

NCSX VACUUM VESSEL FABRICATION

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The National Compact Stellarator Experiment (NCSX) is being constructed at the Princeton Plasma Physics Laboratory (PPPL) in conjunction with the Oak Ridge National Laboratory (ORNL). The goal of this experiment is to develop a device which has the steady state properties of a traditional stellarator along with the high performance characteristics of a tokamak. A key element of this device is its highly shaped Inconel-625 vacuum vessel shown below. This paper will describe the manufacturing of the vessel. The vessel is being fabricated by Major Tool and Machine, Inc. (MTM) in three identical 120° vessel segments, corresponding to the three NCSX field periods, in order to accommodate assembly of the device. The port extensions are welded on, leak checked, cut off within 1 inch of the vessel surface at MTM and then reattached at PPPL, to accommodate assembly of the close-fitting modular coils that surround the vessel. The 120° vessel segments are formed by welding two 60° segments together. Each 60° segment is fabricated by welding 10 press-formed panels together over a collapsible welding fixture which is needed to precisely position the panels. The vessel is joined at assembly by welding via custom machined 8 inch (20.3 cm) wide spacer “spool pieces.” The vessel must have a total leak rate less than 5×10^{-6} t-l/s, magnetic permeability less than 1.02 %, and its contours must be within 0.188 inches (4.76 mm). It is scheduled for completion in January '06.

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