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DOCUMENT CONTROL AND INFORMATION RETRIEVAL SYSTEM FOR THE FAST FLUX TEST FACILITY (FFTF)

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The sub-title for this presentation ought to be "An Engineer's Search for a Retrieval System." It is a brief review of all the steps which our organization took to find and start a system. The system obtained can be identified as one designed by an "Engineer" for "Engineers."

First, I would like to set the stage and give you a picture of the organization where this search took place and for whom the system was designed. Westinghouse Hanford Company is the contractor responsible for design and construction of the Fast Flux Test Facility or (FFTF). For the benefit of those not familiar with the FFTF, it is a liquid sodium-cooled, fast flux reactor designed specifically for irradiation testing of fuels and components for a new generation of nuclear power producers -- liquid metal fast breeder reactors or (LMFBR). It is located seven miles north of Richland, in southeastern Washington State, on the 570-square-mile Hanford reservation. Westinghouse Hanford is the primary contractor to the U. S. Energy Research and Development Administration (ERDA) for construction and operation of this unique facility. Service functions are contracted out to different companys by ERDA. The Library part of the operation is the responsibility of the Battelle Northwest Laboratory (BNWL). Battelle serves Westinghouse and other contractors by providing standard reference services and loaning them books, journals, and reports.

When this search began, there was no centralized retrieval system at which controlled the engineering design, research, construction, maintenance and operational paperwork from inception to obsolescence.

In July 1973, the Westinghouse Hanford Company recognized that documentation would have to be in place and retrievable for the maintenance, operation and safety of FFTF prior to startup and during the life of the plant.

I was the engineer chosen to initiate a study to locate a system suitable for FFTF Document Control and Retrieval. Mr. John Kowalsky was appointed by the Bechtel Corporation to participate in the investigation.

An initial survey of the FFTF documentation was conducted at HEDL during July and August 1973. A similar survey was also conducted during the last week of August at the contractors' sites -- Bechtel Power Corporation, Atomics International, Aerojet Manufacturing Company, Westinghouse Advanced Reactor Division, and Westinghouse Electro-Mechanical Division. The purposes of the surveys were:

To conduct a fast review to find out what kinds of FFTF documentation existed at each site.

To observe the form of the documentation.

To review the systems employed to interface and file the documentation.

To review the methods each contractor used to compile and submit the documents to HEDL to comply with their contractual requirements.

To identify any duplicate filing of the documentation.

To become acquainted with those persons responsible for handling the documents.

The results of the surveys indicated:

The FFTF documentation had various formats.

Each contractor had many locations where documents were filed.

Each contractor had duplicate files.

There was no evidence of centralized indexing systems or plans for compiling and submitting the documentation to HEDL.

Each contractor had a variety of systems for storing and maintaining the FFTF documentation.

In general, the survey indicated that a master plan was required to interface the HEDL system with the existing major contractor systems and their suppliers. As a result, we were chartered in October 1973 to further study the situation, to determine the requirements for an overall documentation control and retrieval system, and to develop a master plan. The objective was to determine how best to satisfy regulatory and agency requirements for control, retrievability, and accountability of the documents issued and used during the pre-operational and the operational life of the FFTF program. As you can observe from the following two slides, the FFTF Project must comply with many regulations.

Therefore, in November 1973, we decided on the basic information needed to help set the parameters for the study. We needed to know the following:

Legal and regulatory requirements to be met.

The organizations to be involved in the system.

The quantities of documents to be handled.

Turn around times necessary to meet the users needs.

Existing equipment and systems available which could be utilized.

We also established other considerations for the FFTF Documentation Control and Retrieval System. They were:

Total control of all necessary documents from one central file.

Automatic searching and instant retrieval from entire data base for desired records.

Reduction of clerical requirements while providing immediate response.

File integrity and elimination of misfiled records.

Automatic purging of files.

Modularity of system - (it grows as we need it to).

Ability to furnish desired records immediately upon request.

Serve as model for future ERDA, Associate Contractors and LMFBR programs or projects to control all correspondence, drawings, purchase orders, and other records.

Alternative uses of micro-wave or co-axial system.

Establishment of a Standard Indexing System to be used on other LMFBR efforts.

Thus, all of the factors to be considered in developing an overall retrieval system were established.

In December 1973, we conducted an internal HEDL survey and an external survey to see if a suitable existing system was already available which could possibly be used for the FFTF. The internal groups surveyed are on the next slide. These groups included HEDL Associate Contractors, ERDA and other Westinghouse and Bechtel divisions.

The external groups surveyed are shown on the following slide.

None of the systems reviewed was considered adequate as a completed package. It was recognized that, of all of the multitude of existing indexes being used by HEDL, associated contractors, vendors, and external groups, not one of them could be used as an overall indexing system for FFTF documentation. Those contacted to help develop such a system to meet our requirements were not interested in working on this vast and complicated project.

In January 1974, we set about collecting the information identified in November. First, the contractors were surveyed to establish as accurately as possible, the number of drawings and pages of text that would be produced by the FFTF Project. The results are noted on the next slide.

The initial survey results indicated that the FFTF would produce 8,000,000 pages of text and 600,000 drawings. Subsequent surveys indicated that 750,000 drawings and 12,000,000 pages of text would be initiated for FFTF and 38,000,000 pages of text for other related LMFBR Projects and programs.

At this point, a users survey was conducted to identify (1) the document formats acceptable to HEDL Technical groups, (2) the speed of retrieval required so that they could effectively carry out their work, (3) the necessary location for files and (4) the search and retrieval devices required during the pre-operational and the operational phases of the FFTF Project.

The final analysis of all these surveys resulted in the following recommendations for the proposed FFTF Documentation and Retrieval System:

HEDL and associated contractors should embark on a program to establish a keyword indexing system for use by FFTF and associated projects.

Associated contractors should provide microform copy of all drawings and documents.

To satisfy user needs, mechanical retrieval equipment should be evaluated and installed to expedite retrieval.

Use of remote viewing devices utilizing closed circuit T.V. should be evaluated in conjunction with the retrieval equipment.

A co-axial cable and micro-wave system for transmitting documents should be evaluated for installation at HEDL.

Computer-Output-Microfilm (COM) should be evaluated for production of the voluminous repetitive-type reports such as Procurement Status Reports (PSR), valve indexes, instrumentation indexes, etc.

Additional centralization of files within each organization should be considered to provide better service to all HEDL engineers and plant operators.

In February 1974, the recommendations for developing the FFTF Documentation and Retrieval System were presented to HEDL management. The proposed system and recommendations were formulated in such a manner that the total system could be started gradually. The first step would be to establish a keyword indexing system which would identify the physical storage location of the documents. The next step would be to identify an existing, real time, interactive, computer software package to accommodate the volume of documents being generated on the FFTF project.

HEDL management concurred with the proviso that the main criteria for the software selection was to find an already existing commercial package that could be adapted with minimal software design effort. In April 1974, Dr. Virginia Sternberg was contracted as a consultant to provide technical assistance in establishing the keyword system and for training analysts in the art of assigning keywords. The document backlog could thus be indexed and the information could be prepared in advance for computer input.

It was at this point that conferences were held to determine which documents were to be included in the system and to what extent each should be indexed. A matrix chart was prepared which included the decisions about each type of document. This guide is presently being used by the analysts.

In September 1974, Stanford Research Institute (SRI) was contracted to provide technical assistance in defining computer software and hardware

requirements to set up the system. SRI was also contracted to perform the programming and testing of the computer hardware and software programs which could potentially handle the anticipated volume of input.

In December 1974, an automated storage and retrieval system which can store and retrieve 200,000 engineering drawings on aperture cards, was obtained on government surplus from the Nuclear Rocket Facility at Jackass Flats, Nevada. This system with the use of co-axial cable has the ability to transmit the drawings for viewing at remote user stations.

In July 1975, HEDL obtained approval from ERDA to microfilm all documents. This made it possible to move ahead rapidly to phase into a system integrating the microfilming, indexing, and retrieval of the large number of documents to be included.

For the next several months, emphasis was placed on (1) developing the keyword indexing system and (2) Selecting an existing software package for on-line storage and retrieval. Training sessions were conducted by Dr. Sternberg and a Thesaurus was started. Input was prepared for tests which were conducted by SRI on various computers using various programs.

The results of SRI's investigation were presented in their final report, entitled "Analysis and Testing of Existing Computer Software Packages for the FFTF Document and Location Identification System", and dated May 1975.

The "Thesaurus for HEDL - LMFBR Projects and Programs" was issued in July 1975, and subsequently revised in October 1975. The number of established terms has now reached 6000.

The "FFTF - LMFBR Documentation Index Analyst's Handbook" was started and available for the keyword analysts to use in October 1975.

The instruction book "How To Assign Keywords" was prepared by Dr. Sternberg and printed in October 1975.

The project has moved ahead rapidly since last November. Management has allocated funding to (1) start the system, (2) acquire microfilm equipment and a mini-computer, (3) hire analysts for assigning keywords, (4) acquire personnel for data input, (5) microfilm the documents, and (6) put the data base on-line.

What remains to be finalized is the co-axial cable system. Decisions have been made concerning this part of the system and plans are being made to have this system installed.

As an engineer, I had rarely used the library, but always had great respect for information. Now that I have been involved in developing this retrieval system, I realize the extent of the problems that librarians and information scientists cope with. We have documented all of our progress over the last three years and have the reports here, if you wish to review them.

I would like to point out that to our knowledge, the FFTF Document Control and Information Retrieval System is unique because it utilizes a mini-computer along with various microfilm equipment.

This is only the beginning of the project. As you may remember, we anticipate that there will be 50 million pages of text to analyze and 750,000 drawings to index. We believe that the system is simple, uncluttered, eliminates duplication, and provides quick retrievability of documents for all technical and administrative personnel.

In closing, I would like to show a few more slides. These will give you a bird's eye view of the equipment and of the people involved in the system. The slides show each major step in the system from the moment the document arrives until it is located by an engineer searching for information.

SURVEYS OF CONTRACTORS

- CONDUCT REVIEW OF DOCUMENTATION
- DETERMINE FORMATS OF DOCUMENTS
- REVIEW EXISTING INDEXING SYSTEMS
- REVIEW METHODS OF SUBMITTING DOCUMENTS
- IDENTIFY DUPLICATE FILING
- BECOME ACQUAINTED WITH DOCUMENTALISTS

HEDL 7604-99.1

RESULTS OF SURVEY

- FORMATS OF DOCUMENTS VARY
- FILING SYSTEMS VARY
- FILES ARE DUPLICATED
- NO CENTRALIZED INDEXING SYSTEMS EXIST
- STORAGE SYSTEMS VARY

HEDL 7604-99.2

REGULATORY REQUIREMENTS FOR DOCUMENTATION

- REACTOR DEVELOPMENT TECHNOLOGY (RDT) F2-2
- AMERICAN SOCIETY OF MECHANICAL ENGINEERS
  ASME BOILER AND PRESSURE VESSEL CODE,
  SECTION III, NUCLEAR POWER PLANT COMPONENTS
- CODE OF FEDERAL REGULATIONS
  10CFR50
- STATE OR LOCAL REGULATORY AGENCIES

HEDL 7604-99.3

REGULATORY REQUIREMENTS FOR DOCUMENTATION (CONT'D)

- HEDL PRIME CONTRACT 2170
- BECHTEL CONTRACT BDR 275, AND SIMILAR CONTRACTS TO THE VARIOUS ASSOCIATE CONTRACTORS
- AMERICAN NATIONAL STANDARDS INSTITUTE
  - ANSI 45.29 (AS A GUIDE)
- RECORDS MANAGEMENT HANDBOOK
  - ERDA MANUAL APPENDIX 0230

HEDL 7604-99.4

BASIC INFORMATION NEEDED

- LEGAL REQUIREMENTS TO BE MET
- ORGANIZATIONS TO BE INCLUDED
- QUANTITIES OF VARIOUS DOCUMENT TYPES
- SPEED OF RETRIEVAL REQUIRED
- EQUIPMENT NOW AVAILABLE

HEDL 7604-99.5

ADDITIONAL FACTORS TO CONSIDER

- CENTRAL CONTROL OF DOCUMENTS
- RETRIEVAL FROM A TOTAL DATA BASE
- REDUCE CLERICAL EFFORT
- MAINTAIN FILE INTEGRITY
- PREVENT MISFILING
- PROVIDE FOR PURGING

HEDL 7604-99.6

BASIC INFORMATION NEEDED

- LEGAL REQUIREMENTS TO BE MET
- ORGANIZATIONS TO BE INCLUDED
- QUANTITIES OF VARIOUS DOCUMENT TYPES
- SPEED OF RETRIEVAL REQUIRED
- EQUIPMENT NOW AVAILABLE

HEDL 7604-99.5

ADDITIONAL FACTORS TO CONSIDER

- CENTRAL CONTROL OF DOCUMENTS
- RETRIEVAL FROM A TOTAL DATA BASE
- REDUCE CLERICAL EFFORT
- MAINTAIN FILE INTEGRITY
- PREVENT MISFILING
- PROVIDE FOR PURGING

HEDL 7604-99.6

EXTERNAL GROUPS SURVEYED

- NAVAL AIR SYSTEM COMMAND, WASHINGTON D.C.
- LIBRARY OF CONGRESS, WASHINGTON D.C.
- ERDA, GERMANTOWN, MARYLAND
- STANFORD RESEARCH INSTITUTE, WASHINGTON D.C. AND CALIFORNIA
- NAVAL AIR STATION, NORTH ISLAND, CALIFORNIA
- NAVAL AIR STATION, MIRAMAR, CALIFORNIA
- BOEING COMPANY, SEATTLE, WASHINGTON
- CHEVRON, RICHMOND, CALIFORNIA
- EXXON, SAN FRANCISCO, CALIFORNIA
- ERDA TEHCNICAL INFORMATION CENTER, TENNESSEE

TOTAL NUMBER OF DOCUMENTS

- ASSOCIATE CONTRACTOR DRAWINGS (5 ITERATIONS EACH) — 200,000
- VENDOR DRAWINGS (3 ITERATIONS EACH) — 550,000
- PAGES TO TEXT — 50,000,000
  - FFTF — 12,000,000
  - RELATED LMFBR PROGRAMS — 38,000,000

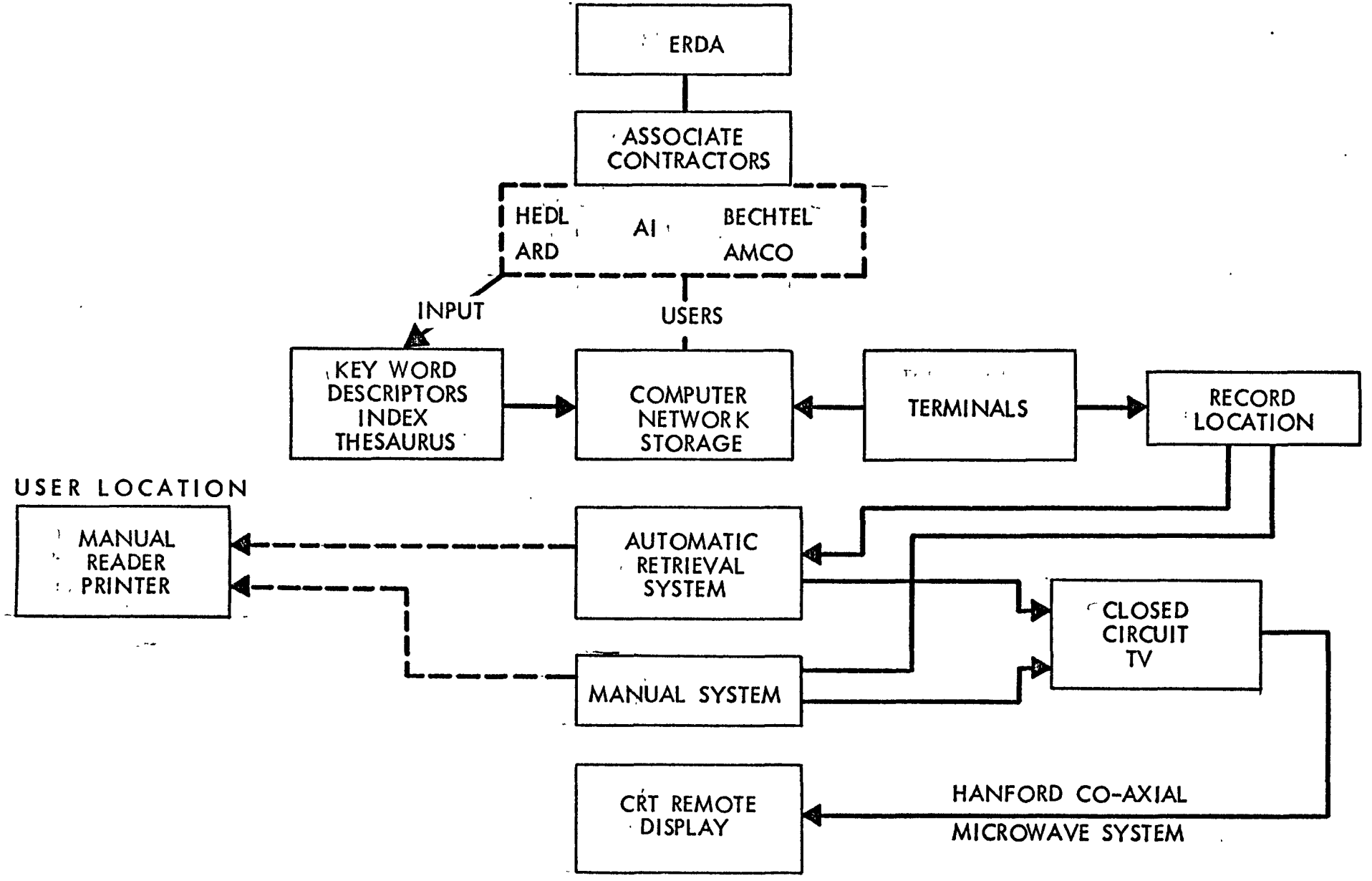
HEDL 7604-99.10

RECOMMENDATIONS

- ESTABLISH KEYWORD SYSTEM
- PROVIDE MICROFORM COPIES OF DOCUMENTS
- PROVIDE MECHANIZED RETRIEVAL
- USE REMOTE VIEWING DEVICES
- PROVIDE CO-AXIAL CABLE MICRO-WAVE TRANSMITTAL
- PROVIDE COM FOR VOLUMINOUS REPETITIVE REPORTS
- CENTRALIZE FILES

HEDL 7604-99.13

PROPOSED DOCUMENT RETRIEVAL SYSTEM



MATRIX

DOC TYPE	SYS NO.	REV NO.	KEY WORDS	IDENT NO.	RESP CONTR. OR CORP AUTHOR	BLDG NO.	ROOM NO.	DATA TYPE	REF DRWGS SPECS	EQUIP NO.	PO NO.	VENDOR NAME	CORPORATE ADDRESSEE	DATE	TITLE OR BEST DESCRIPTION
SDD'S	X	X	X	X	X			X		X				X	X
DRWGS (BECHTEL)	X	X	X	X	X	X	X	X	X	X				X	X
EOIR	X	X	X	X	X	X	X	X	X	X				X	X
ASSOC CONTR	X	X	X	X	X	X	X	X	X	X				X	X
VENDOR	X	X	X	X	X	X	X	X	X	X	X			X	X
FAB ISO'S	X	X	X	X	X	X	X	X	X	X	X			X	X
DATA SHEETS	X	X	X	X	X	X	X	X	X	X	X			X	X
FCN'S	X		X	X	X	X	X	X	X	X	X	X		X	X
DCN'S	X		X	X	X	X	X	X	X	X	X	X		X	X
HWS SPEC	X	X	X	X	X	X	X	X	X	X	X	X		X	X
PO		X	X	X	X	X		X	X	X	X	X		X	X
INDEXES		X	X		X									X	X
CORRES.	X		X	X	X	X	X		X	X	X		X	X	X
SNR'S	X		X	X	X	X	X		X	X	X	X		X	X

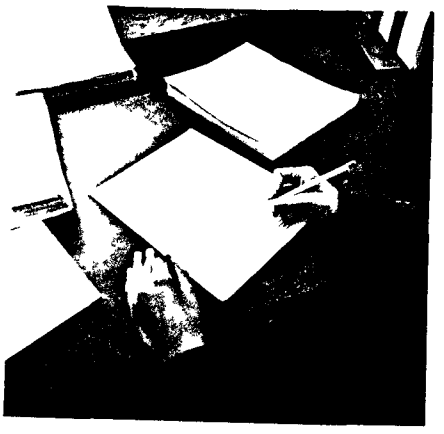
Pictorial Outline of Document Control and Information Retrieval System for the Fast Flux Test Facility (FFTF)

Documents received in HEDL mailroom from many sources.

Mail delivered to Central Files and opened.

Contents of packages of drawings, standards, specifications, etc. being verified against transfer form.

Document And Location Identification System (DALIS) analysis form to accompany document. All fields are to be completed.



Bibliographic information (corporate author, document number, date, title, etc.) being entered on DALIS form.

Additional descriptive information being entered on DALIS form.

Document analyzed for subject content. Subject keywords entered on DALIS form.

Documents microfilmed on automatic feed microfilm unit.

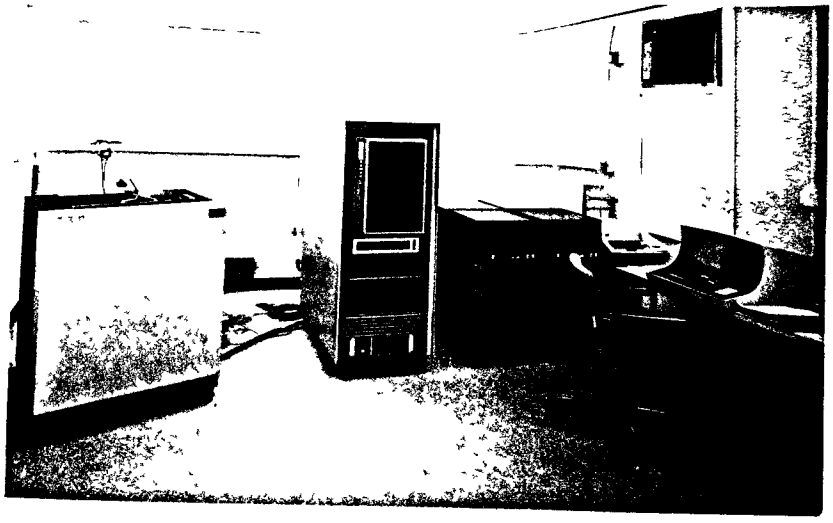
Cartridge of microfilm film is blip coded for retrieval.

Aperture cards are entered into the automated mechanical card retrieval unit.

Microfilm roll number and page image are entered on DALIS form.

Input prepared for loading in computer.

Mini-computer.



Search being conducted via terminal.