposition.

5.6 Supplier selection, approval and surveillance.

5.6.1 Selection of suppliers. The contractor shall select suppliers for contractor-controlled PMP which have a demonstrated capability to produce the item to the specified requirements. Where such capability has not been demonstrated, the contractor shall perform a technical evaluation of the supplier to assure that such capability exists.

5.6.2 Supplier approvals. The contractor shall approve only those suppliers which comply with the requirements established for the item and the supplier. Only those

MIL STD-1836 (USAF)

suppliers which continue to comply with these requirements shall remain on the PMP lists. The criteria for contractor approval as suppliers shall include the following:

- a. Acceptance of the item specification (see 5.4.1).
- b. Establishing and maintaining process baseline controls as required (see 5.5.1).
- c. Establishing and maintaining item qualification (see 5.4.2).
- d. Ability to supply product meeting all specification and schedule requirements.
- e. Current QPL status for MIL SPEC parts.

5.6.3 Supplier surveillance. The contractor shall maintain engineering surveillance over the supplier's manufacturing baseline operations during the fabrication and testing portion of each procurement cycle. The supplier surveillance for contractor-controlled EEE parts used in LE/MC and safety critical equipment shall be in accordance with Appendix F. For all other PMP, the surveillance shall be as required to assure continued supplier compliance with contract and specification requirements.

5.7 Product and data monitoring. Upon receipt of parts and materials, the contractor shall perform special testing and evaluations to assure continued product compliance with program and application requirements. This monitoring shall be in addition to the inspection performed by quality assurance. Monitoring shall include the following, as appropriate:

- a. **Manufacturing defect rate.** The inherent outgoing defect rate, or the defect rate goal, of the manufacturing line, including all functions, shall be 100 parts per million (PPM) or less. The defect rate shall include both material and paperwork defects.
- b. **Measurement of inherent outgoing defect rate.** The inherent outgoing defect rate of the manufacturing line shall be demonstrated, as defined herein, on a continuing basis to be 100 PPM or less, or a plan to achieve 100 PPM which is approved by the contracting activity shall be submitted. The methodology by which the inherent outgoing defect rate is calculated, including inspection points, data gathering and reduction, definition of failure, etc., shall be documented and reported in the minutes of reliability status meetings (see 6.2).
- c. **Calculation of inherent outgoing defect rate.** The inherent outgoing defect rate shall be calculated using sufficient data to assure the calculation of a representative and statistically valid inherent outgoing defect rate: data from all products which are manufactured and inspected using processes and systems (e.g., travelers) similar to those used in the manufacture of devices built for this specification may be used. The inherent outgoing defect rate shall be calculated using data from inspections performed or accepted by the supplier's Quality Department. The data shall be from inspections performed at point(s) in the manufacturing line where the inherent defect rate of the product is received by the procuring activity. the parts per million inherent outgoing defect rate shall be obtained by dividing the total number of defects by the number inspected and multiplying by 1,000,000; total defects and total inspections may be obtained by summing the individual results obtained from different points in the line. Documentation defects shall be equally weighted with product (material) defects.

MIL STD-1836 (USAF)

Where deficiencies are noted in parts and materials during product or data monitoring, the contractor shall define and implement appropriate corrective action(s). The results of special evaluations and tests shall be documented. A summary of findings and corrective action shall be reported in the minutes of reliability status meetings (see 6.2).

MIL STD-1836 (USAF)**6. NOTES**

6.1 Intended use. The purpose of this standard is to standardize control of parts, materials, and processes for ICBM weapon systems.

6.2 Data requirements. When this standard is used in an acquisition which incorporates a DD Form 1423, Contract Data Requirement List (CDRL), the data requirements identified below shall be developed as specified by an approved Data Item Description (DD Form 1664) and delivered in accordance with the approved CDRL incorporated into the contract. When the DFARS subpart 27.475-1 is invoked and the DD Form 1423 is not used, the data specified below shall be delivered by the contractor in accordance with the contract or purchase order requirements. Deliverable data required by this standard is cited in the following paragraphs.

<u>Paragraph no.</u>	<u>Data requirements title</u>	<u>Applicable DID</u>
4.1 5.3.2.1	Parts, Materials and Processes Standardization and Control Program Plan	DI-MISC-80597
4.4.3 Appendix A, 20.4.1	Proposed Changes to Program Parts Control Board Controlled Drawings	DI-MISC-80601
5.2.1	Contractor-Selected Parts, Materials, and Processes List	DI-MISC-80598
5.2.2.1 Appendix C, 30.1	Nonpreferred Part Approval Request	DI-MISC-80599
5.4.1	Part Drawings	DI-MISC-80600
5.4.3.1	Parameter Drift Screening Plan	DI-MISC-80602
5.5.3	Failed Item Analysis Report	DI-RELI-80253
5.7	Progress/Status Meeting Report	DI-A-1005

Copies of DIDs required by contractors in connection with specific acquisition functions should be obtained from the Naval Publications and Forms Center or as directed by the contracting officer.

6.3 Subject term (key word) listing.

Atomic	Missile
Control	Parts
Electronic	Rocket
	Warhead

Custodian:
AF-14

Preparing Activity
AF-14

Review activities.

(Project MISC-F042)

MIL STD-1836 (USAF)**TABLE I. ICBM parts selection - EEE and PMP selection order of preference**

Parts Source EEE Parts in Equipment Categories(6)	(5) PPL/IPL	PPL MIL-SPEC Parts		LAL	MIL Parts Not on PPL	Contractor Selected Parts
		S-Level	B-Level			
Operational AVE	1st(1)	1st(2)(3)	--	2nd(1)	--	3rd(1)
OSE	1st(1)	1st(3)	1st(2)(3)	2nd(1)	--	3rd(1)
Non-operational Safety Critical ABI	1st	1st	2nd	2nd	3rd(4)	4th
Support Equipment ABI/Ground SE	2nd(2)	1st(2)	1st	1st	1st(4)	2nd
DSE/TSE/MSE	2nd(2)	1st(2)	1st	1st	1st(4)	2nd

Parts Source Mechanical PMP(7)	PPL	IPL	LAL	MIL/FED Parts Not on PPL	Contractor Selected PMP
Operational AVE/OSE	1st	2nd	3rd	4th	5th
Non-operational Safety Critical ABI	1st	2nd	3rd	4th	5th
Support Equipment	1st	1st	3rd	4th	5th

NOTES:

- (1) Radiation hard parts qualified to appropriate level.
- (2) Higher reliability level parts may be used if cost effective and meet environmental requirements.
- (3) SCD/SID may be required for additional NH&S requirements.
- (4) Optional if cost effective.
- (5) PPL/IPL column includes selected ICBM parts and common/unique development hard parts for Small ICBM.
- (6) Second, third and fourth order of preference requires NPPAR for EEE parts.
- (7) Mechanical Parts Materials and Processes do not require NPPARs but use of third, fourth, and fifth order of preference requires justification in CPMP.

MIL STD-1836 (USAF)**TABLE II. Electrical, electronic and electromechanical parts**

Federal Supply Classification (FSC)	Part Class
5905	Resistors, thermistors and varistors
5910	Capacitors
5915	Filters and networks
5920	Fuses and lightning arrestors
5925	Circuit breakers
5930	Switches
5935	Connectors, electrical
5945	Relays, contractors and solenoids
5950	Coils and transformers
5955	Crystals
5960	Electron tubes and associated hardware
5961	Semiconductor devices and associated hardware
5962	Microelectronic circuit devices (including hybrids)
5985	Waveguides and RF switches
5990	Synchros and resolvers
5999	printed wiring boards
6000	Fiber optic materials, components, assemblies, and accessories
6105	Motors
6115	Generators
6135 & 6140	Batteries
6240	Electric lamps
6625	Meters
6645	Time totalizing meters
----	Microcircuit packages

MIL STD-1836 (USAF)**TABLE III. Mechanical parts**

Federal Supply Classification (FSC)	Title
3030	Belting, drive belts, fan belts and accessories
3100	Bearings
4710	Pipe and tube
4720	Hose and tubing
4730	Tube and fittings
4800	Valves
5305	Screws
5306	Bolts
5307	Studs
5310	Nuts and washers
5315	Nails, keys and pins
5320	Rivets
5325	Fastening devices
5330	Seals and packing
5340	Miscellaneous hardware
5355	Knobs and pointers
5365	Rings, shims and spacers
5940	Lugs, terminals and terminal strips
5975	Electrical hardware and supplies

MIL STD-1836 (USAF)**TABLE IV. Materials**

Federal Supply Classification (FSC)	Title
4010	Chain and wire rope
4439	Welding materials
5970	Electrical insulators and insulating materials
6145	Wire and cable, electrical
6830	Gasses; compressed and liquified
8010	Paints, dopes, varnished and related products
8030	Preservatives and sealing compounds
8040	Adhesives
9150	Oils and greases, cutting, lube and hydraulic
9320	Rubber fabricated materials
9330	Plastics fabricated materials
9505	Wire, non-electrical, ferrous
9525	Wire, non-electrical, non-ferrous
9600	Metals

MIL STD-1836 (USAF)**TABLE V. Processes**

Assembly/fabrication	Heat treatment
Bonding	Identification/markings
Brazing	Inspection
Calibration	Installation
Casting	Machining
Chemical milling	Packaging
Cleaning	Plating
Coating	Riveting
Crimping	Screen printing
Curing and molding	Shielding
Embedding, potting and encapsulating	Soldering
Finishing	Testing
Handling	Welding
	Wiring

MIL STD-1836 (USAF)**APPENDIX A****REQUIREMENTS FOR THE PROGRAM PARTS CONTROL BOARD****10. SCOPE**

10.1 Scope. This appendix describes the organization, responsibilities, functions and procedures for the Program Parts Control Board (PPCB).

10.2 Applicability. This appendix contains mandatory requirements which are applicable when PPCB participation is requested by the contracting activity.

20. REQUIREMENTS

20.1 Organization. The PPCB membership shall be composed of representatives from the contracting activity, the system engineering/technical assistance (SE/TA) contractor, associate contractors and other government agencies and contractors designated by the contracting activity.

20.1.1 Chairperson. The contracting activity representative shall be the PPCB chairperson and manage the PPCB.

20.1.2 Vice chairperson. The SE/TA contractor representative shall be the PPCB vice chairperson and shall manage the activities of the PPCB as directed by the chairperson. In the absence of the chairperson, the vice chairperson acts for the chairperson.

20.1.3 Working members. Program contractor representatives shall be working members of the board. Working membership shall consist of the following:

- a. Associate contractor members. This designation shall apply to representatives of associate contractors. Associate contractor membership shall be determined by the contracting activity.
- b. Associate subcontractor members. This designation shall apply to representative of major subcontractors of associate contractors. Associate subcontractor membership shall be determined by the associate contractor subject to the approval of the contracting activity.
- c. Participating subcontractor members. This designation shall apply to representatives of subcontractors which are not major subcontractors. Participating subcontractor membership shall be determined by the contractor subject to the approval of the contracting activity.
- d. Participating contractor members. This designation shall apply to contractors which are not associate contractors. Participating contractor membership shall be determined by the contracting activity.

20.1.4 Other members. Other government agencies such as the Air Force Logistic Command (AFLC), the Defense Electronics Supply Center (DESC) and the Defense Industry Supply Center (DISC) will be invited by the contracting activity to participate in PPCB activities as appropriate.

20.2 Responsibilities

MIL STD-1836 (USAF)**APPENDIX A**

20.2.1 PPCB. The PPCB shall be responsible for the standardization and control of parts, materials and processes (PMP) used in common by two or more contractors or other PMP designated by the contracting activity. The responsibility shall include disseminating information and guidance to contractors on the selection and application of PMP listed in the ICBM PMP Standards Manual. Other responsibilities of the PPCB shall include:

- a. Promoting maximum use of program preferred PMP.
- b. Minimizing the number of different types of PMP used.
- c. Promoting the uniform control of parts and suppliers.
- d. Identifying requirements for new program preferred PMP.
- e. Selecting and evaluating PMP for addition to the program preferred PMP lists.
- f. Maintaining change control on PPCB-controlled drawings.
- g. Collecting and disseminating design application data for PMP listed in the ICBM PMP Standards Manual.

20.2.2 PPCB chairperson (with SE/TA contractor member support). The chairperson shall be responsible for providing the technical coordination and administrative direction required for the efficient and effective operation of the board. In addition, the chairperson shall be responsible for:

- a. Directing the functions and activities of the PPCB. Establishing the agenda for and scheduling PPCB meetings.
- b. Establishing and maintaining program PMP lists.
- c. Presiding at PPCB meetings and assigning action items as required.
- d. Assigning and following-up on action items as required.
- e. Recording and distributing PPCB meeting minutes.
- f. Maintaining PPCB records and historical files, including part procurement information.

20.2.3 Working members. As members of the PPCB, working members share the responsibilities of the PPCB (see 20.2.1). In addition, members shall be responsible for the timely and efficient:

- a. Submission and distribution of contractor data to the PPCB in accordance with the Contract Data Requirements List (CDRL).
- b. Response to change requests on PPCB-controlled items for which the contractor is listed as a user.
- c. Response to action items assigned by the PPCB chairperson.

MIL STD-1836 (USAF)

APPENDIX A

- d. Notification to the PPCB of problems encountered in the procurement or use of PMP listed in the ICBM PMP Standards Manual.
- e. Response to requests by the PPCB chairperson for part usage information.
- f. Reporting at PPCB meetings on:
 - (1) Changes in contractor status as a user or non-user of PPCB controlled items.
 - (2) The current status of significant PMP problems encountered by the contractor.
 - (3) Supplier process change request (SPCR) activity including a brief description of major changes and their disposition.

20.2.4 Other members. Representatives of other organizations will share the responsibilities of the PPCB (see 20.2.1) consistent with their participation in the PPCB. Other members will also be requested to:

- a. Respond to action items assigned by the PPCB chairperson.
- b. Notify the PPCB of problems with PMP which could impact the program.

20.3 PPCB meetings. The chairperson of the PPCB shall convene seven formal meetings of the PPCB each year. The chairperson shall formally notify members of the time and location and provide the meeting agenda. In addition, special meetings may be called by the chairperson as necessary to resolve special concerns of the PPCB.

20.3.1 Meeting attendance. Attendance at PPCB meetings shall be mandatory for associate contractor members, associate subcontractor members and participating contractor members. Attendance by participating subcontractor members shall be at the invitation of the contractor with the concurrence of the PPCB chairperson. Attendance by other government organizations shall be at the invitation of the PPCB chairperson. Attendance at special PPCB meetings shall be directed by the PPCB chairperson.

20.4 Change control. Parts under PPCB control cannot be changed by a non-preferred part approval request (NPPAR) submittal. The PPCB shall maintain change control on all drawings for contractor controlled items listed on the Program Preferred List (PPL), Interim Preferred List (IPL) and Nonpreferred Controlled List (NCL). PPCB change control on other contractor-controlled items shall apply when the contractor is notified by the PPCB chairperson that the item has been selected for addition to one of the above lists.

20.4.1 Change request. A change request may be originated by any member of the PPCB. Each change request shall address only one drawing except when identical changes are proposed for more than one drawing or the change affects both the general and a detailed drawing. Each change request shall be identified with the two letter abbreviation of the originating contractor or agency as identified in the ICBM PMP Standards Manual and be numbered sequentially beginning with number "1." Change requests shall be in accordance with DI-MISC-80601 (see 6.2).

MIL STD-1836 (USAF)

APPENDIX A

20.4.1.1 Urgent request. Change requests which require special handling because of program schedules shall be marked "URGENT" by the originator. Urgent requests shall contain additional information as follows:

- a. Reason special handling is required.
- b. The required disposition date.
- c. Program impact if disposition date is not met.

20.4.2 Procedure. The procedure for processing change request shall be as follows:

- a. Step 1. The PPCB member requesting a change shall submit a change request to the PPCB chairperson and vice-chairperson in accordance with 20.4.1, with copies to other affected PPCB members.
- b. Step 2. All PPCB members affected by the change shall review the request to determine that the information required to process the request is complete. If the information is incomplete, the affected member shall informally notify the originator and the PPCB chairperson (or his designee) of the deficiency. If the originator does not provide the missing information within 5 working days, the PPCB chairperson shall formally notify the originator and all PPCB members affected by the change that the disposition of the request will be delayed until the missing information is received.
- c. Step 3. When the information required to process the request is complete, the PPCB members affected shall respond to the request in writing within 15 working days. The responses shall be addressed to the PPCB chairperson (or his designee) with copies to the originator and all other affected members.
- d. Step 4. The PPCB chairperson supported by the SE/TA contractor member shall consolidate affected member responses and determine disposition of the request.
- e. Step 5. The PPCB chairperson shall formally notify the originator and all affected PPCB members of the change request disposition.

20.4.2.1 Special procedures. Change requests designated "Urgent" shall initially be processed through the above procedural steps informally to expedite disposition. Affected members shall informally respond to the change request within 4 working days and confirm the response in writing within 15 working days. The informal disposition of the request shall also be confirmed formally.

20.4.2.2 Cancellation of request. The originator may cancel a change request prior to its disposition by written notification to the PPCB chairperson and all affected PPCB members.

20.4.3 Change implementation.

20.4.3.1 Responsible contractor. The contractor responsible for maintaining the PPCB-controlled drawing shall incorporate changes approved by the PPCB into the drawing and distribute revised drawings to affected PPCB members.

MIL STD-1836 (USAF)

APPENDIX A

20.4.3.2 Using contractors. Contractor members using the PPCB-controlled drawing shall incorporate the revised drawing into their engineering documentation control system and provide verification of such incorporation to the PPCB chairperson or designee.

MIL STD-1836 (USAF)**APPENDIX B****REQUIREMENTS FOR HYBRID MICROCIRCUIT
DESIGN, DEVELOPMENT AND MANUFACTURE****10. SCOPE**

10.1 Scope. This appendix defines the requirements for the control of hybrid microcircuit design, development, and maintenance.

10.2 Applicability. The requirements of this appendix are mandatory for all hybrid microcircuits which are designed and developed for subsequent use in LE/MC equipment.

20. REQUIREMENTS

20.1 Hybrid design and construction. The design, development, and manufacture of new hybrid microcircuits shall be in accordance with MIL-M-38510. Design guidelines shall be developed and used to control the design. The guidelines shall include the following as minimum:

- a. Conductor, resistor, and crossover design rules.
- b. Circuit layout requirements including element placement.
- c. Thermal design criteria.
- d. Derating criteria for internal elements.
- e. Artwork master development.

20.2 Hybrid packages and chip elements. Packages and chip elements used in the design of hybrid microcircuits are considered to be EEE parts within the context of this standard, and the requirements of this standard applicable to EEE parts shall apply.

20.4 Hybrid design reviews. The design of hybrid microcircuits shall be reviewed for compliance with the above requirements and shall include the following subjects as a minimum:

- a. Hybrid drawing(s) and parts list(s).
- b. Worst case circuit analysis.
- c. Parts application review for chip elements.
- d. Thermal analysis.
- e. Process baseline controls.
- f. Conformance to drawing requirements.
- g. Qualification status of chip elements, hybrid package and other constituent parts, materials and processes.
- h. Product assurance program plan.

MIL STD-1836 (USAF)

APPENDIX B

- i. Hardness assurance.
- j. Parameter drift screening
- k. Qualification plan, procedure and schedule.

MIL STD-1836 (USAF)**APPENDIX C****REQUIREMENTS FOR THE APPROVAL OF NON-PREFERRED ELECTRICAL,
ELECTRONIC AND ELECTROMECHANICAL PARTS****10. SCOPE**

10.1 Scope. This appendix defines the information required to justify the selection and use of non-preferred electrical, electronic and electromechanical (EEE) parts. It also defines the procedures for the generation and disposition of a Non-Preferred Part Approval Request (NPPAR).

10.2 Applicability. This appendix contains mandatory requirements which are applicable when contracting activity approval to use non-preferred EEE parts is required by the contract.

20. REQUIREMENTS

20.1 Non-preferred part justification. A non-preferred part shall not be used unless the contractor has determined that the parts listed as first order of preference will not satisfy program requirements. The need to use a non-preferred part shall be verified by a contractor part specialist.

20.2 Non-preferred part qualification. Each non-preferred part shall be qualified in accordance with the qualification requirements specified in the part drawing. The qualification shall apply to specific production and test facilities and controlling process baseline documentation.

30. PROCEDURE

30.1 Contractor procedure. As soon as a Non-Preferred part is identified, a NPPAR shall be submitted per DI-MISC-80599 (see 6.2).

30.2 Contracting activity disposition. The contracting activity will disposition the NPPAR based on the information contained therein. Typical dispositions are:

- a. Approval - All parts of the NPPAR are acceptable including the part drawing and qualification test results.
- b. Conditionally Approved - All data submitted is acceptable except for qualification data. The NPPAR will be approved upon submittal of acceptable qualification data.
- c. Incomplete - A review of the information provided reveals nothing unfavorable to the use of the part. Approval of the NPPAR is deferred pending submittal and review of additional information including an adequate source control drawing.
- d. Disapproved - The part selected is not acceptable for use in the application indicated.

MIL STD-1836 (USAF)**APPENDIX D****REQUIREMENTS FOR PARAMETER DRIFT SCREENING****10. SCOPE**

10.1 Scope. This appendix defines the requirements and criteria for establishing parameter drift screening (PDS) for electrical, electronic and electromechanical (EEE) parts as a condition for individual part and lot acceptance.

10.2 Applicability. This appendix contains requirements which are mandatory for the PDS of contractor-controlled EEE parts used in LE/MC equipment.

20. REQUIREMENTS

20.1 Identification of parts and data. All parts in a lot scheduled for PDS shall be individually identified. The identification of individual parts shall be established prior to prescreening measurement and maintained through final lot acceptance. PDS data for individual parts shall be recorded and referenced to the part identification.

20.2 PDS parameters and test measurement conditions. PDS parameters and test measurement conditions shall be selected for each part type to provide optimum sensitivity and assurance that potentially defective parts will be detected and removed from the lot.

20.3 Screening stress conditions and duration. The principal screening stresses utilized for PDS shall be temperature and electrical excitation. The stress conditions and duration of stress selected for each part shall not degrade normal parts but shall be at a level sufficient to cause identifiable anomalous parameter changes in potentially defective parts.

20.4 Screening procedure.

20.4.1 Prescreening measurements. PDS parameters shall be measured and recorded for all parts in accordance with the drawing requirements. Any part with any PDS parameter measurement outside the acceptance limits specified in the drawing shall be identified and removed from the lot. The data on the removed part shall be excluded from PDS calculations.

20.4.2 Screening stress exposure. All parts meeting the prescreening measurement requirements shall be exposed to the PDS stresses as defined in the part drawing.

20.4.3 Post-screening measurements. The PDS parameters shall be measured again and recorded for each part. Parts with any post-screening measurement outside the limits specified in the drawing shall be identified and removed from the lot. The data on the rejected parts shall be excluded from PDS calculations.

20.4.4 Calculation of parameter drift. The difference between the prescreening and post-screening measurements of each part shall be calculated and recorded for each PDS parameter. If the final reading is greater than the initial reading, the difference shall be defined as positive; if the final reading is smaller than the initial reading, the difference shall be defined as negative.

20.4.5 Data base for statistical calculations. The data base for calculating the mean change and standard deviation of parameter drift shall include the drift data (20.4.4) on all parts in the lot found acceptable after post-screening measurement

MIL STD-1836 (USAF)**APPENDIX D**

(20.4.3). For lots of greater than 500 pieces, the mean change and standard deviation may be calculated using:

- a. The parameter drift data from a random sample of 500 pieces.
- b. The drift data from the first measurement of a PDS parameter where the same parameter is measured more than once on the same part (e.g., micro-circuits).

20.5 Part acceptance criteria.

20.5.1 Parameter drift acceptance limits. The acceptance limits for parameter drift in individual parts shall be determined by one of the conditions specified below. Statistical methods (Calculation condition A) shall be used until sufficient statistical data is accumulated to establish fixed limits (Calculation condition B) and the fixed limits are approved by the procuring activity.

- a. **Calculation condition A - statistical PDS limits.** The acceptance limit for each PDS parameter shall be calculated as follows:
 - (1) Calculate the mean change (i.e., drift) and standard deviation for each PDS parameter.
 - (2) Identify all parts with a parameter drift outside the limits defined by the mean change ± 5 standard deviations.
 - (3) Parts falling outside these limits (± 5 standard deviations) shall be excluded from further computations and the parts rejected.
 - (4) Calculate a new mean and standard deviation and reject parts outside of ± 3 standard deviations. Record those values per paragraph 20.7.
- b. **Calculation condition B - specified PDS limits.** The acceptance limits for parameter drift for each PDS parameter shall be those specified in the SCD. The acceptance limits may be specified as either a fixed number or as a percentage of the prescreening parameter measurement.

20.5.2 Rejection of parts. All parts with PDS parameter drift outside the acceptance limits established as in 20.5.1 shall be identified and rejected from the lot.

20.6 Lot acceptance criteria. The criteria for accepting or rejecting a lot shall be based on the number of individual parts rejected during PDS. If the sum of the parts rejected at post-screening measurements (20.4.3.), and for parameter drift exceeds the percent defective allowable (PDA) specified for the lot in the part drawing, the lot shall be rejected.

20.6.1 Rejected lots. The contractor shall document each recommendation, justification, and rationale for disposition of rejected lots. Disposition of rejected lot shall be approved by the procuring activity.

20.7 PDS data recording. Recording of PDS data shall include the part number, the lot date code and the information by one of the following record options:

MIL STD-1836 (USAF)

APPENDIX D

- a. Option 1. A listing of part variables data for each PDS parameter referenced to the part identification. The variable data shall include:
 - (1) Prescreening measurement value (20.4.1)
 - (2) Post-screening measurement value (20.4.3)
 - (3) Calculated parameter drift (20.4.4)
- b. Option 2. The data in option 1 plus the calculated mean change and standard deviation used to establish the parameter drift acceptance limits.
- c. Option 3. The data in option 1 plus data analysis to include PDS parameter change frequency distributions (histograms), mean change value(s), standard deviation values, number of parts submitted to screening, total number of parts which were rejected because they exceeded post-screening parameter limit(s) and the number of parts rejected for parameter drift for each PDS parameter.

20.8 PDS requirements in source control drawings. The following requirements shall be included in SCD for parts where PDS is required:

- a. Provisions for identifying individual parts (20.1).
- b. PDS parameters and test measurement conditions (20.2).
- c. Screening stress conditions and duration (20.3).
- d. Condition A or B for establishing parameter drift acceptance limits (20.5.1).
- e. Numerical limits when Condition B is specified (20.5.1.b).
- f. PDA for lot acceptance (20.6).
- g. PDA for resubmitted lots (20.6.1).
- h. Data reporting option 1, 2 or 3 (20.7).

MIL STD-1836 (USAF)

APPENDIX E

REQUIREMENTS FOR PROCESS BASELINE CONTROL

10. SCOPE

10.1 Scope. This appendix defines the requirements for the control of processes, materials, tests and inspections used in the manufacture of parts and materials.

10.2 Applicability. This appendix contains requirements which are mandatory for LE/MC equipment when process baseline control (PBC) is required by the contract.

20. REQUIREMENTS

20.1 Criteria for PBC approval. Where process baseline control is required, the following criteria shall be used as the basis for contracting activity approval of a supplier's process baseline:

- a. Product assurance program plan. The supplier's product assurance program plan shall have been approved by the procuring activity.
- b. Process baseline evaluation. The adequacy of each process step used in the manufacture, inspection and test of the item shall have been demonstrated. The procuring activity evaluation of the process baseline shall include a review of process variables, parameters, tolerances, instrumentation, environments, certification of personnel, and other factors which are required to assure production of a product of uniform high quality and reliable performance.
- c. PBC documentation. The supplier process baseline control documentation shall have been audited by the responsible contractor and established as the baseline for production of the item. (see 20.3)
- d. Documentation change control. Change control of PBC documentation shall have been established and implemented by both the responsible contractor and supplier. (see 20.4)
- e. Process baseline control audit. The implementation of PBC shall have been verified by an initial procuring activity audit and all action items assigned shall have been completed. (see 20.5)

20.2 Criteria for continuing PBC approval. Continuation of approval of supplier's process baseline shall be contingent upon:

- a. The responsible contractor and supplier maintaining change control of PBC documentation.
- b. The suppliers adherence to approved PBC documentation, including approved changes, as determined by periodic audits.

20.3 PBC documentation. The supplier process baseline shall be controlled by a top PBC document, identified by number, title, revision letter and revision date. The top PBC document shall list subsidiary PBC documentation by document numbers, title, revision letter and revision date. The subsidiary documentation shall include:

MIL STD-1836 (USAF)

APPENDIX E

- a. Product assurance program plan.
- b. Manufacturing process flow chart (see 20.3.1).
- c. Critical documents list (see 20.3.3).
- d. Item description (see 20.3.4).
- e. List of constituent parts and materials.
- f. List of steps requiring procuring activity representative participation.
- g. Location(s) of all manufacturing and test facilities.

20.3.1 Manufacturing process flow chart. The flow chart shall show the complete sequence of manufacturing process steps used for item production. The flow chart shall contain information on processing, assembly, inspection, testing, and finishing operations and shall include:

- a. A brief description of the flow chart scope.
- b. Where the process flow chart is prepared in segments, a title for each segment of the flow chart which includes identification of the controlled item.
- c. Flow diagrams with entries for principal process steps and for ancillary or preparatory process steps. Symbols shall be used to distinguish among production, quality control (in-process inspections) and quality assurance functions.
- d. Critical process steps identified with the letters "CR", and those which are proprietary with letter "P".
- e. Identification of points in the process/process-control flow at which statistical or other control records are maintained, and the custodian organization of such records.
- f. A separate entry for each process step, with a serial number to identify the step.
- g. A brief description of each individual process or control step.
- h. A checkmark, or similar visible mark, to signify 100 percent production inspection checkpoints.
- i. A letter code, or other suitable marking to identify the quality inspection checkpoints (e.g., "S" for sample check "A" for audit).
- j. Applicable document titles and their numbers shall be listed beside each process step. This includes all applicable documentation used in the production of the item such as design drawings, material specifications, subitem specifications, process specifications, tooling specifications, mask sets, assembly drawings, set-up instructions, test-specifications, special test circuits, quality specifications, and inspection instructions.

MIL STD-1836 (USAF)**APPENDIX E**

- k. The names of the document preparer, checker and responsible manager. Approval authorization signatures for design engineering, manufacturing engineering and quality assurance shall also be included along with approval dates.

20.3.2 Critical document list. The critical documents list shall identify all documentation covering critical manufacturing processes, materials and tooling including mask sets. The list shall be categorized with respect to functional area such as design, processing, assembly, finishing, testing, packaging and quality. The listing shall include the following information:

- a. The serial number(s) identifying the corresponding critical process step(s) from the flow chart.
- b. The document number and title.
- c. The document revision letter, revision date and a reference to the applicable supplier process change notices (SPCRs).

20.3.3 Item description. The item shall be described as indicated in the following subparagraphs.

20.3.3.1 Internal construction. The internal construction shall be illustrated utilizing exploded views and other techniques to clarify all facets of the construction. The various materials and sub-items used in the construction shall be identified and their physical interrelationship illustrated using cross-sectional view(s).

20.3.3.2 Critical properties. Critical material properties, process parameters and physical dimensions shall be identified. Mask sets and other tooling used to control the dimension and internal geometric configuration of the item shall also be identified. The sequence of assembly and the use of mask sets and other critical tooling shall be illustrated.

20.3.3.3 Final package assembly. The final package assembly and the package seal shall be illustrated by cross-sectional view(s) of the completed item. In addition, the following information shall be identified, as applicable:

- a. Material composition and dimensions of interconnection-wire.
- b. Interconnection technique used.
- c. Lead frame composition, finish, thickness and length. Also, number of leads and lead forming information.
- d. Type, material and dimensions of package base, lid and cavity.
- e. Sealing materials, type of sealing, and the time and temperature pertinent to the sealing operation.
- f. Package gas-fill composition (nominal) and maximum permitted moisture content.
- g. Serialization controls, if required.

MIL STD-1836 (USAF)**APPENDIX E**

20.3.3.4 Schematic diagram. The functional elements of the item along with input and output connections shall be illustrated in a schematic diagram. The diagram shall include significant input/output parameters and tolerances, as applicable.

20.4 PBC document change control. All changes to the supplier process baseline documentation shall be subject to contracting activity review and approval. The contracting activity shall retain authority to disapprove the implementation of any change for product being produced to approved PBC documentation. The contracting activity shall establish and implement document change control procedures with the supplier as described in the following subparagraphs.

20.4.1 Supplier process change request (SPCR). All changes to controlled PBC documentation shall be processed for contracting activity review and approval via a SPCR. Each SPCR shall be identified by a unique reference number and date. In addition, the SPCR shall include the number and revision letter of the document(s) affected, a description of the proposed change, the reason for the change with applicable supporting data, the change classification as minor or major, the impact of not making the change, the test lot or date code effectivity and any effect on cost and delivery.

20.4.2 SPCR disposition. The contracting activity's disposition of SPCR(s) shall be as described in the following subparagraphs.

20.4.2.1 Major changes. When the SPCR indicates a major change, the responsible contractor shall provide a written response to the supplier within a specified period (e.g., 10 days) after receipt. Unless the responsible contractor requests a delay in implementation or indicates disapproval within the specified period, the SPCR may be considered approved by the supplier. The responsible contractor's request for delayed implementation shall state the reason and identify any additional information required to process the SPCR.

20.4.2.2 Minor changes. When the SPCR indicates a minor change, a responsible contractor response is not required unless the procuring contractor disagrees with the change classification. In that case, the responsible activity shall notify the supplier accordingly and process a response as defined for a major change (see 20.4.2.1)

20.5 Process baseline control audits. The responsible contractor shall conduct periodic process baseline control audits at the supplier's facility to ensure that the PBC requirements are implemented and maintained. The Government contracting activity reserves the right to have representatives attend supplier audits. The responsible contractor shall notify the Government contracting activity of scheduled audits at least 10 days prior to the audit.

20.5.1 Audit agenda. Each supplier process baseline control audit shall verify, as a minimum, that:

- a. Critical documents are under configuration control and approved revision levels are being used.
- b. Pertinent documents, with current revision levels, are available at each work station.
- c. Evidence exists that appropriate lot traveler/processing documentation records are being maintained.

MIL STD-1836 (USAF)

APPENDIX E

- d. Records of inspections and tests show compliance with applicable standard, and requirements.
- e. Evidence exists that critical incoming supplier materials are controlled.
- f. The approved Product Assurance Program Plan has been implemented.
- g. All SPCRs which have been approved, and only approved SPCRs, have been incorporated. SPCRs awaiting disposition shall be identified.
- h. All previous audit action items have been implemented.

20.5.2 Audit conclusion summary. The auditing responsible contractor shall summarize the audit results, develop an action item summary, assign schedule completion dates, and document conclusions in audit minutes. The responsible contractor shall also verify that all audit action items are completed satisfactorily.

MIL STD-1836 (USAF)

APPENDIX F

**REQUIREMENTS FOR
RESIDENT ENGINEERING SUPPLIER SURVEILLANCE**

10. SCOPE

10.1 Scope. This appendix defines the requirements for engineering surveillance of supplier manufacturing operations during the fabrication and testing portions of the part procurement cycle. These requirements are in addition to those required for quality assurance. The quality assurance and engineering surveillance functions may be performed by the same responsible contractor.

10.2 Applicability. The requirements of this appendix are mandatory for EEE parts with supplier process baseline control which are procured for use in LE/MC equipment.

20. REQUIREMENTS

20.1 Surveillance responsibility. The responsibility for providing engineering surveillance of supplier manufacturing operations shall be as indicated below.

20.1.1 Contractor-controlled EEE parts. The contractor shall provide resident engineering surveillance of suppliers for all contractor-controlled and subcontractor-controlled EEE parts. The contractor may designate a subcontractor to perform the supplier surveillance for specific parts and suppliers, subject to the approval of the procuring activity.

20.1.2 PPCB controlled EEE parts. When designated the responsible contractor for supplier surveillance by the contracting activity, the contractor shall make resident engineering personnel available at the assigned supplier available to all other contractors using the part for the purpose of performing supplier surveillance functions.

20.2 Duties of surveillance personnel. The duties and responsibilities of resident engineering surveillance personnel shall include the following as a minimum:

- a. Verify that the parts are manufactured in accordance with approved process baselines.
- b. Participate as the contractor representative at in-process inspections as required by the process baseline control documentation.
- c. Verify that process variables for critical process steps are within acceptable limits.
- d. Verify that qualification and acceptance tests are performed in accordance with the specified requirements.
- e. Review SEM photographs and verify acceptability of parts sampled.
- f. Review SPCRs for accuracy and completeness, coordinate contractor responses and monitor the implementation of dispositioned SPCRs into the approved baseline documentation.
- g. Confirm part failures and failure analysis results. Monitor the effectiveness of corrective actions.

MIL STD-1836 (USAF)

APPENDIX F

- h. Identify technical problems and monitor problem areas until evidence demonstrates that the problem has been effectively resolved.
- i. Develop recommendations on proposed changes to drawing requirements and process baselines.
- j. Develop problem and status reporting.

20.3 Location of surveillance personnel. The responsible contractor shall maintain residence personnel at each supplier (or a geographically close group of suppliers) such that effective full-time monitoring is provided during the fabrication and testing portion of the manufacturing cycle. Itinerant surveillance personnel may be used at suppliers where full time residency is not required, subject to the approval of the Government contracting agency.



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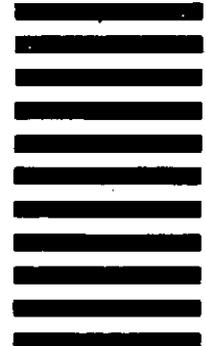
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