

Fermilab

SDC Solenoid Design Note #152

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## More SDC Magnetostatic Results

Bob Wands

### Introduction

This report presents the results of several additional magnetostatic analyses based on the nine generic test cases already reported<sup>(1)</sup>. The effect of decreasing the slot size in the calorimeter (reducing the air/iron ratio) is examined for an endwall design, and the axial compressive force on the coil is calculated as a function of the distance between the end of the coil and the endcap endwall.

### Effect of 1/8 in. Slots

The previous generic case 2, shown in Fig. 1, with an endcap endwall placed 40 cm outside of the coil, was modified to change the slot size from 1/4 in. to 1/8 in. The two slot configurations are shown in Fig. 2. The resulting axial compressive force on the coil was 980 tonnes, which is essentially the same as the 1/4 in slot configuration. As verification, a run was made where the entire endwall was solid iron. The resulting axial compressive force was 930 tonnes. This indicates that the 40 cm endwall is far enough removed from the coil that the quality of the flux return offered by the endcap does not appreciably affect the coil forces.

### Effect of Endwall Distance from Coil

Three generic test cases (0,2, and 3) used endwall distances of -40, 40, and 0 cm, respectively, where a minus sign indicates that the endwall extends into the bore of the solenoid. Four additional cases were run, representing endwall distances of -26, -13, 13, and 26 cm. The resulting coil compressive forces were then plotted as a function of this endwal distance in Fig. 3.

## Conclusion

The effect of 1/8 in. slots (in place of 1/4 in. slots) is negligible in the case where the endcap endwall is 40 cm outside of the solenoid bore. The amount of additional flux lured into the endcap by the slightly higher iron content makes virtually no difference in coil compressive forces.

The axial compressive force is strongly affected by the proximity of the endcap endwall to the end of the coil. The graph of Fig. 3 can give some guidance in the selection of an endwall location that satisfies concerns about coil compressive force.

## References

1. Wands, B., 'Magnetostatic Analysis of Several SDC Solenoid/Calorimeter Configurations', SDC Solenoid Design Note #138, March, 1991

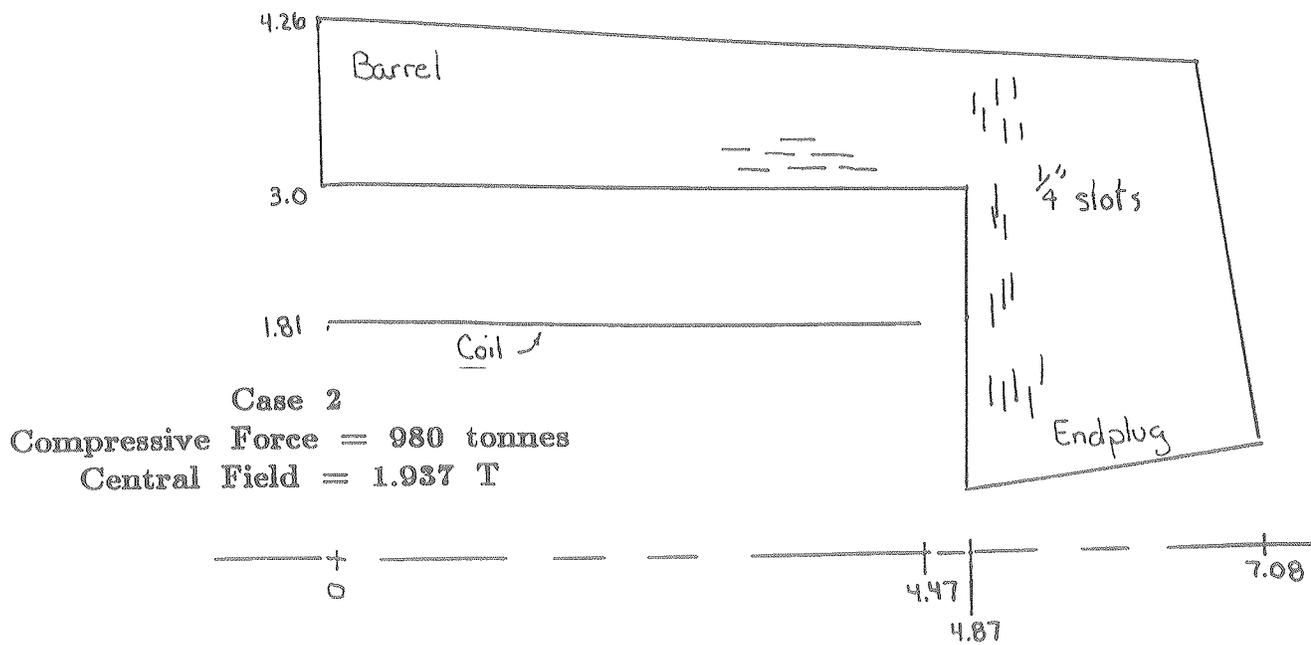


Fig 1. Generic Test Case 2

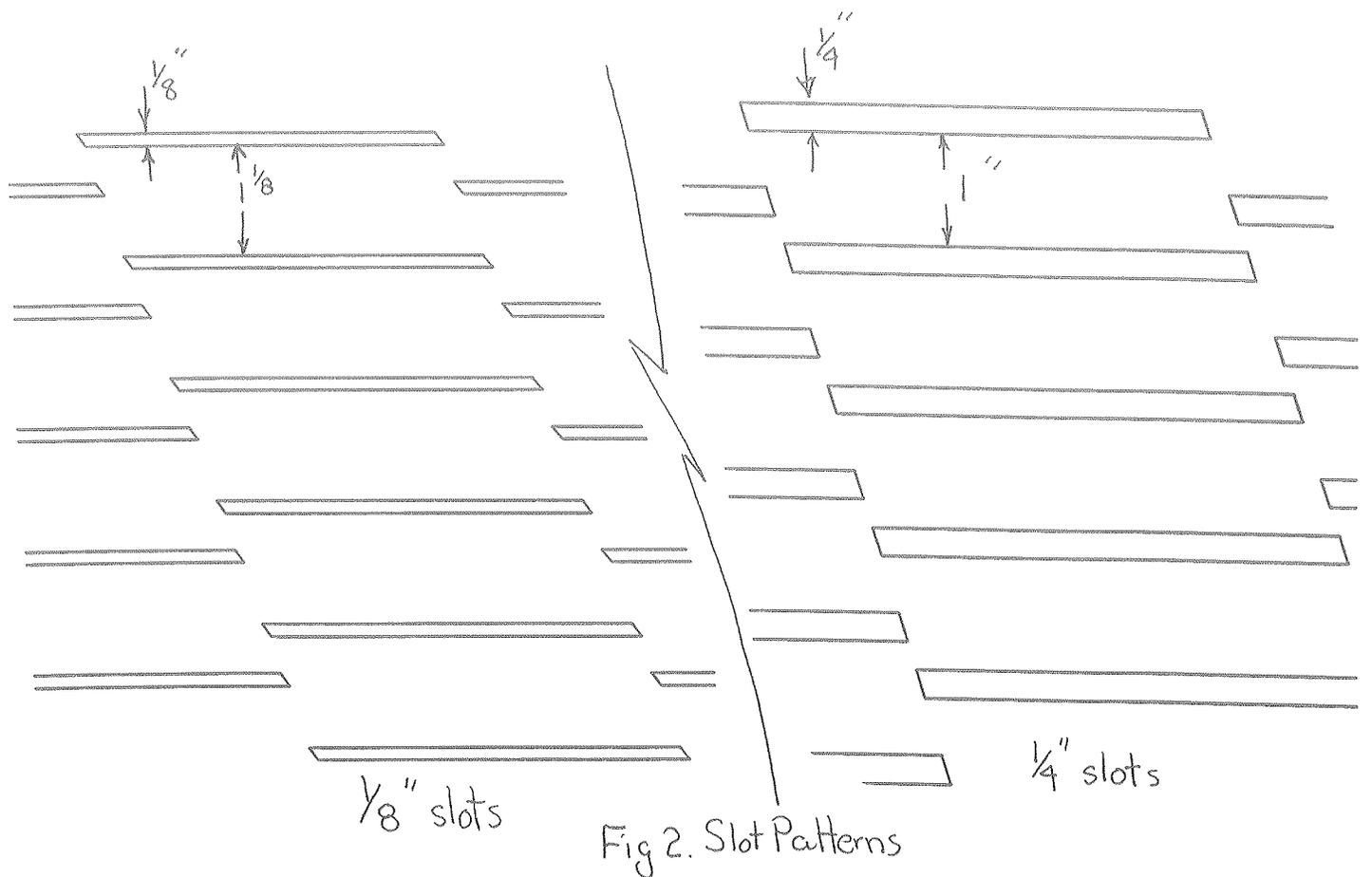


Fig 3

# Axial Compressive for on SDC Solenoid

as function of distance from endwall to coil

