Washington Public Power Supply System
A JOINT OPERATING AGENCY

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December 20, 1979

Mr. Stefan S. Pawlicki, Chief
Materials Engineering Branch
U. S. Nuclear Regulatory Commission
Washington, D.C. 20555

Dear Mr. Pawlicki:

SUBJECT: MOISTURE TESTING OF LOW-HYDROGEN ELECTRODES

Representatives of the Washington Public Power Supply System recently discussed with Mr. Georgiev of the Materials Engineering Branch a proposal to utilize an alternate laboratory test technique from that specified in AWS D1.1 "Structural Welding Code". The test is used to demonstrate that required maximum moisture contents of low-hydrogen electrodes have not been exceeded during lengthened exposures to the environment.

AWS D1.1 requires that testing be conducted as stipulated in Section 25 of AWS A5.5. The method described there is an analysis by a weight difference method wherein oxygen is passed over a heated sample of known weight and then into an absorption U-tube, where the liberated water is collected. The U-tube is weighed before and after the test, and the difference in the weight is due to water liberated from the low-hydrogen electrode.

The technique which has been used by WPPSS to test for water liberation, hereafter called the Exxon Test (see attachment 1), involved measuring the amount of electrical current required to electrolyze the liberated water, rather than determining the weight of liberated water. The amount of water was then calculated from the electrical current value. A DuPont, Model 902 Moisture Evolution Analyzer was used for this determination (attachment 2 provides technical information on the DuPont Model 902 analyzer). The differences in the test techniques are: (1) the Exxon Test used Nitrogen instead of Oxygen, and (2) the temperature applied to the sample to liberate the water was 1470°F instead of 1650-1800°F as specified in AWS A5.5.

The test method described above is used routinely by Exxon Nuclear for water content testing of Uranium Oxide powders. Because of the temperature difference in the test method, it was felt that some additional correlations must be performed to determine if the temperature difference might affect the liberation of water. Therefore, additional testing included three tests under different conditions of the coating from a single electrode as follows:

1. Test conditions as described above.

2. Test conditions as described above except test temperature was 1652°F.

3. Test was run at 3632°F using a hydrogen analyzer in place of the DuPont 902 Moisture Evolution Analyzer.

All three tests provided essentially the same results. The particular coating tested had 0.07 to 0.08% water (AWS maximum allowable is 0.4%).

The reference tests demonstrated that the difference in laboratory technique did not alter the results of the tests. WPPSS proposes that the tests, as described herein, be used as a means of verifying and justifying extended exposures of low-hydrogen electrodes to the environment.

Due to the fact that work is presently underway at our construction sites in Eastern Washington and testing must be done for the work, which will soon by underway at our sites in Western Washington, it is requested that this matter be provided prompt review and approval.

We are prepared to meet with your technical representatives if necessary to provide further information with regard to the proposed test method. Please contact Mr. G. C. Sorensen, Supervisor, Licensing Engineering, if you have any questions regarding our request.

Very truly yours,

D L Renberger

D. L. RENBERGER
ASSISTANT DIRECTOR--TECHNOLOGY

DLR:GCS:crw

Attachments