URS
AN INTERNATIONAL PROFESSIONAL SERVICES ORGANIZATION

URS/JOHN A. BLUME & ASSOCIATES, ENGINEERS
130 JESSIE STREET (AT NEW MONTGOMERY)
SAN FRANCISCO, CALIFORNIA 94105
TEL: (415) 397-2525
CABLE: BLUMENGRS

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May 24, 1985

Mr. Gary G. Zech, Chief
Vendor Program Branch
Division of Quality Assurance, Vendor,
and Technical Training Center Programs
Office of Inspection and Enforcement
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

Reference: Zech letter to URS/Blume dated April 25, 1985;
Docket No. 99900537/85-01

Dear Mr. Zech:

In response to the above referenced letter, which gave results of the inspection conducted by Messrs. P. Sears and R. Harris at URS/John A. Blume & Associates on January 8-11, 1985, I submit our corrective actions to items as stated in Docket No. 99900537/85-01, Appendix A, Notice of Violation, and Appendix B, Notice of Nonconformance. Our response details: (1) a description of steps that have been or are being taken to correct the identified deficiencies, (2) a description of steps that have been or are being taken to prevent recurrence, and (3) the dates on which our corrective actions and preventive measures have been, or will be completed.

Very truly yours,

Joseph P. Nicoletti
President

Enclosures: 1) Appendix A - URS/Blume Response to Notice of Violation
2) Appendix B - URS/Blume Response to Notice of Nonconformance

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NOTICE OF VIOLATION

Contrary to the requirements of 10 CFR 21, URS/John A. Blume & Associates (URS/Blume) failed to evaluate or report to their customers information which would reasonably indicate the existence of a defect (PIP0022) in a computer program used in the design of safety-related piping systems.

URS/BLUME RESPONSE

1. Steps taken to correct this item, and dates of completion,are as follows:

   It should be clarified that, with the exception of PG&E projects, during the time of the NRC Inspection (January 8-10, 1985), URS/Blume was in the process of performing impact evaluations on URS/Blume safety-related design calculations affected by PIP0022. URS/Blume QA procedures require that our clients be notified once it has been determined that the error affects final results that have been submitted to the client. As internal impact evaluations were still in progress, notification to our clients was as yet deemed premature. There were extenuating circumstances regarding actions taken by URS/Blume on PG&E Diablo-related projects which should also be given consideration. Comments regarding actions taken by URS/Blume are as detailed below.

   (a) It should be noted that identification of the computer program error as PIP002 in the NRC Inspection Report (Docket No. 9990537/85-01) is erroneous. The CDC Software Problem Report (SPR) in question dated 7/11/84 is identified as PIP0022.

   (b) URS/Blume responded to outside computer error reports pertaining to PIPESD in a dual capacity: (1) as owner of the program, and (2) as user of the program on nuclear projects. Because URS/Blume owned, maintained, and supported PIPESD to outside computer service bureaus (including CDC), upon receipt of PIPESD outside error reports, URS/Blume's Computer Services Division transmitted them to PIPESD support personnel for review and confirmation. URS/Blume procedures require that if an error is confirmed, an in-house computer program error notification is prepared and issued to applicable URS/Blume management and to the Division Manager for assignment of in-house personnel for performance of impact evaluations on projects.

   (c) The URS/Blume error notification confirming PIP0022 (8123-01-EN9) was issued on 12/21/84. Supervision of impact evaluations on URS/Blume projects was assigned to the N&E Division Software Manager who obtained information from our computer tracking system (established in August, 1983) regarding which URS/Blume projects were affected.

   (d) URS/Blume clients and associated nuclear power plants which were potentially affected by the error in question are as follows:

- Pacific Gas and Electric Company (PG&E)/Diablo Canyon Nuclear Power Plant
- Yankee Atomic Electric Company (YAEC)/Main Yankee
- Cleveland Electric Illuminating Company (CEIC)/Perry Nuclear Power Plant

For details regarding project usage, reference paragraph (e) below.

As previously stated, at the time of the NRC inspection, impact evaluations on YAEC and CEIC projects were in progress. Impact evaluations on PG&E Diablo-related projects were not undertaken at the time for the following reasons:

- URS/Blume engineers had been consistently informed orally by PG&E that our piping analysis using PIPESD was superseded and/or void. The earliest documented evidence of this was found in an internal Record of Conference dated 12/7/84.

- The Diablo Canyon Project was in the process of reviewing all URS/Blume files in order to identify records still relevant for licensing and those that were superseded or void. This was a joint effort of URS/Blume and PG&E. A URS/Blume proposal to PG&E regarding this effort had been sent in October 1983.

- Based on ongoing meetings between URS/Blume and PG&E personnel, URS/Blume's preliminary assessment was that all PG&E piping work had been superseded or was void; URS/Blume was still waiting for PG&E input to conclude this assessment. A memo to that affect was issued by the Project Manager to QA on 1/8/85.

- URS/Blume did not inform PG&E regarding specific PIPESD errors as we knew CDC would be transmitting them to PG&E as a user.

- URS/Blume has since obtained a definitive statement from PG&E regarding this matter, and we have thus been able to close out our PG&E impact evaluations. A letter from PG&E to URS/Blume dated 3/6/85 verifies that all piping analysis performed by URS/Blume on Diablo Canyon using PIPESD computer program have been reanalyzed using another program.

(e) Impact evaluations on all URS/Blume nuclear projects have since been completed. In all cases it was found that there is no impact, and no further action is required. A summary of nuclear projects affected, the date impact evaluations were completed, and evaluation results are detailed as follows:

Client	Project Number/Name	Date Impact Evaluations Completed	Further Actions Required (Y/N)
PG&E: (Diablo Projects)	0902-19/Diablo Review	03/07/85	N
	0902-28/Piping	03/07/85	N
	0902-29 Unit 2 Hangar Review	03/07/85	N
	0902-30/G-Line Anchor	03/07/85	N
	0902-31/Fire Protection System	03/07/85	N
	8168-03/Containment Annulus	03/07/85 (Supported by PG&E letter dated 3/6/85)	N
Yankee: Atomic	8136/Main Yankee 2" SG Blowdown Line	02/25/85	N
Cleveland:	8349/Perry HPCS Diesel Generator	02/25/85	N

Given the above results, and given that URS/Blume had been consistently informed orally by PG&E that our piping analysis using PIPESD had been superseded, reporting in compliance with 10 CFR 21 was not deemed necessary.

(f) It should also be noted that correction of PIPESD error (PIP0022) in the program itself is planned for incorporation in the next version of PIPESD.

2. A description of steps that are being taken to prevent recurrence, and dates of completion, are as follows:

(a) URS/Blume QA procedures for computer program error notification are being revised to incorporate:

- Required time limitations for taking computer program error notification actions
- Designation of service bureau error numbers and their status (e.g., open, being investigated; serious) on sign-off forms for outside computer program error reports
- Issuance of a monthly (rather than quarterly, as now required) error notification status report by the Computer Service Division which details error notification actions taken and those actions outstanding
- Requirement of a documented response from responsible personnel to QA as to the status and the reasons behind any outstanding error notification actions that have not

been completed within thirty days of the issuance of in-house error notification reports, or the receipt of outside error reports

- Clarification that in cases where URS/Blume has decided not to perform impact evaluations because we have reasonable knowledge that our safety-related design calculations (which have been affected by a computer error) have been or are being superseded, the Division Manager notifies the client immediately, and requests from the client written confirmation that our analysis has been or is being superseded. Initial notification may be made orally to be followed with written documentation within three working days of the oral notification. Notification shall include the computer program error report in question. If the client does not respond with written confirmation to that affect, the President or other designated URS/Blume officer shall notify the Commission in compliance with 10 CFR 21.

Date of completion: July 15, 1985

(b) A training sessions will be conducted for all staff members performing safety-related work which will address URS/Blume procedures adopted pursuant to the regulations in 10 CFR 21.

Date of completion: July 31, 1985

NOTICE OF NONCONFORMANCE

A. URS/Blume failed to adequately verify computer programs as evidenced in:

PIPESD

- URS/Blume did not demonstrate the accuracy of the pressure stiffening effect due to internal pressure on pipe elbows in PIPESD verification problem GEOM 06.

- Also, very large displacements (up to 9.4×10^8 mm) found in verification problem SPEC II do not verify either the accuracy of the results or the validity of the algorithms, since PIPESD uses linear elastic material behavior and is therefore limited to small displacements.

DRAIN-2D

Significant differences were found between the results of verification problems run on the computer code DRAIN-2D and the results of the same problems run on ANSYS. Comparisons of the two sets were used to verify URS/Blume computer code DRAIN-2D.

URS/BLUME RESPONSE

1. Steps taken to correct these items, and dates of completion, are as follows:

(a) PIPESD GEOM 06 Verification Problem

An investigation was conducted regarding the PIPESD GEOM 06, verification problem identified in the above Notice of Nonconformance. The cited inaccuracy is attributed to differences in displacements of as much as 60% between the hand calculated and computer calculated values. In the PIPESD Version 6.3 verification documentation it is stated that the differences increase as the wall thickness increases, and it seems therefore that shear deformation (or other factors) not accounted for in the hand calculations are significant.

URS/Blume has since performed additional calculations in which the deflections due to shear deformation were computed by hand and added to the bending deflections. After the addition of shear deflections, the difference between hand calculated and PIPESD computer calculated deflections is less than 4% except for one case in which the difference is 8.8%. This latter difference is attributed to comparing small numbers, 0.031 vs. 0.034, and rounding-off errors.

As the above results are considered to be acceptable, no further

action is deemed necessary. Applicable documentation has been checked, approved, and placed within the PIPESD Version 6.3 verification documentation.

Date of completion: May 24, 1985

(b) PIPESD SPECII Verification Problem

An investigation was conducted regarding the PIPESD SPECII verification problem identified in the Notice of Nonconformance. SPECII compares results obtained by two different options of PIPESD simulating the same problems. As the PIPESD Version 6.3 verification indicates, the results obtained from the two options are indeed very close. The reasons for the large displacements were therefore not investigated at the time of the performance of the original verification.

After a short investigation, it was found that elastic modulus E is input as 0.192E - 6 N/mm^2, instead of 0.192E + 6 N/mm^2. This results in displacements that are larger by a factor of 10^{12}, as the elastic modulus is smaller by a factor of 10^{12}. The computed displacements, when adjusted for this factor, are well within the elastic limits of displacement.

As the above results are considered to be acceptable, no further action is deemed necessary. Applicable documentation has been checked, approved, and placed within the PIPESD Version 6.3 verification documentation. In verification of future versions the error in elastic modulus input will be corrected.

Date of completion: May 24, 1985

(c) DRAIN-2D Verification Problem

An investigation was conducted regarding the DRAIN-2D verification problem identified in the Notice of Nonconformance. The cited significant differnces pertained to runs which had been made on the computer code DRAIN-2D and compared against ANSYS results. These runs were used to verify the gap element available in DRAIN-2D computer code. It should be noted that the users' manual of DRAIN-2D and ANSYS do not call for identical parameters as input for their gap elements. Calculations were needed to arrive at the proper values of the relevant parameters in order to establish equivalence between the two gap element models as used in the two programs.

Our research identified two items of discrepancy in the input used for the DRAIN-2D and ANSYS computer runs. They are as follows:

- The value of a displacement parameter, defining the

force-deformation relationship of the gap element in DRAIN-2D, was input as 0.05 inch. For identical equivalence with the ANSYS gap element model, this value should have been 0.10 inch.

- The input acceleration time-history values for DRAIN-2D have a time shift of 0.005 sec when compared to input values used in ANSYS computer run. For example, if at time t_1, DRAIN-2D has an input acceleration of u, then this value occurs at time $(t_1 + 0.005)$ sec. for ANSYS run input.

The two input discrepancies were corrected in the DRAIN-2D input data and the problem was re-run. The comparison of peak responses now shows a difference within 10% of ANSYS peak responses.

The above results are considered to be within reasonable accuracy limits for nonlinear computational purposes and the DRAIN-2D gap element is concluded to be verified. Applicable documentation has been checked, approved, and placed in the DRAIN-2D Version 4.2A verification documentation.

Date of completion: May 14, 1985

2. Steps that are being taken to prevent recurrence, and dates of completion are as follows:

(a) URS/Blume computer program verification procedures are being revised to require that for each program being verified, one must:

- Establish acceptable tolerance limits within which the calculated results from the computer program may vary from the benchmark solution.

- Discuss the logic behind the tolerance limits.

Date of completion: July 15, 1985

(b) Once the above procedure is revised, QA training sessions will be conducted for appropriate technical staff to ensure their implementation.

Date of completion: July 31, 1985

NOTICE OF NONCONFORMANCE

B. URS/Blume does not have in place measures to assure that the effects on designs, past and present, of computer code errors are promptly evaluated. One such error, designated PIP0022 by Control Data Corporation (CDC), was reported to URS/Blume on or about July 11, 1984. The effects of that error on safety-related piping designs had not been evaluated as of January 1985. The error concerned the use of a stress intensification factor of 1.0 for concentric pipe reducers, whereas the appropriate factor is 2.0.

URS/BLUME RESPONSE

1. Steps taken to correct this item, and dates of completion, are as follows:

   (a) As stated in the URS/Blume response to the Notice of Violation (reference Appendix A), all in-house impact evaluations pertaining to PIP0022 have been completed, with no further actions required.

   Date of completion: March 7, 1985

   (b) URS/Blume QA procedures for computer program error notification are being revised to incorporate time limitations for taking computer program error notification actions.

   Date of completion: July 15, 1985

   (c) The QA Department has monitored the status of required error notification actions monthly and reported outstanding actions to management in order to ensure their timely closeout.

   Date of completion: Ongoing

2. Steps that will be taken to prevent recurrence, and dates of completion, are as follows:

   (a) Once the computer program error notification procedures are revised, QA training sessions will be conducted for appropriate staff members to ensure timely closeout of error notification actions.

   Date of completion: July 31, 1985

   (b) The QA Department will continue to monitor error notification actions and to alert appropriate management regarding any required actions that have not been addressed in a timely manner.

   Date of completion: Ongoing