A4171 PDR-1 LPDR- Wm-10 (2) Wm-11 (2) Wm-16 (2)

UNITED STATES DEPARTMENT OF COMMERCE
National Bureau of Standards
Gaithersburg, Maryland 20899

May 15, 1987

WM DOCKET CONTROL CENTER

'87 MAY 27 A11:27

Mr. Everett A. Wick
Division of Waste Management
Office of Nuclear Materials Safety and Safeguards
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Re: Monthly Letter Status Report for April 1987 (FIN-A-4171-6)

Dear Mr. Wick:

Enclosed is the April 1987 monthly progress report for the project "Evaluation and Compilation of DOE Waste Package Test Data" (FIN-A-4171-6). The financial information is reported separately.

Sincerely,

Charles G. Interrante

Charles G. Interrante
Program Manager
Corrosion Group
Metallurgy Division

Enclosures

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WM Project 10,11,16
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87478806 WM Project: WM-10, 11, 16
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Monthly Letter Report for April 1987

Published May 1987

(FIN-A-4171-6)

Performing Organization: National Bureau of Standards (NBS)
Gaithersburg, MD 20899

Sponsor: Nuclear Regulatory Commission (NRC)
Office of Nuclear Materials Safety and Safeguards
Silver Spring, MD 20910

TASK 1 -- Review of Waste Package Database and High Level Waste Data Center

Software development for a menu-driven search system has been largely completed for the Database for Reviews and Evaluations on High-Level Waste. Menu screens are now available for use by the novice database user. Menus are screens designed and built into an automated system. They lead a user through a series of choices, a predetermined sequence of menus. When menus are provided within a system, the user is able to search for information more quickly and easily and little knowledge of the system is required; thus, the system is "user friendly". Documentation that explains the available options has been included within some of the menu screens. Examples of the menu screens that have been developed are appended as the last eight pages of this report (see "Database Screens"). These include two menus for choosing the format for output of search results. These appended software outputs are presented with this monthly report mainly to give NBS and NRC staff members an initial understanding of how easy they are to use. Documentation to more fully explain the use of the database will be developed. Further live demonstrations of the system are planned for the very near future.

A revision of the draft biannual report that was submitted to the NRC on February 28, 1987 is being reviewed by Washington Editorial Review Board (WERB), and their review should be completed within the time required to permit a final report to be issued by May 30, 1987.

Status of Reviews

Appended to this report are the following two Draft Reviews not previously submitted. Comments by NRC and its contractors are solicited.

1. HEDL-7546, "C-Ring Stress Corrosion Cracking Scoping Experiment for Zircaloy Spent Fuel Cladding," March 1986

2. "Aging of Cast Duplex Stainless Steels in LWR Systems", O. K. Chopra and H.M. Chung, Nuclear Engineering Design, 89, 305-318 (1985).

SRP -- Review is continuing on the following reports.

1. BMI/ONWI-592, "ERG Review of Salt Constitutive Law, Salt Stress Determinations and Salt Corrosion Modeling Studies," March 1986

2. BMI/ONWI-612, "The Effects of Stabilizers on the Heat Transfer Characteristics of a Nuclear Waste Canister," July 1986

3. BMI/ONWI-597, "Buckling Design Criteria for Waste Package Disposal Containers in Mined Salt Repositories," December 1986

4. DOE/CH-21, "Systems Engineering Management Plan for the Salt Repository Project," August 1986

5. UCRL-53726, "Reference Waste Package Environment Report," October 1986

6. "Radiation Damage Studies on Natural Rock Salt from Various Geological Localities of Interest to the Radioactive Waste Disposal Program," Nuclear Technology, 60, 231-243, February 1983

7. BMI/ONWI-626, "ERG Review of the SRP Salt Irradiation Effects Program," November 1986

SRP -- Review has been initiated on the following report.

1. BMI/ONWI-611, "ERG Review of Waste Package Container Materials Selection and Corrosion," July 1986

BWIP -- Review is continuing on the following reports.

1. RHO-BW-SA-391P, "Effect of Grande Ronde Basalt Groundwater Composition and Temperature on the Corrosion of Low-Carbon Steel in the Presence of Basalt-Packing," August 1985

2. RHO-BW-SA-316, "Irradiation-Corrosion Evaluation of Metals for Nuclear Waste Package Applications in Grande Ronde Basalt Groundwater," November 1983

3. SD-BWI-TS-008, "Slow-Strain-Rate Testing of 9% Cr, 1% Mo Wrought Steel and ASTM A27 Cast Steel in Hanford Grande Ronde Groundwater," October 1984

4. RHO-BW-SA-509P, "Thermal Analysis of Waste Package Preliminary Reliability Assessment," March 1986

5. B047154, "BWIP General Corrosion Studies, Summary Report of Activities in FY-1984,"

6. SD-BWI-TS-012, "Short-term Stress-Corrosion-Cracking Tests for A36 and A387-9 Steels in Simulated Hanford Groundwater," January 1985

7. SD-BWI-TI-165, "Technical Progress Report on BWIP Canister Materials Crack Growth Study for FY 1983," January 1984

8. RHO-BW-CR-148P, "REPREL Computer Code: User Guide," June 1985

9. RHO-BW-SA-560P, "Status of Environmentally Assisted Cracking Studies by the Basalt Waste Isolation Project," Symposium on Radioactive Waste Management '86, March 1986

BWIP -- Review has been initiated on the following report.

1. "Electromechanical Testing of AISI 1020 Steel in Hanford Grande Ronde Groundwater," S. G. Pitman, July 1983

NNWSI -- Review is continuing on the following reports.

1. UCRL-15723, "NNWSI Waste Form Test Method for Unsaturated Disposal Conditions," March 1985

2. UCRL-15825, "The Effect of Gamma Radiation on Groundwater Chemistry and Glass Leaching as Related to the NNWSI Repository Site," May 1986

3. ANL-85-41, "One-Year Results of the NNWSI Unsaturated Test Procedure: SRL 165 Glass Application," August 1984

4. UCRL-5317, "Radiation Chemical Effects in Experiments to Study the Reaction of Glass in an Environment of Gamma-Irradiation Groundwater and Tuff," May 1986

5. UCID-20847, "Feasibility Assessment of Copper-Base Waste Package Container Materials in Tuff Repository, September 1986

6. HEDL-7560, "Test Plan for Long-Term Low-Temperature Oxidation of Spent Fuel Series 1", June 1986

7. UCRL-53631, "Reaction of Topopah Spring Tuff with J-13 Water: A Geochemical Modeling Approach Using the EQ3/6 Reaction Path Code," November 1985

NNWSI -- Review has been initiated on the following reports.

1. UCRL-94708, "Carbon-14 in Waste Packages for Spent Fuel in a Tuff Repository," October 1986

2. UCRL-94633, "Experimental Study of the Dissolution Spent Fuel at 85°C in Natural Groundwater," December 1986

3. UCRL-95962, "Hydrogen Speciation in Hydrated Layers on Nuclear Waste Glass," January 1987

4. UCRL-94658, "Integrated Testing of the SRL-165 Glass Waste Form," December 1986

5. UCRL-91258, "Leaching Savannah River Plant Nuclear Waste Glass in a Saturated Tuff Environment," November 1984

6. DP-MS-85-141, "Leaching Fully Radioactive SRP Nuclear Waste Glass in Tuff Groundwater in Stainless Steel Vessels," May 1986

7. UCID-20895, "Application EQ3/6 to Modeling of Nuclear Waste Glass Behavior in a Tuff Repository," May 1986

GLASS -- Review is continuing on the following reports.

1. "Chemical Durability Studies on Glass Compositions Pertaining to Waste Immobilization at West Valley," A. Barkatt, et al., Waste Management 1986

2. "Long Term Leach Behavior of West Valley HLW Glasses," P.B. Macedo, et al., ANS Spectrum, 1986

3. "Leach Mechanisms of Borosilicate Glass Defense Waste Forms - Effects of Composition," A. Barkatt, et al., no date

4. "Chemical Determination of West Valley Waste Form Products," D. M. Oldman, J. R. Stimmel, and J.H. Marlow, no date

5. "Startup and Initial Experimental Results for the West Valley Vitrification Demonstration Project, Waste Management '86: Waste Isolation in the U.S. Technical Programs and Public Education Volume 2 High-Level Waste; Proceedings of the Symposium on Waste Management, Tucson, AZ, March 2-6, 1986

6. "Method for Showing Compliance with High-Level Waste Acceptance Specifications, Waste Management '86: Waste Isolation in the U.S. Technical Programs and Public Education Volume 2 High-Level Waste; Proceedings of the Symposium on Waste Management, Tucson, AZ, March 2-6, 1986

7. "Solubility Tests on Borosilicate Glasses for West Valley Waste Immobilization, High-Level and Transuranic Waste Management," X. Feng and A. Barkatt, ANS Transactions, 1986

8. PNL-4382, "Workshop on the Leaching Mechanisms of Nuclear Waste Forms," Summary Report, May 19-20, 1982

9. "Effects of Composition on the Leach Behavior of West Valley HLW Glasses," X. Feng, et al., no date

10. PNL-5157, "Final Report of the Defense High-Level Waste Leaching Mechanisms Program," August 1984

GLASS -- Review has been initiated on the following report.

1. WVDP-056, "Description of the West Valley Demonstration Project Reference High-Level Waste Form and Canister," July 1986

OTHER REPORTS/TECHNICAL PAPERS -- Review has been initiated on the following report judged to have related scientific value sufficient to warrant its review (as reference material)

1. "Aging Degradation of Cast Stainless Steel," O. K. Chopra and H. M. Chung, October 1986

TASK 2 -- Identification of Additional Data Required and Identification of Tests to Generate the Data

NBS lead workers are continuing their studies concerning the types of additional data and verification tests needed to demonstrate that the DOE waste package designs will meet the performance objectives of 10 CFR 60.

TASK 4 -- General Technical Assistance

Dr. Charles Interrante and Dr. Dale Hall attended a site visit at the Savannah River Plant, Aiken, South Carolina on April 22 and 23, 1987. They were accompanied by contractors Mr. Bruce Adams and Dr. John Wasylyk.

NBS held an orientation and faimilarization meeting for the NRC on May 1, 1987. At this meeting presentations were made by NBS personnel on (1) staffing of the HLW Program at NBS and (2) brief summarizes of the work for each of the DoE project offices (BWIP, NNWSI, and SRP), MCC activities, and Waste Form and Glass. A tour of selected Metallurgy Division Laboratories and Data Center Facilities was also conducted.

NBS REVIEW OF TECHNICAL REPORTS ON THE HIGH LEVEL WASTE PACKAGE FOR NUCLEAR WASTE STORAGE

DATA SOURCE

(a) Organization Producing Data: Westinghouse Hanford Company, P. O. Box 1970, Richland, Washington

(b) Author(s), Reference, Reference Availability: "C-Ring Stress Corrosion Cracking Scoping Experiment for Zircaloy Spent Fuel Cladding", H. D. Smith, March 1986, HEDL-7546, Prepared for the US DOE, Office of Civilian Radioactive Waste Management, Contract No. DE-AC06-76FF02170

DATE REVIEWED: 4/2/87

TYPE OF DATA: There is no data because this is a research plan.

MATERIALS/COMPONENTS: Zircaloy cladding from Turkey Point spent fuel, some specimens will have a thick oxide coating (10 μm) and other specimens will have a thin oxide coating (3 μm).

TEST CONDITIONS: This "C-Ring" test method is patterned after ASTM G 38, "Standard Recommended Practice for Making and Using C-Ring Stress-Corrosion Test Specimens". The environment is 120 psi, 170°C water in an autoclave; 90°C tuff equilibrated J-13 well water. The stress is applied by C-ring loading. The yield stress of the C-rings will be determined in air to establish load levels for the stress corrosion cracking (scc) tests.

METHODS OF DATA COLLECTION/ANALYSIS: Each experiment will be monitored using a linear variable displacement transducer (LVDT). A time vs. deflection record will be kept and from these data, a failure load stress level can be defined. The experiment will be terminated at a predetermined deflection which is characteristic of failure. Specimens will be examined in the scanning electron microscope to study the fracture surface, the outside surface near the scc crack, and the relationship between the surface oxide layer fracture and the fracture of the metal. Failure rate vs. load under given environmental conditions will be determined. The chemistry of the water will be monitored regularly and adjusted if needed. Quality assurance procedures will be followed.

AMOUNT OF DATA: There is no data. There are three figures describing the experiment: Figure 1. "C-Ring" Experiment Apparatus. Arms with weights in place lowered to "C-Ring" stressing position; Figure 2. Schematic Cross Section of the Water Tank of the "C-Ring" Stress Corrosion Cracking Scoping Experiment Apparatus with the Anvils in Position Stressing a "C-Ring" Specimen; and Figure 3. Cladding "C-Ring" Specimen. Figure 1A in the appendix shows plots of the variation of the "apparent mechanical advantage" (R) versus the distance from the design load line (x).

UNCERTAINTIES IN DATA

DEFICIENCIES/LIMITATIONS IN DATABASE

KEYWORDS: planned work, laboratory, Yucca Mountain, stress corrosion cracking (scc), corrosion, test, J-13 water, water, tuff, ambient temperature, high temperature, static (no flow), Zircaloy, mixed stress loading, spent fuel

RELATED HLW REPORTS

APPLICABILITY OF DATA TO LICENSING
[Ranking: key data ( ), supporting (X)]

(a) Relationship to Waste Package Performance Issues Already Identified

2.3.6 Potential damage and failure mechanisms for spent fuel cladding

(b) New Licensing Issues

(c) General Comments: This test is described for use in a scoping experiment, and it is a practical test for this purpose. The circumferential stress in the "C-Ring" specimen is not uniform. The stress will vary through the specimen thickness, around the circumference to the middle of the arc and across the width of the ring. The transverse stress also varies and is a maximum at mid-width of the specimen and zero at the edges. The applied stress in the "C-Ring" test can be measured accurately with deflection methods. Surface oxide thickness can influence scc susceptibility. Solution pH can influence scc by causing the surface oxide to be unstable. An attempt should be made, during the microscopic analyses, to determine whether the failure is due to scc or some other form of local corrosion, such as hydrogen embrittlement, corrosion fatigue, etc. The absence of scc susceptibility after running this test would not be conclusive. Other tests such as slow-strain-rate tests, low frequency corrosion-fatigue tests, and electrochemically controlled scc tests should be conducted to characterize the material in terms of resistance to scc.

NBS REVIEW OF TECHNICAL REPORTS ON THE HIGH LEVEL WASTE PACKAGE FOR NUCLEAR WASTE STORAGE

DATA SOURCE: Nuclear Engineering and Design, 89, 305-318, 1987, North-Holland, Amsterdam, Elsevier Science Publishers B.V.

(a) Organization Producing Data: Naterials Science and Technology Division, Argonne National Laboratory, Argonne, IL 60439, USA

(b) Author(s), Reference, Reference Availability: O. K. Chopra and H. M. Chung, "Aging of Cast Duplex Stainless Steels in LWR Systems"

DATE REVIEWED: 4/20/87

TYPE OF DATA: Experimental; microstructural characterization using transmission electron microscopy; diagrams to show effects of aging on impact energy (Charpy Impact tests); an aging parameter (p) is given, which represents the degree of aging reached after 10 hours at 400°C; Rockwell hardness values; ferrite content; grain structure description; electron diffraction to identify ferrite, Type M ($M_{23}C_6$-like) precipitates, Type P platlet precipitates, Type X precipitates on dislocations and Type ML precipitates associated with Type M precipitates and dislocations, and weak patterns from Type S precipitates.

MATERIALS/COMPONENTS: Cast stainless steels, CF-3, CF-8, CF-8M and a cast stainless steel cover plate from the recirculating pump of the KRB reactor

TEST CONDITIONS: Materials aged for up to 70,000 hours at temperatures of 300, 350 and 400°C; thin foils prepared for electron microscopy analysis

METHODS OF DATA COLLECTION/ANALYSIS: Transmission electron micrographs (TEM), selected area electron diffraction (SAD) patterns, scanning electron microscopy, Charpy-Impact-test measurements, Rockwell hardness measurements

AMOUNT OF DATA: There are seven figures and three tables. The first two figures show the effect of thermal aging on the impact energy of the pump cover material (30% ferrite), CF-8 (15% ferrite) and CF-8M (22% ferrite) stainless steels by plotting the impact energy versus the parameter (p). The impact energy is reduced at p values of 2, 3, and 4, respectively, for these materials. Figure 3 shows effects of thermal aging on the transition curves for impact energy of cast CF-8 stainless steel. Figure 4 shows TEMs and SAD patterns of cast CF-8 stainless steel after aging at 300°C for 70,000 hours. Figure 5 shows TEMs and an SAD pattern for cast CF-8 after aging at 400°C for 66,650 hours. Figure 6 shows TEMs and an SAD pattern for CF-8 after aging at 300°C. Figures 7 and 8 are SEM micrographs of fracture surfaces after impact fracture of CF-8 aged at 300°C for 70,000 hours. Table 1 gives the chemical composition, hardness and ferrite content of the various heats of cast stainless steels, Table 2 gives the ferrite content and grain structure of various cast stainless steel pipes, and Table 3 is a summary of types of precipitates observed in ferritic alloys and cast duplex stainless steel after long term aging at 300-475°C.

UNCERTAINITIES IN DATA: At 300°C aging for only 8 years, the toughness of the material will be determined either by the austenitic phase or by interactions between the austenitic and ferritic phases.

DEFICIENCIES/LIMITATIONS IN DATABASE: The authors state that an understanding of the aging process is needed. "The mechanism of embrittlement needs to be established to verify that the activa- tion energy obtained from laboratory tests is representative of the actual process."

KEYWORDS: Microscopy, transmission electron microscopy, scanning electron microscopy, hardness, aged, fracture, Charpy impact test

RELATED HLW REPORTS

APPLICABILITY OF DATA TO LICENSING
[Ranking: key data( ), supporting( ), other scientific papers(X)]

(a) Relationship to Waste Package Performance Issues Already Identified

This work is related to issue 2.2.3 regarding possible failure modes of the waste package container.

(b) New Licensing Issues

(c) General Comments: This paper will serve as a data reference for studying microstructures and properties of various types of steels. The paper reports on a study to investigate the embrittlement of cast duplex stainless steels in light water reactors (LWR) and correlates microstructural characterization and fractographic analysis with aging temperatures and times and Charpy impact test data. In general, thermal aging of duplex stainless steels at 300°C to 450°C causes an increase in hardness and tensile strength and a decrease in ductility. The ferrite content is important since this is the phase which becomes embrittled during aging. Four different precipitates are identified. Two types of these precipitates, Types M and X, pin dislocations in the ferritic phase and are responsible for the embrittlement of the ferritic phase. The authors state that since the ferrite phase becomes embrittled after aging at 300°C for 8 yrs., the toughness of the cast stainless steel after longer term aging is determined by the austenite phase or interactions between the austenitic and ferritic phases. Some of data in this paper imply but do not clearly establish that certain actions (ex. dislocation pinning to cause embrittlement) are occurring. More work of this type is needed on these alloys and on controlled steel compositions before definitive statements can be made regarding long term aging effects on these stainless steels.

DATABASE SCREENS

```
Single user REVELATION..


10:46:53   13 MAY 1987
Your account please:SYSPROG


***                 WELCOME TO REVELATION                    ***
***                     By Cosmos, Inc                       ***
***                  10:46:59  13 MAY 1987                   ***
***   Copyright 1985 Cosmos, Inc.  All rights reserved.  ***


 Attaching files for account "SYSPROG".

 The following options are now always implied: (E)

:HELP.MENUS
```

The database management system (DBMS) used for the High Level Waste Database is Revelation® (trade name). To enter the system it asks for an account: "SYSPROG" is the user's response. The user can access the contents of the database by either of two methods.

1. RLIST commands, which can be written according to rules of the DBMS (Revelation). These can be given whenever the colon prompt appears on the screen. When you see the colon the Relevation is operating at the terminal control level (TCL).

2. Help menus, which can be used to narrow the data into subsets by searching, list (on the screen or print to a printer) the results of a search and sort any subset.

   Successive subsets can be created by multiple passes through the four screens to follow: Verb menu, major categories, keywords. While not necessary, it would help to have a copy of the "Keyword Tree" available. One is not included in this monthly letter report.

VERB MENU

0. END - Terminate or exit menu system and return to TCL. You will still be in Revelation. To exit Revelation follow this command by the command in capital letters: OFF (carriage return)

1. SELECT - Create a subset of the entire database.

2. LIST - Displays "SELECT" items.

3. CLEAR - Start a new search.

MAKE ONE SELECTION: 1

To find information in a database, each (successive) search is initiated with this Verb menu, using commands referred to in revelation as Verbs.

MAJOR CATAGORIES

1. TECHNICAL DESCRIPTION OF REPORT
2. ENVIRONMENTAL FACTORS
3. MATERIALS TESTED
4. PROPERTIES AND FAILURE MODES STUDIED

MAKE ONE SELECTION: 3

The Keyword Tree has major categories and subcategories, which are user selected during each pass or successive search. These choices bring the user to one particular branch of the tree and that branch contains one set of keywords.

SUBCATAGORIES

1. General material type
2. Specific material designation
3. Condition prior to test
4. Test specimen specification
5. Radioactive waste form
6. Radionuclides
7. Kind of water present
8. Electrolytes present
9. Environment solids

MAKE ONE SELECTION: 2

KEYWORDS

1. 308L weld filler wire
2. 317L stainless steel
3. 1025 carbon steel
4. high-nickel alloy 825
5. UO\/2/\
6. zircaloy-2
7. 321 stainless steel
8. 347 stainless steel
9. high-nichel alloy 825
10. zircaloy-4
11. 308L stainless steel
12. 316L stainless steel
13. 316ELC stainless steel
14. 316NG stainless steel
15. CF-3
16. XM-19
17. 1020 carbon steel
18. 304 stainless steel
19. 304L stainless steel

SEPARATE EACH SELECTION BY A COMMA. (EXAMPLE: 1,2,3)
SELECTIONS: 19

5 Record(s) Selected.

PRESS <ENTER> TO CONTINUE

One or more words are chosen from the list (of 19 in this example). The system responds with the number of records in the subset selected. By again using the verb menu, this subset can be either displayed (see the menus on the following two pages) or it can be searched again by, restarting at the verb menu which appears after this menu.

TEXT DISPLAY
(What part of HLW document do you want to display?)

1. NRC.ABS - This file contains the abstract in the high level waste (HLW) document.

2. NRC.FIG - This file contains the heading for figures, tables, appendices, and illustrations found in the HLW document.

3. NRC.KEY - These are the key fields and words for the HLW document.

4. NRC.REF - Contains all known bibliographical information on the HLW document.

5. NRC.REV - This is the review document produced by the reviewer for the HLW document.

6. RETURN - Return to VERB MENU.

MAKE ONE SELECTION: 5

If option number two (list) in the verb menu is chosen, this menu is displayed. This menu enables the user to choose the section of the HLW document that he wants to display for the entire set of documents found in the preceding search. For example, the complete review may be viewed by selecting option 5. After the selection is complete, the next menu appears, which for option 5 is MENU FOR SORTING FIELDS. As will become apparent, a total of three menus will be used to govern the nature of the displayed output.

MENU FOR SORTING FIELDS

(This governs the sequences in which the output is sent to the display device.)

1. AMOUNT.OF.DATA	6. GENERAL.COMMENTS	11. RANKING
2. CIT.NO	7. KEYWORDS	12. RELATED.REPORTS
3. DATA.SOURCE	8. LICENSING	13. TEST.CONDITIONS
4. DATE.REVIEWED	9. MATERIALS	14. TYPE.OF.DATA
5. DEFICIENCIES	10. METHOD.OF.DATA	15. UNCERTAINTIES

SEPARATE EACH SELECTION BY A COMMA. (EXAMPLE: 1,2,3)
SELECTIONS: 2

A completed review of an HLW document is stored in the above 15 fields. With this menu, the user chooses the sequence of presentation of the reviews selected from the previous search. For example, every report contains a unique citation number (CIT.NO). The display can be listed by citation number by selecting option number 2 in the above menu. Then, the first display will be the report with the lowest citation number, etc. until the report with the highest citation number is displayed.

TEXT FORMAT MENU
(How do you want your selections displayed?)

1. FTF - (Formatted Text Fields) Each field is on a seperate line. Each record is seperated by a blank line.

2. PACK - Similar to PACKIT, except when a record is displayed the field name is highlighted making it easier to read the information.

3. PACKIT - Condenses the information for each record and displays as many records as possible.

4. SUPER - Similiar to FTF, except superscripts and subscripts are located above and below the text line. This makes equations and formulas easier to read.
EXAMPLE (using a formula): H O
2

5. SUPERLIST - Similiar to SUPER, except each record is printed on a seperate page.

MAKE ONE SELECTION: 5

The above help screen enables the user to select among five text formats currently available for output to screen or printer. After this selection is made another menu (not shown in this report) permits the user to select whether the output is to be sent to the printer or to the screen. After that menu is executed, the output is sent to the specified device, and then the Text Display Menu again appears on the screen. From there, the display process can be repeated with different choices or the user may choose to return to the verb menu to conduct another search.