PROCEDURE: NCSX–PROC–003 Revision 0		Page: 1 of 6
Title **NCSX Interface Control**	**Initiated by:** Robert Simmons 2003.02.20 12:03:52 -05'00' NCSX Systems Engineering Support Manager	**Effective Date:**
Concurred by Judith Malsbury 2003.02.27 10:58:13 -05'00' NCSX Quality Assurance Manager	**Approved by:** Wayne Reiersen Digitally signed by Wayne Reiersen DN: cn=Wayne Reiersen, o=PPPL, c=US Date: 2003.02.28 14:10:32 -05'00' Reason: Approved by Location: PPPL Signature Not Verified NCSX Engineering Manager	**Supersedes:** New

Applicability

This procedure is applicable to the entire NCSX Project.

Introduction

This procedure describes how interfaces for the NCSX Project are defined, processed and controlled.

An interface is a common boundary between the activities or WBS elements. Interface control is the process of developing a technical agreement between two or more activities or Work Breakdown Structure (WBS) elements that documents the functional, performance, and physical characteristics required to exist at this common boundary. Interface control defines the integration constraints to ensure that systems and subsystems mutually can be assembled and/or function together. As the design evolves, increasingly more detailed interfaces will also evolve and be documented. The process described in the Interface Control Management Plan (ICMP) describes the policies and procedures for generating and administering these technical agreements.

There are two types of interfaces; physical interfaces and functional interfaces. Physical interfaces define the physical envelopes and will eventually be reflected in an ICD. Functional interfaces define the performance requirements and will eventually be reflected in analyses and developmental or "design to" specifications. Supporting the development of these two types of interfaces will be design studies that assess and demonstrate the potential impact of either physical or functional interfaces.

Within these two types of interfaces are two classes of interfaces; primary interfaces and secondary interfaces. A primary interface exists between two separately deliverable items (referred to as Configuration Items/CIs in systems engineering terms) when the mutual boundary area is not controlled by a single developmental or "design to" specification, when the interface is with systems outside the project (external interfaces identified in the General Requirements Document/GRD), or when, at the discretion of the cognizant Project Engineer, the interface is determined to be critical to the performance of the NCSX program. Configuration Items (CIs) represent the lowest level of control under configuration management and may be a single physical or functional item or collection of items that will

satisfy a final end product or deliverable. Primary interfaces will be defined, documented, and brought under configuration control by the time of the earliest Preliminary Design Review (PDR) for those CIs. The methods by which primary interfaces are identified, documented, and managed is controlled by the system described in the ICMP and this procedure.

A secondary interface is an interface can be defined by a single developmental or "design to" specification. Secondary interfaces will remain under local control by the WBS Manager until such time that the design is completed and the CI ready for delivery or the CI interface is elevated to a primary interface status. The methods by which secondary interfaces are identified and managed are left to the discretion of the WBS Manager. Accordingly, the system described in the ICMP and this procedure is not mandated for secondary interfaces.

The process of defining and managing interfaces on NCSX is called Interface Control and Management (ICM). The ICM program outlined in this ICMP recognizes that the interface definition begins well before the start of conceptual design, but that the formal control and management process does not begin until the start of preliminary design. The ICM program ends with project decommissioning. Two key requirements of ICM are the:

- Technical efforts to arrive at mutually acceptable technical agreements and the preparation of supporting documentation of these agreements; and
- The administrative efforts to manage the generation of agreements and related documentation, including changes as the design evolves.

The ICM Program is closely linked to the Systems Engineering (SE) program and its detailed supporting programs such as Configuration Management and Data Management.

Referenced Documents

NCSX-PLAN-PEP	NCSX Project Execution Plan
NCSX-PLAN-SEMP	NCSX Systems Engineering Plan
NCTX-PLAN-CMP	NCSX Configuration Management Plan
NCSX-PLAN-DMP	NCSX Data Management Plan
NCSX-PLAN-DOC	NCSX Document and Records Plan
NCSX-PLAN-ICMP	NCSX Interface Control Management Plan
NCSX-PROC-001	NCSX Procedure, Glossary of Acronyms and Definitions
NCSX-PROC-002	NCSX Configuration Control
PPPL Engineering Procedure 006	ENG-006 - Review and Approval of Specifications and Statement of Work

A.1 Scope Sheet Agreements (See Attachment 1)

Responsibility	Action
Responsible Managers between two primary interfaces	1. Identify the need to define an interface that will be reflected in an Interface Control Document (ICD) for physical interfaces or developmental ("design to") for functional interfaces. 2. Discusses interface definition with the other responsible manager and reaches agreement with the other manager, including: • Agreement that an interface exists and the general definition of the interface; • Which manager will be responsible for documenting the interface in the form of an ICD (physical interface), developmental specification (functional interfaces), or design memo for design studies (may lead to an ICD or developmental specification); • Agreement as to when the ICD will be needed if different than by the ICD for the earliest Preliminary Design Review (PDR) for the two interfacing systems; and •The specific Work Authorization Form (WAF) task identification number to ensure that all interfaces are properly reflected in work plans with sufficient resources to accomplish those interfaces. 3. Documents the scope sheet agreement in an e-mail to the Systems Engineering Support Manager with copy to the other responsible manager.
Systems Engineering Support Manager	4. Reviews proposed scope sheet agreement e-mail for completeness and clarity. 5. If necessary, clarifies issues not clearly defined and reaches agreement from both responsible managers. 6. Keeps record copy of finalized scope sheet agreement and forwards copy to the Engineering Manager and Project Control Manager for monthly statusing discussions.

B. Interface Control Documents (See Attachments 2-4)

B.1 Guidelines for Preparing ICDs

All ICDs will be prepared in a book form or written format. They will be prepared electronically. All ICDs will contain the following information.

Responsible Manager

1. Completes **Page 1, Title and Approval Page**, to include the following information:
    a. **Title Section** to include the following:
        - **ICD Number –** per numbering scheme contained in Attachment 4 of this procedure. For example, this interface might be numbered: NCSX-250-661-0010.
        - **Author of ICD –** identifies the ICD Participant (WBS Manager) who has lead responsibility for defining the interface
        - **WBS Elements Impacted –** e.g., WBS 611 and WBS250
        - **Type of Interface –** e.g., mechanical/envelope interface
        - **Description of Interface –** e.g., Neutral Beam Cooling Water System to Neutral Beam Heating System.
    b. **Revision Record Table -** to include record of revision numbers and date of the revision. The initial approved issue will be Revision 0.
    c. **Approval Record –** to include the signatures of both responsible managers, the appropriate responsible Project Engineers, and the Systems Engineering Support Manager when processed and approved (utilization of the Adobe Acrobat Electronic signature feature is permitted).

2. Completes **Page 2, ICD Detail Sheet,** including the following information (as applicable):
    a. **Scope** – this should be a summary of the ICD contents and its intended purpose. Only need to enter a brief word description of the systems to adequately describe the interface, e.g., "The Neutral Beam Cooling Water System(WBS 661) shall provide water to cool the Neutral Beam Injection System (WBS 250) components. Coolant lines shall be provide for supply and return of the coolant." The ICD should accurately reflect the latest approved technical baseline that will be reviewed as part of the PDR. If deemed necessary to adequately describe the interface, the methods employed by the ICD to document/verify interface design parameters; the drawing/model number.
    b. **Equipment and Responsibility List** – the equipment responsibility list should consist of a list of interfacing hardware/software/facilities, along with their respective identification number, common name, and the ICD participant (WBS Manager) responsible for their design.
    c. **Related ICDs** – all ICDs should include a complete list of those ICDs that may be impacted by and/or impacts the new/revised ICD. These related ICDs shall be identified by their unique identifier and name. Related ICDs should be reviewed for impact whenever an interface design is implemented or proposed.

d. **Notes and Abbreviations** - any explanatory notes that might clarify the intent of the ICD or explain or quantify information which applies to the ICD, whether in general or to specific areas of the interface. Tolerances should also be specified. Also define all unfamiliar abbreviations, acronyms, symbols, etc. used in an ICD.

e. **Interface Block Diagrams** – if needed, the interface block diagram should be a relatively simple pictorial representation of the interface. The interface block diagram can be more complex if required to adequately define the interface. In cases where the interface is depicted on an existing drawing or model, you need only record the drawing number and title here (per the numbering scheme outlined in the DMP and Pro/INTRALINK Users Guide).

f. **Installation Information** – provide a physical description (augmented by sketches if appropriate) of the installation of the interface, e.g., the mechanical interface between WBS 661 and WBS 250 in this example

g. **Other information** – provide other interface information as appropriate. For example, if the interface involves a cooling system, the supply information (flow rate, temperature, and pressure) should be specified as well as the return information (pressure). For electrical interfaces, both the mechanical and electrical details should be specified to adequately define the interface.Submits ICD to the Systems Engineering Manager for processing..

Systems Engineering Support Manager

3. Circulates proposed ICD for review and approval.
4. Receives reviewer comments/input/signature and, if required, resolves comments with the responsible manager who submitted the proposed ICD.
5. Once ICD fully approved, posts the ICD on the Interface Control Web Page and records ICD into the ICD Tracking Log.

B.2 Revising ICDs

ICDS shall be revised utilizing the Engineering Change Proposal (ECP) form specified in NCSX Procedure 002 (NCSX-PROC-002), NCSX Configuration Control.

Attachments

Attachment 1: Sample Scope Sheet Agreement

Attachment 2:ICD

Attachment 3: ICD Tracking Log

Attachment 4: ICD Numbering Scheme

Scope Sheet Agreement
(WBS 11/WBS 12)

Scope Sheet **Date of agreement:** *TBD*

WBS Managers Goranson (WBS 11 and 12)
Project Engineer Nelson (WBS 1)
Systems Engineer Simmons (WBS 82)

	Scope	Lead Responsibility	Deliverable	Due Date	WAF Task Ref
Design Studies	Assess impact of incorporating a lithium divertor.	Goranson (WBS 11)	Memo - Project will use as basis for establishing lithium-related performance and interface requirements.	*Needs to be done well in advance of when WBS 12 performance specification is due*	
Functional Interfaces	Bakeout heat loads on the VV and In-Vessel Components	Goranson (WBS 11)	Maximum heat loads incorporated in WBS 11 and WBS 12 performance specifications	*Needs to be done in advance of [1] when thermal analysis and cooling system is planned and [2] when WBS 12 performance (design-to) spec is due*	
Physical Interfaces	Physical interface between initial limiter and vacuum vessel	Goranson (WBS 11)	Separate ICD	*Needs to be done in time to incorporate into VV design and associated drawings, which have to be reviewed and promoted to Preliminary Design Release Level prior to the PDR*	
	Provisions required in vacuum vessel design to accommodate possible PFC upgrades	Goranson (WBS 11)	Separate ICD	*Needs to be done in time to incorporate into VV design and associated drawings, which have to be reviewed and promoted to Preliminary Design Release Level prior to the PDR*	
	Grounding connections between PFCs and vacuum vessel	Goranson (WBS 11)	Separate ICD	*Needs to be done in time to incorporate into VV design and associated drawings, which have to be reviewed and promoted to Preliminary Design Release Level prior to the PDR*	
	Provisions required in vacuum vessel design to accommodate internal trim coil upgrade	Goranson (WBS 11)	Separate ICD	*Needs to be done in time to incorporate into VV design and associated drawings, which have to be reviewed and promoted to Preliminary Design Release Level prior to the PDR*	

INTERFACE CONTROL DOCUMENT TITLE AND APPROVAL PAGE

(Page 1)

ICD Number:	Primary Author:
Impacted WBS Elements:	Type of Interface:

Description of Interface:

Record of Revisions

Revision Numb	Description	Date

Approvals

WBS Manager:	WBS Manager:
Project Engineer:	Project Engineer:
Systems Engineering Support Manager:	

ICD DETAIL SHEET

(Page 2)

(Use Continuation Sheets as Necessary to Include the Following Applicable Information)

Scope of Interface:

Equipment and Responsibility List:

Related ICDs:

Notes and Abbreviations:

Interface Block Diagrams:

Installation Information:

Other Pertinent Information:

WBS #1	WBS #2	ICD	Sequential Number	Brief Description
110	120	ICD	ICD-110-120-0001	Magnetic diagnostics port allocations through the vacuum vessel