UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
UNION ELECTRIC COMPANY	)	Docket Nos. STN 50-483
	)	STN 50-486
(Callaway Plant, Units 1 and 2)	)	

NRC STAFF TESTIMONY OF EUGENE J. GALLAGHER

Q. Please state your name and position with the NRC?

A. My name is Eugene J. Gallagher. I am a civil engineer with the U.S. Nuclear Regulatory Commission. Since February 1981, I have been assigned to the Reactor Engineering Branch, Division of Resident and Regional Reactor Inspection, Office of Inspection and Enforcement. Prior to February 1981, I was a reactor inspector assigned to the Region III, Reactor Construction and Engineering Support Branch, Office of Inspection and Enforcement. A statement of my professional qualifications is attached.

Q. Please describe the nature of your involvement with the Callaway facility?

A. As a civil engineer inspector for the Region III Office of Inspection and Enforcement, I conducted five inspections with respect to the Callaway Plant, Unit 1, in order to: (1) ascertain whether adequate quality assurance plans, instructions and procedures had been established for the construction of concrete structures; (2) provide an independent evaluation of the performance, work in progress and completed work to

ascertain whether activities relative to concrete construction were accomplished in accordance with NRC requirements; and (3) review the quality related records to ascertain whether these records reflected work accomplished consistent with NRC requirements and license commitments. The results of these inspections are contained in the following NRC inspection reports:

50-483/77-11,	conducted December 13, 1977 through January 8, 1978.
50-483/78-01,	conducted January 10, 1978 through February 8, 1978.
50-483/78-03,	conducted March 29, April 18-19, 1978.
50-483/80-14, (Exhibit __)	conducted April 10, 1980 through August 14, 1980.
50-483/80-16,	conducted June 10-12, 1980.

Q. What is the purpose of this testimony?

A. The purpose of this testimony is to address Joint Intervenors' Contention I-A dealing with embedded plates.

Q. Could you describe the embedded plates?

A. Embedded plates are steel plates set in concrete to serve as supports for piping, electrical conduits and cable trays, HVAC components, and structural steel framing. The plates are constructed by welding studs to one side of the plate. A plate is then positioned before concrete for the walls is poured. The concrete hardens around the studs, thereby affixing the plate to the wall.

Q. Could you describe the welding processes used to attach the studs to the plates?

A. Studs are welded to the plates by one of two methods. They can either be manually welded to the plate material by use of the shield metal arc process in accordance with American Welding Society (AWS) code, or the studs can be welded to the plates by use of automatically-timed machines in accordance with AWS code. Generally, the larger studs are manually welded, the smaller ones are machine welded. Both manual and machine-welded plates are used at the Callaway Plant. All the plates for the facility were welded by the Cives Steel Company at their plant in Gouverneur, New York.

Q. How were defective plates first discovered on the site?

A. On June 9, 1977, during a routine NRC inspection (documented in Report No. 50-483/77-05), an NRC inspector identified embedded plates with machine-welded studs which did not contain full 360 degree weld (flash) material and had not been bend tested as required by AWS D1.1-75 (Part F) welding code. The bend test requires machine-welded studs without 360 degree weld to be bent fifteen degrees in the direction opposite to the gap in the weld. If a crack in the weld appears (or if the stud breaks off from the plate), repairs must be made. Otherwise, the weld and the stud may be used as is.

As a result of the NRC inspection, Daniel Construction issued two "stop work" orders pending a complete investigation of the problem. One stop work order prevented further placement of concrete with embedded plates; the other prohibited issuance of plates to the field. Prior to June 9, 1977, 480 safety-related plates had been embedded in concrete. 255 of these plates used machine-welded studs; 225 used manually-welded studs.

Q. What steps were taken to assure that the plates would not adversely affect the safe operation of the facility?

A. As a first step in resolving the problem, a 100% reinspection program of all plate welds was performed by Cives and monitored by Applicant's architect-engineer (Bechtel). This inspection included manually-welded as well as machine-welded studs.

Machine-welded studs that upon visual inspection did not reveal a complete 360 degree weld were subjected to the required ASW bend test. Of 81,673 machine-welded studs, only 66 studs failed the AWS bend test. This defect rate of 0.08% is exceedingly low and demonstrates that adequate quality controls were in effect during fabrication of the embedded plates. All the studs that failed were subsequently repaired.

The inspection also revealed that certain of the manually-welded studs contained visual weld defects. These visual defects were all corrected before the affected plates were used at the site.

In addition to the 100% reinspection program, the NRC requested that Applicant have some tests performed on embedded plates to give assurance that the 480 installed plates would not consitute a safety problem. Twelve manually-welded studs with visual weld defects were tested at Lehigh University. Six studs were bend tested to 30 degrees; six studs were subject to tensile tests. None of the stud welds failed the tests. This provides adequate assurance that even if manually-welded studs with visually defective welds had been embedded, they would behave acceptably over the life of the plant.

Six of the installed plates with machine-welded studs were randomly selected and tension-tested to design load conditions. All performed

acceptably. This testing, coupled with the extremely low stud failure rate, provide adequate assurance that the machine-welded studs will not adversely affect the safe operation of the plant.

Q. Did the NRC Staff review the inspection and testing you have just described?

A. Yes, we reviewed and evaluated the inspection and testing program related to the embedded plates. The results of our review are set forth in NRC Report 50-483/80-14 (Exhibit 6). As there documented, we find adequate assurance that the 480 installed plates will not threaten the safe operation of the plant and that none of the uninstalled plates contain any studs with defective welds.

Q. Could you describe the exceptions to the AWS code listed in Section 3.8.3.6.4.3 of the Callaway FSAR?

A. The exceptions which are listed in FSAR Section 3.8.3.6.4.3 pertain only to manually-welded studs. Briefly, the exceptions state: (1) a vertical leg of the weld may be up to 1/16 of an inch smaller than specified in the design drawing; (2) the vertical legs need not be equal in length; (3) weld profile and convexity requirements need not be imposed; and (4) an undercut of up to 1/16 of an inch for 10% of the weld length may be permitted. These exceptions are minor in nature and do not affect the basic weld design or the capacity of the connection.

Q. Did you submit an affidavit in support of the NRC Staff Motion for Summary Disposition of Joint Intervenors' Contention I-A?

A. Yes, I did.

Q. Have you subsequently looked at Joint Intervenors' Answer to the Staff's motion?

A. Yes.

Q. Is there anything in Joint Intervenors' Response which causes you to disagree with the substantive conclusions set forth in your affidavit concerning the safety implications of the embedded plates?

A. No, there is not.

Q. The following are questions concerning the Joint Intervenors' Response to NRC Staff's Statement of Material Facts on Part I.A, appearing on pages 28-31 of their answer. In response to Fact #2, Intervenors state that an NRC inspector identified machine-welded studs which did not contain a full 360 degree weld, but claim that there is no evidence the inspector knew at the time whether the studs had been bend tested as required by the AWS code. Could you comment on that response?

A. If a machine-welded stud shows less than a full 360 degree weld, the AWS code requires that it be bent 15 degrees in the direction opposite the gap in the weld. After this test, assuming the weld passed (i.e., did not exhibit a crack), the stud would be left in the bent position. In other words, after studs are bend tested, they are not hammered back into an upright position. Thus, an inspector who observed a machine-welded stud with less than a full 360 degree weld could visually tell by the angle of the stud whether it had been bend tested or not.

Q. In their response to #3, Intervenors state that 691 plates (rather than 480) were embedded in Seismic Class 1 structures and systems on or before June 9, 1977. Could you comment on the difference between these numbers?

A. Intervenors are correct in their statement that more than 480 plates were embedded in structures on the site on or before June 9, 1977. As

stated in my affidavit supporting the Staff motion (at p. 3), the 480 figure refers to safety-related plates. While other plates may have been embedded on the site, it is only the safety-related plates that are a potential source of concern.

Q. In their response to #4, Intervenors allege various deficiencies in the reinspection program. Could you comment?

A. A distinction must first be made between manual and machine-welded studs. The AWS code does not require that manual-welded studs be bend tested; these studs are often too big physically to be hammered 15 degrees. A visually defective manual-welded stud would be reworked instead. It is only the machine-welded studs that are subject to the 15 degree bend test and then either used as is or reworked (depending on the outcome of the test). All the machine-welded studs that showed less than a complete weld were bend tested. It remains my view that there were no deficiencies in the reinspection program.

Q. In their response to #5, Intervenors disagree with the number of defective welds found. Could you comment?

A. First, I would like to correct a figure used in the NRC motion. The correct number of machine welded studs inspected is 81,673 and not 81,643. This discrepancy was caused by a typographical error in Inspection Report 80-14.

The figures cited by Intervenors in their response relate to manual-welded studs, not machine-welded studs. The Staff's Statement of Material Fact #5 addressed machine-welded studs. I know of no documents that challenge the figures for machine-welded studs (66 failures out of 81,673 studs).

Q. Could you comment on Intervenors' response to Staff Statement #7 which criticizes the tests pertaining to manually-welded studs performed at Lehigh University?

A. Again, Section 4.30 of the AWS code does not pertain to manually-welded studs. The tests performed at Lehigh are not prescribed by the AWS code; they were selected an engineering basis to determine whether the installed manual welds would pose a threat to the safe operation of the plant. It would have been physically impossible to hammer the twelve studs selected to a 15 degree angle. In any event, the tests at Lehigh subjected the studs to a greater bend test of 30 degrees and none failed.

While the record does not indicate when the plates involved in the test were fabricated or delivered to the site, the plates were fabricated before June 9, 1977, and were thus representative of the manually-welded plates embedded on the site prior to that date.

Q. Could you comment on Intervenors' response to Statement #8 which criticizes the tests performed on the machine-welded studs already embedded in concrete?

A. Intervenors are correct in that the test procedures called for selecting four EP-512 plates and two EP-912 plates. The tests are considered random in that nothing was known about the quality of the studs tested. Intervenors also indicate some confusion as to whether the plates were "tension-tested, load tested, or what." The plates were tested by attaching a hydraulic tensioning device to a plate and then applying the tension load to the plate. Attachment E to Report 80-14 indicates that the tested plates did in fact perform acceptably.

EUGENE J. GALLAGHER

OFFICE OF INSPECTION AND ENFORCEMENT
U.S. NUCLEAR REGULATORY COMMISSION

PROFESSIONAL QUALIFICATIONS

I am a Civil Engineer in the Division of Resident and Regional Reactor Inspection, Reactor Engineering Branch, Office of Inspection and Enforcement.

I received a Bachelor of Engineering Degree in Civil Engineering from Villanova University in 1973 and a Master of Science Degree in Civil/Structural Engineering from Polytechnical Institute of New York in 1974. I am a registered Professional Engineer in the States of Illinois (#37828), Florida (#29114) and Louisiana (#16376). I am a member of the American Society of Civil Engineers, American Concrete Institute and Tau Beta Pi National Engineering Honor Society.

In my present work at the NRC, I provide technical assistance in the area of civil engineering to Regional offices and resident inspectors with particular emphasis on the design and construction of reinforced and prestressed concrete structures, foundations, structural steel buildings and in structural testing and surveillance. In addition, I provide technical input for the development and interpretation of industry codes, standards and regulatory requirements relating to inspection activities.

From 1978 to 1981 I was a member of the NRC Region 3 inspection staff responsible for the inspections of civil engineering aspects of plants under construction and in operation. This included the Inspection of laboratory and field testing of concrete, steel and soils materials, earth embankments and dams, material sources, piping systems and reinforced and prestressed concrete structures. In addition, a review of management controls and quality assurance programs were performed at plants under construction. I participated in approximately 90 inspections of reactor facilities.

Prior to joining the NRC Staff I was employed by EBASCO Services, Inc. in New York City from 1973 to 1978. I performed designs of reinforced concrete and steel structures, design of hydraulic and water supply systems and preparation of specifications for construction. From 1976 to 1978, I was the civil resident engineer at the Waterford 3 Nuclear Plant site responsible for providing technical assistance to construction.

During 1972 and 1973 I was employed by Valley Forge Laboratory in Devon, PA performing inspection and testing on concrete, steel and soil materials.

ADDITIONAL NRC TRAINING

Fundamentals of Inspection, NRC, February 1978 (40 hours)
BWR Fundamentals Course, NRC, March 1978 (40 hours)
Concrete Technology and Codes, Portland Cement Assoc., May 1978 (80 hours)
Quality Assurance Course, NRC, August 1978 (40 hours)
Nondestructive Examination and Codes, Rockwell Int'l., August 1978 (120 hours)
PWR Fundamentals Course, NRC, November 1978 (40 hours)
Welding Metallurgy, Ohio State University, September 1980 (80 hours)