



Westinghouse Electric Corporation
Nuclear and Advanced Technology Division

Subject

INTERFACE CONTROL DOCUMENT**AP600****Program Operating Procedure**Approved: *H.J. Bruschi*

H.J. Bruschi, Director AP600 Program

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**AUTHOR / RESPONSIBLE
FUNCTION**

Contact Manager, Nuclear Equipment Engineering, for questions concerning this procedure.

PURPOSE

This procedure establishes the requirements and responsibilities for developing, approving, implementing, revising and maintaining Interface Control Documents (ICDs) related to the AP600 Program.

SCOPE

This procedure applies to all ICDs that are to be developed for AP600 systems, equipment or computer software that interacts with equipment or software being designed by organizations.

DEFINITIONS

AP600 CONFIGURATION CONTROL BOARD (CCB) -- A board of individuals drawn from various organizations and disciplines to review and approve (or disapprove) Design Change Proposals (See Figure A) and to determine whether proposed changes require DOE review and approval. The CCB organization is defined in the AP600 Program Operating Procedure, AP-3.2, "Design Configuration Change Control for AP600 Program, Phase 2".

INTERFACE -- A functional or physical characteristic required to define a common boundary between two or more pieces of equipment, software or systems that are designed by different Westinghouse divisions, departments, or contractors/suppliers.

INTERFACE CONTROL DOCUMENT(ICD) - A formal document or drawing which defines the interface relationships between organizations with design responsibility for the AP600 program consistent with the program milestones (See Figure A).

The ICD applies to all physical, functional or operational interfaces of systems, equipment, software, facilities and installation requirements (Figure B) which are typically characterized by mechanical, electrical or functional data parameters or procedures with associated data requirements.

The ICD is designed to supplement not to duplicate information contained in the system specification document (SSD) by providing the details of the interfaces.

LEAD ICD ENGINEER - The Lead ICD Engineer is the appointed Westinghouse AP600 representative responsible for a particular ICD and the interfacing that may be required with the other affected engineers for the issuance of the ICD. The Lead ICD Engineer can be the Responsible Design Engineer.

ICD ENGINEER - Official ICD interface person of the responsible group (other Westinghouse departments/divisions or contractors/suppliers) that has an interface with the specific AP600 equipment or software to which the ICD applies. This person is assigned by the responsible group organization to work with the Lead ICD Engineer in the development of the particular ICD.

SUPPLIER - As used in this procedure, a Supplier is any non-Westinghouse organization with design responsibility for systems, structures, equipment or software that interfaces with systems, structures, equipment or software designed/integrated by Westinghouse.

PROCEDURE
GENERAL

- A The ICD is typically prepared by the responsible design organization.
- B The ICD identifies the responsibilities of the responsible organizations at the design interfaces and ensures that design changes affecting interfaces are properly coordinated.
- C An ICD Team is assembled by the appropriate AP600 Engineering manager for each ICD. As a minimum the ICD team is composed of an appointed Lead ICD Engineer and/or a Design Engineer and those engineers from other organizations including outside suppliers who are responsible for specific interfaces.
- D Each appointed ICD Engineer shall enforce ICD control procedures within their organizations.
- E The nature of the ICD varies considerably, depending on the interface being documented. It can be a physical or an operational interface. Interface definition takes the form of drawings, tables, figures, schematics, function lists, data format diagrams, and other data required by designers to complete their detail design and ensure that all the parts of the system work harmoniously (Figure B). The ICD could be a formal document or a formal drawing. In either case, the ICD shall identify the assignment of responsibilities among the participating design organizations for the review, approval, release, distribution, and revision of interface design information and the document(s) in which interface design information is defined. Additionally, each ICD should have a schedule identifying the major milestones that each organization must meet, together, for final ICD issuance.
- F Appendices A, B, and C provide instruction(s) for a typical ICD.
- G For those ICDs which are issued as documents, the Lead ICD engineer ensures that any ICD revision contains a Record of Changes page describing, in detail, significant changes along with a reason for the change in addition to any approvals required by AP-3.2. Approval for any revision(s) shall be obtained from the groups who originally reviewed and approved the interfaces. Revisions (changes) should be identified throughout the document by a bar line on the right hand margin or by "A" pages (e.g. change pages, looseleaf pages). The bar or vertical line appears once and is not cumulative in future revisions.

- H For those ICDs which are issued as drawings, the Lead ICD engineer ensures that an Engineering Change Notice (ECN) describes the changes in detail along with a reason for the change in addition to any approvals required by AP-3.2. Approval for any revision(s) shall be obtained from the groups who originally reviewed and approved the interfaces. The changes or reference to the ECN should be identified in the revision column of the drawing.
- I Each ICD shall be controlled in accordance with this procedure. Any proposed change to the ICD (document or drawing) shall be made in writing via the designated Lead ICD Engineer using the forms identified in AP-3.2, "Design Configuration Change Control for AP600 Program, Phase 2".

RESPONSIBILITY / ACTION

AP600 RESPONSIBLE DESIGN MANAGER

- 1 Identifies the need for defining interfaces that exist between specific equipment, systems, processes or software and requests the preparation of the ICD.
- 2 Responsible for administering this procedure, defining and issuing standards to third parties (other Westinghouse organizations, contractors, or suppliers) for any ICD information that will be required to be provided by the third party.
- 3 Assigns a Lead ICD Engineer and identifies interfacing organizations (other cognizant groups, divisions or Suppliers) that will provide input to and approve ICD.
- 4 Establishes milestones and a schedule for the development and completion of the ICD.
- 5 Obtains commitment from interfacing organization(s) to assign ICD Engineer(s) and forms an ICD team.
- 6 Supervises the ICD Team in accordance with Figure A and acts as the arbitrator in case the ICD Team can not resolve technical issues.
- 7 Ensures that all ICD comments have been properly resolved with the mandatory review groups and that the ICD has been properly reviewed and signed-off.

- 8 Ensures that the ICD meets the program and contractual requirements. Reviews, approves and signs the ICD.

ICD TEAM

- 9 Responsible for identifying all relevant interfaces and for reviewing the ICD to ensure that a schedule and organizational responsibilities are defined; and that each technical discipline (mechanical, electrical, software, etc.) has been appropriately addressed. Once an ICD is issued, the ICD team will evaluate all proposed changes prior to revising the ICD (see Figure A).

The ICD Team shall meet, as needed, to resolve any technical concerns and reviews proposed ICD changes.

LEAD ICD ENGINEER

- 10 Identifies the ICD format e.g. a document, drawing or combination of both (See Procedure/General Section).
- 11 Obtains a document number in accordance with standard AP600 document numbering system (GW-GMP-005) for those ICDs that will be issued in a document format. Furthermore, the Document Cover sheets identified in the Forms/Exhibit section shall be utilized to formally sign ICDs.
- 12 Ensures that all drawings required by ICD are in accordance with standard Westinghouse AP600 drawing procedures and format as defined in "Preparation and Control of Drawings" (Reference WCAP-12601).
- 13 Prepares draft ICD and distributes to ICD Engineers. Coordinates management reviews, Configuration Control Board reviews, and verifies that all proposed changes are technically within the Baseline Design.
- 14 Resolves comments to the ICD generated during the review process.
- 15 Ensures that the "original" signed off ICD is properly filed in accordance with the applicable AP600 records flow schedule, document control and the Configuration Control Process.

- 16 Ensures that the ICD is maintained current as the design progresses.
- 17 Initiates or reviews any proposed revision(s) to the ICD, and ensures that the original ICD is revised in accordance with this procedure and that all revisions are placed under configuration control. (Figure A).

RESPONSIBLE DESIGN MANAGER

- 18 Defines the level of effort required from own organization to support and provide ICD input.
- 19 Provides input on schedule to support ICD.
- 20 Identifies the ICD Engineer within own organization.
- 21 Reviews and approves the ICD, as appropriate.

ICD ENGINEER

- 22 Provides input on format, content and schedule, as appropriate.
- 23 Coordinates review of draft ICD within own organization and provides comments to Lead ICD Engineer.
- 24 Upon resolution of all comments, signs ICD for own organization or obtains authorizing signature in accordance with organization's requirements.
- 25 Identifies any necessary changes to ICD to Lead ICD Engineer using the forms identified in Procedure AP-3.2, "Design Configuration Change Control for AP600 Program, Phase 2".
- 26 Responds to Lead ICD Engineer within 15 working days from the time of the original request on proposed changes to ICD.

REFERENCES

- A GW-GMP-005, "AP600 Document Numbering Procedure"
- B WCAP-12601, AP-3.2, "Design Configuration Change Control for AP600 Program, Phase 2"
- C WCAP-9565, DP-3.2.6, "Preparation and Control of Drawings".

FORMS / EXHIBITS

Document Cover Sheet, Form 58202, Exhibit 10.

Standard Internal Review Sheet, Form 58203, Exhibit 17.

Record Of Changes, Form 58204, Exhibit 16.

APPENDICES

- A. ICD Document Format
- B. ICD Table Of Contents (Typical Document format)
- C. Limited Rights Notice

FIGURE A
ICD INFORMATION CONFIGURATION CONTROL FLOW

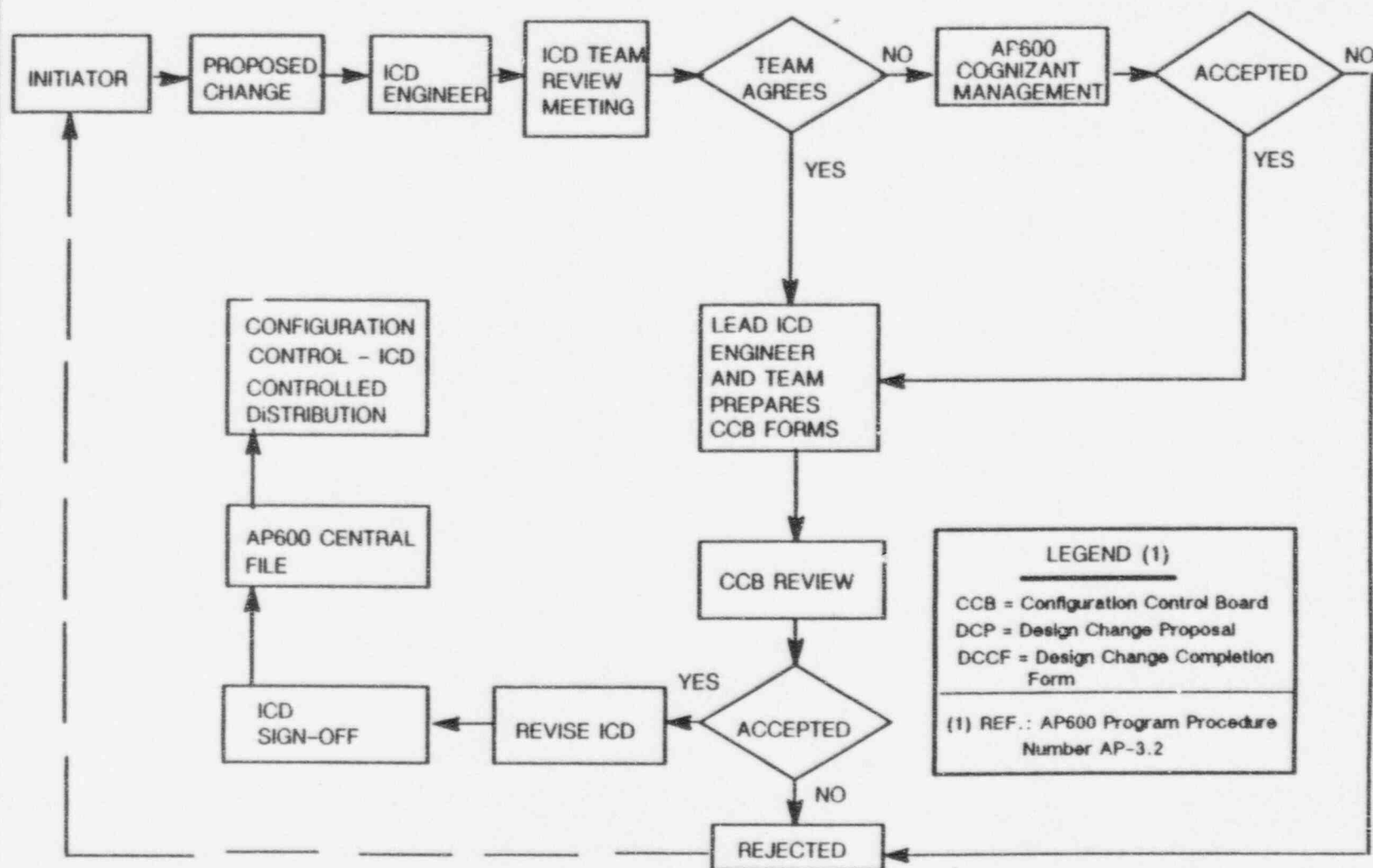
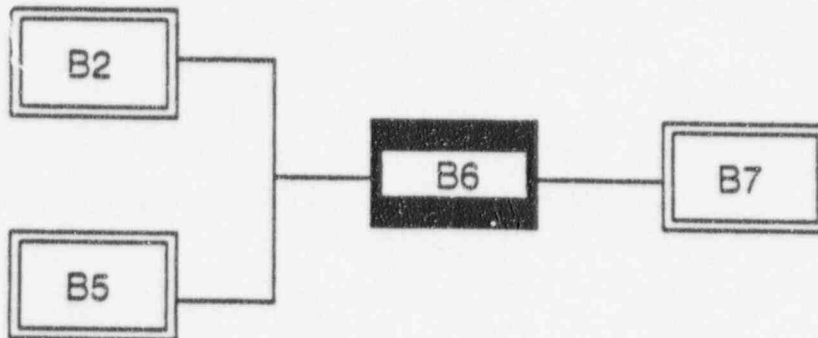


FIGURE B

EXAMPLE : DEFINING INTERFACE FUNCTIONS

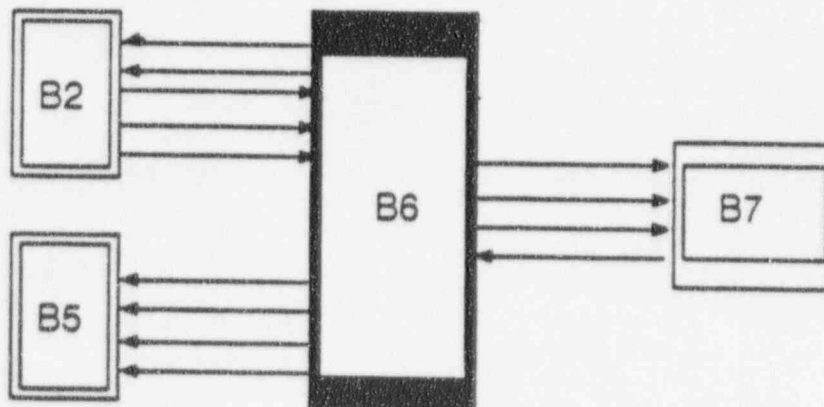
The following figure depicts 4 pieces of equipment that are to be designed by different organizations:



In an effort to identify the interfaces between all four pieces of equipment, a block diagram is drawn and the following questions are asked which should be answered via an ICD:

- o If B6 'talks' to B2, B5 and B7, What does it say? What do they say?
- o If B6 requires something, what does it require? How much? When?
- o If B6 supplies something, what does it supply? How much? When?

The ICD should break down the functional diagram into a more detailed list of the various functions, requirements, flows in or out between B6, B2, B5 and B7.



As a minimum, for the above diagram, the ICD will be the vehicle to:

- o Define the responsible organizations that are affected by the various interfaces
- o Assign values, dimensions, tolerances, times, durations, etc.
- o Select connector types and assign pins as above 'settles down'.
- o Define mounting, ducts, bolts, etc.
- o Depict energy balance for components.
- o Maintain load limits of components.

APPENDIX A INTERFACE CONTROL DOCUMENT FORMAT

A.1 INTERFACE CONTROL DOCUMENT COVER SHEET

In accordance with exhibit 10.

NOTE

EACH ICD SHALL CONTAIN A WESTINGHOUSE INTERNAL REVIEW SHEET IN ACCORDANCE WITH EXHIBIT 17. THE INTERNAL REVIEW SHEET IS TO BE MAINTAINED INTERNAL TO THE AP600 PROGRAM.

A.2 RECORD OF CHANGES (REVISIONS)

In accordance with exhibit 16.

A.3 TABLE OF CONTENTS

Appendix B provides a guideline for the preparation of an Interface Control Document. This Table of Contents could be customized as needed for the specific application (See section 4.0).

In the event that the Limited Rights Statement needs to be identified in the document it shall be in accordance with appendix C.

APPENDIX B

INTERFACE CONTROL DOCUMENT - TABLE OF CONTENTS

1.0 INTRODUCTION

- o Purpose
- o Scope
- o ICD Control Policy
- o Organization of ICD

2.0 APPLICABLE DOCUMENTS

3.0 GENERAL REQUIREMENTS

4.0 PHYSICAL INTERFACES

- o Geometric Relationships: Coordinate Systems
- o Mechanical Interfaces: Envelope, Attachment, Alignment, Dimensions, Tolerancing

5.0 STRUCTURAL INTERFACES

- o Design Limits and Constraints: Safety/Design Factors
- o Mass Properties: Weight, Moment of Inertia, Center-of-Gravity, Location, Axes, Models of Exchange (Math/Physical)
- o Design Conditions (ASME Category A, B, C, D)
- o Loading combinations (e.g. anchor, nozzle, support, attachment, seismic)

6.0 FLUID INTERFACES

- o Hydraulic/Pneumatic Interface: Type, Flow Rate, Temperature, Pressure
- o Physical Interfaces: Pipe Sizes, Type Connectors

APPENDIX B (Continued)

7.0 ENVIRONMENT INTERFACES

- o Thermal: Temperature Range, Heating Rates, Heat Transfer Surfaces.
- o Magnetic: Flux Density, Rate-of-Change
- o Radiation: Type, Flux Density, Total Dose
- o Ambient: Pressure, Temperature, Flow Rates
- o Air Conditioning: Temperature, Flow Rates

8.0 ELECTRICAL POWER INTERFACE

- o Electrical Power: Type, Voltage, Power Profile, Protection, Distribution, Connectors
- o Electromagnetic Compatibility System Isolation

9.0 I&C INTERFACES

- o Command Signals: Format, Rates, Identification
- o Data Signals: Radio Frequency Characteristics, Format Rate
- o Telemetry Signals: Format, Clock, Identification, Recording
- o Timing and Sequencing: Control and Logic, Relationships, Data
- o Transfers, Input Sensing
- o Interconnection Diagrams

10.0 SOFTWARE INTERFACES

- o Data: Inputs, Outputs, Rates
- o Messages: Format, Content, Storage
- o Protocols: Enable, Processing, Validation, Error Detection, Recovery
- o Software:
 - Diagrams, Standards and Conventions
 - Timing and Sequencing: Control & Logic Relationships, Data Transfers, Input Sensing

APPENDIX B (Continued)

11.0 INDUCED ENVIRONMENTS

- o Structural: Vibration, Shock, Acoustic, Loads, Dynamic Mode Shape
- o Thermal: Temperature Range, Heating Rates, Heat Transfer Surfaces
- o Magnetic: Flux Density, Rate-of-Change
- o Radiation: Type, Flux Density, Total Dose

12.0 OTHER INTERFACES

- o Safety
- o Materials Compatibility

13.0 ELECTRICAL WIRING INTERFACES

- o Physical Interfaces: Pin Assignments, Type of Connectors, Harness Management

14.0 VERIFICATION:

- o QA Requirements
- o ICD Requirements Verification Matrix
- o Models
- o Support Equipment Tests
- o Integration Tests

15.0 SCHEDULES

This section should contain the key milestones that are to be met by each affected party that are required to provide input to the ICD. Typically schedules are tracked by PCCA, however, their inclusion as part of the ICD provides all parties with specific target dates to have their design information available for other affected parties, thus ensuring that the integration process is accomplished in an effective, efficient and cost productive manner.

APPENDIX: Glossary of Terms

APPENDIX C

THE LIMITED RIGHTS STATEMENT IS TO BE INCLUDED IN ALL ICDS THAT ARE SIGNED OFF AND RELEASED FORMALLY OUTSIDE THE AP600 PROGRAM

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