

UCR

AMENDMENT OF SOLICITATION/MODIFICATION OF CONTRACT

1. CONTRACT ID CODE		PAGE 1	OF PAGES 1
2. AMENDMENT/MODIFICATION NO. 5	3. EFFECTIVE DATE 11-16-1999	4. REQUISITION/PURCHASE REQ. NO. RES-C00-312	5. PROJECT NO. (If applicable)
6. ISSUED BY U.S. Nuclear Regulatory Commission Division of Contracts and Property Mgt. Attn: T-7-I-2 Contract Management Branch Washington DC 20555		7. ADMINISTERED BY (If other than Item 6)	

8. NAME AND ADDRESS OF CONTRACTOR (No., street, county, State and ZIP Code) Battelle Memorial Institute Columbus Operations 505 King Ave. Columbus, OH 43201-2693	(X)	9A. AMENDMENT OF SOLICITATION NO.
		9B. DATED (SEE ITEM 11)
		10A. MODIFICATION OF CONTRACT/ORDER NO. Con# NRC-04-97-052
	X	10B. DATED (SEE ITEM 13) 10-01-1997

11. THIS ITEM ONLY APPLIES TO AMENDMENTS OF SOLICITATIONS

The above numbered solicitation is amended as set forth in Item 14. The hour and date specified for receipt of Offers is extended, is not extended. Offers must acknowledge receipt of this amendment prior to the hour and date specified in the solicitation or as amended, by one of the following methods: (a) By completing Items 8 and 15, and returning _____ copies of the amendment; (b) By acknowledging receipt of this amendment of each copy of offer submitted; or (c) By separate letter or telegram which includes a reference to the solicitation and amendment numbers. FAILURE OF YOUR ACKNOWLEDGMENT TO BE RECEIVED AT THE PLACE DESIGNATED FOR THE RECEIPT OF OFFERS PRIOR TO THE HOUR AND DATE SPECIFIED MAY RESULT IN REJECTION OF YOUR OFFER. If by virtue of this amendment you desire to change an offer already submitted, such change may be made by telegram or letter, provided each telegram or letter makes reference to the solicitation and this amendment, and is received prior to the opening hour and date specified.

12. ACCOUNTING AND APPROPRIATION DATA (If required) 31X0200 06015110120 W6775 252A \$70,000

13. THIS ITEM APPLIES ONLY TO MODIFICATIONS OF CONTRACTS/ORDERS, IT MODIFIES THE CONTRACT/ORDER NO. AS DESCRIBED IN ITEM 14.

(X)	A. THIS CHANGE ORDER IS ISSUED PURSUANT TO: (Specify authority) THE CHANGES SET FORTH IN ITEM 14 ARE MADE IN THE CONTRACT ORDER NO. IN ITEM 10A.
	B. THE ABOVE NUMBERED CONTRACT/ORDER IS MODIFIED TO REFLECT THE ADMINISTRATIVE CHANGES (such as changes in paying office, appropriation date, etc.) SET FORTH IN ITEM 14, PURSUANT TO THE AUTHORITY OF FAR 43.103(b).
X	C. THIS SUPPLEMENTAL AGREEMENT IS ENTERED INTO PURSUANT TO AUTHORITY OF: BINP Proposal Task no. 8
	D. OTHER (Specify type of modification and authority)

E. IMPORTANT: Contractor is not, is required to sign this document and return two copies to the issuing office.

14. DESCRIPTION OF AMENDMENT/MODIFICATION (Organized by UCF section headings, including solicitation/contract subject matter where feasible.)
See attached continuation sheet.

DFO2

15A. NAME AND TITLE OF SIGNER (Type or print) WILLIAM E. JONES CONTRACTING OFFICER		16A. NAME AND TITLE OF CONTRACTING OFFICER (Type or print) Stephen M. Pool	
15B. CONTRACTOR/OFFEROR <i>William E. Jones</i> (Signature of person authorized to sign)	15C. DATE SIGNED 12/15/91	16B. UNITED STATES OF AMERICA <i>Stephen M. Pool</i> (Signature of Contracting Officer)	16C. DATE SIGNED 11-16-1999

PDR CONTR NRC 0497052

CONTINUATION PAGE

The purpose of this contract modification is (1) to incorporate a within-scope modification to the Statement of Work, Section C, by adding Tasks 8.1 and 8.2 and (2) to make an equitable adjustment to the contract estimated cost and fixed fee and (3) to allot funding in support of the modification.

1. Section C.1 of the contract is hereby modified by the addition of the language on the attached pages for Tasks 8.1 and 8.2. These attached pages are hereby incorporated into and made a part of this contract.

2. As a result of the above, the contract estimated cost and fixed fee are hereby increased as shown below:

	FROM:	BY:	TO:
Est Cost (Includes FCCM)	403,527	\$65,406	\$468,933
Fixed Fee	31,341	\$ 5,038	\$ 36,379
CPFF	434,868	\$70,444	\$505,312

3. In addition, \$70,000 in incremental funds are hereby allotted to this contract. As a result, Section B.3 is hereby replaced by the following language:

**B.3 CONSIDERATION AND OBLIGATION--COST PLUS FIXED FEE
(JUN 1988) ALTERNATE I (JUN 1991)**

(a) The total estimated cost to the Government for full performance of this contract is \$505,312 of which the sum of \$468,933 represents the estimated reimbursable costs, and of which \$36,379 represents the fixed fee.

(b) There shall be no adjustment in the amount of the Contractor's fixed fee by reason of differences between any estimate of cost for performance of the work under this contract and the actual cost for performance of that work.

(c) The amount currently obligated by the Government with respect to this contract is \$420,200 of which the sum of \$389,948 represents the estimated reimbursable costs, and of which \$30,252 represents the fixed fee.

(d) It is estimated that the amount currently allotted will cover performance through December 31, 2000.

4. A summary of obligations from award date is provided below:

FY W6775 97 Obs	\$72,200
FY W6775 98 Obs	\$100,000
FY W6775 00 Obs	\$70,000
FY W6779 97 Obs	\$55,000
FY W6779 98 Obs	\$53,000
FY W6779 99 Obs	\$70,000
Cumulative Obs	\$420,200

5. All other terms and conditions remain unchanged.

**Proposal for Contract Modification for Developing Elbow Through-wall
Crack Analysis Methodology and Additional Model Development for
Pipe-System Analysis as Part of Task 8 of the BINP Program
(Contract Number - NRC-04-97-052, Job Code W6775)**

Introduction - The purpose of this contract modification is to conduct development of an elbow through-wall crack analysis methodology and additional model development activities as part of Task 8 of the Battelle Integrity of Nuclear Piping Program (BINP). Both of these activities are needed for the NRC's Leak-Before-Break (LBB) regulatory guide program. Both activities were included in the original scope for the BINP program (dated November 1996). However, when the scope of the BINP program was revised in August 1998, these activities were deleted because of available resources at that time. These activities are to be added back to the scope, and will be funded solely by NRC as Part of Task 8 (Resolution of Issues of Interest to Selected Members). Separate discussions of two tasks is provided below.

Task 8.1 Development of an Elbow Through-Wall Crack Analysis Methodology

Background - As part of Subtask 3.1 of the NRC's LBB Reg. Guide programs, Battelle, in conjunction with Engineering Mechanics Corporation of Columbus (Emc2), is to conduct a number of sensitivity studies on LBB related issues that have not been addressed as part of one of the prior NRC integrity programs, i.e., Degraded Piping, Short Cracks, or one of the International Piping Integrity Research Group (IPIRG) programs. The three sensitivity studies of most interest to the NRC dealt with the subjects of:

- The effect of sulfur content on the load-carrying capacity of stainless steel pipes,
- The effect of differences in leak-rate codes on LBB assessments, and
- The applicability of LBB to pipe fittings, such as elbows.

However, before the third sensitivity study can be undertaken, some preliminary elbow through-wall crack analysis development activities have to be conducted. Originally, these analysis development activities were to be undertaken as part of Task I-3 of the original BINP SOW. However, with the restructuring of the BINP SOW, these analysis development activities were eliminated from the SOW. Consequently, it is decided to undertake these activities as part of Task 8 of the BINP program.

Objective - Develop elbow through-wall crack analysis methodology in support the development of a regulatory guide for the LBB applications through comparisons with the earlier data (data from ELBOWCK).

Work Statement - In the IPIRG-2 program, a general methodology was developed to relate the fracture behavior of surface cracks in elbows to the fracture behavior of surface cracks in straight pipe. For the case of surface cracks, influence functions (Y_x^f functions) were developed to relate the two geometries. The through-wall crack analysis effort will involve developing influence functions, similar to the Y_x^f functions developed for surface cracks.

Existing solutions in the literature will be examined and key finite element analyses will be conducted to establish these influence functions for extrados circumferential and axial flank through-wall cracks in elbows. Through-wall-cracked elbow data in the ELBOWCK database will be used to validate the methodology. No experiments are planned at this time.

Schedule and Reporting Requirements - Once we have authorization to proceed with this effort, it will take approximately 4 months to complete this effort. Allowing for one month to do the elbow LBB sensitivity study and to incorporate the results from that sensitivity study into the Task 3 final report, this effort should not impact the overall schedule of Task 3, as long as authorization to proceed with this effort is received at least 5 months prior to the anticipated completion date for Task 3.

Task 8.2 Additional Model Development for Pipe-System Analyses

Background - As part of Subtask 3.2 of the NRC's LBB Reg. Guide program, Battelle, in conjunction with Emc2, is developing a 3-level tiered approach for LBB analyses. Level 1 is a very simplistic analysis method, with minimal data input requirements. Level 2 is a more complex analysis method, requiring more detailed knowledge of the piping system, and which will incorporate some of the advancements in the technology that resulted from the NRC research programs conducted over the past 10 to 15 years, e.g., pressure induced bending effects. Finally, Level 3 is the most complex of the analysis methods, only to be used when a candidate system cannot pass a Level 1 or Level 2 analysis. A Level 3 analysis will most likely involve a dynamic finite element analysis of the piping system.

In the original BINP proposal, the actual margin task (Task I-1) was to have been done analytically, using finite element analyses. (In the revised BINP SOW, it was decided to do this task experimentally, using the IPIRG pipe loop facility.) When the proposal for the LBB Reg. Guide program was written, it was assumed that some of the finite element analysis model development work from Task I-1 would feed into the activities associated with the development of the Level 3 method. Consequently, with the revised BINP SOW that changed the scope of the actual margins task from analytical to experimental, it is necessary to reintroduce the model development activities into the scope of work for the BINP program, which in turn will be shared with the LBB Reg. Guide program.

Objective - Perform finite element analysis of piping systems in support of the development of a regulatory guide on LBB applications.

Work Statement - As part of this effort, ANSYS finite element models of two piping systems will be developed. These models will in turn be used in the development of the Level 3 approach for the LBB Reg. Guide program. Potential candidate systems include:

- A primary loop system,
- A main steam line,
- A surge line, or

- A smaller diameter system, such as the RHR, safety injection system, or accumulator line

Most likely, we will model these lines based on data available from the Beaver Valley plant since sufficient data exists for these lines for Beaver Valley in the LBB application submittals supplied to Battelle and Emc2 by the NRC. The final decision as to which lines to model will be made jointly by Battelle, Emc2, and the NRC.

Schedule and Reporting Requirements - Once we have authorization to proceed with this effort, it will take approximately 2 months to complete. Allowing for three months to do the Level 3 analyses and to incorporate the results from those analyses into the Task 3 final report, this effort should not impact the overall schedule of Task 3, as long as authorization to proceed with this effort is received at least 5 months prior to the anticipated completion date for Task 3.

Travel - No travel is anticipated.

Level of Effort - Estimated level of effort is approximately 0.25 staff year for both tasks, Task 8.1 and 8.2.

Period of Performance - For both Tasks 8.1 and 8.2, period of performance is anticipated from 12/01/1999 to 12/31/2000.

Technical Direction - Technical direction for this work is provided by the NRC Project manager for the BINP program:

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Publications - Publications requirements of BINP program are to be followed.