ATTACHMENT 1

NIAGARA MOHAWK POWER CORPORATION
NINE MILE POINT NUCLEAR STATION, UNIT 2
DOCKET NO. 50-410

SUPPLEMENTAL SAFETY EVALUATION REPORT

MATERIALS ENGINEERING BRANCH
MATERIALS APPLICATION SECTION

3.8.4.2 Applicable Codes, Standards and Specifications and 3.8.4.6.3 Structural Steel

The staff concludes that the use of Nuclear Construction Issues Group (NCIG)-01 Rev. 2, 05/07/85, "Visual Weld Acceptance Criteria for Structural Welding at Nuclear Power Plants" (VWAC) will provide adequate quality of non-ASME Code structural steel welds. These 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 main building framing members and connecting members, supports for equipment and piping (non-ASME Code), cable trays and conduit, HVAC ducts and duct supports, and miscellaneous steel including bracing and stiffeners, embedments, stairways and handrails, doors and door frames, windows and window frames, gratings, covers, etc.

There are eleven criteria addressed in VWAC. For cracks, the same criteria as exist in AWS D.1.1 are specified; the welds shall have no cracks. For under-filled craters, if proper weld size is achieved and cracks are absent, there is no reason for rejecting them, and therefore, they are acceptable.

For arc strikes, surface slag and weld spatter, the VWAC criteria are based more on the effects on 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 the acceptance of a weld which shows a gross lack of control by the welder. Isolated surface slag which remains after weld cleaning has no structural significance.

Criteria for the following types of defects/faults are also provided in VWAC:

a) fillet weld size

b) incomplete fusion

c) weld overlap

d) weld profiles

e) undercut

f) surface porosity

g) weld length and location

The basis for the acceptance criteria in VWAC is the amount of reduction in cross sectional area caused by the defect or fault. In such calculations, the conservative approach used is to consider the length of weld in which a defect occurs as being nonexistent, 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/faults are rounded off up to the smallest measurement unit specified. For instance, a 1/32 inch maximum undercut for the entire length on one side for 3/16 inch thickness material results in a 16.7 percent reduction in area. Because the 1/32 undercut will not be uniform along the entire length, most of the undercut will be less than 1/32 inch in depth. Although the 16.7 percent maximum reduction is a theoretical possibility, it is not likely to occur.

The 12.5 percent "benchmark" was chosen based upon the presently allowed percent reduction in area allowed by the undercut criteria in AWS D 1.1-85 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 amount due to reductions in area, other defects/faults that would result in a reduction of similar magnitude should also be acceptable.

The acceptance by engineering evaluation of thousands of field weldments with similar defects/faults not meeting the criteria of AWS D.1.1 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 criterion in AWS D.1.1-85 is a practical demonstration of this.

The deviations from AWS D.1.1. as proposed in VWAC are relatively insignificant in that the redundancy of these structures and their individual welds, as well as 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. We find these criteria are appropriate and provide adequate integrity of the affected structures and, accordingly, General Design Criterion 1 of Appendix A to 10 CFR Part 50, has been met.

The applicant should make the following changes/corrections to the proposed FSAR changes for 3.8.4.6.3, page 3.8-73 submitted in their letter of September 18, 1985:

1. As the applicant has used a criterion for undercut different from the VWAC undercut criteria, it is suggested that the applicant indicate a date for when the new criteria are to apply, and the acceptability of work inspected and accepted to the former criteria.

2. Review the use of the word "fillers" in the third paragraph. It appears the more appropriate word would be "fillets".

3. In the bottom paragraph, "approved" is used which has specific regulatory meanings. A more appropriate word would be "accepted".