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GENERAL ELECTRIC

HANFORD ATOMIC PRODUCTS OPERATION - RICHLAND, WASHINGTON

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TITLE

Project Proposal - Spectroscopy Laboratory 325 Bldg.
CGH-923

AUTHOR

R. C. Ingersoll

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PROJECT PROPOSAL
SPECTROSCOPY LABORATORY

325-BUILDING

CGH-

February 10, 1961

HANFORD LABORATORIES OPERATION

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PROJECT PROPOSAL
GENERAL ELECTRIC

HANFORD LABORATORIES OPERATION

DATE February 10, 1961

PROJECT NO. CGH- 723 REV. NO. 0

TITLE

SPECTROSCOPY LABORATORY
325 BUILDING

Total Funds Requested \$95,000

Value of Transferred
Capital Property 0

Total Estimated Project
Cost \$95,000

Portion of Item 1
Expenditure by GE \$95,000

RESPONSIBLE DEPARTMENT

HANFORD LABORATORIES OPERATION

PROJECT MANAGEMENT

GENERAL ELECTRIC COMPANY
Contract AT(45-1)-1350
SCHEDULE (MONTHS AFTER AUTHORIZATION)

START

DESIGN 1
PROCUREMENT 2
CONSTRUCTION 3

BENEFICIAL USE

As Completed

COMPLETE

DESIGN 3
PROCUREMENT 4
CONSTRUCTION 7

SOURCE OF FUNDS

Equipment Not Included in
Construction Projects Account
No. 0290

PREPARED BY R. C. Ingersoll

APPROVED:

H. M. Barber DATE 2/10/61
MANAGER-HANFORD LABORATORIES

DATE
GENERAL MANAGER-
HANFORD ATOMIC PRODUCTS OPERATION

PROJECT PROPOSAL
GENERAL ELECTRIC
HANFORD LABORATORIES OPERATION
SUPPLEMENTAL APPROVAL SHEET

DATE February 10, 1961

TITLE

PROJECT NO. CGH-723 REV. NO. 0

SPECTROSCOPY LABORATORY
325 BUILDING

PREPARED BY - R. C. Ingersoll DATE 1-4-61

[Signature]
MANAGER - FACILITIES ENGINEERING DATE 1/10/61

[Signature]
MANAGER - LABORATORY AUXILIARIES DATE 1/11/61

USING DEPARTMENT RESPONSIBILITY:

[Signature]
MANAGER - FINANCE DATE 1/19/61

HANFORD LABORATORIES OPERATION

[Signature]
MANAGER - Chemical Research DATE 1-12-61

PROJECT MANAGEMENT RESPONSIBILITY:

[Signature]
MANAGER - Chemical Research and Development DATE 1/15/61

GENERAL ELECTRIC COMPANY

ENGINEERING BY - R. C. Ingersoll DATE 1-10-61

DATE
DATE

PROJECT PROPOSAL
SPECTROSCOPY LABORATORY
325 - BUILDING

I. INTRODUCTION

A. Purpose of the Project

The purpose of this project is to construct a laboratory room for specialized spectrometry work, to procure and install a Nuclear Magnetic Resonance (NMR) Spectrometer, and to relocate the Electron Paramagnetic Resonance (EPR) Spectrometer from its present position in the 329 Building.

B. Request for Authorization

It is requested that the General Electric Company manage this project and be authorized to incur costs in the amount of \$95,000. The General Electric Company will perform management and architect-engineer services in accordance with the provisions of Contract AT(45-1)-1350.

2. DESCRIPTION OF PROPOSED FACILITY

It is proposed to construct a laboratory of approximately 450 square feet in the basement of the 325 Building to procure and install a Nuclear Magnetic Resonance Spectrometer and to relocate the Electron Paramagnetic Resonance (EPR) Spectrometer from the 329 Building to the proposed laboratory.

The NMR Spectrometer system will include the following basic components:

- a) DP-60 Varian Dual Purpose Spectrometer
- b) Recorder
- c) Counter for calibration
- d) Integrator
- e) Oscillators
- f) Variable Frequency R. F. Unit and Probe

The EPR Spectrometer consists of a control console, magnet and a magnet power supply. Also to be relocated with the EPR equipment is a cobalt-60 irradiator used in conjunction with the EPR Spectrometer.

The laboratory room will be equipped with a refrigerated air conditioner, laboratory bench with sink, desks and chairs, and laboratory utilities including oxygen, propane, hot and cold water, vacuum and electrical outlets.

3. ADVANTAGES TO BE GAINED AND JUSTIFICATION FOR PROPOSED WORK

Nuclear Magnetic Resonance (NMR) Spectroscopy is a relatively new technique for investigating the properties of matter. Although the NMR facility will be used for research work primarily in the field of chemistry, it can also be used in metallurgy, ceramics and physics. The most fruitful applications of NMR have been in the field of chemistry for studying the nature of the bonding and the structure of molecules and also as an analytical tool. It provides information on molecular structure and chemical reactions that is frequently not available by any other technique.

Immediate application to HAPO research programs for the NMR facility are described briefly below:

A. Structure Determination of Organic Compounds

By the use of high resolution NMR spectroscopy, it is possible to identify the types and numbers of hydrogen atoms in a molecule as well as its configuration, i.e. whether parts of the molecule can rotate freely with respect to other parts, etc. Such information is of great value in the present solvent studies programs. The structure of new solvents, the types of hydrocarbons present in Purex diluents, the degradation products from radiation and chemical damage suffered by solvents can be determined. Other similar problems would include the structure of plastics, lubricating oils and greases and organic coolants.

B. Study of Heavy Metal Compounds

- In the fundamental study of the complexes that exist between heavy metal compounds (U, Pu, Np, etc) and organic molecules, it is anticipated that NMR will furnish needed information that is not presently available. Investigation of NMR spectra of compounds of these metals is a fertile and virtually untouched field and offers a means of obtaining new and needed knowledge in this area of fundamental research.

C. Inorganic Chemistry

In the study of the types of bonds in chemical compounds and mixtures of compounds, information offered by NMR will be immediately applicable to HAPO research programs. For example, in fused salt systems containing aluminum chloride, NMR offers information on the types and concentrations of aluminum complexes that exist. Similar information on the nature of neptunium and actinide species in fused salts may also be obtained. This study will aid greatly in the programs presently underway and in future research or pyrochemical separation processes.

D. Fuel Development

Of great interest in fuel development work are questions concerning different phases in oxides (including metallic phases), water content, hydrogen content of aluminum and zirconium, silicon in aluminum and the nature of intermetallic compounds such as $FeAl_3$, $NiAl_3$, and $FeNiAl_9$.

E. Analytical Chemistry

Although the proposed facility is not primarily for analytical work, it should be mentioned that the NMR method offers extreme sensitivity for detecting isotopes of great interest to HAPO operations. Isotopes which have high sensitivities include about three dozen elements among which the following have particular significance to the Atomic Energy Program: hydrogen, boron, fluorine, aluminum, phosphorus, niobium, bismuth, iodine and neptunium. Data obtained by the NMR method are absolute and distinct since the NMR resonance signal of each isotope is sharp and far removed from that of other isotopes.

Operating experience with the EPR Spectrometer in the 329 Building has shown that for more advanced work, very precisely controlled temperature and humidity conditions are required for proper operation and consistent fidelity data output. The 329 Building location is difficult and expensive to air condition because of its location in a chemical laboratory with high air-flow hoods. It will be more economical to add additional air conditioning to that proposed for the NMR facility in the 325 Building than to install similar equipment in the 329 Building.

It is also expected that improved instrument operation will result with the EPR equipment situated in a location with reduced vibration such as that proposed for the NMR installation.

Relocation of the EPR work will also free needed laboratory space in the 329 Building for the radiochemistry work for which the space was originally constructed.

4. WHY ALTERNATE FACILITIES CANNOT BE USED

There are no other available NMR facilities available at HAPO. The location in the basement of the 325 Building was chosen after consideration of several other possibilities. It was felt that this was the only location that would be essentially vibration free and permit relatively simple air conditioning, while still being located close to the associated chemical laboratories.

As explained above, more advanced work with the EPR equipment will require refrigerated air conditioning and vibration control. These features will be more economically achieved in the proposed spectrometry laboratory.

5. CLASSIFICATION OF THE PROJECT

The work proposed by this project is classified as capital.

6. METHODS OF PERFORMING WORK

A. Engineering and Management

It is proposed that detailed design, field engineering and project management services be performed by the General Electric Company.

B. Procurement

It is proposed that procurement of the NMR equipment be performed by the General Electric Company.

C. Physical Performance of Work

It is proposed that physical performance of work be performed by HAPO CPFF Construction Services Contractor forces. Tie-in of utilities and building services will be performed by the General Electric Company Plant Forces.

Where necessary, minor deviations from the above work methods will be made in accordance with the policy regularly in effect at Hanford.

7. EFFECT ON OPERATING CONTINUITY

The production operations of the General Electric Company at HAPO will not be affected by this project. The proposed work is not expected to interrupt the research and development work in the 325 and 329 Buildings.

8. HAZARDS

This laboratory will be installed in the basement of the 325 Building. The basement area contains the process exhaust system for the entire building and there is always a chance that this system could become contaminated. However, during the seven years of occupancy no hazardous conditions have developed which limited the occupancy of the basement area.

9. PLANT IMPROVEMENT PROGRAM

This project is included in Hanford Laboratories Operation's Plant Improvement Program report revision number 1 dated 5-9-60 in Program 4 "General Laboratories Facilities and Equipment Not Unique to Any One Research and Development Program" as a miscellaneous undefined equipment project.

10. ATTACHMENT

Project cost estimate.

GENERAL ELECTRIC COMPANY

HANFORD ATOMIC PRODUCTS OPERATION

PROJECT COST ESTIMATE SUMMARY

TITLE SPECTROSCOPY LABORATORY 325 BUILDING	PROJECT NO. ER-1306
	DATE 1/5/61
	PREPARED BY Estimating/CPG
PREPARED FOR HANFORD LABORATORIES OPERATION	CHECKED BY

INSTALLATION & ERECTION COST

I. CONSTRUCTION OPERATION	15,000	
II. G. E. PLANT FORCES	68,000 *	
III. FIXED PRICE CONTRACTOR		
IV. SUPERVISION OF CONSTRUCTION (TITLE III)	1,500	
V. PROJECT START - UP		
VI. CONTINGENCY	2,500	
VII. ESCALATION		
SUB-TOTAL		87,000
VIII. GENERAL OVERHEAD (2-1/2% OF SUBTOTAL)		2,500
TOTAL INSTALLATION & ERECTION COST		89,500
MANAGEMENT SERVICES		2,500
DESIGN SERVICES (TITLE I & II)		3,000
TOTAL FUNDS REQUESTED		95,000
TRANSFERRED CAPITAL PROPERTY		
TOTAL PROJECT COST		95,000

* INCLUDES \$ 65,000 FOR EQUIPMENT PROCURED BY G.E.

APPROVED BY	DATE
(ESTIMATING) <i>W. J. Peterson</i>	1-5-61
(ENGINEERING) <i>R. L. Ingersoll</i>	1-10-61
(FINANCIAL) <i>Joe G. Warburton</i>	1-11-61

