Statement of Work
for
NCSX Modular Coil On Site Weld Design Review
and
Sample Evaluation

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1 INTRODUCTION AND SCOPE

1.1 INTRODUCTION

Stellarators are a class of magnetic fusion confinement devices characterized by three dimensional magnetic fields and plasma shapes and are the best-developed class of magnetic fusion devices after the tokamak. The stellarator concept has greatly advanced since its invention by Dr. Lyman Spitzer, the founding director of the Princeton Plasma Physics Laboratory (PPPL), during the 1950's. A traditional stellarator uses only external magnetic fields to shape and confine the plasma. The National Compact Stellarator Experiment (NCSX) is the first of a new class of stellarators known as "compact stellarators." The differentiating feature of a compact stellarator is the use of plasma current in combination with external fields to accomplish shaping and confinement. This combination permits a more compact device. The NCSX project is managed by PPPL in partnership with the Oak Ridge National Laboratory. This Subcontract will be administered by PPPL.

The winding forms are austenitic (non-magnetic) stainless steel structures that are one of the most important components of the modular coils and the NCSX device. The winding forms perform two very important functions: (1) the conductors are wound on the winding forms, and are located in precise position by these forms; (2) the winding forms serve as their structural support during assembly and operation. There are three (3) distinct shapes of winding forms. Six (6) of each are required for a total of eighteen (18). The NCSX device is comprised of three identical "field periods", each of which consists of two each of the three winding form types, a 120 degree sector of the vacuum vessel, and associated toroidal field (TF), poloidal field (PF), and correction field coils.

The modular coils within a field period are joined together by bolts in the outer periphery and welding along the inner "legs", as shown in figure 1-1. A design review of PPPL's plans for these welds and evaluation of sample welds made by PPPL (figure 1-2) are the subject of this Statement of Work (SOW).

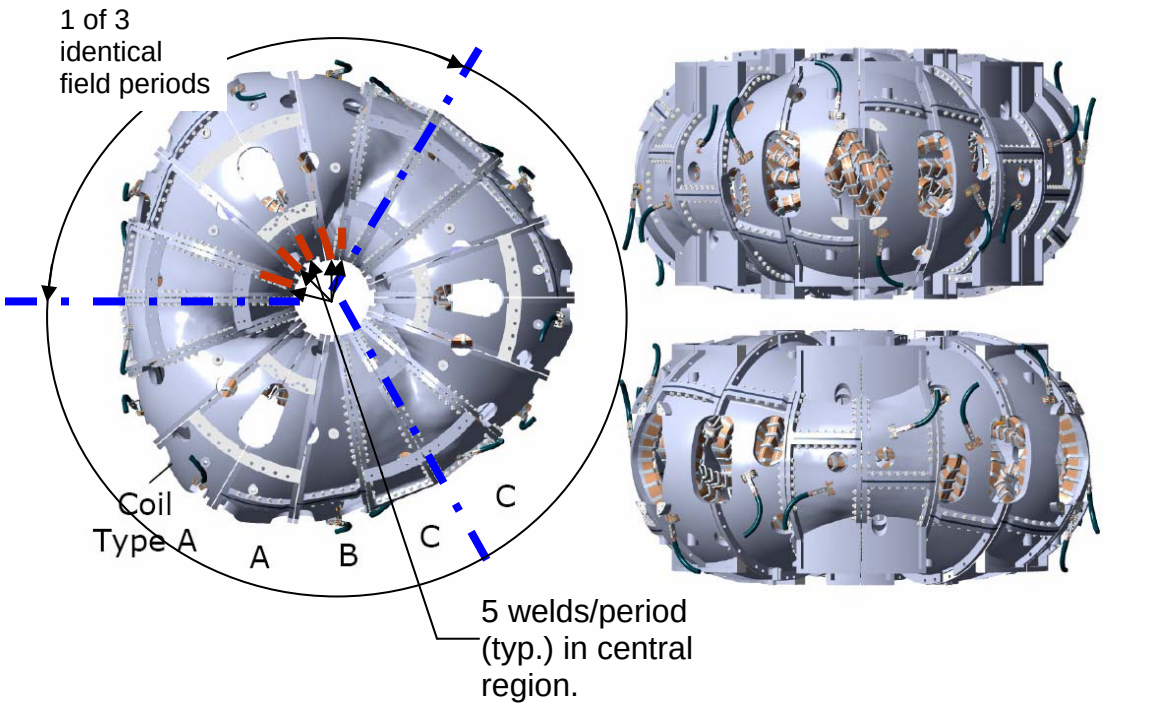

Figure 1-1 NCSX Modular Coil Weld Interfaces

Figure 1-2. PPPL Weld Test Part

1.2 SCOPE

The Scope includes:

1. An on-site design review by Bill Mohr of the Edison Welding Institute (EWI) to be held at the Princeton Plasma Physics Laboratory on a mutually agreeable date. The review will include a general fitness-for-service assessment, along with an assessment of areas of particular concern: weld distortion, and allowable stresses for both static and fatigue conditions.
2. Evaluation of the sample welds from the test part shown in Fig. 1-2 at EWI which includes ultrasonic and radiographic testing, and preparation of (6) materials mounts, and macrographs 0.280" x 0.375" which will be cut from this test part.

1.3 DELIVERABLES

The findings from the on-site design review shall be contained in a written report, along with a summary of the results of the sample weld evaluations and recommendations, if any, for additional work. This report shall be provided to PPPL as a computer file (in either .pdf or .doc) format within 7 days of the on-site review.