PROCEDURE: NCSX–PROC–003 Revision 1		Page: 1 of 5
Title **NCSX Interface Control**	**Initiated by:** Bob Simmons Digitally signed by Bob Simmons DN: CN = Bob Simmons, C = US Reason: I am the author of this document Date: 2005.01.20 15:31:40 -05'00' NCSX Systems Engineering Support Manager	**Effective Date:** **1/20/2005**
Concurred by Judith Malsbury Digitally signed by Judith Malsbury DN: CN = Judith Malsbury, C = US, O = PPPL, OU = Quality Assurance Reason: I concur with this document. Date: 2005.01.20 16:17:03 -05'00' NCSX Quality Assurance Manager	**Approved by:** Wayne Reiersen Digitally signed by Wayne Reiersen DN: CN = Wayne Reiersen, C = US, O = PPPL Reason: I am approving this document Date: 2005.01.21 09:09:42 -05'00' NCSX Engineering Manager	**Supersedes:** Revision 0 Dated 2/28/2003

Record of Revisions:

Revision	Date	Description of Changes
0	**2/28/2003**	**Initial Issue**
1	**1/20/2005**	**Added record of revisions table. Changed to a simplified flow chart format. Clarified roles of Scope Sheet and Interface Control Documents. Revised ICD format (Attachment 2)**

Applicability

This procedure is applicable to the entire NCSX Project.

Introduction

The Interface Control Management Plan (ICMP) describes the program for generating and administering interfaces. This procedure describes the processes consistent with the ICMP for the definition and control of interfaces.

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. 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 (either in a book entry format (written) or on a drawing. Functional interfaces define the performance requirements and will eventually be reflected in analyses and product 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. As the design evolves, increasingly more detailed interfaces will also evolve and be documented.

Interfacing systems are defined in the subsystem development specifications (SRDs). This is the starting point where interfaces are identified. The details of the interface are then planned in Scope Sheets which establish a path forward, responsibility, and schedule for defining each interface. The final step in formally defining the interface occurs in formal Interface Control Documents (ICDs).

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 should 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 are controlled by the systems described in the ICMP and this procedure.

A secondary interface is an interface can be defined by a single developmental 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 the 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.

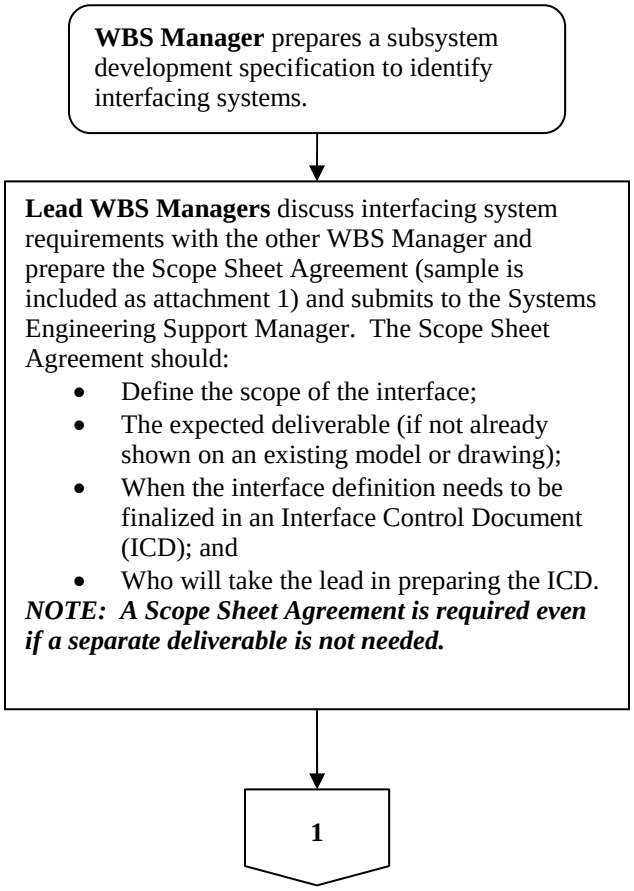
The ICM Program is closely linked to the Systems Engineering (SE) program and its detailed supporting programs such as Configuration Management and Data Management.

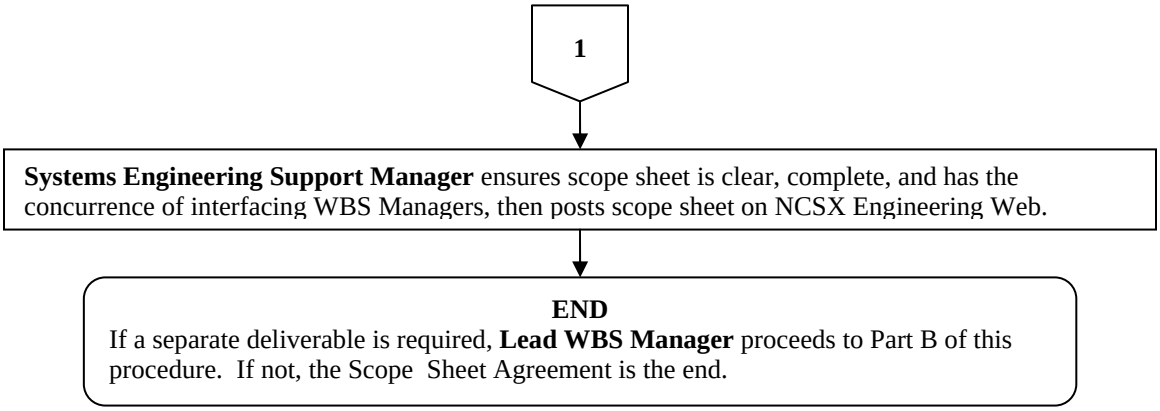
Referenced Documents

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

Procedure

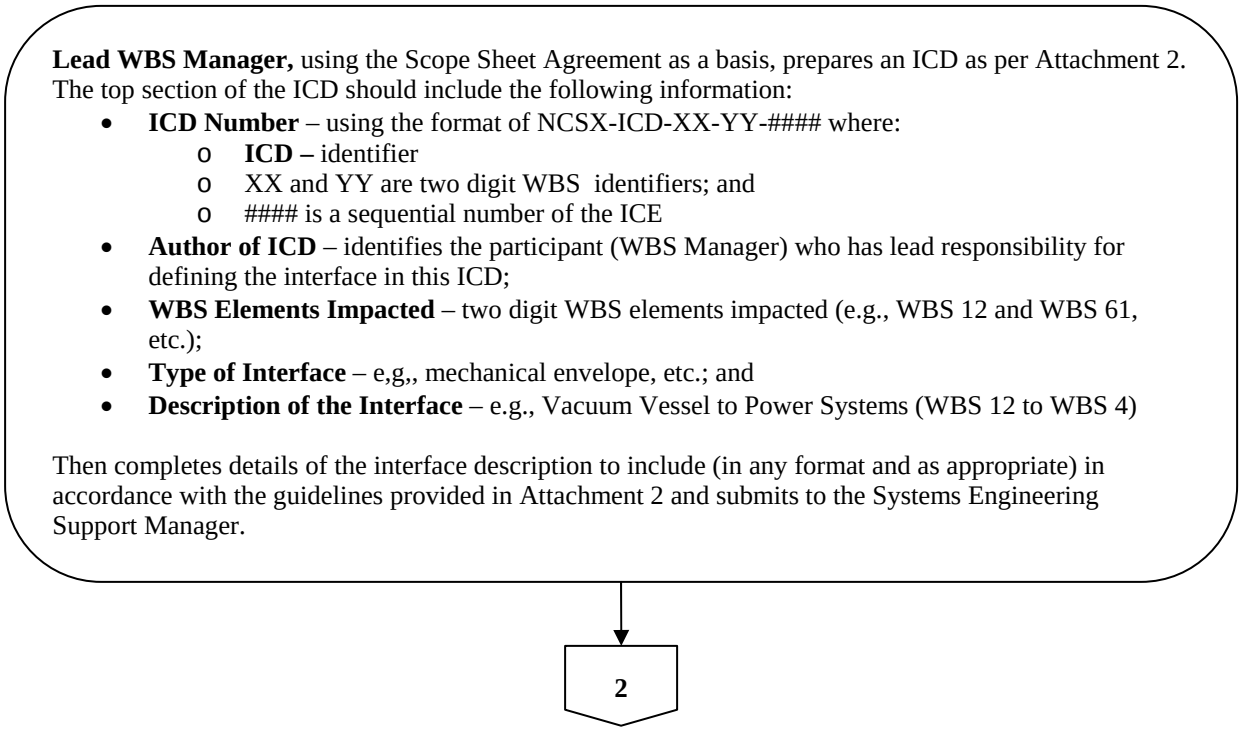
A. Scope Sheet Agreements (See Attachment 1)

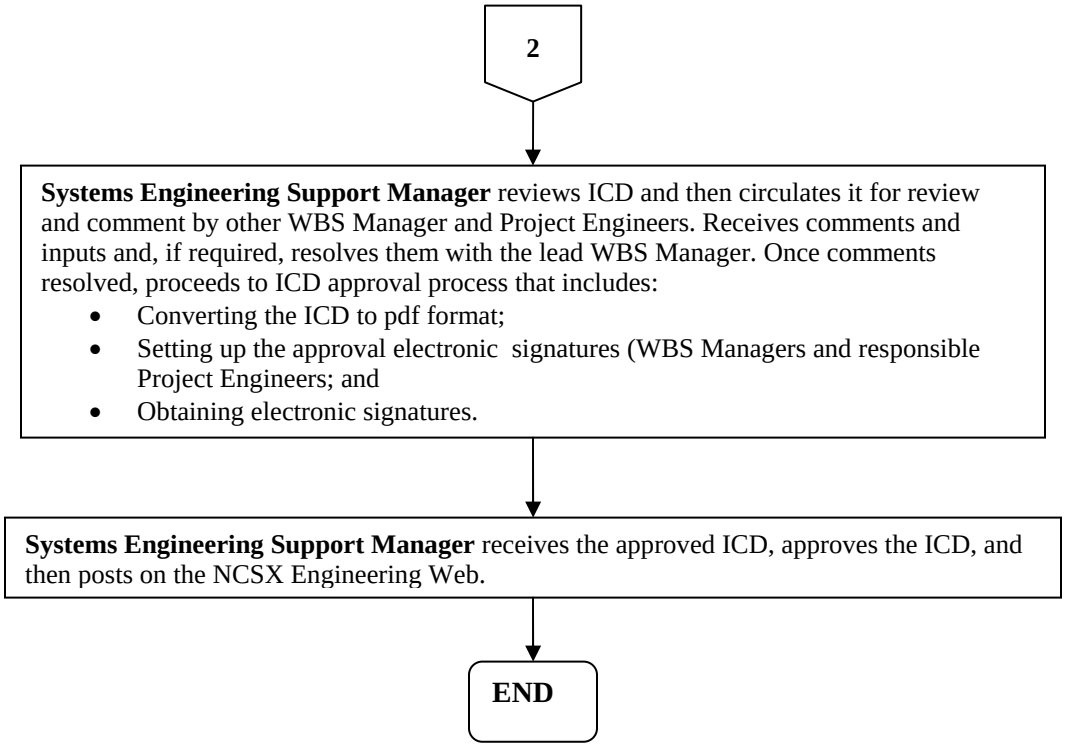




B. Interface Control Documents (See Attachments 2 and 3)

ICDs may be prepared in a book form/written format and include sketches or alternatively, at the discretion of the WBS Managers, include references to annotations or details on existing drawings that are sufficient to document the interface (in which case a simple reference to the existing drawing will be adequate). ICDs should be prepared electronically. The following procedure outlines the steps necessary to create an ICD. This procedure provides the guidelines for preparing book form (written) ICDs).





C. Revising Approved ICDs

Approved ICDs come under configuration control and shall be revised utilizing the Engineering Change Proposal (ECP) process described in the NCSX Procedure on configuration control (NCSX-PROC-002).

Attachments:

1 – Sample Scope Sheet Agreement
2 – ICD Form

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 COVER PAGE

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:	

Any format can be used to document the ICD details. The following information should be included as appropriate in either a written or tabular format:

- **Scope –** this should be a summary of the ICD contents and its intended purpose. Only a brief word description of the interface (e.g., "This ICD defines the requirements for the heaters and defines the WBS interfaces between WBS 12 and WBS 4. For purpose of assigning interface responsibility, the WBS 4 responsibility shall end at the power panel. The leads from the power panel to the heaters shall be the responsibility of WBS 12." The ICD should accurately reflect the latest approved technical baseline. ***It should NOT introduce new scope and/or cost and schedule impacts without first going through a configuration control process.*** If deemed necessary to adequately define the interface, the ICD methods to be employed to document/verify interface design parameter
- **Equipment and Responsibility List** – the equipment responsibility list should identify the interfacing hardware/software/facilities; the model/drawing number.
- **Related ICDs** – all ICDs should include a complete list of those ICDs that may be impacted by and/or impact the new/revised ICD. Those related ICDs shall be identified by their unique ICD identifier and name. Related ICDs should be reviewed for impact whenever an interface design is implemented or proposed.
- **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. All unfamiliar abbreviations, acronyms, symbols, etc. used on the ICD should be defined.
- **Interface Block Diagram** – if needed, an interface block diagram should be included that provides a relatively simple (and not too complex unless necessary) pictorial representation of the interface. In instances where the interface is depicted (either as a item or annotation on an existing drawing or model, only the drawing number need be entered.
- **Installation Information** – if appropriate, a physical description (augmented by sketches if necessary) of the installation of the interface, e.g., the mechanical interface between two WBS elements.
- **Other Pertinent Information** – provide any other pertinent information that will assist in clarifying the interface. For example, if the interface involves a cooling system, the supply information (flow rate, temperature, and pressure) should be identified as well as the return pressure. For electrical interfaces, both the mechanical and electrical details should be specified to adequately define the interface.