

CONTRACT BETWEEN
THE UNIVERSITY OF SHEFFIELD
AND
THE U. S. NUCLEAR REGULATORY COMMISSION

THIS AGREEMENT, effective the 1st day of January, 1980, by and between the UNITED STATES OF AMERICA (hereinafter referred to as the "Government"), as represented by the U. S. NUCLEAR REGULATORY COMMISSION (hereinafter referred to as the "Commission"), and THE UNIVERSITY OF SHEFFIELD, a nonprofit educational institution existing under the laws of the United Kingdom with its principal office in Sheffield, United Kingdom (hereinafter referred to as the "Contractor"),

WITNESSETH THAT:

WHEREAS, the Commission desires to have the Contractor perform certain research work, as hereinafter provided; and

WHEREAS, this agreement is authorized by law, including the Energy Reorganization Act of 1974, as amended, and the Atomic Energy Act of 1954, as amended.

NOW, THEREFORE, the parties hereto agree as follows:

ARTICLE I - THE RESEARCH TO BE PERFORMED

- (a) The Contractor shall to the best of its ability, furnish personnel, facilities, equipment, materials, supplies, and services except such as are furnished by the Government, necessary for the performance of the research set forth in Appendix A hereto, and shall perform the research and report thereon pursuant to the provisions of this contract.
- (b) This work shall be conducted under the direction of Dr. Keith John Miller or such other member of the Contractor's staff as may be mutually satisfactory to the parties.

ARTICLE II - THE PERIOD OF PERFORMANCE

The period of performance under this contract shall commence on January 1, 1980 and expire on December 31, 1980. Performance may be extended for additional period by the mutual written agreement of the parties.

ARTICLE III - CONSIDERATION

In full consideration of the Contractor's performance hereunder, the Commission shall pay the Contractor the sum of \$45,200.00 provided, however, that at the expiration of the contract period, the Contractor will refund to the Commission, or will make such disposition as the Commission may, in writing, otherwise direct, any part of the Consideration, which has not been expended by the Contractor in the performance of the work under this contract.

ARTICLE IV - GOVERNMENT PROPERTY

The following items of property procured or fabricated by the Contractor are hereby listed as "Government property":

None

ARTICLE V - STOP WORK ORDER

The Contracting Officer may, at any time, by written order to the Contractor, require the Contractor to stop all, or any part, of the work called for by this contract for a period of ninety (90) days after the order is delivered to the Contractor, and for any further period to which the parties may agree. Any such order shall be specifically identified as a Stop Work Order issued pursuant to this clause. Upon receipt of such an order, the Contractor shall forthwith comply with its terms and take all reasonable steps to minimize the incurrence of costs allocable to the work covered by the order during the period of work stoppage. Within a period of ninety (90) days after a Stop Work Order is delivered to the Contractor, or within any extension of that period to which the parties shall have agreed, the Contracting Officer shall either:

- (i) Cancel the Stop Work Order, or
- (ii) Terminate the Work covered by such order as provided in the "Default" or the "Termination for Convenience" clause of this contract.

If a Stop Work Order issued under this clause is cancelled or the period of the order or any extension thereof expires, the Contractor shall resume work. An equitable adjustment shall be made in the delivery schedule or contract price, or both, and the contract shall be modified in writing accordingly, if:

- (i) The Stop Work Order results in an increase in the time required for, or in the Contractor's cost properly allocable to, the performance of any part of this contract, and
- (ii) The Contractor asserts a claim for such adjustment within thirty (30) days after the end of the period of work stoppage provided that, if the Contracting Officer decides the facts justify such action, he may receive and act upon any such claim asserted at any time prior to final payment under this contract.

If a Stop Work Order is not cancelled and the work covered by such order is terminated for the convenience of the Government, the reasonable costs resulting from the Stop Work Order shall be allowed in arriving at the termination settlement.

If a Stop Work Order is not cancelled and the work covered by such order is terminated for default, the reasonable costs resulting from the Stop Work Order shall be allowed by equitable adjustment or otherwise.

ARTICLE VI - WORK FOR OTHERS

Notwithstanding any other provision of this contract, during the term of this contract, the Contractor agrees to forego entering into consulting or other contractual arrangements with any firm or organization, the result of which may give rise to an actual or apparent conflict of interest with respect to the work being performed under this contract. The Contractor shall insure that all employees who are employed full time under this contract and employees designated as key personnel, if any, under this contract abide by the provision of this clause. If the Contractor believes with respect to itself or any such employee that any proposed consultant or other contractual arrangement with any firm or organization may involve a possible conflict of interest, the Contractor shall obtain the written approval of the Contracting Officer prior to execution of such contractual arrangement.

ARTICLE VII - REPORTS

(a) Reporting of results will be accomplished as follows:

1. Quarterly progress reports will provide summary information and data.
2. Complete data reports will be issued on all measured quantities. Data reporting will be as fundamental as possible although calibrated values should be presented with the calibration of equipment reported as topical reports.
3. Topical Reports will be issued as significant phases are completed.
4. A summary index of all issued reports will be included with each quarterly report.

(b) Only a reproducible master and one copy of each report need to be air mailed to the NRC for reproduction and further distribution within the United States.

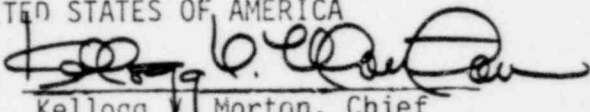
ARTICLE VIII - APPENDICES

Appendix A - Research to be Performed by Contractor, Appendix B - General Provisions, Fixed Price Contracts With Foreign Educational Institutions, which are incorporated herein by reference and made a part hereof.

IN WITNESS WHEREOF, the parties have executed this document.

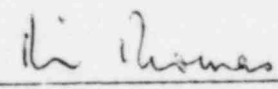
UNITED STATES OF AMERICA

BY:


Kellogg Morton, Chief
Research Contracts Branch
(title)

Nuclear Regulatory Commission

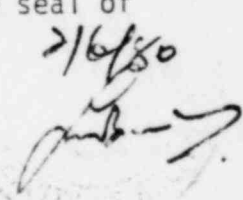
BY:


T.A. Thomas,
Deputy Director of Finance
(title)

I, J.H. BARKER, certify that I am the Director of Finance
of the Contractor named under this document; that T.A. THOMAS
(Signatory)

who signed this document on behalf of said Contractor was then Deputy Director of Finance
of said Contractor; that this document was duly signed for and on behalf of said
Contractor by authority of its governing body and its within the scope of its legal
powers.

IN WITNESS WHEREOF, I have hereunto affixed my hand and the seal of
said Contractor.


J.H. Barker,
Director of Finance

(SEAL)

APPENDIX A

RESEARCH TO BE PERFORMED BY CONTRACTOR

The scope of the work under this contract is unclassified and shall be in accordance with the work set forth in the Contractor's proposal entitled "Damage and Integrity Aspects of Safety in Nuclear Plant Subjected to Creep and Fatigue," which proposal is incorporated by reference and made a part hereof. The work shall be funded and performed on an annual basis over the proposed six year life of the contract

The Contractor shall continue to perform such work initiated in the prior period of this contract. Such unexpended funds as may remain from that period may continue to be used in the completion of such work.

This contract involves the development, construction and utilization of a biaxial test facility for creep and fatigue studies at elevated temperatures. A compatible test specimen with an uniform biaxial strain region has been developed and is being used in the evaluation of the initiation and growth of cracks in various biaxial stress states. Qualification and quantification of strain measurement in the test region have been completed and a number of tests have been completed at room temperature. Suitable heater and thermal controls have been constructed, checked out and supplied with extensometry. Elevated temperature tests will be conducted in this year segment of the contract. Testing to date has been conducted on archival 316SS (supplied by ORNL) which has a large body of material data obtained on DOE programs. An additional commercial heat of 316SS is on hand at Sheffield which was supplied by EPRI and will be compatible with licensing requirements.

The experimental program has provided crack propagation rates in uniaxial, equibiaxial and pure shear states of stress at room temperature. Continuation of the program will provide data for: biaxial out-of-phase loading, temperature effects, fatigue crack propagation interaction with creep, and comparison of the archival heat of 316SS with a commercial heat. The analytical portion of the program will resolve the above data into forms applicable to the definition of design rules for the application of 316SS at elevated temperatures.