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INFORMATION STORAGE AND RETRIEVAL SYSTEM AT WESTINGHOUSE HANFORD COMPANY*

HANFORD ENGINEERING DEVELOPMENT LABORATORY (HEDL)

P. O. BOX 1970

RICHLAND, WASHINGTON

MICHAEL G. THEO

MANAGER, HEDL DOCUMENTATION CONTROL

RICHLAND, WASHINGTON

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RESEARCH AND DEVELOPMENT ADMINISTRATION

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Good Afternoon,

My name is Michael Theo, and I'm the Documentation Control Manager for the Westinghouse-Hanford Company in Richland, Washington.

I'm here to tell you about the information storage and retrieval system we have developed at Westinghouse-Hanford. Our system, when completed, will be able to store over two million documents on line - a total of fifty million pages of microfilmed text, and three-quarters of a million microfilmed engineering drawings.

To retrieve the information stored on the microfilm, the Document and Location Identification System, known as DALIS, employs an interactive mini-computer system with interfacing CRT terminals, to do the searching for documents, linked to microfilm reader-printers that provide the viewing capability once the documents are found. We believe that our system is unique in

THIS RESPECT, THAT IT LINKS INTERACTIVE COMPUTER TECHNOLOGY TO MICROFILM DEVICES TO PROVIDE FAST, EFFICIENT DOCUMENT RETRIEVAL.

BEFORE I GO INTO DETAILS OF HOW OUR SYSTEM WORKS, I WOULD LIKE TO DESCRIBE WHAT OUR COMPANY DOES THAT GIVES US A NEED FOR THIS SOPHISTICATED STORAGE-AND-RETRIEVAL SYSTEM. WE HAVE TWO MAJOR ACTIVITIES AT HANFORD FOR WHICH WE ARE UNDER CONTRACT TO THE ENERGY RESEARCH AND DEVELOPMENT ADMINISTRATION, OR ERDA.

2.

300 Area Double	Photo

(2.) ONE OF OUR ACTIVITIES IS TO MANAGE THE HANFORD ENGINEERING DEVELOPMENT LABORATORY, LOCATED FIVE MILES NORTH OF RICHLAND. THE LABORATORY IS ONE OF THE MAJOR RESEARCH SITES IN THE UNITED STATES FOR DEVELOPMENT OF THE LIQUID-METAL FAST-BREEDER REACTOR.

3

400 Area Double	Site Photo

OUR SECOND MAJOR ACTIVITY AT WESTINGHOUSE-HANFORD COMPANY IS CON-STRUCTING THE (3) FAST FLUX TEST FACILITY, KNOWN AS THE FFTF. THE FFTF WILL BE A LARGE TEST REACTOR, AND WILL TEST NUCLEAR

FUELS AND MATERIALS. WE HOPE TO GAIN
INFORMATION FROM THE FFTF ABOUT REACTOR
SAFETY, REACTOR PHYSICS, THE BREEDING
PROCESS, AND OTHER REACTOR-RELATED
AREAS. WE ARE THE PRIME CONTRACTOR FOR
CONSTRUCTION OF THE FFTF.

4

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④ IN THE ACTIVITIES DESCRIBED --
OPERATING THE LABORATORY AND CONSTRUCTING
THE FFTF -- WESTINGHOUSE-HANFORD AND
ASSOCIATED ERDA CONTRACTORS GENERATE A
LOT OF PAPER WORK CONTAINING DESIGN
REPORTS, TEST RESULTS, PROCEDURES,
STATEMENTS OF COMPLIANCE WITH PROCEDURES,
ETCETERA, ETCETERA.

A SURVEY TAKEN IN 1973 ESTIMATED
THAT, BY 1982, WE WILL PROBABLY STORE
AND RETRIEVE SELECTED DOCUMENT TYPES
RANGING FROM VARIOUS FORMS OF ONE- AND
TWO-PAGES TO SEVERAL-HUNDRED-PAGE RESEARCH
REPORTS AND SAFETY ANALYSES. THESE
DOCUMENTS WILL BE USED DURING THE
MAINTENANCE AND OPERATION OF THE PLANT.
RETRIEVAL TIME FOR THE DOCUMENTS SHOULD
BE ABOUT ~~TWO~~ one TO FIVE MINUTES FROM THE
TIME OF USER REQUEST. THERE WILL ALSO

BE A NEED TO HAVE STORED IN CONVENIENTLY
RETRIEVABLE FORM APPROXIMATELY 200,000
ENGINEERING DRAWINGS.

RECOGNIZING THAT SOME KIND OF
CENTRALIZED INFORMATION STORAGE AND
RETRIEVAL SYSTEM WOULD BE NEEDED TO
HANDLE THE DEMAND, WESTINGHOUSE-HANFORD
MANAGEMENT DECIDED THAT AN ENGINEER
SHOULD BE APPOINTED TO OVERSEE THE
ACQUISITION AND DEVELOPMENT OF SUCH A
SYSTEM, SINCE MOST USERS WOULD BE
ENGINEERS THEMSELVES.

WE SURVEYED THE USERS' NEEDS FOR
INFORMATION AT THE LABORATORY, AND ALSO
LOOKED AT OTHER BUSINESS ORGANIZATIONS,
GOVERNMENT ORGANIZATIONS, AND MILITARY
INSTALLATIONS THAT MIGHT HAVE A SYSTEM
WHOSE METHOD OF OPERATION WE COULD USE.
NONE TOTALLY SATISFIED OUR NEEDS -- NONE
OF THE SYSTEMS WE REVIEWED WERE ABLE TO
PROVIDE THE STORAGE CAPACITY, SPEED OF
RETRIEVAL, OR SCOPE OF SEARCH CAPABILITY
THAT WE HAD IN MIND.

SO, WE SELECTED BITS AND PIECES
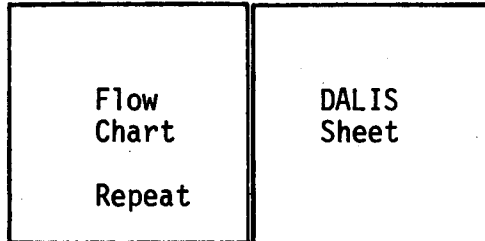FROM OTHER SYSTEMS AND, IN EFFECT,

Flow Chart	Blank

5

Flow Chart Repeat	DALIS Sheet

6
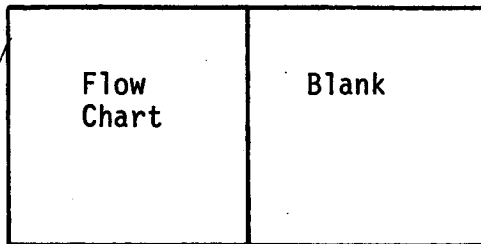
DEVELOPED OUR <u>OWN</u> SYSTEM. THIS FLOWCHART GIVES AN OVERVIEW OF THE SYSTEM OPERATION.

FIRST, A DALIS DATA SHEET IS MADE FOR EACH DOCUMENT, AND THE DATA ARE ENTERED IN THE DALIS COMPUTER. THE DALIS DATA CONSIST OF THE FIELDS OF INFORMATION SHOWN HERE. MOST OF THE FIELDS SHOWN ARE SELF-EXPLANATORY, SUCH AS DOCUMENT NUMBER, TITLE, AUTHOR, DATE, AND SO FORTH, BUT ONE FIELD IN PARTICULAR IS WORTHY OF NOTE, THE FIELD "KEYWORDS", NUMBER 24.

WE SET UP DALIS TO BE A KEYWORD SYSTEM, SO THAT DOCUMENTS WOULD BE RETRIEVABLE BY SEARCHES ACCORDING TO EXACT SUBJECT MATTER, AND ACCORDING TO THE WAY USERS TALK IN REAL LIFE. A LIBRARY-CARD CATALOG KIND OF SYSTEM, WHERE A PERSON HAS TO THINK OF THE EXACT INDEXING <u>PHRASE</u> IN ORDER TO FIND A DOCUMENT, WOULD NOT MEET OUR USER'S NEEDS. INSTEAD, WE DEVELOPED A SYSTEM THAT ALLOWED USERS TO FIND DOCUMENTS FROM A VARIETY OF PATHS, SINCE TWO DIFFERENT PEOPLE MIGHT THINK OF OR USE

TWO DIFFERENT SETS OF KEYWORDS TO
DESCRIBE THE SAME DOCUMENT, WE ALSO
WANTED TO MAKE NOTE OF THE FACT THAT
DIFFERENT GROUPS OF PEOPLE TALK DIFFERENTLY
FROM ONE ANOTHER -- ENGINEERS DO NOT USE
THE SAME WORDS AS OPERATIONS PEOPLE, AND
MAINTENANCE PEOPLE DO NOT USE THE SAME
TERMS AS PROCUREMENT PEOPLE. ALL OF
THESE VARYING GROUPS OF PEOPLE, AND
MORE, WOULD SOMEDAY USE THE SYSTEM. WE
WANTED A SYSTEM THAT WOULD ACCOMMODATE
ALL THESE VARIOUS "CIRCLES" OF LANGUAGE,
AND WOULD BE CONVENIENT AND SIMPLE FOR
EVERYONE TO USE.

THE RESULT WAS TO CREATE A KEYWORD
THESAURUS, WHICH IS PRESENTLY 14,000
WORDS LONG. WE EXPECT IT TO GROW SLIGHTLY
LARGER, BEFORE WE'RE FINISHED. ALMOST
EVERY DOCUMENT IN THE SYSTEM HAS ONE OR
MORE KEYWORD PHRASES ASSIGNED TO IT.
THAT WAY, IF A SYSTEM USER HAS SOME
DOCUMENT IN MIND BUT DOESN'T KNOW EXACTLY
WHICH ONE IT IS, HE CAN ASK FOR THE
COMPUTER TO SEARCH THROUGH ITS LIST OF
KEYWORD ENTRIES UNDER A GIVEN SUBJECT,
THEN VIEW THE LIST TO SEE IF THE DOCUMENT

HE WANTS IS THERE. OR, HE CAN KEEP
SPECIFYING SEARCH CRITERIA -- FOR
EXAMPLE, HE MIGHT ASK FOR ALL DOCUMENTS
ABOUT SODIUM SYSTEM PIPING WRITTEN BY
ATOMICS INTERNATIONAL -- TO GET PRECISELY
THE INFORMATION HE IS LOOKING FOR.
KEYWORDING IS A VERY TIME-CONSUMING PART
OF CREATING THE DATA BASE FOR THE DALIS
SYSTEM, BUT BY FAR THE MOST REWARDING,
IN TERMS OF RETRIEVABILITY. IT GIVES
THE SYSTEM FAR MORE FLEXIBILITY AND
USEFULNESS THAN THE SYSTEM WOULD HAVE
WITHOUT IT. IN FACT, WITHOUT KEYWORDING,
DALIS WOULD BE JUST AN INDEXING SYSTEM
STORED ON A COMPUTER. BUT DALIS IS
MORE. THE KEYWORDING SYSTEM IS CON-
VENIENT FOR THE USER, BECAUSE THE USER
IS NOT LIKELY TO REMEMBER EXACT TITLES
OR DOCUMENT NUMBERS, BUT IS LIKELY TO
RECALL SUBJECTS OF INFORMATION HE IS
FAMILIAR WITH AND INTERESTED IN.

⑦ TO GO BACK TO THE WAY THE SYSTEM
WORKS:

ONCE WE HAVE THE DOCUMENT MICRO-
FILMED AND A RECORD MADE OF IT IN THE

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Retrieval Flow	Blank

DALIS DATA BASE, WE ARE FINISHED WITH
THE INPUT PART. WE HAVE CAPTURED THE
INFORMATION FOR LIFE. THE DOCUMENT WILL
ALWAYS BE AVAILABLE TO ANY USER WHO ASKS
FOR IT, EVEN IF A HUNDRED REQUESTS COME
IN FOR THE SAME DOCUMENT ON THE SAME
DAY. IT NEVER EXITS THE SYSTEM, WHICH
IS A FUNDAMENTAL ADVANTAGE OF COMPUTER
AND MICROFILM INFORMATION STORAGE
OPERATIONS.

HAVING COMPLETED THE INPUT STAGE,
WE COME TO THE OUTPUT, OR THE USER'S
PART OF THE SYSTEM. HOW DO USERS GET
INFORMATION OUT OF DALIS?

GETTING INFORMATION FROM THE SYSTEM
IS ACCOMPLISHED IN TWO STEPS ⑧ SEARCHING
FOR THE MICROFILM LOCATIONS OF DESIRED
DOCUMENTS, AND VIEWING DOCUMENTS ON
MICROFILM.

TO SEARCH FOR A DOCUMENT, A USER
LOGS IN TO THE COMPUTER SYSTEM, THEN
TURNS TO ONE OF TWO PROGRAMS: THE FIND
PROGRAM OR THE SEARCH PROGRAM. FIND IS
A PROGRAM FOR BEGINNING COMPUTER USERS,

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| Find | Search |

WHILE SEARCH IS A MORE ADVANCED AND
SPEEDIER PROGRAM. THE TWO DIFFER MAINLY
IN SPEED OF USE: FIND IS A HIGHLY
STRUCTURED PROGRAM THAT GUIDES THE USER
IN SMALL STEPS THROUGH A COMPUTER SEARCH;
SEARCH IS A MORE FREESTYLE PROGRAM, FOR
EXPERIENCED USERS, AND IS MORE CONVERSA-
TIONAL AND INTERACTIVE. AFTER ONE
LEARNS THE LOGIC BEHIND FIND, ONE CAN
QUICKLY ADVANCE TO SEARCH, BECAUSE THE
LOGIC BEHIND THE TWO PROGRAMS IS THE
SAME. THE IDEA IS TO INPUT TO THE
COMPUTER ENOUGH DESCRIPTORS OF A DOCU-
MENT TO FIND THE PHYSICAL LOCATION OF
THAT DOCUMENT.

ONE DESCRIPTOR THAT MIGHT BE INPUT,
FOR EXAMPLE, TO OBTAIN A MICROFILM
LOCATION ON A SPECIFIC DOCUMENT IS THE
DOCUMENT'S NUMBER -- NORMALLY THERE IS
ONLY ONE DOCUMENT OF A GIVEN NUMBER IN
THE DALIS FILE. A USER CAN ASK FOR A
DOCUMENT BY NUMBER, AND THE COMPUTER
WOULD GIVE HIM ITS MICROFILM LOCATION.

IF OUR USERS ALWAYS KNEW THE
NUMBERS OF THE DOCUMENTS THEY WANTED TO

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Find	Search
(1)TR976	Doc. No. TR976

FIND, WE WOULD HAVE STOPPED THERE. BUT
USERS DO NOT ALWAYS KNOW THE DOCUMENT
NUMBERS, AND SO THEY MUST HAVE SOME
CAPABILITY TO SEARCH FOR DOCUMENTS THAT
MIGHT CONTAIN THE INFORMATION THEY NEED.

BECAUSE OF THIS, WE GAVE DALIS ITS
VERSATILE KEYWORDING FEATURES.

10	
Find	Search
Program	--
	--
	--

TO ILLUSTRATE, LET'S USE A TYPICAL
EXAMPLE. LET'S SAY A USER HAS LOGGED 10
IN, AND ASKED FOR THE SEARCH PROGRAM. I
WILL SHOW YOU NOW HOW THE SYSTEM WORKS,
IN ITS MOST BASIC FORM. AFTER THAT, I
WILL DESCRIBE A COUPLE OF OTHER CAPABILITIES
OF THE DALIS SYSTEM.

11	
Search	Find
FSAR	FSAR

THE USER'S FIRST COMMAND IS THE
KEYWORD FSAR; 11 THAT IS, HE IS ASKING FOR
ALL THE DOCUMENTS IN THE SYSTEM RELATED
TO THE FINAL SAFETY ANALYSIS REPORT OF
THE FTTF. IN THIS CASE, THE USER IS
TELLING THE COMPUTER TO SEARCH THROUGH
ITS INDEX OF KEYWORDS FOR DOCUMENTS
KEYWORDED FSAR. UNLESS OTHERWISE
SPECIFIED, THE COMPUTER ASSUMES THAT ANY
REQUEST MADE TO IT IS A REQUEST TO
SEARCH THROUGH THE KEYWORD INDEX.

THE INDEXES FOR EACH DESCRIPTOR ARE "INVERTED FILES" FROM THE DOCUMENT DESCRIPTOR INDEX. THAT IS, IN MAKING UP THE DOCUMENT DESCRIPTOR INDEX, WE LISTED ALL THE DESCRIPTORS THAT APPLIED TO A GIVEN DOCUMENT. TO LOGICALLY INVERT THAT FILE TO MAKE AN INDEX FOR EACH DESCRIPTOR, WE MADE UP A LIST OF ALL THE DOCUMENTS THAT APPLY TO A GIVEN DESCRIPTOR. IN THE FIRST CASE, WE HAVE A LIST OF DESCRIPTORS FOR EACH DOCUMENT; IN THE SECOND CASE, WE HAVE A LIST OF DOCUMENTS FOR EACH DESCRIPTOR. IT IS THIS INVERTED FILE THAT ALLOWS THE USER TO RUN SEARCHES.

TO RETURN TO THE EXAMPLE, THE USER HAS ASKED FOR ALL DOCUMENTS PERTAINING TO FSAR. THE COMPUTER RESPONDS THAT IT HAS FOUND 1810 "HITS", OR DOCUMENTS RELATING TO THE FSAR.

AT THIS POINT, THE USER HAS SEVERAL CHOICES: HE CAN ASK TO EXAMINE THE DALIS RECORD OF EACH HIT; HE CAN ASK TO SEE JUST A FEW DESCRIPTORS FOR EACH HIT; HE CAN NARROW DOWN HIS SEARCH BY INCLUDING ADDITIONAL DESCRIPTORS; OR HE CAN START

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Search	Criteria
FSAR 1810 hits	FSAR

A NEW SEARCH, IF HIS PREVIOUS ANSWER SUGGESTED TO HIM THAT HE WAS NOT ON THE RIGHT TRACK. LET'S SAY THAT THIS USER CHOOSES TO NARROW DOWN THE SEARCH FURTHER.

(13) HE DOES SO BY TYPING THE COMMAND AND STRESS ANALYSES. HIS SEARCH CRITERIA NOW READ FSAR AND STRESS ANALYSES. THE COMPUTER PERFORMS THIS SEARCH, AND REPLIES THAT THERE ARE 86 HIT RECORDS (14) RELATING TO BOTH OF THESE.

OUR USER HAS NARROWED DOWN HIS SEARCH FROM A POSSIBLE 1,810 DOCUMENTS TO 86 DOCUMENTS, HOWEVER, LET US ASSUME THAT THIS IS STILL TOO MANY HITS FOR HIM TO EXAMINE. HE CHOOSES TO NARROW DOWN THE SEARCH STILL FURTHER AND TYPES AND (15) PIPING. HIS SEARCH CRITERIA NOW READ FSAR AND STRESS ANALYSES AND PIPING. HE WANTS ONLY THOSE DOCUMENTS THAT HAVE ALL THREE OF THESE INCLUDED IN THEIR KEYWORDS.

THE COMPUTER PERFORMS THE SEARCH, AND REPLIES THAT THERE ARE EIGHT DOCUMENTS (16) SATISFYING THESE SEARCH CRITERIA.

13

Search	Criteria
FSAR 1810 hits and Stress Analysis	and Stress Analysis

14

86 hits	and Stress Analysis

15

and Piping	and Piping

16

8 hits	and Piping

FOR THE PURPOSES OF THIS EXAMPLE, WE WILL SAY THAT THE USER WANTS TO NARROW DOWN THE SEARCH STILL FURTHER, AND WANTS ONLY THOSE DOCUMENTS THAT WERE ORIGINATED BY BECHTEL POWER CORPORATION RELATED TO ALL THESE THINGS. THE ABBREVIATION FOR BECHTEL POWER CORPORATION IS BPC, SO THE USER TYPES AND ORIG=BPC. NOTE THAT THIS IS THE FIRST TIME HE HAS ASKED FOR ANYTHING OTHER THAN A KEYWORD SEARCH. THIS TIME HE WANTS A SEARCH THROUGH THE ORIGINATER INDEX, SO HE PREFACES THE COMMAND WITH THE CHARACTERS ORIG.

orig. BPC	BPC

THE COMPUTER PERFORMS THE SEARCH, AND REPLIES THAT THERE IS ONLY ONE DOCUMENT IN THE SYSTEM THAT WAS ORIGINATED BY BECHTEL POWER CORPORATION AND IS KEYWORDED FSAR, STRESS ANALYSES, AND PIPING.

1 hit	BPC

AT THIS POINT, THE USER ASKS TO DISPLAY THE DALIS RECORD FOR THE HIT, AND IT IS SHOWN HERE. YOU SEE THE TITLE, DATE, AUTHOR, THE ORIGINATOR, MICROFILM LOCATION, AND KEYWORDS.

Display	BPC

NOTICE THAT THERE ARE SEVERAL KEYWORDS
SHOWN HERE. A DIFFERENT USER MIGHT HAVE
ARRIVED AT THIS DOCUMENT BY A DIFFERENT
ROUTE THAN THE ONE WE CHOSE -- HE MIGHT
HAVE THE AUTHOR AND DATE OF THE DOCUMENT
BUT NOT THE TITLE, OR MAYBE A COUPLE OF
DIFFERENT KEYWORDS WOULD HAVE COME TO
MIND. HE CAN SEARCH WITH DIFFERENT
DESCRIPTORS, IF THOSE DESCRIPTORS WERE
USED WHEN THE DOCUMENT WAS KEYWORDED,
AND ARRIVE AT THE SAME DOCUMENT BY A
DIFFERENT ROUTE. 20

A FEW ADDITIONAL CAPABILITIES OF
DALIS ARE NOTEWORTHY. FOR EXAMPLE, WE
HAVE A LOGICAL SEARCH CAPABILITY, BY
WHICH USERS CAN SEARCH FOR SOMETHING OR
SOMETHING ELSE, NOT JUST SOMETHING AND
SOMETHING ELSE. FOR INSTANCE, WE MIGHT
SPECIFY FIND KEYWORD REACTOR SODIUM
SYSTEMS OR REACTOR PLANT SYSTEMS. THEN,
IN ORDER TO QUALIFY AS A HIT, A DOCUMENT
WOULD HAVE TO BE FOUND IN THE INDEX
UNDER EITHER REACTOR SODIUM SYSTEMS OR
REACTOR PLANT SYSTEMS, AND NOT NECESSARILY
BOTH, AS WOULD HAVE BEEN THE CASE WITH
THE COMMAND AND. THE LOGICAL STRUCTURE

20

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OF THE JOB CONTROL LANGUAGE WORKS MUCH
THE SAME WAY AS THE PROCESSES OF LOGIC
IN MATHEMATICS.

WE ALSO HAVE A LOGICAL NOT SEARCH
CAPABILITY -- WE CAN SEARCH FOR A DOCUMENT
WHOSE KEYWORDS DO NOT INCLUDE SOMETHING.
FOR INSTANCE, WE MIGHT TELL THE COMPUTER
TO FIND KEYWORD REACTOR PLANT SYSTEMS
AND NOT REACTOR SODIUM SYSTEMS, IN WHICH
CASE WE ARE ASKING FOR ALL DOCUMENTS
HAVING TO DO WITH REACTOR PLANT SYSTEMS
OTHER THAN REACTOR SODIUM SYSTEMS. THIS
CAPABILITY IS USEFUL FOR NARROWING LARGE
SEARCHES.

A USER CAN ALSO SEARCH FOR DOCUMENTS
BY USING A DATE-RANGE SEARCH, THAT IS,
HE CAN SEARCH FOR DOCUMENTS PUBLISHED
BETWEEN TWO DATES OR BEFORE OR AFTER ONE
SPECIFIED DATE. WE HAVE A (21) SIX-DIGIT
CODE FOR ENTERING DATES OF DOCUMENT
PUBLICATION, IN WHICH THE FIRST TWO
DIGITS ARE USED FOR THE YEAR, THE NEXT
TWO FOR THE MONTH, AND THE LAST TWO FOR
THE DAY OF THE MONTH. FOR EXAMPLE, A
SEARCH FOR ALL DOCUMENTS WITH DATE

21

| 75 06 01 | Blank |

22

Less than Greater than	

23

Blank	Blank

(22)

GREATER THAN 750601 AND LESS THAN 750630 YIELDS ALL THE DOCUMENTS WRITTEN IN JUNE 1975.

IN ADDITION, WE HAVE WHAT WE CALL A "BEGINS WITH" SEARCH. THIS GIVES US THE CAPABILITY TO SPECIFY ONE OR MORE BEGINNING (23) LETTERS OF A DESCRIPTOR. FOR EXAMPLE, IF WE WANTED TO FIND DOCUMENTS KEYWORDED "PRINCIPAL ...", WE COULD USE THE COMMAND "PR" TO FIND ALL THE DOCUMENTS THAT HAD KEYWORDS BEGINNING WITH THE LETTERS PR. THIS IS PARTICULARLY USEFUL WHEN THE PROPER SPELLING OR FORM OF A SEARCH CRITERION IS NOT KNOWN, OR WHEN A WORD OR PHRASE IS LENGTHY.

ONE MORE CAPABILITY WORTHY OF NOTE IN THE DALIS SYSTEM IS THE ABILITY TO SEARCH FOR CHARACTER STRINGS IN A GIVEN DESCRIPTOR. FOR INSTANCE, A USER MIGHT SEARCH THROUGH DOCUMENT TITLES FOR EVERY TITLE THAT MENTIONS THE PHRASE "REACTOR SAFETY"; THE WAY THE SOFTWARE PACKAGE IS PROGRAMMED, HE CAN ONLY DO IT ONE WORD AT A TIME, SO THE COMMAND WOULD BE FIND TITLE=REACTOR AND TITLE=SAFETY. THE

MENTION OF THESE WORDS COULD COME ANYWHERE IN THE TITLE; THEY WOULD NOT HAVE TO BE AT THE BEGINNING, OR AT ANY OTHER SPECIFIC POINT WITHIN THE TITLE OF THE DOCUMENT.

THESE CAPABILITIES AND OTHERS ARE PROVIDED BY A MINI-COMPUTER WITH A 64K CORE MEMORY, AND AN ACCESS MEMORY CONSISTING OF FOUR 200-MEGABYTE DISCS, EXPANDABLE TO 2.1 BILLION BYTES. USER-ORIENTED SOFTWARE FOR THE DALIS IS WRITTEN IN BASIC.

RETURNING NOW TO THE FIRST EXAMPLE I SHOWED YOU, LET US SUPPOSE THAT THE USER WANTED TO EXAMINE THE DOCUMENT HE FOUND ON MICROFILM. THE MICROFILM LOCATION CODE IS A NINE-DIGIT CODE, WHERE THE FIRST FIVE DIGITS ARE USED TO DESIGNATE A CARTRIDGE NUMBER, AND THE LAST FOUR DESIGNATE A FRAME NUMBER. THEREFORE, IN OUR EXAMPLE, THE DOCUMENT IN QUESTION IS LOCATED ON MICROFILM CARTRIDGE NUMBER 05063, FRAME 1341. THE USER THEN TURNS TO THE MICROFILM LIBRARY, TAKES THE APPROPRIATE CARTRIDGE, AND INSERTS IT INTO THE MICROFILM READER-PRINTER.

24

Picture of Mini Computer	Blank

Mike is Zytron provides new 35's mm, replace here.

25

Display of Record	Cartridge Number

THE MICROFILM READERS ARE LINKED TO THE CRT'S, SO THAT A USER CAN BE GUIDED BY THE COMPUTER THROUGH HIS VIEWING OF SEVERAL MICROFILM HITS. THIS COMPUTER-ASSISTANCE CAPABILITY IS ESPECIALLY EFFECTIVE FOR VIEWING LONG LISTS OF DOCUMENTS.
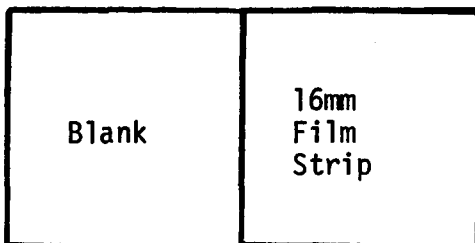
26

Picture of User at Reader	Blank
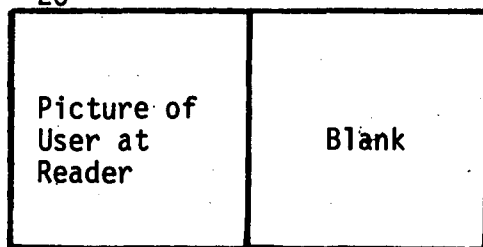
(26) AFTER THE MICROFILM IS IN THE READER, THE USER DIRECTS THE COMPUTER, VIA THE CRT TERMINAL, TO ADVANCE THE FILM TO THE SELECTED FRAME (1341). THE USER CAN ALSO MOVE THE MICROFILM FORWARD AND BACKWARD, ONE FRAME AT A TIME, USING THE CRT TO CONTROL THE ADVANCE OR REWIND.

IN OUR SYSTEM, THE COUNTING OF FRAMES IS DONE BY MEANS OF A BLIP CODE ON THE EDGE OF THE 16MM FILMSTRIP. THE BLIP CODE, (27) AS YOU CAN SEE IN THIS VIEW OF A MICROFILM STRIP, IS JUST A HEAVY RECTANGULAR SPOT IN AN AREA WHERE THE MICROFILM IS USUALLY CLEAR. AT THE START OF OUR EXPERIMENTS WITH THIS SYSTEM, WE EXPERIENCED SOME DIFFICULTIES WITH QUALITY CONTROL OF THE BLIP CODES -- SOME BLIPS WOULD COME OUT TOO LIGHT OR

27

Blank	16mm Film Strip

BLURRY, IN WHICH CASE THE MICROFILM
MACHINE DIDN'T SEE THEM. THE UPSHOT OF
THIS QUALITY CONTROL PROBLEM WAS THAT ON
LONG FILM ADVANCES OR REWINDS, THE
MACHINE WOULD BE SEVERAL FRAMES OFF, AND
THE USER WOULD HAVE TO ADJUST THE MICRO-
FILM MANUALLY.

THIS WAS NOT A BIG PROBLEM, BUT IT
WAS ANNOYING, AND IT WAS FAIRLY SIMPLE
TO SOLVE -- IT WAS JUST A MATTER OF MORE
CAREFUL QUALITY CONTROL DURING MICROFILM
PROCESSING. I POINT THIS OUT AS ONE OF
THE PROBLEMS WE FACED WITH THIS SYSTEM
THAT WE HAVE ELIMINATED. 28

28

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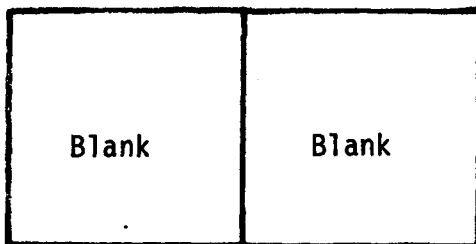
THIS DESCRIBES, IN A BRIEF WAY, THE
INFORMATION STORAGE AND RETRIEVAL SYSTEM
AT WESTINGHOUSE-HANFORD AS IT IS IN
OPERATION TODAY.

ONE OF THE MAJOR NEAR-TERM ADVANCES
WILL BE THE INSTALLATION OF A CLOSED-
CIRCUIT TELEVISION SYSTEM FOR REMOTE
VIEWING OF ENGINEERING DRAWINGS, WHICH
IS AN AREA OF GREAT CONCERN AND EXPENSE
AROUND THE LABORATORY. WE ALREADY HAVE

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| Picture of Mosler | Blank |

30

| Blank | Blank |

(29) AN APERTURE-CARD MACHINE, WHICH WE OBTAINED FROM GOVERNMENT SURPLUS, WHICH WILL STORE ABOUT 200,000 IMAGES OF ENGINEERING DRAWINGS ON 35MM APERTURE CARDS. WHAT WE NEED IS A USER CAPABILITY TO REQUEST AT THE COMPUTER TERMINAL THAT AN ENGINEERING DRAWING BE SHOWN TO HIM OVER CLOSED-CIRCUIT TELEVISION. A TELEVISION SCREEN WOULD BE SITUATED AT EACH USER STATION. THE COMPUTER WOULD THEN SELECT THE REQUESTED DRAWING OUT OF THE APERTURE-CARD CARTRIDGE, DISPLAY IT ON THE TELEVISION SYSTEM, AND RETURN THE CARD TO ITS APPROPRIATE CARTRIDGE IN THE MACHINE WHEN THE USER WAS FINISHED WITH IT. THE USER, MEANWHILE, COULD VIEW THE DRAWING ON THE SCREEN, AND OBTAIN A PORTION OF THE DRAWING IN HARD COPY, IF HE NEEDED IT, SIMPLY BY PRESSING A BUTTON, OR REQUEST A 1/2-SIZE HARD COPY PRINT FROM CENTRAL FILES. (30)

WE ALREADY HAVE APPROVAL FOR ONE EXPERIMENTAL USER STATION OF THIS SYSTEM, TO BE LOCATED IN THE MAIN ENGINEERING ADMINISTRATION BUILDING AT THE LABORATORY. IMPLEMENTATION OF THIS EXPERIMENTAL

STATION IS AWAITING THE RUNNING OF A
VIDEO CABLE FROM THE MAIN ENGINEERING
BUILDING TO OUR SERVICE BUILDING. THIS
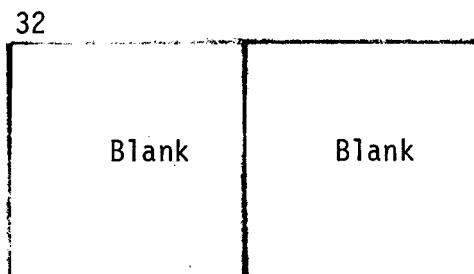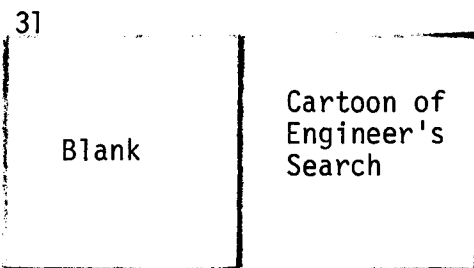SHOULD BE IN OPERATION THIS YEAR.

IN SUMMARY, WE FEEL THAT WE HAVE
DEVELOPED A SYSTEM THAT SUITS THE
LABORATORY'S NEED WELL. IN THE AREA OF
DOCUMENT SEARCHES, WE WILL CENTRALIZE
MOST OF THE INFORMATION THAT VARIOUS
USERS AROUND THE LABORATORY ARE LIKELY
TO NEED, MEETING OUR REGULATORY REQUIRE-
MENTS AND PROVIDING USERS WITH A FLEXIBLE
SYSTEM FOR FINDING INFORMATION. THIS
FLEXIBILITY ALLOWS FOR RAPID DOCUMENT
SEARCHES, AND ALLOWS A USER TO SPEND A
LITTLE TIME TO FIND OTHER DOCUMENTS THAT
HE MIGHT BE INTERESTED IN.

SIMILARLY, WE FEEL WE HAVE A VERY
EFFICIENT METHOD OF HANDLING THE STORAGE
AND RETRIEVAL PROBLEM FOR ENGINEERING
DRAWINGS, WITH MINIMUM EFFORT AND SPACE.

THE CRUCIAL FACTOR IN THE SUCCESS
OF A DOCUMENT RETRIEVAL SYSTEM, WHETHER
DOCUMENTS ARE STORED IN MICROFILM OR IN

HARD COPY, IS THE EASE OF DOCUMENT
RETRIEVABILITY THROUGH THE INDEXING
SYSTEM. ANY STORAGE SYSTEM IS WORTHLESS
UNLESS DOCUMENTS CAN ALSO BE RETRIEVED
EASILY. WE BELIEVE THAT THE KEYWORDING
METHOD IS THE MOST FLEXIBLE INDEXING
METHOD FOR A DOCUMENT STORAGE SYSTEM
THAT MUST ENCOMPASS THE VARIETY OF
DOCUMENT TYPES THAT WE HANDLE. WITH
KEYWORDING, WE CAN STORE DOCUMENTS BY
SPECIFIC AND GENERAL SUBJECT MATTER,
USING KEYWORD PHRASES THAT CORRESPOND TO
THE WAY USERS TALK IN REAL LIFE ABOUT A
SPECIFIC PROJECT OR PROGRAM.

IN CLOSING, I ALSO LEAVE YOU WITH
THIS THOUGHT -- THAT THE SYSTEM I HAVE
DESCRIBED IS THE RESULT OF AN ENGINEER'S (31)
SEARCH FOR A UNIVERSAL DOCUMENT RETRIEVAL
SYSTEM. I WILL BE HAPPY TO ANSWER ANY
QUESTIONS YOU MIGHT HAVE ABOUT OUR
SYSTEM AND OUR PLANS, AND I THANK YOU
FOR ALLOWING ME THE PLEASURE OF SHARING
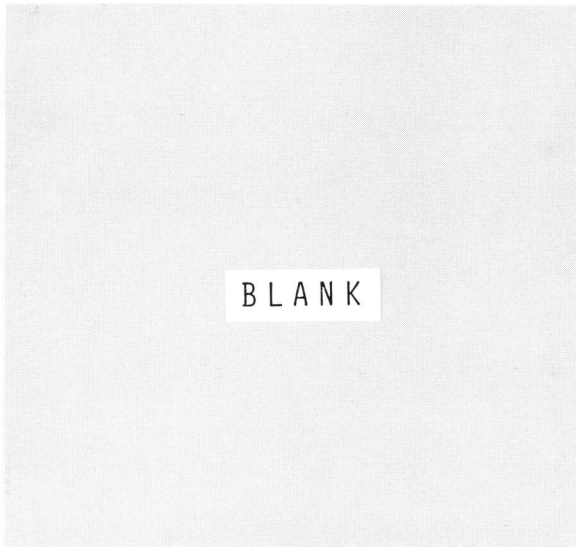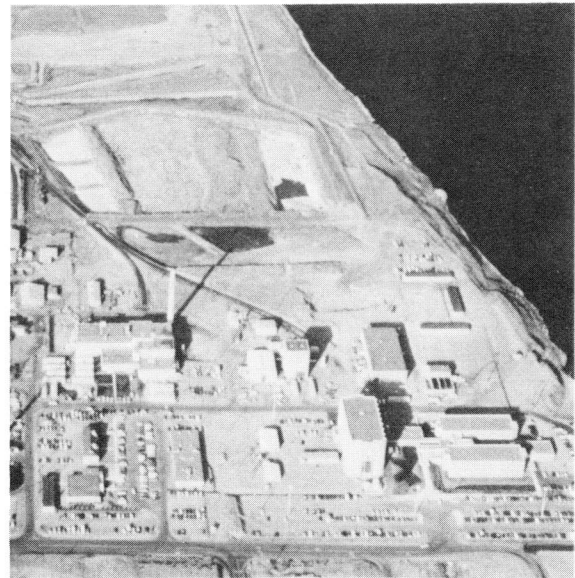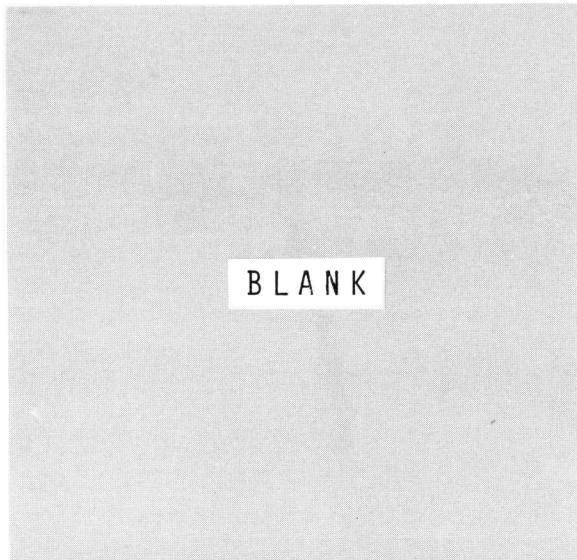THIS INFORMATION WITH YOU THIS AFTERNOON. (32)

31

Blank	Cartoon of Engineer's Search

32

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33   33 Start of GRP

LEFT   RIGHT

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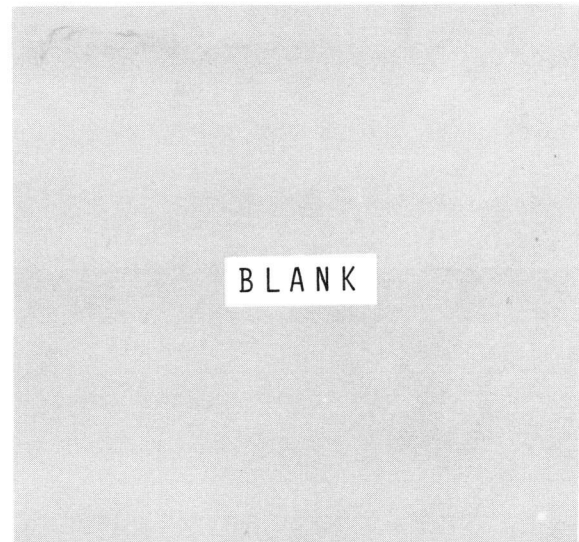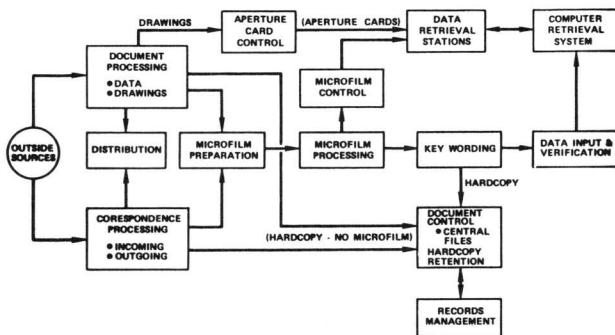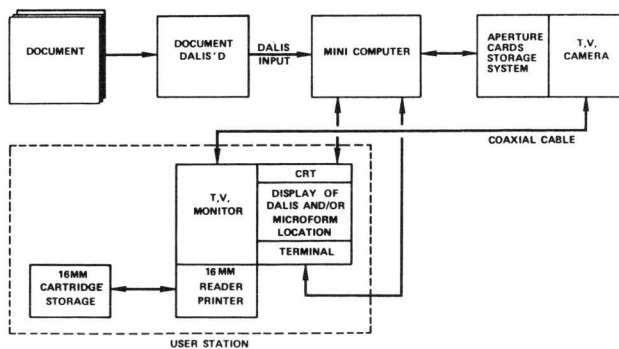
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HEDL DOCUMENTATION CONTROL DEPARTMENT
OVERALL WORK FLOW DIAGRAM

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6

DOCUMENTATION CONTROL AND RETRIEVAL SYSTEM

DOCUMENTATION
AND   DATA INPUT SHEET
LOCATION
IDENTIFICATION
SYSTEM

FILM IDENTIFICATION NUMBER

FIELD NO.	DESCRIPTOR	DATA
1	DOCUMENT NUMBER	
2	SHEET NUMBER	
3	REVISION	
4	DATE	
5	TITLE	
6	ORIGINATOR (CORP.)	
7	RECEIVER (CORP.)	
8	SYSTEM	
9	CROSS REFERENCE	
10	SPECIFICATION	
11	DOCUMENT TYPE	
12	LOCATION	
13	HARDWARE NUMBER	
14	ITEM SERIAL NUMBER	
15	BUILDING NUMBER	
16	AFFECTED DOCUMENTS	
17	REFERENCES	
18	HANFORD INDEX NUMBER	
19	VENDOR PART NUMBER	
20	VENDOR DRAWING NUMBER	
21	VENDOR DRAWING TITLE	
22	NEXT USED ON	
23		
24	KEY WORDS	

BD-7400-057 (5-76)   G.P.O. 1976: 697-600
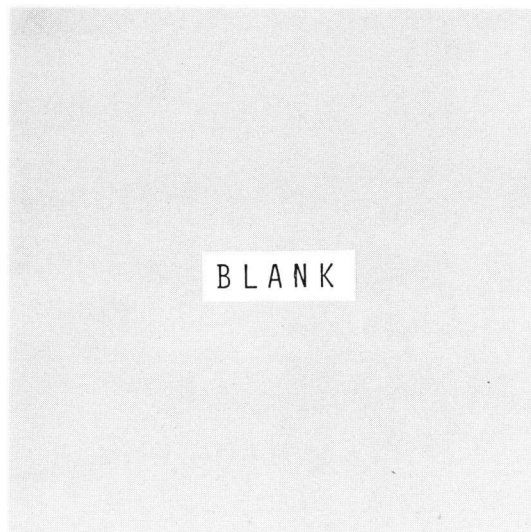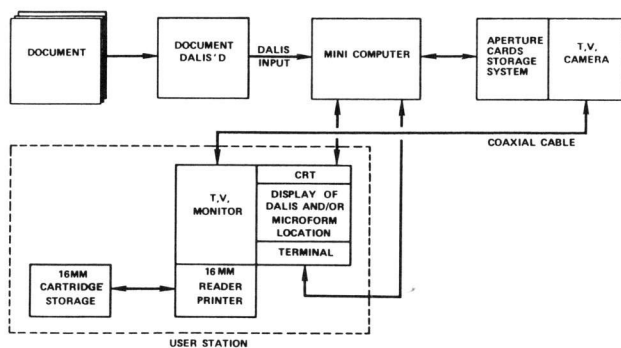
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DOCUMENTATION CONTROL AND RETRIEVAL SYSTEM

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FIND___   SEARCH___

FIND PROGRAM

1   (1) DOCUMENT # : TR976
2   (2) SHEET #
3   (3) REVISION
4   (4) DATE
5   (5) TITLE
6   (6) ORIGINATOR
7   (7) RECEIVER
8   (8) SYSTEM
9   (9) X REFERENCE
10 (10) SPEC.
11 (11) DOC TYPE
12 (12) LOCATION
13 (13) HARDWARE #
14 (17) REFERENCES
15 (24) KEYWORDS

(VALID COMMANDS ARE $N, $D, <NEWLINE>, .)
CORRECTIONS ($N, Q<NEWLINE>) :___

SEARCH

VERSION 11/3.0

S:

S: DOC NO - TR976

yellow

3

FIND PROGRAM

SEARCH

VERSION 11/3.0

1   (1) DOCUMENT # :___
2   (2) SHEET #
3   (3) REVISION
4   (4) DATE
5   (5) TITLE
6   (6) ORIGINATOR
7   (7) RECEIVER
8   (8) SYSTEM
9   (9) X REFERENCE
10 (10) SPEC.
11 (11) DOC TYPE
12 (12) LOCATION
13 (13) HARDWARE #
14 (17) REFERENCES
15 (24) KEYWORDS

S:

S:___

(VALID COMMANDS ARE $N, $D, <NEWLINE>, .)

SEARCH

VERSION 11/3.0

S:

S: FSAR

CRITERIA

FIND ALL DOCUMENTS KEYWORDED FSAR

SEARCH

VERSION 11/3.0

S:

S: FSAR

1810 HITS

CRITERIA

FIND ALL DOCUMENTS KEYWORDED FSAR

LEFT   RIGHT

         SEARCH   CRITERIA

VERSION 11/3.0   FIND ALL DOCUMENTS KEYWORDED FSAR <u>AND</u>

S: STRESS ANALYSIS

S: FSAR

    1810 HITS

S: AND STRESS ANALYSIS

         SEARCH   CRITERIA

VERSION 11/3.0   FIND ALL DOCUMENTS KEYWORDED FSAR <u>AND</u>

S: STRESS ANALYSIS

S: FSAR

    1810 HITS

S: AND STRESS ANALYSIS

    86 HITS

         SEARCH   CRITERIA

VERSION 11/3.0   FIND ALL DOCUMENTS KEYWORDED FSAR <u>AND</u>

S: STRESS ANALYSIS <u>AND</u>

S: FSAR   PIPING

    1810 HITS

S: AND STRESS ANALYSIS

    86 HITS

S: AND PIPING

LEFT   RIGHT

| | | 16 |

SEARCH   CRITERIA

VERSION 11/3.0   FIND ALL DOCUMENTS KEYWORDED FSAR AND

S: STRESS ANALYSIS AND

S: FSAR   PIPING

    1810 HITS

S: AND PIPING

    86 HITS

S: AND PIPING

    8 HITS

| | | 17 |

SEARCH   CRITERIA

VERSION 11/3.0   FIND ALL DOCUMENTS KEYWORDED FSAR AND

S: STRESS ANALYSIS AND

S: FSAR   PIPING AND

    1810 HITS   ORIG BY (BECHTEL POWER CORPORATION) BPC

S: AND STRESS ANALYSIS   *white*

    86 HITS   *(Blk)*

S: AND PIPING

    8 HITS

S: AND ORIG. - (BECHTEL POWER CORP) BCP   *BPC.*

yellow

| | | 18 |

SEARCH   CRITERIA

VERSION 11/3.0   FIND ALL DOCUMENTS KEYWORDED FSAR AND

S: STRESS ANALYSIS AND

S: FSAR   PIPING AND
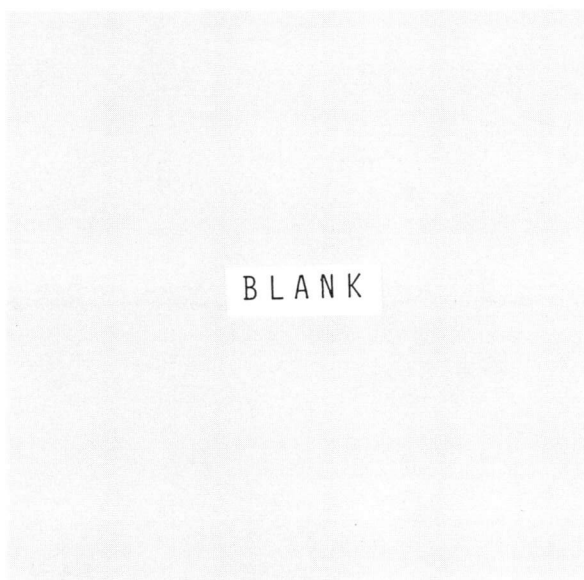
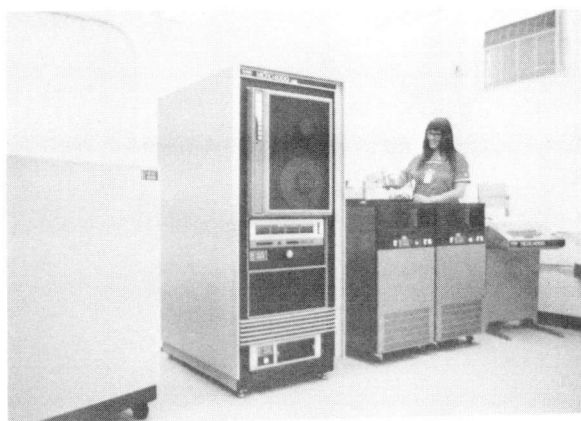   1810 HITS   ORIG BY (BECHTEL POWER CORPORATION) BPC

S: AND STRESS ANALYSIS

    86 HITS

S: AND PIPING

    8 HITS

S: AND ORIG. - (BECHTEL POWER CORP) BPC

    1 HIT

LEFT

WESTINGHOUSE DOCUMENT INFORMATION

FILM-REFERENCE NO. 050631341 HIT NO. 1

(1) DOC NO   BCL3529
(2) SHEET NO
(3) REV
(4) DATE   720211
(5) TITLE   FFTF STRESS ANALYSIS-PIPING NEW CRELAX PROGRAM
(6) ORIG   BPC
(7) RECVR
(8) SYSTEM   51
(9) X REF   FSAR 10.6R024
(10) SPEC
(11) DOC TYPE   REPORT
(12) LOC   050631341
(13) HDW
(14) I SER NO
(15) BLDG NO
(16) AF DOC
(17) REF
(18) H INDEX
(19) V PART NO
(20) V DWG NO
(21) V DWGT
(22) NEXT
(23) EXTRA
(24) KWDS   FFTF, FSAR, APPLIED TECHNOLOGY, COMPUTER CODES, CREEP
                  DAMAGE, PIPING SYSTEMS, PIPING, STRESS ANALYSIS, HTS.

TYPE 'NEW LINE' TO CONTINUE: ___

RIGHT

19

CRITERIA

FIND ALL DOCUMENTS KEYWORDED FSAR <u>AND</u>

STRESS ANALYSIS <u>AND</u>

PIPING <u>AND</u>

ORIG BY (BECHTEL POWER CORPORATION) BPC

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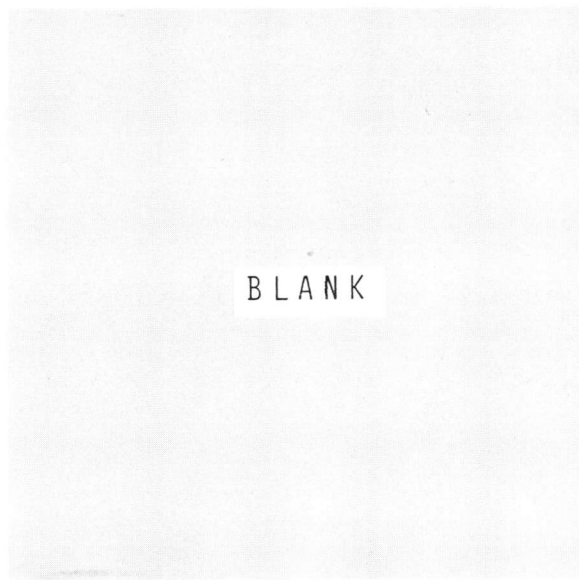**7 5 0 6 0 1**

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SEARCH

VERSION 11/3.0

S:

S: DATE/750601, 750630

670 HITS

7 5   0 6   0 1
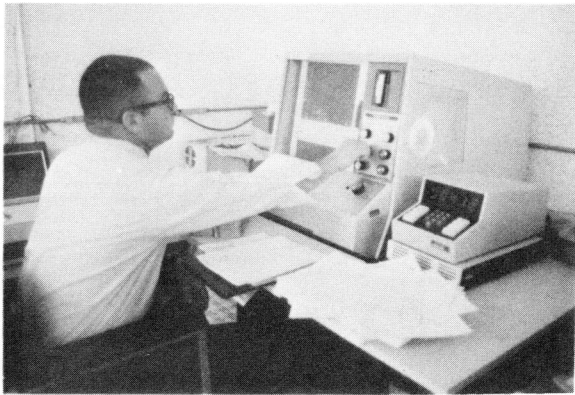
YY   MM   DD

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WESTINGHOUSE DOCUMENT INFORMATION

FILM-REFERENCE NO. 050631341 HIT NO. 1
(1) DOC NO   BCL3529
(2) SHEET NO
(3) REV
(4) DATE   720211
(5) TITLE   FFTF STRESS ANALYSIS-PIPING NEW CRELAX PROGRAM
(6) ORIG   BPC
(7) RECVR
(8) SYSTEM   51
(9) X REF   FSAR 10.6R024
(10) SPEC
(11) DOC TYPE   REPORT
(12) LOC   050631341
(13) HDW
(14) I SER NO
(15) BLDG NO
(16) AF DOC
(17) REF
(18) H INDEX
(19) V PART NO
(20) V DWG NO
(21) V DWGT
(22) NEXT
(23) EXTRA
(24) KWDS   FFTF, FSAR, APPLIED TECHNOLOGY, COMPUTER CODES, CREEP
                  DAMAGE, PIPING SYSTEMS, PIPING, STRESS ANALYSIS, HTS.

TYPE 'NEW LINE' TO CONTINUE: ___
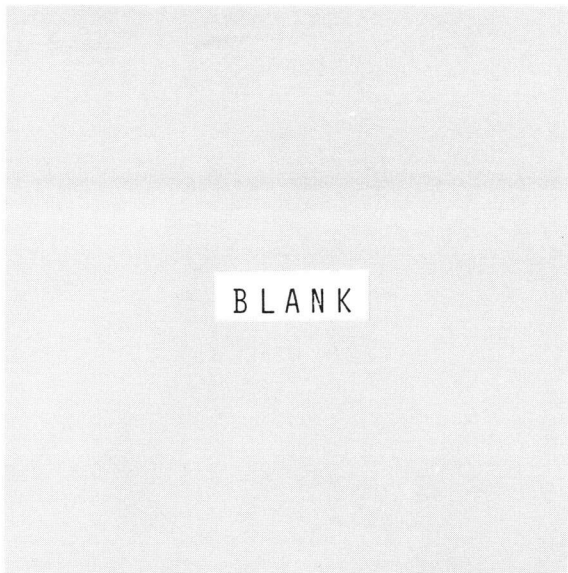
MICRO FILM

LOCATION NUMBER

25

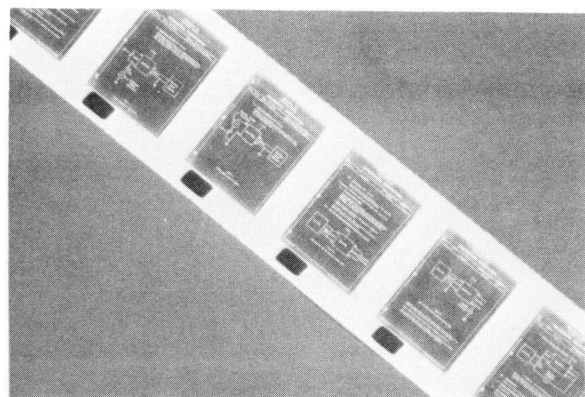**0 5 0 6 3 1 3 4 1**
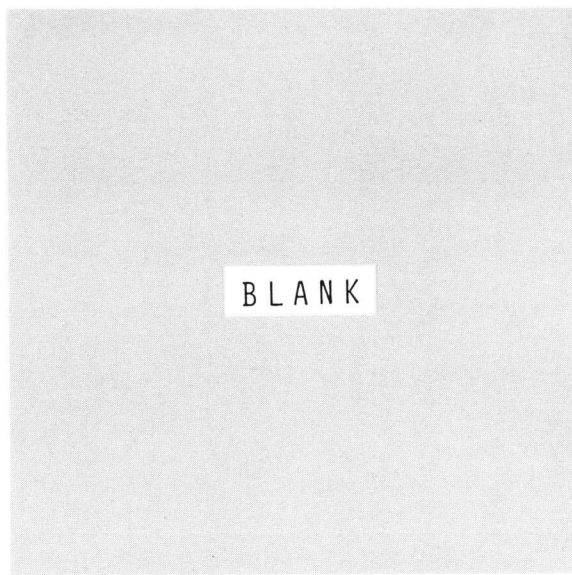
CARTRIDGE   FRAME
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