OAK RIDGE NATIONAL LABORATORY
OPERATED BY
UNION CARBIDE CORPORATION
NUCLEAR DIVISION

POST OFFICE BOX X
OAK RIDGE, TENNESSEE 37830

August 29, 1980

Mr. R. M. Satterfield, Chief
Instrumentation & Controls Systems Branch
Division of Systems Integration
Office of Nuclear Reactor Regulation
U. S. Nuclear Regulatory Commission

Dear Sir:

Trip Report to Audit Vitro Laboratories V&V Program
for Babcock & Wilcox RPS-II

On June 16, 1980, the undersigned visited the Quality Assurance Manager, Mr. Jim Daugherty, of the Vitro Laboratories Division of Automation Industries, Inc., Silver Spring, MD. As indicated in my June 23, 1980 letter to you, a portion of the RPS-II software was produced by the Vitro Labs, and the information pertaining to the methods for verification of the software code against the software description was not available during the Lynchburg audit. The description of the project organization was presented by Mr. Daugherty and the overall job QA plan special requirements, in recognition of 10CFR50, Appendix B, was discussed and is shown in Attachment 1.

As shown in figure 1 of the attachment, a software revision program with several intermediate steps of review and approval are recognized requirements by Vitro as part of their V&V program. An interview was arranged with the lead programmer, Mr. Millard Pick, and a technical discussion regarding the techniques used by his organization for software verification was held. When I indicated that the master plan did not specify a source image as a part of the work plan, Mr. Pick recalled that a source image had, in fact, been generated and recently transmitted to B&W as a routine part of the system documentation. Subsequent discussions with B&W indicated this, in fact, had been done and would probably be a useful starting point for source material in the software sneak analysis. Mr. Pick indicated the lead programmer would normally be assigned to such a task with 2 to 3 assistants.

The guidelines as attached in the Quality Assurance Plan do not formally specify programming procedures or details, but it was observed that the practices included numbering source lines, logically grouping modules, good commenting techniques, and the use of a master library. The coding procedures including limiting the number of modules per job based on the test requirements,

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compiling the modules until error-free compilations are achieved, followed by the use a 360/165 emulator for final debugging and a build-a-little, test-a-little integration philosophy culminating in an integration test on the actual hardware with completed ROMs. The master QA plan provides good documentation control guidance for numbering and identifing ROMs and software revision references.

The archive files contain the formal Simulation Test Report, STR2915.0400 and the Integrated System Test Report, ITR2915-0400. Sample test runs from the simulation test reports were reviewed with tracings indicating results that were in compliance with the simulation test plan SP2915-0200. Samples of the integrated test plan SP2915-0300 were selected and compared to results in the integrated test report. The data sheets and error lists were reviewed and it was observed that 14 errors had been reported during the integrated system testing. Generally, it appeared that these errors are likely derived from a lack of detailed review of the system software prior to the integrated system testing. However, for a programming system of this size, the numbers are not out of the range of expectation.

As noted in our Lynchburg audit of June 23, a formal procedure using document comment forms was identified by B&W as the primary method for communicating between the Nuclear Power Generation Group and Vitro Labs. These are presented in the attached figure and the files at Vitro substantiate the evidence of the functioning of this procedure.

The audit was attended by representatives Steve Eschbach and Chris Schieck who expressed an interest in obtaining a copy of this audit report.

Should you require any additional information or clarification on the enclosed material, please let me know.

Sincerely,

J. B. Bullock

JBB/djg

Attachments