

MCGUIRE POST MODIFICATION STEAM GENERATOR
TUBE VIBRATION MONITORING PROGRAM

PRELIMINARY REPORT

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WESTINGHOUSE ELECTRIC CORPORATION
Nuclear Energy Systems
P. O. Box 355
Pittsburgh, Pennsylvania 15230

8309270495 830914
PDR ADOCK 05000369
P PDR

0824s:10-2

1.0 INTRODUCTION

Westinghouse has designed and tested a modification to reduce flow induced vibration of the tubes in the preheater section of the Model D2 steam generators. This modification was installed in the McGuire Unit 1 Nuclear Power Plant. Selected tubes in one of the steam generators at McGuire Unit 1 were instrumented with accelerometers. During May and June of 1983, field vibration data were recorded on these selected tubes for power levels from 0 percent to 100 percent power. This report provides the results of the preliminary vibration analysis for the 100 percent power level. The purpose of this analysis is to provide initial information regarding preheater tube vibration with the preheater inlet modification. The evaluation of the preheater modification performance will be based on eddy current examination.

It should be noted that the data for Tubes R49C40 and R49C71 in this report are correct. The data for these tubes are interchanged in the "Westinghouse Preheat Steam Generator D2/D3 Design Modification Evaluation Package" dated December 1982. This error is due to a mislabeling of signal wires.

2.0 SUMMARY AND CONCLUSIONS

The data at 100 percent power were analyzed to obtain the three parameters that are used to characterize tube motion: the peak-to-peak acceleration, G , the RMS tube displacement, Δ , and [

] ^{a,c,e}
Data

from the instrumented tubes indicate that the manifold is performing as expected, reducing the potential for tube wear. The observed post-modification RMS displacement and peak-to-peak acceleration values are consistent with the results obtained from the 50 percent power pre-modification and the full scale test model data analyses. The frequency contents of the tube vibration data obtained at 100 percent power are similar to those observed from 50 percent power pre-modification data and full scale test model data.

3.0 TEST RESULTS

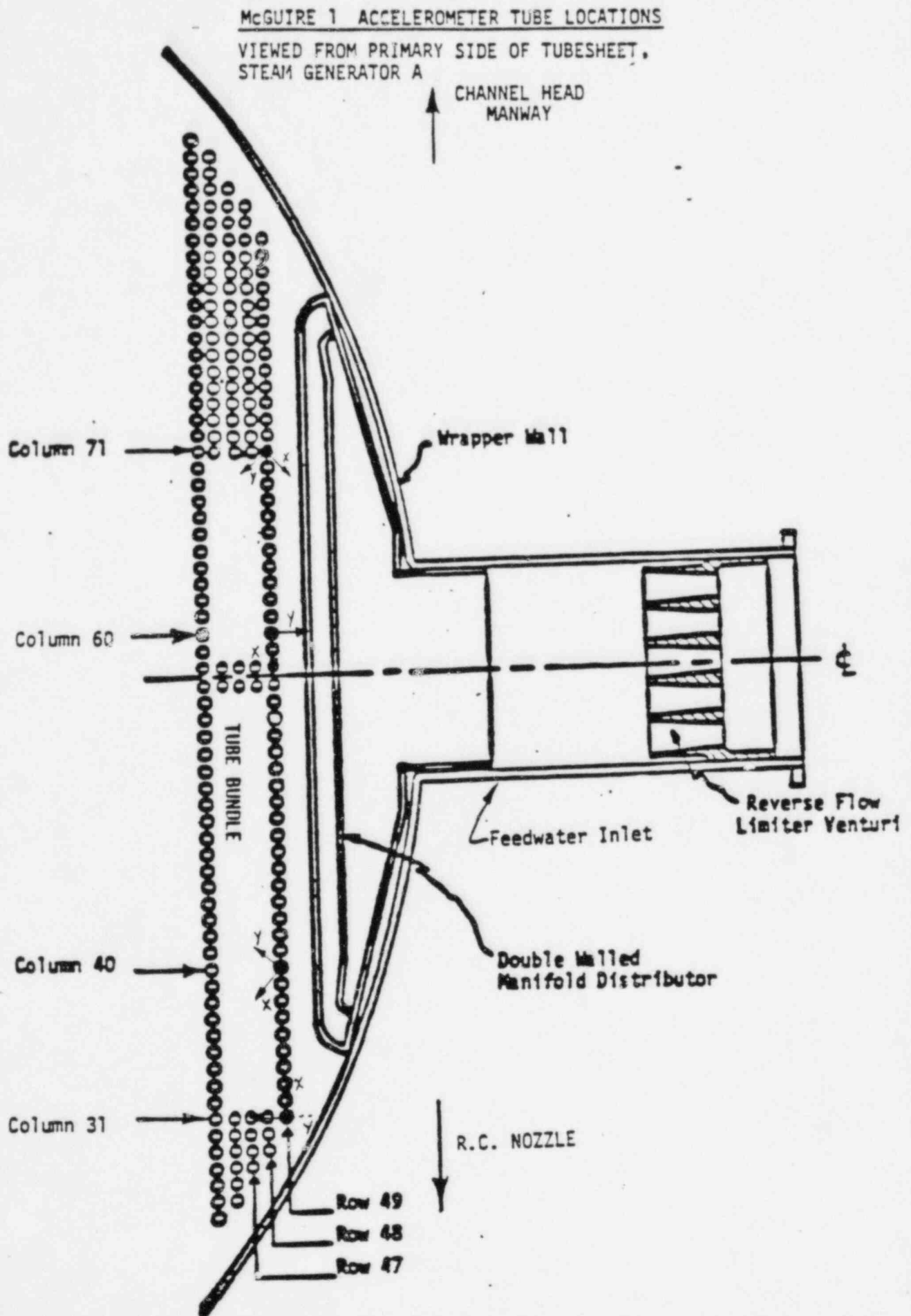
Prior to the installation of the manifold modification, four biaxial accelerometers were installed in Tube R49C40 and in Tube R49C71. The four accelerometer locations in Tube R49C40 are designated, for example, as 40TX, 40TY, 40BX, and 40BY (T - top, B - bottom, X, Y - coordinate directions). The other accelerometers are similarly designated. Pre-modification flow vibration data measurements were made in March 1982. The March data set included various power levels from 0 percent to 75 percent in 5 percent power increments. Following the installation of the modification, accelerometers were installed in two additional tubes (R49C31 and R49C60). Figures 1 and 2 show the accelerometer locations and their orientation. Figures 3 and 4 show tube vibration responses at 100 percent power for Tubes R49C40 and R49C71 along with the pre-modification responses at 50 percent power. Figures 5 through 19 show post-modification RMS acceleration and displacement spectra at 75, 90, and 100 percent power. The narrow band peaks seen on some of the figures at the harmonics of 60 Hz are the result of line noise, and do not represent tube motion.

4.0 DISCUSSION OF RESULTS

Vibration measurements were taken from 0 percent to 100 percent power. The results of the data reduction at 100 percent power are compared in this report to the results of the 50 percent power level prior to the modification. Values of the peak-to-peak acceleration, RMS displacement, and $\left[\begin{smallmatrix} a \\ c \\ e \end{smallmatrix} \right]$ are provided in Table 1 for each of the accelerometer locations.

a, c, e

Figure 1



a,b,c,e

Figures 2 thru 19 and Table 1 contain tube vibration
data which is considered Westinghouse proprietary