



## Goddard Procedures and Guidelines

**DIRECTIVE NO.** GPG 8700.2C  
**EFFECTIVE DATE:** May 4, 2000  
**EXPIRATION DATE:** May 4, 2005

**APPROVED BY Signature:** Original Signed by  
**NAME:** A. V. Diaz  
**TITLE:** Director

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**Responsible Office:** 500/Applied Engineering and Technology Directorate  
**Title:** DESIGN DEVELOPMENT

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### Preface

#### P1. PURPOSE

This procedure establishes the process for providing design input, for generating design output, for performing design verification, and for handling design changes that occur as the result of design verification and/or validation.

#### P2. APPLICABILITY

This procedure applies to the development of all Goddard Space Flight Center (GSFC) products and processes covered by the scope of the GSFC Quality Management System.

#### P3. AUTHORITY

NPD 8730.3, NASA Quality Management System Policy (ISO 9000)

#### P4. REFERENCES

- a. GPG 1310.1, Customer Commitments and Review
- b. GPG 1410.2, Configuration Management
- c. GPG 1710.1, Corrective and Preventive Action
- d. GPG 5330.1, Product Processing, Inspection, and Test
- e. GPG 8070.2, Identification and Application of Statistical Techniques
- f. GPG 8700.1, Design Planning and Interface Management
- g. GPG 8700.3, Design Validation
- h. GPG 8700.4, Technical Review Program

#### P5. CANCELLATION

GPG 8700.2B, Design Development

## P6. RECORDS

Quality Record Title	Record Custodian	Retention
Work Order Authorization (WOA) or equivalent for software, Completed	Product Manager (PM)	NASA Records Retention Schedule (NRRS) 8/5A2 Project Test, Engineering, and Evaluation Files. Records may be retired to a Federal Records Center (FRC) when 2 years old. Destroy when 15 years old.
Design Verification Test Reports and/or Summaries	Product Design Lead (PDL)	NRRS 8/5A2

### Procedure

#### 1. DEFINITIONS

- a. Product Design Lead (PDL) - The manager or leader with overall responsibility for managing the design activity, managing the technical and organizational interfaces identified during design planning, and where required, forming and leading the Product Design Team (PDT). The term refers to flight project managers, mission managers, instrument managers, subsystem technical managers, integrated product development team leaders, lead engineers, etc.
- b. Product Manager (PM) - The manager or leader with overall responsibility for a product.
- c. Verification - In design and development, verification is the process of examining the design to determine conformity with the documented design requirements. This includes reviewing documentation prior to release, performing alternate calculations to verify the original analysis, and performing physical tests of hardware and operational tests of software.
- d. Validation - In design and development, validation is the process of examining the product to determine conformity with the user's functional requirements. This includes product inspections, functional and operational tests, and environmental simulations.

#### 2. IMPLEMENTATION

##### 2.1 Design Input

The PDL convenes the PDT to review the customer requirements (see GPG 1310.1) and the design plan (see GPG 8700.1), review the scope of the product design, document derived requirements as design input, and develop detailed product designs as appropriate.

2.1.1 When developing detailed product designs, the PDL shall determine if statistical techniques will be utilized as part of the design process and, if so, document such techniques per GPG 8070.2.

2.1.2 As a result of design verification or validation (and subsequent corrective action per GPG 1710.1), additional design development activities may be required. In these cases, the PDL shall update the design plan documentation generated by GPG 8700.1.

## **2.2 Design Output**

The PDT shall document the design output in terms that can be verified against design requirements. Design output consists of drawings, specifications, and/or procedures necessary to manufacture and/or operate the product. This includes acceptance criteria for product validation as well as specific requirements for safe and proper functioning of the product. Design output shall be used to refine the Product Validation Plan (see GPG 8700.1 and GPG 8700.3).

## **2.3 Design Verification**

The PDT shall perform design verification activities which include, but are not limited to, drawing checking, finite element analysis, breadboard/prototype tests, software code walk-throughs, mathematical simulations, and peer reviews (See GPG 8700.4). The WOA (Form 4-30), or equivalent for software, shall be used to document all functional and environmental tests for design verification and, where applicable, the WOA may be used to document other design verification activities (See GPG 5330.1).

## **2.4 Product Configuration Control**

The PDT ensures that design changes are controlled and documented in accordance with the applicable configuration control procedures as described in GPG 1410.2. If the design fails to meet requirements, the PDL recommends and implements design changes per these procedures.

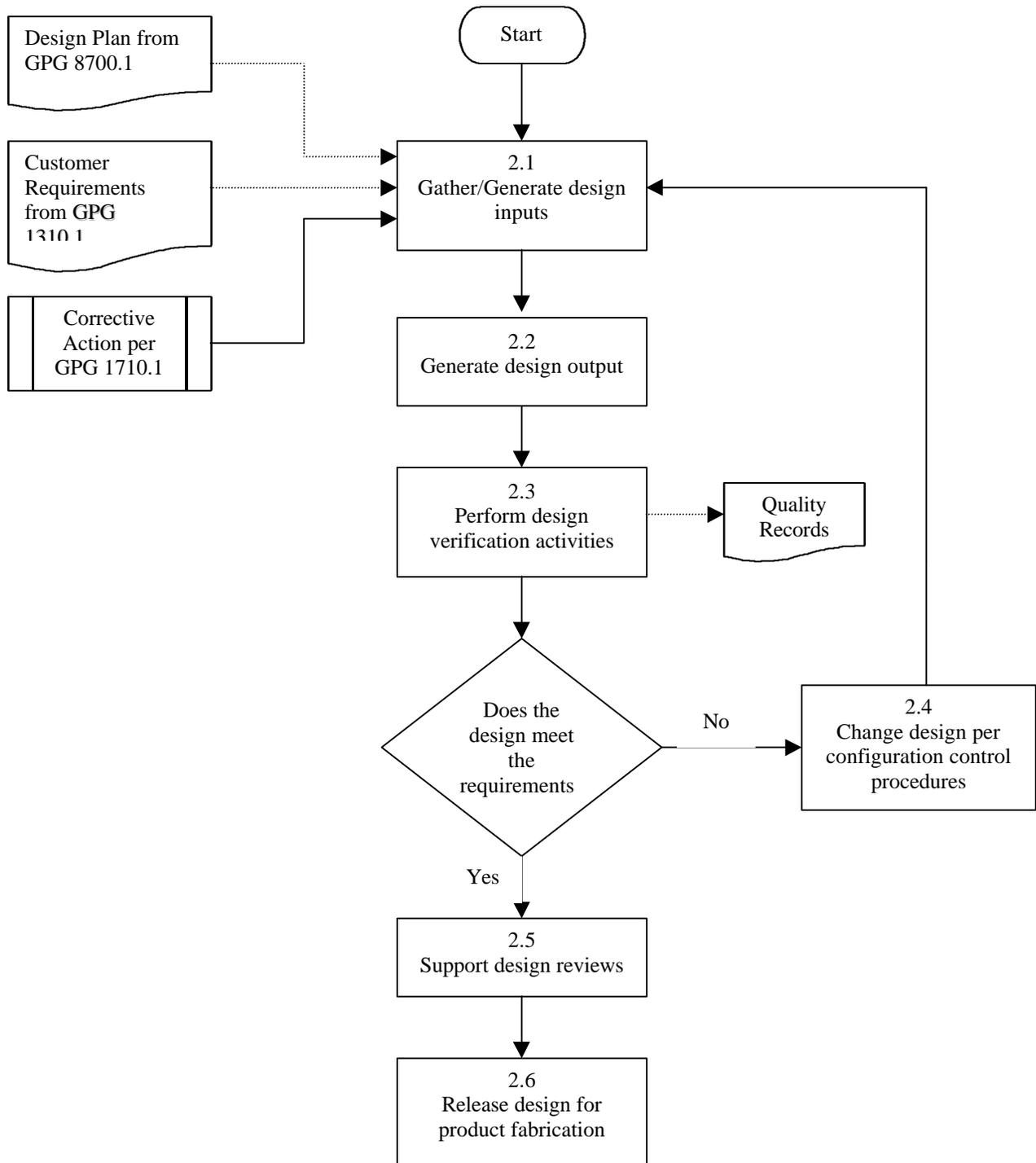
## **2.5 Design Review Support**

The PDL/PDT shall prepare and present documentation for design reviews (see GPG 8700.4), as required by the design plan (See GPG 8700.1).

## **2.6 Design Release**

The PDL shall document the successful completion of design development and verification, and release the design for final product fabrication (and subsequent validation) in accordance with the design plan (see GPG 8700.1) and customer requirements (see GPG 1310.1).

### Design Development Flowchart



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### CHANGE HISTORY LOG

Revision	Date	Description of Changes
Baseline	8/12/98	
A	10/6/98	Header and footer format changes. New title for GPG 1310.1 reference. Indicated responsibility for maintenance of quality records.
B	5/7/99	Clarified Purpose. Corrected reference list to include GPG 1710.1. Added definition for validation. Added requirements to update product design plans and to consider use of statistical methods in step 2.1. Divided step 2.2 into 2.2 (design output) and 2.3 (design verification). Moved requirement to create a validation plan to GPG 8700.1. Clarified PDL's responsibilities regarding design changes in step 2.4.2. Modified quality records requirements. Modified flow chart to support the text.
C	May 4, 2000	Added GPG 1410.2 as a reference. Modified Quality Records requirements to include <i>completed</i> WOA's, with the Product Manager as custodian, to be consistent with GPG 5330.1. Deleted definitions of Configuration Baseline, Configuration Control Board, Configuration Documents, and Configuration Items. Removed all configuration management requirements and referenced GPG 1410.2.