

July 31, 2000

Mr. D. N. Morey  
Vice President - Farley Project  
Southern Nuclear Operating  
Company, Inc.  
Post Office Box 1295  
Birmingham, Alabama 35201-1295

SUBJECT: JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2, RE: QUALITY ASSURANCE PROGRAM CHANGE — APPROVAL TO USE NCIG-01, REV. 2, "VISUAL WELD ACCEPTANCE CRITERIA FOR STRUCTURAL WELDING AT NUCLEAR POWER PLANTS" (TAC NOS. MA9337 AND MA9338)

Dear Mr. Morey:

Your letter of June 9, 2000, proposed changes to the Farley Nuclear Plant (FNP) Quality Assurance Program (QAP). The changes would permit the use of Nuclear Construction Issues Group Specification-01, Revision 2, "Visual Weld Acceptance Criteria for Structural Welding at Nuclear Power Plants" for non-American Society of Mechanical Engineers Code welds.

We have completed our review of your proposed changes to the FNP QAP and find them to be acceptable. We approve your requested changes to FNP's Updated Final Safety Analysis Report.

Our safety evaluation is enclosed. Please contact me if you have any questions.

Sincerely,

*/RA/*

L. Mark Padovan, Project Manager, Section 1  
Project Directorate II  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

Docket Nos. 50-348 and 50-364

Enclosure: As stated

cc w/encl: See next page

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SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

RELATING TO VISUAL WELD ACCEPTANCE CRITERIA

FOR STRUCTURAL WELDING AT

SOUTHERN NUCLEAR OPERATING COMPANY'S

JOSEPH M. FARLEY NUCLEAR PLANT, UNITS 1 AND 2

DOCKET NOS. 50-348 AND 50-364

1.0 INTRODUCTION

Southern Nuclear Operating Company's (SNC's) letter of June 9, 2000, proposed changes to the Farley Nuclear Plant (FNP) Quality Assurance Program (QAP). The changes would permit the use of Nuclear Construction Issues Group Specification-01, Revision 2, "Visual Weld Acceptance Criteria for Structural Welding at Nuclear Power Plants" (VWAC) for non-American Society of Mechanical Engineers (ASME) Code welds. James Knight's (NRC) letter of June 26, 1985, to Mr. D. E. Dutton of the Nuclear Construction Issues Group approved VWAC for use. Approval for using VWAC on a plant-specific basis is based on licensees not taking significant exception to VWAC, Revision 2. SNC did not indicate that it was taking any exception to VWAC, Revision 2 provisions. Approving VWAC for use at FNP requires changing Chapters 3 and 17 of FNP's Updated Final Safety Analysis Report (UFSAR) as follows:

- Add NCIG-01, Rev.2 to the list in Section 3.8.1.2 "Applicable Codes, Standards and Specifications," for containment.
- Add NCIG-01, Rev.2 to the list in Section 3.8.4.2 "Applicable Codes, Standards and Specifications," for all Category I structures other than containment.
- Revise Section 17.2.8, "Identification and Control of Materials, Parts, and Components," to include the phrase "or other criteria approved by the NRC for FNP."

2.0 EVALUATION

The staff concludes that using VWAC, Revision 2, will provide adequate quality of non-ASME Code structural steel welds. These visual weld acceptance criteria are limited to non-ASME class welded steel structures where fatigue is not the governing design consideration. Typical examples of structures to which these criteria may be applied are as follows:

- main building framing members and connecting members
- non-ASME Code supports for equipment and piping
- cable trays and conduit

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- heating, ventilation, and air conditioning ducts and duct supports
- miscellaneous steel (including bracing and stiffeners embedments, stairways and handrails, doors and door frames, windows and window frames, gratings, covers, etc.).

VWAC addresses visual weld acceptance criteria for the following 11 defects and faults:

- cracks
- underfilled craters
- arc strikes
- surface slag and weld spatter
- fillet weld size
- incomplete fusion
- weld overlap
- weld profiles
- undercut
- surface porosity
- weld length and location

For cracks, VWAC specifies that welds shall have no cracks. This criteria is the same as that specified in American Welding Society (AWS) Standard D1.1. Underfilled craters are acceptable if proper weld size is achieved and cracks are absent. For arc strikes, surface slag, and weld spatter, VWAC criteria are based more on the effects of structural strength rather than workmanship. Arc strikes are acceptable provided cracks are not visually detectable. Weld spatter remaining after cleaning is acceptable. For surface slag, the criteria are designed to prevent accepting a weld which shows a gross lack of control by the welder. Isolated surface slag which remains after weld cleaning has no structural significance.

VWAC acceptance criteria are based on how much a defect or fault reduces weld cross-sectional area. In these calculations, the conservative approach used is to assume that the length of weld having a defect does not exist (i.e., does not support any of the load). Such cross-section reductions are usually less than 12.5 percent. There are some exceptions to this, particularly in thinner section members. This occurs because measurements of defects and faults are rounded off up to the smallest measurement unit specified. For instance, a 1/32-inch maximum undercut of the entire length of the weld for 3/16-inch thickness material results in a 16.7 percent reduction in area. Most of the undercut will be less than 1/32-inch deep since the 1/32-inch undercut will not be uniform along the entire length. The 16.7 percent maximum reduction is not likely to occur although it is a theoretical possibility.

A 12.5 percent "benchmark" was chosen based upon the presently allowed percent reduction in area affected by the undercut criteria in AWS D1.1-86, "Structural Welding Code - Steel," for the most limiting case in the thinnest member. The reasoning behind this is that if undercut is allowed to reduce the load carrying capability by a given number, other defects and faults that would result in a reduction of similar or less magnitude should also be acceptable.

The acceptance by engineering evaluation of thousands of field weldments with similar defects and faults not meeting the criteria of AWS D1.1 has resulted in the decision to use the weldments "as is" without repair. This is possible because common engineering design practices result in significant margins above design requirements, such that a small reduction of

10 to 12 percent can be easily accommodated. The present undercut criteria in AWS D.1.1-86 is a practical demonstration of this.

Deviations from AWS D1.1 proposed in VWAC are relatively insignificant. The redundancy of these structures and their individual welds, and the conservative design practices used, allow non-ASME Code structural steel weldments (which are not designed for fatigue) to use alternative criteria as provided in Criterion II of 10 CFR Part 50, Appendix B.

### 3.0 CONCLUSION

The staff finds that VWAC criteria are appropriate and provide adequate integrity of the affected structures at FNP, Units 1 and 2. Accordingly, General Design Criterion I of Appendix A to 10 CFR Part 50 has been met and we approve SNC's proposed UFSAR changes.

Principal Contributor: M. Padovan

Date: July 31, 2000

Joseph M. Farley Nuclear Plant

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