National Aeronautics and
Space Administration

MSFC-STD-555
REVISION: H
EFFECTIVE DATE: September 9, 2009

George C. Marshall Space Flight Center
Marshall Space Flight Center, Alabama 35812

ED11

MULTIPROGRAM/PROJECT COMMON-USE DOCUMENT

MSFC ENGINEERING DOCUMENTATION STANDARD

Approved for Public Release; Distribution Unlimited

CHECK THE MASTER LIST— VERIFY THAT THIS IS THE CORRECT VERSION BEFORE USE

MSFC - Form 454 (Rev. October 1992)

DOCUMENT HISTORY LOG

Status (Baseline/ Revision/ Cancelled)	Document Revision	Effective Date	Description
Revision	D		General Revision – Deleted document preparation requirements excluding drawings and parts lists. Data included in MWI 7120.4. Previous history retained as part of superseded or cancelled MSFC Documentation Repository files.
Revision	E		Para 2.j Replaced CM-INST-002 with "MSFC Forms, All MSFC forms are accessible at http:// starbase.msfc.nasa.gov:8000/forms." Para 4.2.2, deleted "or CM-INST-002". Para 5.1.2.1 deleted and renumbered subsequent paragraphs. Para 5.2.2 deleted last sentence, "Forms and preparation instructions can be found in CM-INST-002." Para 5.2.3 deleted "per CM-INST-002" in last sentence. Tables I, II, III, and IV, deleted references to "CM-INST-002." Para 5.4.1.b deleted "(see CM-INST-002)".
Revision	F		CONTENTS added "4.4.4. ICMS Database Reports." Deleted paragraph 2.1and paragraphs k., l., and m. and renumbered paragraphs accordingly. 4.1.c., deleted "that is authorized for release." 4.1.d. deleted 2nd sentence. 4.2.2.a. deleted 2nd sentence. 4.3.2.2, replaced "in accordance with MIL-STD-130 and MIL-STD-129, part and bulk marking, respectively." with "as shown below." To satisfy RCAR 177, paragraphs 4.3.3.3 a. through c. are changed to read: "4.3.3.3 Matched Set Dash Numbers. Dash numbers shall be assigned to two or more matched or machined parts that are not interchangeable. The following rules apply: a. When an assembly is created having matched parts, each part must be identified with a dash number and a separate EPL. b. The next higher assembly(s) will identify each matched part in the drawing(s) and the EPL(s) until they are reassembled as a matched set. The assembling drawing will have a note stating "Matched Set" next to th find numbers. This note number will also be added to the EPL. c. Matched parts drawing requirements shall be per MSFC-STD-2806." 4.4.2 Replaced sentence with "The Release Desk shall be the single point of release for MSFC in-house projects' flight and flight-related ground support equipment (GSE) configuration documentation in accordance with the documentation approval matrix contained in each project's configuration management plan." 4.4.2.a., replace text with "The Release Desk may release nonconfiguration documentation as defined in the project's data management plan. "Delete "NOTE: Manufacturing must sign all FEO's and FEPL's." Added new paragraphs 4.4.4 through 4.4.4.5. ICMS Database Reports. 4.5.1, deleted "according to the requirements of MIL-STD-100 and." 4.5.2 Replaced text with: "A complete set of original drawings and parts lists and a listing of all specifications and standards and ancillary documents used for the design definition shall be obtained and placed in the MSFC Repository. When available, drawing trees, indentured

Status (Baseline/ Revision/ Cancelled)	Document Revision	Effective Date	Description
			part lists, and/or associated listings shall also be placed in the MSFC Repository. MSFC Form 2896 shall accompany the package." 4.5.3.b, 2nd para, add "and documented in the configuration management plan" after "systems engineer" 5.2.2, delete "MSFC Form 421-1," in first sentence and added "shall be prepared according to the format specified in MSFC-STD-2806 and" 5.3.4, 1st sentence changed to read "Although the Secretariat is responsible to review the package, the Release Desk also reviews each approved package to ensure that all the required forms are included and properly completed." Change 2nd sentence to read: "If corrections are required, the Release Desk shall return the package to the Secretariat who in turn will forward to the OPR designee." 5.3.7, 1st sentence changed to read: "Although the Secretariat is responsible to review the package, the Release Desk also reviews each approved change package to ensure that all the required forms are included and properly completed." Change 2nd sentence to read as follows: "If corrections are required, the Release Desk shall return the package to the Secretariat who in turn will forward to the OPR designee."
Revision	G	7/25/2002	Paragraph 3 - deleted duplicate definitions contained in cited documents (2.c and 2.d); deleted forms from definitions (2.e, 2.f, 2.g, 2.i, 2.j, 2.k, 2.l, and 2.n) and added form numbers to form titles when used in the text. 5.2.1.f., Added 2 new sentences at the end of paragraph: " An EO shall not be written to delete parts that were added by a previous EO that has not been incorporated. The EO must be canceled and reissued in accordance with paragraph 5.2.1.g."
Revision	H	9/9/2009	Updated language to utilize "shall" for requirements in accordance with the Rules Review. General - Updated document to current requirements and applicable documents. Added definition for Effectivity Code. Para 4.1.6 Updated ED03 to ED11. Para 4.2.1 clarified procedure for drawing revisions (RCAR 235). Added Para 4.3.2 Establishing Effectivity Codes. Para 4.3.3.1, renumbered 4.3.4, added requirements for serial/lot numbering format and re-use. Para 4.3.3.2.1, renumbered 4.3.6, clarified use of new and previous CAGE Codes. Para 4.3.3.4, renumbered 4.3.7, added requirements for part number re-identification. Added Para 4.5.5 Preparation of an Envelope Drawing (RCAR 235). Added Para 4.6, Software and Firmware Identification Requirements. Added Para 5.1.1.3 and Para 5.1.1.4 to describe update of the component drawing revision on assembly Engineering Parts Lists (EPLs) when component drawings are revised (RCAR 259). Para 5.1.3 Changing Effectivities – clarified title and contents. Updated Figure 1 to better describe EPL revisions. Updated Para 5.2.1 to describe EO incorporation by drawing revision and Revised and Redrawn procedure (RCAR 235). Para 5.2.2 added Engineering Order (EO) numbering requirements and use of the EO Number Request and Trending System. Para 5.3 combined initial and release package processing into the same paragraphs. Para 5.4 Updated document cancellation sections.

FOREWORD

This standard specifies the requirements and instructions for releasing MSFC configuration documentation through the MSFC Release Desk using the Integrated Configuration Management System (ICMS). It also specifies the requirements for preparation of engineering drawings and parts lists. This standard shall be used only for MSFC programs/projects.

TABLE OF CONTENTS

PARAGRAPH **PAGE**

DOCUMENT HISTORY LOG 2

FOREWORD 4

1. SCOPE 7

2. AUTHORITY, APPLICABLE, AND REFERENCE DOCUMENTS 7
2.1 Authority Documents 7
2.2 Applicable Documents 7
2.3 Reference Documents 7

3. DEFINITIONS 8
3.1 Definitions 8
3.2 Acronyms 11

4. GENERAL REQUIREMENTS 11
4.1 Engineering Documents Usage 11
4.2 Documents Released in the MSFC ICMS 12
4.2.1 Drawings and Drawing Revisions 12
4.2.2 Engineering Parts List (EPL) 12
4.2.3 Floor Engineering Parts List (FEPL) 13
4.2.4 Engineering Order (EO) 13
4.2.5 Floor Engineering Order (FEO) 13
4.2.6 Specifications/Standards/Interface Control Documents/Software Version Descriptions 13
4.2.7 Document Release List (DRL) 13
4.2.8 Documentation Package/Routing Slip (DP/RS) 13
4.3 Information on Specific MSFC ICMS Effectivities and Drawing, Part, and Dash Numbering 13
4.3.1 Drawing Numbers 13
4.3.2 Establishing Effectivity Codes 14
4.3.3 Part Numbers (P/N) 14
4.3.4 Serial/Lot Number 14
4.3.5 Unique Part Identification Numbers (PIN) 15
4.3.6 Use of Previous CAGE Code Versus New CAGE Code 15
4.3.7 Changes Requiring Part Number Re-identification 15
4.3.8 Dash Numbers 17
4.4 ICMS Operations and Release Desk Functions. 18
4.4.1 ICMS Release 18
4.4.2 Release Desk Functions 19
4.4.3 Distribution 19
4.4.4 ICMS Database Reports. 19
4.5 ICMS Requirements for Design Responsibility Transfer. 20

4.5.1 Transfer of Design Responsibility to MSFC. 20
4.5.2 Requirements for Design Documentation. 20
4.5.3 Documenting MSFC Changes to the Design Documentation. 20
4.5.4 Preparation of an Altered Item Drawing. 20
4.5.5 Preparation of an Envelope Drawing. 20
4.5.6 Conversion of Contractor or Other Design Activity Drawing to MSFC Drawings. ...20
4.6 Software, Firmware, & Programmable Logic Devices Identification and Marking 21
4.6.1 Software Identification and Marking 21
4.6.2 Firmware Identification and Marking 22
4.6.3 Programmable Logic Devices (PLD 22

5. DETAILED REQUIREMENTS 24
5.1 Engineering Parts List (EPL)....24
5.1.1 General 24
5.1.2 Preparation....25
5.1.3 Effectivity Changes....25
5.1.4 Engineering Parts List (EPL) Identification....27
5.2 Engineering Order (EO). 28
5.2.1 General 28
5.2.2 Preparation and Identification. 30
5.2.3 Add New Parts 31
5.2.4 Create New MSFC Parts 31
5.2.5 Correcting Effectivities of Incorporated EOs 31
5.2.6 Revising/Cancelling EOs 31
5.3 Release of Configuration Documentation....31
5.3.1 General. 31
5.3.2 Initial and Revision Packages for Review and Release....31
5.3.3 Initial or Revision Package Disposition by CCB and Processing....33
5.3.4 Package Release and Distribution. 34
5.3.5 ICD Revision 34
5.4 Cancellation of Documents....34
5.4.1 Responsible Office 35
5.4.2 MSFC Release Desk....35
5.4.3 MSFC Documentation Repository....35

6. NOTES 35

TABLES

I. EPL Re-identification Steps....28
II. Initial Configuration Document Package Preparation Forms (Excluding Drawings and Parts Lists)....32
III. Initial Drawings and Parts List Package Preparation Forms....32
IV. Revised Configuration Document Package Preparation Forms....32
V. Revised Drawings and Parts List Package Preparation Forms....33

1. SCOPE

This standard specifies the requirements and instructions for releasing Marshall Space Flight Center (MSFC) configuration documentation through the MSFC Release Desk using the Integrated Configuration Management System (ICMS) as specified in MPR 8040.1 and MWI 7120.4. It also specifies the requirements for preparing engineering drawings and parts lists. This standard is intended for MSFC in-house use only.

2. AUTHORITY, APPLICABLE, AND REFERENCE DOCUMENTS

2.1 Authority Documents.

a.	MPR 8040.1	Configuration Management, MSFC Programs/Projects
b.	MWI 7120.4	Documentation Preparation, Programs/Projects

2.2 Applicable Documents.

a.	ED03-OWI-001	MSFC Engineering Documentation Checking
b.	Global Engineering	Global Drawing Requirements Manual Tenth Edition
c.	H4/H8	Commercial and Government Entity (CAGE) Cataloging Handbo
d.	MPR 8040.1	Configuration Management, MSFC Programs/Projects
e.	MPR 8040.2	Product Identification and Traceability
f.	MSFC Forms	All MSFC forms are accessible through the Inside Marshall website: http://inside.msfc.nasa.gov/ .
g.	MSFC-STD-2806	MSFC Tailoring Standard for the Global Drawing Requirements Manual Tenth Edition
h.	MWI 2210.1	MSFC Documentation Repository Input/Output and Data Management Project Requests
i.	MWI 7120.4	Documentation Preparation, Programs/Projects
j.	MWI 8040.5	Floor Engineering Orders and Floor Engineering Parts Lists (FEOs/FEPLs)

2.3 Reference Documents.

a.	ASME Y14.24-1999	Types and Applications of Engineering Drawings
b.	MSFC Form 420	Engineering Parts List (EPL)/Floor EPL (FEPL)
c.	MSFC Form 420-5	Document Release List (DRL)
d.	MSFC Form 421	Engineering Order (EO)/Floor EO (FEO)
e.	MSFC Form 847	Deviation Approval Request (DAR)

f. MSFC Form 2312 Control Board Directive

g. MSFC Form 2327 Engineering Change Request (ECR)

h. MSFC Form 3418 Documentation Package/Routing Slip (DP/RS)

i. MSFC Form 2896 MSFC Repository Document Input Record

j. MSFC Form 4341 Effectivity Sheet

3. DEFINITIONS AND ACRONYMS

3.1 Definitions.

3.1.1 The following definitions are related to terms utilized in this standard, with additional information that defines any unique implementation of these definitions related to the MSFC Release Desk processes and the MSFC Integrated Configuration Management System (ICMS). The definitions in MPR 8040.1and MWI 7120.4 also apply.

3.1.1.1 Altered Item Drawing. An altered item drawing delineates the physical alteration of an existing item under control of another design activity [other than MSFC] or defined by a nationally recognized standard. An altered item drawing establishes a new item identification for the altered item. (Reference ASME Y14.24) Note: An altered item drawing is not used to modify an MSFC part.

3.1.1.2 Assembly Drawing. An assembly drawing defines the configuration and contents of the assembly or assemblies depicted thereon. The assembly drawing establishes item identification for each assembly. (Reference ASME Y14.24) An assembly drawing depicts the assembled relationship of two or more parts, a combination of parts and subordinate assemblies, or a group of assemblies required to form an assembly of higher order. (Reference GDRM).

3.1.1.3 Baseline. A baseline is the approved and released configuration documentation that defines the physical and functional attributes of a configuration item. After the baseline is established, the Configuration Control Board controls all changes to the configuration documentation.

3.1.1.4 Commercial and Government Entity (CAGE) Code. The CAGE Code is a five-character code listed in Cataloging Handbook H4/H8 that is assigned to commercial and Government activities that manufacture or develop items, or provide services and/or supplies for the Government. When used with a drawing or part number, the CAGE Code designates the design activity to which the drawing or part number is assigned. NOTE: The CAGE Code was previously called manufacturer's code, code identification number, or Federal Supply Code for Manufacturers (FSCM).

3.1.1.5 Detail Assembly Drawing. A detail assembly drawing shows the assembled relationship of items, one or more of which is detailed on the assembly drawing. Separate engineering drawings are not required for items so delineated. Detailed assembly drawings are particularly useful for inseparable assemblies. (Reference GDRM)

3.1.1.6 Detail Drawing. A detail drawing provides the complete end-product definition of the part or parts depicted on the drawing. A detail drawing establishes item identification for each part depicted thereon. Note: A monodetail drawing delineates a single part. (Reference ASME Y14.24)

3.1.1.7 Effectivity. Effectivity is a designation defining the Configuration Item (CI) range (e.g., serial numbers, lot numbers, model, dates, mission) where parts, changes, or variances are to be applied.

3.1.1.8 Effectivity Code. As it pertains to ICMS, an effectivity code is the project code plus numerical sequence number, (e.g., MG01, MG02, etc.), and represents the configuration of a flight/mission or experiment. Effectivity Codes may only be assigned at a top assembly level in ICMS. The Effectivity Code specifies the configuration that a change applies against, and database comparison between Effectivity Codes/Top Assemblies can provide a listing of differences between the two configurations being compared.

3.1.1.9 Envelope Drawing. An envelope drawing discloses the basic technical data and performance requirements necessary for development or design selection of an item. It specifies a configuration and performance envelope, without details of internal construction. All features other than those shown on the drawing are left to the producer to meet the specified design and performance data. The envelope drawing establishes a control number for use in engineering documentation until development is complete or until vendor item identification is established. When item development is completed, envelope drawings normally evolve into detail drawings, specifications, or vendor item control or source control drawings. (Reference ASME Y14.24 and GDRM)

3.1.1.10 Find Number. The Find Number is the numbered item on the Engineering Parts List (EPL) that corresponds to the numbered callout on a Drawing.

3.1.1.11 Installation Drawing. An installation drawing provides information for properly positioning and installing items relative to their supporting structure and adjacent items. This information may include dimensional data, hardware descriptions, and general configuration information for the installation site. An installation drawing is prepared to provide detailed installation information for functionally related items (such as a control system, electrical system, or hydraulic system) that cannot be effectively shown on an assembly drawing of the item to which it belongs. (Reference ASME Y14.24)

3.1.1.12 Lot Number. A lot number is a unique number assigned to identify a group of identical parts that are produced concurrently by a common process. Lot number requirements apply to procured parts and parts manufactured in-house.

3.1.1.13 Multidetail Drawing. A multidetail drawing delineates two or more uniquely identified parts in separate views or in separate sets of views on the same drawing. A multidetail drawing is prepared to describe parts usually related to one another. (Reference ASME Y14.24)

3.1.1.14 Part Identification Number (PIN). The MSFC PIN consists of the CAGE Code, part number, and serial/lot number. See paragraph 4.3.5.

3.1.1.15 Project Code. The Project Code is a unique alphabetic code (typically 2 characters) assigned by the MSFC Release Desk to each Project which has a Configuration Control Board (CCB). The Project Code allows identification within the Integrated Configuration Management System (ICMS) database and is used as the basis for Effectivity and CCB Codes.

3.1.1.16 Release. Release is the authorization to disseminate for use or implementation approved information and/or products subject to configuration management. In MSFC Release Desk procedures, it is the point at which a document is electronically released in ICMS and has the Release Desk "football" stamp applied.

3.1.1.17 Selected Item Drawing. A selected item drawing defines refined acceptance criteria for an existing item under the control of another design activity [other than MSFC] or defined by a nationally recognized standard which requires further selection, restriction, or testing for such characteristics as fit, tolerance, material (in cases where alternate materials are used in the existing item), performance, reliability, etc. This drawing type generally permits selection to be performed by any competent inspection or test facility including those of the original manufacturer, the selecting design activity, or a third party. A selected item drawing establishes a new item identification for the selected item. Although visible physical modification is not performed, the item is, because of the selection technique employed, demonstratively different from other items which meet only the requirements imposed on the original item. (Reference ASME Y14.24)

3.1.1.18 Serial Number. A serial number is a permanent number assigned sequentially to selected hardware which, in conjunction with the part number, permits isolation of the item and facilitates hardware allocation, traceability, accountability, location determination, and identification of design change effectivity.

3.1.1.19 Source Control Drawing. A source control drawing provides an engineering description, qualification requirements, and acceptance criteria for commercial items or vendor-developed items procurable from a specialized segment of industry, that provide performance, installation, interchangeability, or other characteristics required for critical applications. The drawing provides a list of approved sources of supply and the vendor's item identification for the item(s) that have been qualified and approved for use in the critical application(s). The source control drawing number establishes the source control item identification. (Reference ASME Y14.24)

3.1.1.20 Tabulated Drawing. Any drawing type may be tabulated to delineate similar items which, as a group, have some common characteristics and some variable features. Tabulated drawings are prepared to avoid preparation of individual drawings for each similar item tabulated. Each item included in the tabulation is assigned a part number. (Reference ASME Y14.24)

3.1.1.21 Vendor Item Control Drawing. (Formerly Specification Control Drawing) A vendor item control drawing provides an engineering description and acceptance criteria for commercial items or vendor-developed items that are procurable "off-the-shelf" or from a specialized segment of industry. The manufacturer's (vendor's) part or identifying number is the item identification. The drawing provides a list of suggested source(s) of supply, the vendor's item

identification, and sufficient engineering definition for acceptance of interchangeable items within specified limits. (Reference ASME Y14.24)

3.2 Acronyms,

CAGE	Commercial and Government Entity
CBD	Control Board Directive
CCB	Configuration Control Board
CI	Configuration Item
CM	Configuration Management
CMP	Configuration Management Plan
CPIN	Computer Program Identification Number
CSCI	Computer Software Configuration Item
DAR	Deviation Approval Request
DP/RS	Documentation Package/Routing Slip
DRL	Document Release List
ECR	Engineering Change Request
EO	Engineering Order
EPL	Engineering Parts List
FEO	Floor Engineering Order
FEPL	Floor Engineering Parts List
GDRM	Global Drawing Requirements Manual
GSE	Ground Support Equipment
ICD	Interface Control Document
ICMS	Integrated Configuration Management System
IRN	Interface Revision Notice
IWG	Interface Working Group
OPR	Office of Primary Responsibility
P/N	Part Number
PCN	Program Control Number
PIN	Part Identification Number
PIRN	Preliminary Interface Revision Notice
S&MA	Safety and Mission Assurance
SOCD	Source Control Drawing
SPEC	Specification
STD	Standard
SVD	Software Version Description
VICD	Vendor Item Control Drawing

4. GENERAL REQUIREMENTS

4.1 Engineering Documents Usage.

4.1.1 The drawing, Engineering Parts List (EPL) (MSFC Form 420), Engineering Order (EO) (MSFC Form 421), and specification (which includes all book form requirements) are the primary engineering “as-designed” documents described herein and in MWI 7120.4, all of which shall be released through the Integrated Configuration Management System (ICMS).

4.1.2 At the request of the project manager, the Safety and Mission Assurance (S&MA) Office or designee shall generate the as-built documentation list from the inspection records. S&MA shall perform the as-designed/as-built comparison at the request of the project manager in support of a physical configuration audit. CM shall support investigation and resolution of any differences between the as-designed and as-built configurations. The project manager in coordination with S&MA and CM shall allow sufficient time in the project schedules to perform inspections, physical configuration audits, and to resolve discrepancies.

4.1.3 The Engineering Change Request (ECR) (MSFC Form 2327), or equivalent, shall be used to submit “as-designed” documentation to the CCB for disposition.

4.1.4 The Documentation Package/Routing Slip (DP/RS)(MSFC Form 3418) shall be used to itemize and track documents through release and submittal to the MSFC Repository.

4.1.5 The Deviation Approval Request (DAR) (MSFC Form 847), or equivalent, shall be utilized to document Deviations and Waivers as defined in MPR 8040.1.

4.1.6 All Engineering documentation shall undergo a checking function for compliance with the requirements of this document by the Engineering Product Management Office (ED11) or its successors. The checking organization’s process is defined in ED03-OWI-001.

4.2 Documents Released in the MSFC ICMS.

4.2.1 Drawings and Drawing Revisions. Drawings shall be prepared in accordance with the Global Drawing Requirements Manual (GDRM) and its tailoring standard, MSFC-STD-2806. Drawing revisions shall be prepared only to incorporate Engineering Orders (EOs). Additional changes made during a revision, in addition to the incorporation of previously authorized but outstanding EOs, shall be documented on a “none”-effectivity EO that is processed with the drawing revision package. If a drawing requires revision when there are no previously authorized but unincorporated EOs, the reason for revision and description of changes shall be documented on a “none”-effectivity EO that is processed with the drawing revision package. When a drawing is revised, the “Original Date of Drawing” block and the drawing signature blocks shall maintain the information from the Basic drawing revision (original signatures shall be printed in the signature blocks). See paragraph 5.2.1 for additional EO incorporation/drawing revision requirements.

4.2.2 Engineering Parts List (EPL). The EPL identifies part(s) information including release authority, part(s) numbers, quantities, weights, traceability requirements and part(s) descriptions required to build the respective assemblies and subassemblies. MSFC separates the EPL from the drawing to allow it to be expeditiously prepared and changed separately from the drawing. In many cases, the drawing does not have to be changed if the find (item) number only (no part number) appears on the assembly drawing. See paragraph 5.1 for detailed EPL requirements.

4.2.2.1 All parts called out in the assembly drawing shall be listed by find (item) number on the EPL for the drawing. Exceptions to this requirement: Multiple electrical parts from the assembly drawing may be listed under one Find Number when reference designators are used. Also, materials required by a specification or standard referenced in a drawing note are not required to be listed by Find Number on the EPL.

4.2.2.2 The EPL shall pass a manual and electronic edit before release.

4.2.2.3 For additional information, refer to the official MSFC forms preparation instructions located in the MSFC Integrated Document Library (MIDL).

4.2.3 Floor Engineering Parts List (FEPL) (MSFC Form 420). The FEPL may be used to expedite a change to an EPL at the MSFC in-house manufacturing service provider's shop floor or test area prior to processing an EPL change for release. New parts (find numbers) shall not be added by a FEPL; the FEPL shall at all times match the drawing. FEPLs shall be released in sequential order. Instructions for processing FEPLs are in MWI 8040.5. Final quality inspection shall not be implemented using FEPLs; FEPLs shall be routed for additional technical approvals and released as CCB-approved EPLs prior to final inspection of the hardware.

4.2.4 Engineering Order (EO). The EO describes changes to a physical part/assembly. EOs shall be released in sequential order. Additional changes made during a revision, in addition to the incorporation of outstanding EOs, shall be documented on a "none" effectivity EO. (NOTE: "none" is indicated in ICMS by an empty field.) Changes to an assembly that affect the EPL only shall be made by EPL revision in lieu of an EO, with the exception of adding new parts or deleting find numbers. The EO itself does not change the drawing or the EPL; it shall be incorporated to effect the drawing change. See paragraph 5.2 for detailed EO requirements.

4.2.5 Floor Engineering Order (FEO) (MSFC Form 421). The FEO may be used to expedite a change to a drawing (or EPL) at the MSFC in-house manufacturing service provider's shop floor or test area prior to processing a drawing change for release. MWI 8040.5 contains instructions for processing FEOs. Final quality inspection shall not be implemented using FEOs; FEOs shall be routed for additional technical approvals and released as CCB-approved EOs prior to final inspection of the hardware.

4.2.6 Specifications (SPEC)/Standards (STD)/Interface Control Documents (ICD)/Software Version Descriptions (SVD). Configuration documentation release is described in paragraph 5.3.

4.2.7 Document Release List (DRL) (MSFC Form 420-5). The DRL is used in a document release package to record and maintain status information (SPEC, STD, and ICD).

4.2.8 Documentation Package/Routing Slip (DP/RS). A DP/RS shall accompany each package of drawings/DRLs/EPLs/EOs for tracking purposes. The DP/RS has a unique number which shall be referenced on the ECR, Control Board Directive (CBD), work orders, etc., to specify the documentation numbers involved.

4.3 Information on ICMS Effectivities and MSFC Drawing, Part, and Dash Numbering.

4.3.1 Drawing Numbers. Drawing numbers shall be assigned by the Release Desk per the format in paragraph 4.3.1.1. The Release Desk, upon request, can assign blocks of numbers to organizations. The organization requesting the block of numbers shall be responsible for tracking and assigning the specific drawing numbers within the assigned number block.

4.3.1.1 MSFC drawing numbers shall be assigned in the following format:

YZMXXXXX, where

YZ = 2-digit number
M = “M”
XXXXX = 5-digit number assigned sequentially starting at “00001” for each combination of YZ

The following YZ combinations have been reserved as specified:
“10” - “89”, “91” - “94” = assigned to previous projects or organizations
“90” = Special Test Equipment (non-flight)
”95” - “99” = current series assigned by the MSFC Release Desk

4.3.2 Establishing Effectivity Codes.

4.3.2.1 In accordance with MPR 8040.1, effectivity codes shall be established utilizing MSFC Form 4341, Effectivity Sheet, (or equivalent) which is authorized by the applicable CCB and provided to the MSFC Release Desk.

4.3.2.2 Effectivity code NM01, where NM represents the 2-letter Project Code, shall be utilized as the effectivity code for documentation release.

4.3.2.3 Effectivity codes NM02, NM03, etc. shall be assigned to top assembly items.

4.3.2.4 One effectivity code may be assigned to multiple top assembly part numbers.

Example Effectivity Code Assignments:

Eff Code	Description	Top Assembly Part No.
NM01	Project NM Documentation	n/a
NM02	Project NM Flight 001	96MXXXXX-001
NM03	Project NM Flight 002	96MXXXXX-003
NN01	Project NN Documentation	n/a
NN02	Project NN Flight Unit	97MXXXXX-001
NN03	Project NN Ground Unit	97MXXXXX-003
NN04	Project NN Flight Unit On-Orbit Configuration	97MXXXXX-005

4.3.3 Part Numbers (P/N). Each MSFC part or assembly part number shall include a drawing number and a unique dash number. The MSFC part/assembly procurement specification number shall not be used as a part number. The procurement specification, which may be used to procure more than one part, is referenced on the part drawing.

4.3.4 Serial/Lot Number. Serial/lot numbers, when required according to the traceability criteria of MPR 8040.2, shall be assigned and logged by the Release Desk. Design shall specify the requirements for serialization on the engineering documentation (drawings, specifications, and purchase order requests). The Release Desk shall assign serial/lot numbers consecutively per

part number in the following format, 001, 002, 003, etc., unless a unique serial or lot numbering format is specified by the requester. The original serial number assigned to a part shall not be changed even when a change affecting interchangeability may require rework and re-identification of the part number. Once assigned, serial numbers shall not be reused for the same part/assembly/CI.

4.3.4.1 The following information shall be provided to the Release Desk at the time of the request:

a. Drawing number

b. Part number(s) for which serial/lot numbers are required

c. Quantity of parts by part number (for serial numbers)

d. Number of lots required per part number

e. Unique serial or lot number construction, if required

4.3.4.2 When MSFC-designed equipment is to be procured, the MSFC engineering personnel submitting the purchase request shall obtain the required serial or lot numbers, as identified above, and include them in the purchase request.

4.3.5 Unique Part Identification Numbers (PIN). The MSFC part/assembly PIN consists of the CAGE Code, part number, and the serial or lot number. The part number provides a path to the “as-designed” configuration data which describes the part. The part and serial number provide a path to the "as-built" configuration data.

NOTE: If more than one drawing revision and EPL number are active for an assembly part, then both the part number and EPL number identifiers are required to map to the “as-designed” configuration.

4.3.6 Use of Previous CAGE Code Versus New CAGE Code. The previous CAGE Code used for MSFC design documentation was 14981. The objective during the transition from using the old CAGE Code to the new CAGE Code is for the CAGE Code marked on the hardware to match the CAGE Code on the drawing. Apply the following rules when identifying the CAGE Code:

4.3.6.1 Where the drawing was initially released using CAGE Code 14981 and there is existing hardware marked with 14981, drawing revisions should continue to use CAGE Code 14981.

4.3.6.2 Where the drawing was initially released using CAGE Code 14981 but there is no existing hardware marked with 14981, drawing revisions shall use the new CAGE Code 339B2.

4.3.6.3 All new drawings shall use CAGE Code 339B2.

4.3.7 Changes Requiring Part Number Re-identification. Part number re-identification is required to ensure unique identification of different configurations. This is important so that

differing parts are not identified with the same number, which could lead to safety or performance issues with no traceability of differences between parts. During the design phase prior to build, parts may be changed without assigning a new part number. But, when the first unit of a part built to released drawings is past final quality inspection (accepted, in inventory, installed, delivered, etc.), the criteria below shall be applied to each change to determine whether a new part number is required.

NOTE: If program/project requirements preclude changing a top assembly part number, part numbers should be changed up to the highest level possible where interchangeability is re-established, and the parts should be noted as alternates at the subassembly level.

4.3.7.1 New Part Number Assignment Criteria. A new part number shall be assigned:

a. When performance or durability is affected to such an extent that the previous versions must be discarded, modified, or designated “for restricted use” for reasons of safety or malfunction.

b. If the part is altered, selected, or is a source controlled item.

c. If Engineering determines that other technical considerations require a new part number to define co-existing configuration items, assemblies or parts to preclude interchange or to provide additional protection from inadvertent use of prior items.

d. Under the following conditions unless all existing units of the part being changed, including spares and installed parts, are modified to conform to the change.

1. The part being changed is no longer interchangeable functionally or physically with the previous version. Parts are interchangeable when they possess such physical and functional characteristics as to be equivalent in performance and durability, and are capable of being exchanged one for another without alteration of the items themselves or adjoining items. The following functional and physical characteristics would constitute interchangeability:

(a) Interchangeable parts have the same design envelope and have no limitations imposed on use.

(b) Interchangeable parts utilize the same attachments, mountings or mating surfaces. Attachments, connectors, wiring, ground support equipment, and tubing is the same to the extent that no re-work is required on installation.

(c) Interchangeable parts meet the same baselined design requirements for performance and durability. Performance or durability design requirements include the same safety, software, strength, electrical, mechanical, reliability, maintainability, tolerance, and weight and center of gravity requirements.

(d) Interchangeable parts have the same adjustments, testing, operations, and maintenance requirements and design to the extent that the same test procedures, specifications, and operating procedures have been and/or may be utilized.

2. The part being changed has different restrictions (e.g., safety, reliability, usage limitation, application, etc.).

3. If a new part number is assigned, a new part number shall also be assigned to all subsequent higher assemblies up to and including the level at which interchangeability is re-established. NOTE: When parts are interchangeable both the previous and re-identified part can be listed on the drawing/parts list as being acceptable.

4.3.7.2 If none of the conditions in 4.3.7.1 apply the part may be changed through an EO/drawing revision without altering the part number.

4.3.8 Dash Numbers. A dash number system shall be used to identify parts, assemblies, or installations, which are completely described on drawings. Such part numbers shall consist of the drawing number with a dash number suffix. The use of dash numbers is classified as follows:

a. To denote the shown and opposite-hand part of details, assemblies, or installations.

b. To designate a part detailed on a detail, assembly, or installation drawing, including parts or bulk material (e.g., the pieces that make up a window of laminated glass, molded rubber parts with metal weldments, tape, wires, adhesives, etc.)

c. To provide part numbers for the variations shown on tabulated and non-tabulated drawings.

d. On tabulated detail drawings utilizing tabulation blocks, no other listing is required. For other non-tabulated versions, list the tabulated part numbers above the title block thus:

97MXXXXX-005 NOTED
97MXXXXX-003 NOTED
97MXXXXX-001 SHOWN

NOTE: Dash numbered assemblies may share a drawing but shall have separate EPLs.

4.3.8.1 Odd Dash Numbers. The first part shown on a multi-detail drawing shall be assigned the part number “basic drawing number -1.” The -1 shall also be assigned as the part number to the first total version shown on an assembly or installation drawing. The identification shall be so noted immediately above the title block thus: 97MXXXXX-1 SHOWN or 97MXXXXX-1 ASSY SHOWN. Detail parts defined on a “detail assembly” drawing shall be dash numbered with consecutive odd numbers, beginning with -003, i.e., -003, -005, -007, etc., if only one assembly is anticipated. If more than one assembly is anticipated, numbering of the detail parts should start with -009 or higher.

4.3.8.2 Even Dash Numbers. Even dash numbers shall be used to denote opposite-hand (mirror image) parts, assemblies, or installations to those shown.

a. The opposite part shall be assigned the next consecutive even dash number. For example: -002 would be the opposite of -001, -006 the opposite of -005, etc. The opposite part need not

be pictured but shall be noted. Where the opposite part is noted for a total version of an assembly, installation, or detail drawing, it shall be so noted above the title block thus:

97MXXXXX-002 OPPOSITE
97MXXXXX-001 SHOWN

b. Opposites of details completely described on detail assembly or installation drawings shall be noted in the callout on the body of the drawing. A part that is difficult to visualize as an opposite shall require a new drawing and drawing number. Dash numbered assemblies may share a drawing but shall have separate EPLs. Multiple assemblies (-001, -003, -005, etc.) may be shown on the same drawing, but each shall have its own separate parts list.

4.3.8.3 Matched Set Dash Numbers. Dash numbers shall be assigned to two or more matched or machined parts that are not interchangeable. The following rules apply:

a. When an assembly is created using matched parts, each part shall be identified with a different dash number and a separate EPL.

b. The next higher assembly(s) shall identify each matched part on its drawing(s) and its EPL(s) until the matched parts are reassembled as a matched set. The assembly drawing shall have a note stating “Matched Set” next to the find numbers. This note number shall also be added to the EPL.

c. Matched parts drawing requirements shall be per MSFC-STD-2806.

4.3.8.4 Bulk Material Dash Numbers. Dash numbers may be used to provide numbers for bulk materials, which are cut to fit at the point of assembly. The length, type material, etc., shall appear in the General Notes.

4.3.8.5 Identical Parts. Where two or more near identical parts are called out on the face of a tabulated drawing and an additional view is not required, i.e., two identical parts except for material or opposites, the different part numbers may be assigned to one find number and the usage so noted. The two dashes shall require two EPLs. For example, -001 and -003 EPLs or -001 and -002 shown and opposite EPLs may share the same find numbers.

4.3.8.6 Reference Parts. Parts that are shown on a drawing and not assigned a find number, but are identified by part number shall be noted as “REF”. Such parts should be shown in phantom. Repeated find numbers and part numbers (except those defining a specific quantity of a part not covered by the other call-out) shall also be noted as “REF”.

4.4 ICMS Operations and Release Desk Functions.

4.4.1 ICMS Release. Drawing/document release is the point at which an initial issue or revision of a document becomes an official baselined “as designed” drawing/document in ICMS.

4.4.1.1 An EPL or EO shall accompany each drawing being processed through the release system for release. A DRL shall accompany each document being processed through the

release system. A DP/RS shall accompany every drawing or document change package that is processed through the release system.

4.4.1.2 A part shall be released only once for the same top assembly and effectivity, i.e., only one configuration can exist for each effectivity and drawing revision.

4.4.1.3 A part that was released by another design activity may be released by MSFC as an MSFC drawing or MSFC altered item drawing in accordance with paragraph 4.5.3 once design activity responsibility has been transferred to MSFC.

4.4.2 Release Desk Functions. The Release Desk shall be the single point of release for MSFC in-house projects' flight and flight related ground support equipment (GSE) configuration documentation.

4.4.2.1 The Release Desk may release non-configuration documentation.. NOTE: Release of non-configuration documentation through the Release Desk is optional.

4.4.2.2 A Release Desk stamp shall be applied on initial releases above the title block of the drawing or graphic sheet of the EO. For revisions, a Release Desk stamp shall be applied beside the drawing revision block.

4.4.3 Distribution. The MSFC Documentation Repository shall be the single point for distribution of released documents in accordance with the distribution list prepared by the originating organization. The originating organization shall provide the distribution list and shall provide distribution list updates to the Repository as changes in personnel occur. The Repository requires the originator to complete MSFC Form 2896 or the equivalent Repository Electronic Document Submittal Interface in accordance with MWI 2210.1.

4.4.4 ICMS Database Reports. Various reports and lists are generated to assist manufacturing, assembly, and inspection of flight hardware. Manufacturing and quality inspection may use the following reports in the build and inspection process. NOTE: This list does not include all the reports available in ICMS.

4.4.4.1 Generation Breakdown**.** This is an indentured parts list reflecting the specific top assembly configuration.

4.4.4.2 Engineering Master Parts List. This reflects the summation of parts and the identification of usage in a prescribed assembly. The information is tallied by the database based upon the release of drawings, EPLs, and EOs. This report is useful in (1) allowing shops to order parts based upon the quantity of vendor parts or materials, and (2) allowing a quick search of the configuration to identify the location of a specific part.

4.4.4.3 Periodic Activity**.** This identifies all the activities (released drawings, EPLs and EOs) that have occurred against a project based upon the project code within a specific time period.

4.4.4.4 Release Record List. This identifies all the EPLs and EOs released against a project.

4.4.4.5 As-designed/As-built Report. This identifies the differences between the as-designed configuration and the as-built configuration.

4.5 ICMS Requirements for Design Responsibility Transfer.

4.5.1 Transfer of Design Responsibility to MSFC. The transfer of design responsibility from a contractor or other design organization shall be accomplished as specified herein.

4.5.2 Requirements for Design Documentation. A complete set of original drawings and parts lists and a listing of all specifications and standards and ancillary documents used for the design definition shall be obtained and placed in the MSFC Repository. When available, drawing trees, indentured part lists, and/or associated listings shall also be placed in the MSFC Repository. MSFC Form 2896 shall accompany the package.

4.5.3 Documenting MSFC Changes to the Design Documentation. Two methods are available to document MSFC design changes to contractor or other design activity drawings:

4.5.3.1 An altered item drawing can be prepared when changes are expected to be simple and few, affecting less than 30% of the drawing (as a guideline). When changes are complex or numerous, affecting 30% of the drawing or more (as a guideline), conversion of the drawing set shall be accomplished in accordance with paragraph 4.5.6.

4.5.3.2 If all or most of the changes are expected to be to a defined area of the contractor's design, a combination of the two methods is possible, utilizing the conversion method for the portion requiring extensive change and the "altered item drawing" method for the remainder. , Subtier parts and assembly drawings for the affected assembly are not converted.

4.5.3.3 The decision of which method to use, or whether to use a combination of the two, shall be made by the project manager or systems engineer and documented in the configuration management plan.

4.5.4 Preparation of an Altered Item Drawing. An altered item drawing shall be prepared in accordance with the Global Drawing Requirements Manual.

4.5.5 Preparation of an Envelope Drawing. An Envelope drawing shall be prepared in accordance with the Global Drawing Requirements Manual when drawings contain incomplete design information or the design information is "To Be Determined" (TBD) later. The notation "ENVELOPE DRAWING" shall be added above the title block in .25 inch high letters. Once the design information or the "To Be Determined" (TBD) data is complete, the Envelope Drawing shall be converted to a design drawing, Vendor Item Control Drawing (VICD) or Source Control Drawing (SOCD).

4.5.6 Conversion of Contractor or Other Design Activity Drawing to MSFC Drawings. The following actions are required for conversion to an MSFC drawing:

4.5.6.1 Change the Cage Code, the drawing and part numbers, and design activity identification (logo) from contractor to MSFC.

4.5.6.2 State in the revision description field, "Made from drawing XXXXXXXX, Cage Code No. XXXXX." Also, describe any additional changes made.

4.5.6.3 Prepare EPLs utilizing MSFC Form 420 for all assemblies. Also prepare DRLs to release specifications and other documentation.

NOTE: If the format of the original design activity's parts list is sufficiently similar to MSFC Form 420 and provides the required input data, its use may be allowed, as is, or with necessary modification, to provide the ICMS input.

4.5.6.4 After release, changes shall be made by EOs and drawing revisions to incorporate outstanding EOs.

4.6 Software, Firmware, and Programmable Logic Devices Identification and Marking. The developing organization shall uniquely identify and mark software, firmware, and programmable logic devices (PLDs). Firmware is a hardware device that includes computer instructions or data residing as Read Only Memory (ROM).

4.6.1 Software Identification and Marking. Each release of software shall be identified. When physically possible, software identification data shall be evident at boot-up, at request of a user, or as part of transmitted telemetry information. The software identifier and version number shall also be noted in the log book of the item in which the software is loaded. Software programs and media shall be identified with the following information:

4.6.1.1 Software identifier

4.6.1.2 Version or build number

4.6.1.3 Software Version Description (SVD)

4.6.1.4 Project Name

4.6.1.5 CSCI

4.6.1.6 The date of software release

4.6.1.7 Notice of availability (e.g., SBU, export controlled – see NPR 1600.1)

4.6.1.8 Contract number, if applicable

4.6.1.9 When software is issued in hard media format such as discs, the following additional requirements apply:

a. Disc number for multiple disc sets (e.g. Disc 1 of 2, 2 of 2, etc.)

b. If software developer requires distribution controls of discs, each issued disc shall be numbered sequentially, (e.g. 001, 002, etc.) and software configuration management shall record who receives each copy as an official record

4.6.2 Firmware Identification and Marking.

4.6.2.1 Firmware shall be identified under a single part number defining both the hardware device and the embedded software code. The single part number makes the software an integral part of the configuration definition.

4.6.2.2 The part number shall be marked or labeled on the firmware device, or if the device is too small, on the next higher assembly.

4.6.2.3 The part number of the hardware device and the embedded code identifiers shall be specified on the drawing.

4.6.2.4 The drawing shall be assigned to the level of assembly (e.g. chip level, board-level, or box-level, as appropriate) at which the programming of the firmware into the hardware is accomplished.

4.6.2.5 The drawing shall contain or reference the following information:

a. Firmware identifier (part number)

b. Version or build number

c. Identification of Software Design Specification if software being loaded is a CSCI

d. Project Name

e. Notice of availability (e.g., SBU, export controlled – mark drawing in accordance with MSFC-STD-2806

f. Contract (if applicable)

g. Hardware (e.g. Chip, board, box) identifier – (hardware vendor's part number)

h. Design of software (code, compiler instructions, resulting data files) being loaded into device

i. Labeling requirements (part number and serial number) re-identifying the chip per the drawing.

4.6.2.6 The firmware shall be replaced if the part number changes, and the new firmware shall be noted in the log book.

4.6.2.7 The change action shall be accomplished by incorporation of EOs or drawing revisions, or installation of a modification kit

4.6.3 Programmable Logic Devices (PLD). PLD is a generic term describing an integrated circuit that can be programmed to perform complex logic functions. For labeling purposes, PLDs are classified as follows:

4.6.3.1 Non-reconfigurable (One-Time Programmable). Labeling for non-reconfigurable chips is like firmware and controlled by drawing and parts identification. When issuing a change, the developer shall issue a drawing revision, and EO, or a mod-kit for field replacement of the obsolescent chip. The drawing for the device shall include or reference the following information.

a. Design identifier functional name or description)

b. Version or build number

c. Chip identifier – hardware vendor's part number

d. Identification of design for logic programming (the code, compiler instructions, and resulting data files)

e. Project Name

f. Notice of availability (e.g., SBU, export controlled – mark drawing in accordance with MSFC-STD-2806)

g. Contract (if applicable)

h. Labeling requirements (part number and serial number) re-identifying the chip per the drawing.

4.6.3.2 Reconfigurable. A reconfigurable PLD is distinct from an in-circuit reconfigurable device (see below) in that the device must be removed from the assembly in which it is installed in order to change the programmed configuration. The following requirements apply:

a. The initial configuration of the device shall meet the requirements for a Non-Reconfigurable PLD

b. Subsequent reconfigurations, once removed from the assembly in which the chip has previously been installed, if any, shall meet the requirements of a Non-Reconfigurable PLD, plus

(1) It shall include instructions for removal of the previous design.

(2) It shall include instructions, if required, for removing previous labeling that is obsolete and applying new labeling per the new design.

c. In-Circuit Reconfigurable. The initial configuration of the component at the time the device is installed into the next higher assembly, if configured other than in the configuration shipped from the original manufacturer, shall be recorded on a drawing and identified with a part number at the level of assembly (e.g. chip, board, box) at which the initial configuration is made.

(1) The drawing shall include the following information:

(a) Firmware identifier (part number)

(b) Version or build number – (subject to iteration)

(c) Chip identifier – (hardware vendor's part number)

(d) Project Name

(e) Notice of availability (classification sensitivity of software (SBU, export controlled) – mark drawing in accordance with MSFC-STD-2806

(f) Contract (if applicable)

(g) Method of documenting additional configurations

(h) Labeling requirements (part number and serial number) re-identifying the chip per the drawing.

(2) The loaded configuration shall be reconfigured if the part number changes and the new design load shall be noted in the log book. The change action shall be accomplished by incorporation of EO's or drawing revisions, or installation of a modification kit.

5. DETAILED REQUIREMENTS

5.1 Engineering Parts List (EPL). See additional EPL requirements in paragraph 4.2.2.

5.1.1 General. The EPL shall be used to: (1) list all components of an assembly; (2) release detail parts concurrent with or prior to release of their using assembly drawing; and (3) release "nonpart" documents referred to on the assembly drawing (e.g., schematics, etc.).

5.1.1.1 When an EPL is entered in the ICMS through the online system, confirmation data sheets are created. After the transaction is entered, a confirmation edit is run. If there are no errors, the transaction is locked and a confirmation data sheet printed. This sheet shall be used to obtain the approval signatures. These data sheets serve in the same capacity as MSFC Form 420 for approval purposes. When the on-line system is not used, the EPL, MSFC Form 420, shall be utilized for appropriate signatures for all EPL transactions.

5.1.1.2 Release approval signature on the EPL being revised and the approved CBD authorize the release of all subtier EOs and EPLs being automatically adjusted. The following message shall automatically appear in the revision description of each EO and EPL data sheet being revised: "This revision issued to accomplish effectivity adjustment authorized by EPL/DRL (actual part number, drawing revision, dash number, and dash number revision appear here)."

NOTE: The term "usage" pertains to Top Assembly, Project Code, and Effectivity in part or in whole.)

5.1.1.3 The EPL may be revised independently or in conjunction with a drawing change.

a. When a drawing is revised and the effectivity of the previous revision and new revision are the same, a new EPL (101-) shall be required which supersedes the previous drawing revision EPL.

b. When a drawing is revised and the effectivity of the new revision is not the same, an active EPL shall exist for each drawing revision.

c. To revise an EPL, only new or changed information shall be entered on the input form. Reference paragraph 5.1.3.5.

5.1.1.4 The EPL for a detail assembly drawing shall meet the following requirements.

a. A part number shall be assigned to each part configuration on a detail assembly drawing. For example: Detail-assembly drawing 96M00044 has the following part numbers 96M00044-1 and 96M00044-3. Part 96M00044-3 is on the EPL for 96M00044-1.

b. When the detail assembly drawing is revised, the drawing revision of the detail assembly part listed on the assembly EPL shall be updated to reflect the new release drawing revision.

5.1.2 Engineering Parts List (EPL) Preparation. The confirmation data sheets shall be used to obtain the approval signatures when using the ICMS online system. When the on-line system is not used, MSFC Form 420 shall be used to obtain the approval signatures.

5.1.2.1 Preparing an FEPL. Preparation/procedures shall be as defined in MWI 8040.5. See paragraph 4.2.3 for additional requirements.

5.1.3 Effectivity Changes. Effectivities relate to a top assembly and represent a configuration. When an effectivity is specified for an EPL or EO, this is specifying which configuration/top assembly part number that the EPL or EO is being applied against.

5.1.3.1 To obtain the full Indentured Parts List of a top assembly, all the parts in the assembly must have an effectivity code which matches the top assembly effectivity code.

5.1.3.2 Typically, when an EPL is revised, the effectivity of the previous EPL revision becomes “none”, meaning that it is no longer effective on any configuration, and the newly approved EPL revision becomes effective for the specified effectivities. Similarly, when EOs are incorporated into a Drawing revision, the EO effectivities become “none” and the Drawing revision becomes effective.

5.1.3.3 Only one assembly drawing revision and one EPL can exist for a specific effectivity. When a new or revised EPL is issued with effectivities that duplicate some or all of the effectivites of previously released EPLs of the same assembly part number, the effectivities of the previously released EPLs shall be changed to avoid any duplication. This shall be done concurrent with release of the new or revised EPL.

5.1.3.4 Updating Effectivities of Incorporated EOs. EOs incorporated into a drawing shall, concurrent with release of the incorporating revision, be updated to delete the effectivities included in the effectivity of the new revision. Check Incorporated EO Effectivities block, on the B sheet of the EPL being revised and list on sheet D the incorporated EOs. These EOs are automatically revised and reissued to delete the effectivities included in the effectivity of the new drawing revision.

5.1.3.5 Automatic Method. Enter code AA in "EFF ADJ" block, sheet "A", MSFC Form 420 of the EPL to automatically accomplish the action indicated. The affected "made from" EPL and/or other existing EPLs (of the same part number as the new or revised EPL) are automatically revised and reissued by the Integrated Configuration Management System (ICMS) to eliminate duplication with the effectivity of the new or revised EPL. .

5.1.3.6 Adjusting/Matching the Effectivities of EOs and EPLs affected by Revision to the Effectivity of an Assembly. To maintain the effectivities of the releasing EPLs of parts/assemblies consistent with the effectivity of their using assembly and the effectivity of EOs consistent with the effectivity of the part/assembly to which they apply, these related EPLs and EOs shall be revised to correct their effectivity. This shall be done concurrent with release of the EPL being revised utilizing the following rules and methods as applicable:

a. The effectivities for which an assembly is released shall include all of the effectivities called for by its using assemblies.

b. The effectivities of an EO shall match an effectivity within the effectivity range of the part/assembly to which it applies.

c. When the effectivity of the EPL of any assembly in the hierarchy is changed, the effectivity of all related (both subtier and higher) assembly EPLs shall be revised accordingly. Exceptions: When the part/assembly has usage in other next assemblies for some or all of the effectivities being deleted.

d. The effectivity of all outstanding EOs against these assemblies and their detailed parts shall contain only the effectivity usage of the part/assembly to which it applies. Exceptions: (1) When the part/assembly has usage in other next assemblies for some or all of the effectivities being deleted; and (2) when it is not intended that the EO apply to some or all of the added effectivities.

5.1.3.7 Semiautomatic Method. Check "Effectivity Action Last" block on the EPL B sheet being revised, and list on sheet C the part number and drawing revision of the EPLs and the part number and EO dash number of the EOs to be revised. Those items listed are automatically revised and reissued by the ICMS to match the effectivity change of the EPL revision being released. This method is applicable to both subtier and higher-level assemblies.

5.1.3.8 Fully Automatic Method. Enter "FA" in "Eff Adj" block of MSFC Form 420 for the EPL being revised. On the reverse side of MSFC Form 420, enter an "X" in Full Auto-Adjust, block, and enter the target Project Code and Effectivity in Full Auto-Adjust PC and Full Auto-Adjust Eff blocks for usage increases. Usage changes are automatically applied to (1) EOs to this assembly

and subtier assemblies/parts, and (2) EPLs for subtier assemblies. The configuration of the added usage shall be the same as the configuration of the Project Code/Effectivity.

a. No auto-adjust action is taken on EPLs and EOs of subassemblies being added or deleted in conjunction with the auto-adjust transaction, if the package also contains other transactions to the deleted subassemblies EPLs. The following rules apply in this situation:

b. If subassemblies are being added, they shall have the matching top assembly/project code/effectivity, or the package shall include input forms for establishing the top assembly/project code/effectivity match; otherwise, the entire package is rejected.

c. If subassemblies are being deleted, the designer shall determine if the top assembly/project code/effectivity of the deleted subassemblies require revision and subsequently, shall take action to delete any top assembly/project code/effectivity applications that are no longer valid after the auto-adjust action, either by current or anticipated future usage. This action shall be accomplished manually according to paragraph 5.1.3.2, with the exception that EOs to the deleted assemblies and their subtier assemblies/parts and EPLs for their subtier assemblies may be corrected by auto-adjust action against the deleted assemblies.

5.1.4 Engineering Parts List (EPL) Identification**.** The EPL identification consists of the assembly drawing number, dash number, and drawing revision letter plus an EPL dash number (101 to 199) and revision letter(s). The following rules apply to EPLs:

5.1.4.1 Only one EPL shall exist per assembly dash number/drawing revision.

5.1.4.2 A configuration definition change to the EPL shall be noted by changing the EPL dash number, regardless of a change or no change to the associated effectivity. Any "revision" to the body of the EPL, shall result in an EPL number change which supersedes the previous EPL number and letter, i.e., 102- supersedes -10lB.

5.1.4.3 An effectivity-only change shall be made by changing the EPL dash number revision letter(s), e.g., 96M12345-101- would go to 96M12345-101A. Any "revision" that only changes the user information shall result in an EPL revision letter change, which supersedes the previous letter, i.e., 101B supersedes 101A.

5.1.4.4 Each EPL dash number and dash number revision is superseding. Only the numerically highest dash number (i.e., 103 vs. 102) is active, and only the alphabetically highest revision letter (i.e., B vs. A) is active.

5.1.4.5 The EPL revision letter is not part of the part identification and shall not be used in the Operations Maintenance Instruction, part marking/tagging, or “as-built” configuration.

5.1.4.6 Table I illustrates typical EPL re-identification steps resulting from various types of changes for effectivities that have not flown:

TABLE I. EPL Re-identification Steps

Assembly Drawing No.	Dash No.	Drawing Rev.	EPL Dash No.	EPL Dash No, Revision	Effectivity	Type of Change
First EPL (Initial Release)						
97M00005	-1	-	101	-	AA07	New EPL
97M00005	-1	-	102	-	AA07	EPL Chg
97M00005	-1	-	102	A	AA07, AA09	Eff. Only
97M00005	-1	-	103	-	AA07, AA09	EPL Chg.
Second EPL (Drawing Revised, EPL "made from" 97M00005-1-103-						
97M00005	-1	A	101	-	AA10	New EPL
97M00005	-1	A	102	-	AA10	EPL Chg
97M00005	-1	A	102	A	AA10, AA11	Eff. Only
97M00005	-1	A	103	-	AA10, AA11	EPL Chg.
Third EPL (Drawing Revised, EPL "made from" 97M00005-1A-103-						
97M00005	-1	B	101	-	AA08	New EPL
97M00005	-1	B	102	-	AA08	EPL Chg
97M00005	-1	B	102	A	AA08, AA12	Eff. Only
97M00005	-1	B	103	-	AA08, AA12, AA13	EPL Chg.

5.2 Engineering Order (EO). See additional EO requirements in paragraph 4.2.4.

5.2.1 General. The EO shall serve as an auxiliary to a previously released drawing to provide advance notice of a design or documentation change or correction to be made to the drawing.

5.2.1.1 An EO is applicable to all next assemblies of the part/assembly to which it applies for the effectivity specified.

5.2.1.2 The EO shall list all parts being affected.

5.2.1.3 An EO shall always be written against (identified to) and describe changes to a physical part/assembly except in those cases where the drawing itself is documentary or procedural in content. In these cases, the drawing does not identify hardware, and the EO shall be written against the drawing number.

5.2.1.4 When changes are similar and/or related in content, two or more EOs may appear on the same input form. The use of multiple EOs shall be confined to the following:

a. To describe an identical change for several parts or documentary drawings.

b. To describe simple changes to several parts or documentary drawings which pertain to related overall system change.

5.2.1.5 The use of one EO per input form is preferred when changes are complex or lengthy.

5.2.1.6 An EO can modify a condition created by a previously issued EO. The new EO shall state: "This EO supersedes the configuration established by EO ____." An EO shall not be written to delete parts that were added by a previous EO that has not been incorporated. The previous EO shall be canceled and reissued in accordance with paragraph 5.2.1.8.

5.2.1.7 If changes to existing EOs are to be accomplished by taking the current EO effectivity to "none" and reissuing the EO under a new number, with the change incorporated, the new EO shall contain the following statement: "This EO cancels and supersedes EO___ in its entirety.

5.2.1.8 An EO can be created by an organization other than the design activity controlling the drawing. In all cases, the EO shall be approved by the controlling activity.

5.2.1.9 A released EO shall be revised only to change the CBD, PCN, project code, or effectivity.

5.2.1.10 An FEO may create a new part/assembly dash number (i.e., -3, -5, etc.). If a new dash numbered part is required, the creation of the new dash number shall be written against the -1 assembly/part and contain all information required for manufacturing the assembly. For Instructions to complete and process an FEO, see MWI 8040.5.

5.2.1.11 The physical incorporation of the drawing change(s) detailed in an EO is usually accomplished at a later date. During the interim period, the EO is utilized as the revised portion of the drawing.

5.2.1.12 All outstanding EOs are part of the part identification. Revisions to EOs are not part of the part identification.

5.2.1.13 Higher numbered EOs or later dated EOs do not take precedence in the event of conflict with previously issued EOs unless so stated. Such conflict (where no precedence statement exists) is an engineering error, which requires correction.

5.2.1.14 In the event of conflict, drawing and EPL revisions do not take precedence over previously issued EOs which were not incorporated and which have effectivities common to the revised drawing and/or EPL. Such conflict is an engineering error that requires correction.

5.2.1.15 The only revisions allowed to a drawing shall be to incorporate EOs.

a. <u>EO to Identify Additional Changes in a Drawing Revision</u>. When a revision is prepared to incorporate released EOs, and additional changes are identified which need to be incorporated into the revision, a new EO shall be initiated describing the additional changes in detail, and this EO shall be immediately incorporated into the revision, taken to effectivity "none", and approved in the same package as the drawing revision. This "none" effectivity EO should include sufficient detail for the reviewers and users of the drawing revision to identify the additional changes that are being incorporated into the revision. This is especially important after the drawings are provided to manufacturing to ensure that design changes are clearly communicated and incorporated in the hardware/software.

b. Revised and Redrawn. If the changes are extensive so that it is necessary to revise and redraw the entire drawing, a “none” effectivity EO shall be written to describe the revisions in detail as described in 5.2.1.16.a. Enter the statement “Revised and Redrawn” in the description block of the EO and the drawing’s revision block. The revision description entered in the “none” effectivity EO and the drawing’s revision block shall address each EO being incorporated and whether the EO content is being incorporated as originally approved, or whether the EO is being cancelled because the EO content is either fully or partially superseded by new content. Partially incorporated EOs should be cancelled and the portion being incorporated in the drawing revision should be described in the “Revised and Redrawn” EO description.

5.2.1.16 Changes to assemblies wherein both the drawing and EPL are affected shall be accomplished simultaneously by EO. The EO shall be completed to reflect the EPL changes required on the back of MSFC Form 421.

5.2.1.17 Changes to assemblies wherein only the EPL is affected shall be accomplished by EPL revision (i.e., not by EO). This applies only when no drawing change of any type is necessary. A complete, definitive revision description shall be provided on the EPL revision input form.

5.2.1.18 Outstanding EOs shall be incorporated into drawing revisions when their quantity or complexity becomes such that correct and ready interpretation of the intended or designed definition becomes difficult or questionable. It is recommended that outstanding EOs be incorporated into the drawing within 90 days and/or when more than 6 EOs are outstanding.

5.2.1.19 Signatures, organizations, and approvals shall be defined by the Approval Matrix in MPR 8040.1 Appendix A, or the matrix defined in the specific program/project Configuration Management Plan (CMP).

5.2.1.20 The EO, MSFC Form 421, shall be used to obtain appropriate signatures for all EO transactions, or if the ICMS online system is utilized, the EO confirmation data sheet shall be used to obtain the approval signatures. The confirmation data sheets are created when an EO is entered into the ICMS through the online system. After the transaction is entered, a confirmation edit is run. If there are no errors, the transaction is locked and a confirmation data sheet printed..

5.2.2 Preparation and Identification. The forms to be used for the EO system are the input form for Engineering Order (computer-prepared application data sheet), MSFC Form 421, hereinafter referred to as the “A” sheet, and the Engineering Order (Graphic Data Sheet), hereinafter referred to as the “B” sheet. The “B” sheet shall be prepared according to the format specified in MSFC-STD-2806, and is mandatory for initial release. EO numbers shall be assigned in sequential order (1, 2, 3, etc.) for each part, or for each drawing for drawings that do not describe hardware and contain documentary or procedural content only (as described in 5.2.1.c). The sequence shall be continuous for each part (or drawing per 5.2.1.4) and therefore is not restarted after EO incorporation into a drawing revision. EO numbers shall be requested from the MSFC Release Desk through the EO Number Request and Trending System at https://masterlist.msfc.nasa.gov/eo.

5.2.3 Add New Parts. When calling for parts that are not listed on the EPL (and therefore no find number is assigned), the graphic data sheet (of the EO) shall show the callout bubble without the find number, and add the part number in parenthesis at the bubble. The part number, quantity description, etc., shall be added to the back of the "A" sheet.

5.2.4 Create New MSFC Parts. Standard or vendor parts can be added by EO. An MSFC part number can be "created" on an existing MSFC detail drawing by an EO and called for on the EO to the next higher assembly and be released on the same EO form.

5.2.5 Correcting Effectivities of Incorporated EOs. EOs incorporated into a drawing shall, concurrent with release of the incorporating revision, be revised to delete the effectivities included in the effectivity of the new revision.

5.2.6 Revising/Cancelling EOs. An EO shall be revised only to change the CBD, PCN, project code, or effectivity. Technical changes shall be made by issuing a new EO. The latest revised issue of an EO supersedes all previous issues. To cancel an EO, the effectivity shall be changed to "None". Once an EO has been cancelled, it cannot be reinstated. All revisions shall be submitted on the "A" sheet only. For all revisions to an EO subsequent to the initial issue, only the computer printout shall be distributed. The words "RETAIN INITIAL GRAPHIC DATA SHEET" shall appear in the upper right corner of the printout. Graphic data sheets from the initial issue shall be retained by the recipient for use with subsequent revisions

5.3 Release of Configuration Documentation.

5.3.1 General. This chapter provides instructions for releasing MSFC configuration documentation specifications (SPECs), standards (STDs), interface control documents (ICDs), software version descriptions (SVDs), and changes or revisions to drawings and parts lists.

5.3.2 Initial and Revision Packages for Review and Release. The OPR designee shall prepare the initial or revision package for review and release in accordance with the reviews and signatures set forth in the Configuration Documentation Approval Matrix in MPR 8040.1 and the program/project CMP. The forms listed in the following tables shall be used to assemble a release package: Table II for a specification/standard/ICD/SVD initial release package, Table III for a drawing and parts list initial release package, Table IV for a specification/standard/ICD/SVD revision package, and Table V for a drawing or parts list change or revision package. The sources in parenthesis provide instructions for preparing these forms. The completed package shall be organized as shown in Table II, III, IV, and V.

TABLE II. Initial Configuration Document Package Preparation Forms (Excluding Drawings and Parts Lists)

	Title	MSFC Form	Release
1.	Engineering Change Request (ECR)	2327	X
2.	Document Release List (DRL)	420-5	X
3.	Document Package Routing Slip (DP/RS)	3418	N/A
4.	Document Signature Page If Required (Refer to MWI 7120.4.)	N/A	X
5.	Specification/Standard/ICD/SVD (Refer to MWI 7120.4 for preparation instructions.)	N/A	X
6.	Control Board Directive (CBD)	2312	X
7.	Repository Distribution List	N/A	X
8.	Document Input Record	2896	X

TABLE III. Initial Drawings and Parts Lists Package Preparation Forms

	Title	MSFC Form	Release
1.	Engineering Change Request (ECR)	2327	X
2.	Engineering Parts List (EPL) and Drawings	420	X
3.	Document Package Routing Slip (DP/RS)	3418	X
4.	Control Board Directive (CBD)	2312	X
5.	Repository Distribution List	N/A	X
6.	Document Input Record	2896	X

TABLE IV. Revised Configuration Document Package Preparation Forms

	Title	MSFC Forms	Release
1.	Engineering Change Request (ECR)	2327	X
2.	Document Release List (DRL)	420-5	X
3.	Document Change Package Routing Slip (DP/RS)	3418	X
4.	Document Signature Page If Required (Refer to MWI 7120.4)	N/A	X
5.	Revised Specification/Standard/ICD/SVD	N/A	X
6.	Control Board Directive	2312	X
7.	Repository Distribution List (If Changed)	N/A	X
8.	Document Input Record	2896	X

TABLE V. Revised Drawing and Parts List Package Preparation Forms			
	Title	MSFC Forms	Release
1.	Engineering Change Request (ECR)	2327	X
2.	Engineering Parts List (EPL)	420	X
3.	Engineering Order/Drawing Revision	421	X
4.	Document Package Routing Slip (DP/RS)	3418	X
5.	Control Board Directive (CBD)	2312	X
6.	Repository Distribution List (If Changed)	N/A	X
7.	Document Input Record	2896	X

5.3.3 Initial or Revision Package Disposition by CCB and Processing. The OPR designee shall forward the completed package to the appropriate CCB secretariat for processing through the CCB. The CCB dispositions the package as approve as written, approve with changes, or disapprove and issues a CBD documenting the disposition, implementation actions, and action suspense dates. The following actions shall occur for each disposition:

5.3.3.1 Disapprove (document or drawing/parts list package): The CCB secretariat shall notify the OPR designee.

5.3.3.2 Approve as written:

a. Drawing/Parts List Package: The CCB secretariat shall add the CBD to the package, obtain a distribution list from the OPR designee for the Repository (for initial release), and forward the package to the Release Desk for release.

b. Document Package: The CCB Secretariat shall provide the OPR designee implementation actions (e.g. updating the document Effective Date to match the CBD disposition date, updating the Document History Log, providing a distribution list for the Repository (initial release)) and either the OPR designee or CCB secretariat shall deliver the updated document to Drawing Checking for verification that the document meets MWI 7120.4 format requirements and is in agreement with the CBD.

5.3.3.3 Approve with changes:

a. Drawing/parts list package: The package and the CBD describing the changes shall be returned to the OPR designee for corrections. The OPR designee shall make the CCB-directed changes and deliver to Drawing Checking for verification that the package is in agreement with the CBD.

b. Document package: The CCB Secretariat shall provide the OPR designee direction to update the document in accordance with the changes specified in the CBD and other implementation actions (e.g. updating the document Effective Date to match the CBD disposition date, updating the Document History Log, providing a distribution list for the Repository (initial release)) and either the OPRD or CCB secretariat shall deliver the updated

document to Drawing Checking for verification that the document meets MWI 7120.4 format requirements and is in agreement with the CBD.

c. If corrections are required, Drawing Checking shall return the package to the OPR designee or CCB Secretariat. If no corrections are required, Drawing Checking shall forward the package to the OPR Designee/CCB secretariat who shall deliver to the Release Desk for release.

5.3.4 Package Release and Distribution. Although the Secretariat is responsible for reviewing the package, the Release Desk also reviews each approved package to ensure that all required forms are included and are properly completed. If corrections are required, the Release Desk shall return the package to the Secretariat who in turn shall forward to the OPR designee. If corrections are not required, the package is released and forwarded to the Repository for distribution.

5.3.5 ICD Revision. All ICD changes shall be proposed by an ECR in accordance with the form's preparation instructions. The ECR shall be accompanied by a Preliminary Interface Revision Notice (PIRN). The PIRN shall be given a tracking number by the Interface Working Group (IWG) responsible for the ICD; in the absence of an IWG, the person responsible for maintenance of the ICD shall assign the number. The PIRN shall record the agreement of all sides of the interface (the respective engineering, scientific or management organizations) with the necessity of the change. After all sides of the interface sign the PIRN, the controlling CCB shall issue a CBD indicating approval of the ICD change. The CBD shall state: "PIRN No. _____ is approved as IRN _____." (The CCB secretariat shall assign the IRN number.)

5.3.6 The OPR designee shall organize the ICD change package in the following order for each CCB-approved change and forward it to the Release Desk for release and subsequent routing to the MSFC Documentation Repository for distribution:

- DP/RS
- DRL
- CBD
- ECR
- IRN
- Revised ICD
- Reproduction Distribution List
- Document Input Record

5.4 Cancellation of Documents. Configuration documentation should be reviewed at least every 5 years to determine which documents need to be updated or cancelled. A document cancellation shall be authorized by the CCB which originally approved the document, or if that CCB has been deactivated then by the organization having current authority for the work related to the document. Once a document is cancelled, reissuance shall be approved by the CCB that authorized

cancellation, by the CCB that plans to utilize and control the document, or by the Director, Engineering Directorate.

5.4.1 Responsible Office. To initiate document cancellations for documents released through the Release Desk, the responsible organization shall do the following:

5.4.1.1 Prepare an ECR to the CCB which approved the document requesting document cancellation; the CCB shall produce a CBD dispositioning the request which shall be provided to the MSFC Release Desk for processing. If there is no active CCB, the OPR Directorate/Office Director shall prepare a letter requesting the document cancellation and provide it to the MSFC Release Desk. The letter shall be forwarded to the appropriate Directorate/Office Director responsible for the work related to that document or the Engineering Director for cancellation approval. The ECR/letter shall include the document title and number to be cancelled, the cancellation need date, and a brief statement of why the document is being cancelled.

5.4.1.2 The OPR designee shall submit a DRL, supporting documentation, and the document to be cancelled.

5.4.2 MSFC Release Desk. To process the cancellation, the Release Desk shall do the following:

5.4.2.1 Receive the CBD approving cancellation or receive the letter requesting cancellation and obtain authorization for the Letter request, document the cancellation in ICMS, and forward the documentation package to the MSFC Documentation Repository.

5.4.2.2 Ensure that any future actions against the document are referred to the originator or the organization with notification of the previous cancellation.

5.4.3 MSFC Documentation Repository. Upon receipt of the above document package, Repository personnel shall:

5.4.3.1 Maintain an electronic cancellation notice (DRL) as the latest revision of the cancelled document. NOTE: The Repository has discontinued the production of microfiche but does maintain some legacy microfiche.

5.4.3.2 Maintain electronic copy of the cancelled document and the cancellation letter.

5.4.3.3 Provide to requesters only copies of the revision that shows the cancellation notice.

5.4.3.4 Prevent acceptance/distribution of any future action against the cancelled document.

5.4.3.5 Provide one copy of the cancelled document to the originator, if requested.

6. NOTES

None.