

# NATIONAL COMPACT STELLARATOR PROJECT

## Engineering Change Proposal (ECP)

### COVER PAGE

*(TO BE COMPLETED BY SYSTEMS ENGINEERING SUPPORT MANAGER)*

Originator: Bob Simmons	Date: November 16, 2005
ECP No: 038R1	ECP Title: Change in Modular Coil Winding Form Requirements

#### Required Reviewers

**Required Reviewers for this ECP:**  
 Dave Williamson, Brad Nelson, Wayne Reiersen, Phil Heitzenroeder, Frank Malinowski, Judy Malsbury, Jerry Levine, Mike Zarnstorff

#### ECP Approval Level

Expedited ECP?  Yes  No  
 Change Level: 3 Project  
 Approving Official: 3 Reg ECP - Project Manager

#### Actions

- (1) Revise MCWF CSPEC – NCSX-CSPEC-141-03 to Revision 10 by November 15th
- (2) Revise impacted drawings per ECNs #5016 and 5026 by November 15th
- (3) Update contract documentation by November 15th

### APPROVALS

*(TO BE COMPLETED BY APPROVING OFFICIALS)*

Change Level	Approving Official	Approval?	Signature
3	NCSX Project Manager	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	
3a (Expedited ECP)	NCSX Engineering Manager	<input type="checkbox"/> Yes <input type="checkbox"/> No	
2	NCSX Federal Project Director	<input type="checkbox"/> Yes <input type="checkbox"/> No	
1	Associate Director OFES	<input type="checkbox"/> Yes <input type="checkbox"/> No	
0	Deputy Secretary of Energy	<input type="checkbox"/> Yes <input type="checkbox"/> No	

**NATIONAL COMPACT STELLARATOR PROJECT**  
**Engineering Change Proposal (ECP)**  
**ECP-038R1**

*PART I*  
*(TO BE COMPLETED BY ORIGINATOR)*

Originator: Bob Simmons

Date: November 16, 2005

Overview of Change

Type of ECP:         EXPEDITED         STANDARD

Type of Change:     TECHNICAL     COST     SCHEDULE     EDITORIAL

(Check all that Apply)

**Reason for Change:** Inspection of C-1 winding form as delivered identified several issues requiring resolution and/or clarification. Some were errors by MTM and some were design errors.

**Impacted WBS Elements:** WBS 14

**Impacts of Change (Briefly Describe):** As a result of the inspections, a revision/update to the design requirements are needed to ensure that future winding forms do not have the same issues. This will involve changes (Revision 10) to the MCWF CSPEC (NCSX-CSPEC-141-03) and to assorted MCWF drawings.

The proposed changes are all technical in nature, however, it is expected that resolution by the vendor (MTM) will result in some cost and schedule adjustments. A Rough Order of Magnitude (ROM) estimate has been provided of approximately \$135K and three weeks total schedule impact. A fully documented cost and schedule estimate will be provided by Nov. 23. Accordingly, the cost and schedule impacts will not be addressed in this ECP, but will be reserved for a later ECP when the cost and schedule impacts have been quantified.

**Assessment of Other Options:** None

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***PART I***  
***(TO BE COMPLETED BY ORIGINATOR)***

**Originator: Bob Simmons**

**Date: November 16, 2005**

**Detailed Description of the Change:**

(Use Continuation Sheets and/or Attach Information/Sketches, As Needed)

**List Attachments, Impacted Documents, etc.**

- (1) **Draft MCWF CSPEC Revision 10 (NCSX-CSPEC-141-03) – all the subsequent attachments will be incorporated into this revision**
- (2) **ECN-5016 (Approved 8/9/2005)**
- (3) **ECN-5026 (Approved 10/24/2005)**
- (4) **RFD-14-005 (Approved 9/15/2005)**
- (5) **RFD-14-006 (Approved 9/15/2005)**
- (6) **RFD-14-008 (Approved 9/22/2005)**
- (7) **RFD-14-009R1 (Approved 10/24/2005)**

**Description of Change:**

Incorporated RFD-14-005 RFD-14-006, RFD-14-008, and RFD-14-009R1; incorporated ECNs 5016 and 5026; and incorporated ECP-038. Changes include changes in requirements, clarifications and/or correction of omissions, and updated information on drawings and models and RFDs:

- **Changes in Requirements:**
  - Revised Section 4.2.4 (Verification of Surface Finish) to add the requirement for separate reporting of surface finish inspections that do not meet the requirements of Section 3.1.1.4 (Surface Finish Requirements) in the tee area and other machined surfaces.
  - Revised Section 3.1.1.7 (Radiographic Inspection) clarify radiographic inspection requirements as per MSS SP 54.
  - Restored Section 3.1.1.8 to clarify and simplify inspection requirements within the high stress areas; flaw size changed to 0.080" major dimension in the web region of the tee. The base of the flange radiographic inspection requirement was removed.
  - Revised Sections 3.2.1 (Production Drawings) and 3.2.2.1 (Measurement) to clarify wording.
  - Revised Section 3.2.3.2.3 (Repairs in High Stress Regions) to state that any defect (either surface or subsurface) that exceeds the defect size and depth, should be repaired. Eliminated any references to NCR requirement.
  - Revised Section 4.2.6 (Verification of Dimensions and Tolerances) to increase dimension inspection coverage of flange of the tee.
  - Revised Sections 3.1.1.6.2 (Liquid Penetrant Inspection of Casting), 4.2.7.2.1 (General Liquid Penetrant Inspection Verifications), and 4.2.7.2.2 (Post-Maching Liquid Penetrant Inspection Verifications) to add ASTM A903 Level II for casting and Level I liquid penetrant inspections for post-machining acceptance criteria.
  - Revised Section 4.2.8 (Inspection of Internal Defects) to delete references to "pre-machining" and "post-machining" inspections for internal defects.

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**Continuation Sheet:**

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- Clarifications and/or Correction of Omissions:
  - Expanded Section 3.1.1.5 (Relative Magnet Permeability Requirements) into in two sub-sections, 3.1.1.5.1 which addresses the casting, including upgrades, and 3.1.1.5.2, which addresses fasteners and hardware (previously not addressed). Also revised Section 4.2.5 (Verification of Magnetic Permeability) accordingly.
  - Updated Section 3.1.1.1 (Chemical Composition of Casting Alloy and Weld Wire), to modify or add Table 3-1 (Weight % of Chemical Constituents in Casting Alloy) , Table 3-2 (Weight % of Chemical Constituents of Bare Weld Wire), and Table 3-3 (Weight % of Chemical Constituents of Covered Welding Electrodes) to clarify the chemical composition requirements for the casting alloy and weld wire.
  - Revised Section 3.1.1.6.1 (Visual Inspection Requirements) to delete the reference to SCRATA graded references for machined surfaces. Requirement for SCRATA graded references for casting surfaces remain.
  - Revised Section 4.2.3.1 (Mid-Plane Insulation) and 4.2.3.2 (Bolt Insulation) concerning verification of electrical insulation at the poloidal break.
  - Expanded Section 4.2.5 (Verification of Magnetic Permeability Requirements) into four subparagraphs, 4.2.5.1 which addresses weld repairs, 4.2.5.2 which addresses cast surfaces, 4.2.5.3 which addresses machined surfaces, and 4.2.5.4 which addresses fasteners and hardware. Previous Section 4.2.5 was not as specific.
- Updated information on Drawings/Models and RFDs
  - Updated Table 6-1 to provide updated listing of zip files for ProE, STEP, and pdf files. These drawings and models incorporate changes outlined in RFD-14-009R1 and ECNs 5016 and 5026. New Table 6-2 and Read Me file on Supplier FTP Site provide most recent revision for all drawings.
  - Added new updated Table 6-2 to replace Appendix B which was deleted. This new Table 6-2 lists the most recent revision of all drawings.
  - Renumbered and updated Table 6-3 to list all approved Requests for Deviation. Added RFDs 14- 005, 14-006, 14-008, and 14-009R1.
  - Updated Table 7-1 to clarify high stress region.

**(2) ECN-5016**

Affected Drawing(s)	New Revision Number	Title
SE142C-134	1	Type-C Side-A Lower Lead Block

**Correction of Drafting Error: Quad C7 - The drawing dimension, 7.97-in, mistakenly extends from the edge of the block to the centerline of the adjacent hole. The correct dimension for the width of block is 7.44 +/- .01-in.**

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**Continuation Sheet:**

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(3) ECN-5026

Affected Drawing(s)	New Revision Number	Title
SE141-103	3	Mod Coil Winding Form Asm Type-C
SE141-078	2	Poloidal Break Shim Asm Type-C
SE141-116	7	Production Winding Form Type-C
DS141-036	2	STUD, 1.375 DIA X 9.5 LG
DS141-060	1	Nut, 1.375-6unc 12 Pt Hex
DS141-079	Deleted	WASHER, 2.75 OD X 1.66 ID X 0.5 THK
SE141-137	0	MCWF Pol Break Bearing Plate
SE141-138	0	MCWF Pol Break Bearing Plate

This ECN incorporates the changes shown on RFD-14-009R1 (approved 10/24/2005) as well as previous changes approved in RFD-14-005, RFD-14-006, and RFD-14-008.