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PR-EDB: Power Reactor Embrittlement Data Base, Version 1

Program Description

Prepared by F. W. Stallmann, F. B. K. Kam, B. J. Taylor

Oak Ridge National Laboratory

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Prepared by
F. W. Stallmann, F. B. K. Kam, B. J. Taylor

Oak Ridge National Laboratory
Operated by Martin Marietta Energy Systems, Inc.

Oak Ridge National Laboratory
Oak Ridge, TN 37831

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ABSTRACT

Data concerning radiation embrittlement of pressure vessel steels in commercial power reactors have been collected from available surveillance reports. The purpose of this NRC-sponsored program is to provide the technical bases for voluntary consensus standards, regulatory guides, standard review plans, and codes. The data can also be used for the exploration and verification of embrittlement prediction models. The data files are given in dBASE III Plus format and can be accessed with any personal computer using the DOS operating system. Menu-driven software is provided for easy access to the data including curve fitting and plotting facilities. This software has drastically reduced the time and effort for data processing and evaluation compared to previous data bases.

The current compilation of the Power Reactor Embrittlement Data Base (PR-EDB, version 1) contains results from surveillance capsule reports of 78 reactors with 381 data points from 110 different irradiated base materials (plates and forgings) and 161 data points from 79 different welds. Results from heat-affected-zone materials are also listed. Electric Power Research Institute (EPRI), reactor vendors, and utilities are in the process of providing back-up quality assurance checks of the PR-EDB and will be supplementing the data base with additional data and documentation.

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PREFACE

This current compilation of the Power Reactor Embrittlement Data Base (PR-EDB, version 1) will be updated periodically and released to authorized users.

ACKNOWLEDGMENTS

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1. INTRODUCTION

Regulatory and research evaluations of embrittlement prediction models and of vessel integrity under load can be greatly expedited by the use of a well-designed, computerized embrittlement data base. The Power Reactor Embrittlement Data Base (PR-EDB) is a comprehensive collection of data from surveillance reports and other published reports of commercial nuclear reactors. The uses of the data base require that as many different data as available are collected from as many sources as possible with complete references and that subsets of relevant data can be easily retrieved and processed.

The objectives of this NRC-sponsored program are as follows:

1. to compile and to verify the quality of the PR-EDB;

2. to provide user-friendly software to access and process the data;

3. to explore or confirm embrittlement prediction models; and

4. to interact with standards organizations to provide the technical bases for voluntary consensus standards that can be used in regulatory guides, standard review plans, and codes.

To achieve these goals, the data base architecture was designed after much discussion and planning with prospective users. The PR-EDB is designed for use with any personal computer using any DOS system above Version 2.0. Updates will be issued periodically to authorized users. The data files in the PR-EDB are in dBASE format and can be accessed with any version of dBASE or compatible software, such as Clipper. A customized software package (EDB-Utilities), which handles most routine tasks, has been distributed with the data base and will be periodically updated. This report assumes that the reader has some familiarity with the use of personal computers, preferably with DOS and dBASE (III or IV).

The current compilation of the PR-EDB (Version 1) contains results from surveillance capsule reports of 78 reactors with 381 data points for 110 different irradiated base materials (plates and forgings) and 161 data points for 79 different welds. Results from heat-affected-zone materials are also listed. The menu-driven software, EDB-Utilities, facilitates maintenance, processing, and evaluations of the data. The time and effort required to process and evaluate different types of data in the PR-EDB have been drastically reduced from previous data bases.

Electric Power Research Institute (EPRI), reactor vendors, and utilities are in the process of providing back-up quality assurance checks of PR-EDB and will be supplementing the data base with additional data and documentation. Also EPRI, the Boiling Water Reactor Owner's Group (BWR-OG) Supplemental Material Surveillance Committee, and General Electric have agreed to release boiling-water-reactor data for insertion into the PR-EDB. This effort and coordination with the NRC research staff, EPRI, and industry have led to the adoption of PR-EDB as the basis for an industry-wide data base by the EPRI Reactor Vessel Embrittlement Management Project.

2. ARCHITECTURE

2.1 INTRODUCTION

The information in most data bases is contained in one or more "data files," with the data arranged in each file in the form of a table. Each row of such a table is called a "record," and each unit of information is stored in its assigned "data field" that corresponds to a particular column in the table. Older data bases, such as the ones published by MPC, consist of just one table, which means that all different data fields are contained in each record. In creating such a table, a decision must be made which types of data fields are to be included before data collection starts, and the data base must be redesigned whenever new types of data are added. Since every record contains all possible data fields, there are many duplications and a large number of empty fields. It is also fairly difficult to accommodate in such a table, multiple determinations of the same quantity such as chemistry and to provide complete references if the data in the same record come from different sources.

To avoid the problems of a single table data base, the PR-EDB is designed as a collection of many different data files, each of which closely resembles the data tables found in the original surveillance reports. For instance, most reports have tables containing transition temperatures and upper shelf energies for Charpy specimen before and after irradiation and/or the shift in these values during irradiation, and these data are collected in the file "SHF1_PR". Data are collected as reported (i.e., there are fields for unirradiated, irradiated, and shift values, depending on what is reported; fields are added for units because some reports use U.S. units, others, the new international units, and still others, the older European engineering units (see Table 1). Similarly, information about tensile tests is collected in the file TEN_PR, information about the irradiation, such as capsule fluence and temperature, in the file REAC_PR, and so on. A complete list of the data files in the PR-EDB is given in Sect. 2.4. This approach has many significant advantages:

1. The structure of the data files need not be predetermined; the data files are designed according to what is available in the original reports, and new data files can be added without disturbing the existing ones.

2. Because every record in a data file originates from a single report and, in most cases, from a single table in this report, a unique reference, including page number(s), can be given for each record.

3. Multiple determinations of the same quantity are given in different records, each with its proper references. Such multiple determinations occur, for instance, if the chemistry is determined by the manufacturer of the material as well as from broken specimens. Also, fluence determinations are frequently updated in subsequent reports using improved neutron physics calculations. All different determinations are kept in the PR-EDB, and it is up to the user to decide which determination to use for a particular application or, perhaps, calculate averages from several of them.

Table 1. Units used in PR-EDB files

Description	Symbol used in PR-EDB	Type of unit	Conversion factors to U.S. unit		to Int'l unit	
Mil	MIL	Length	0.001	inch	0.00254	cm
mm	MM	Length	0.03937	inch	0.1	cm
cm	CM	Length	0.3937	inch	1.0	cm
Inch	IN.	Length	1.0	inch	2.54	cm
Fahrenheit	F	Temperature	F		(F-32)/1.8 = C	
Centigrade	C	Temperature	1.8 C + 32 = F		C	
Foot-pounds	FT-LB	Energy	1.0	ft-lb	1.3558	joules
Joules	J	Energy	0.7376	ft-lb	1.0	joules
Kilogram-meters	KGM	Energy	7.2330	ft-lb	9.8066	joules
mkp*	MKP	Energy	7.2330	ft-lb	9.8066	joules
mkp.cm^2**	MK/C2	Energy	5.78	ft-lb	7.92	joules
Kilogram/mm^2	K/MM	Stress	1.4223	ksi	9.8066	MPa***
Kip/inch^2	KSI	Stress	1.0	ksi	6.895	MPa***
Pound/inch^2	PSI	Stress	0.001	ksi	6.895	kPa***
Mega pascal	MPA	Stress	0.145	ksi	1.0	MPa***

*Same as kilogram-meters.

**Energy relative to the cross section of the Charpy minus notch ≈0.8 cm^2 (reported for the Beznau reactors).

***kPA = kilo pascal = 10^3 pascal, MPa = mega pascal = 10^6 pascal.

Because the data in the PR-EDB are distributed over many different files, means must be provided for combining data from several files. This is done with the techniques of "relational data bases," specifically dBASE by Ashton Tate. The format for data and auxiliary files and the techniques introduced by dBASE are now widely used in data base applications. The choice of the dBASE format for the PR-EDB allows the use of any version of the dBASE software as well as any of the other software packages which use the dBASE format, such as Clipper. The linkage between different data files in a relational data base is provided by "key identifiers" which are common to these files. For instance, all files with data concerning a specific material such as results of material property tests, material manufacture, heat treatment, and chemistry contain a field for the material identifier HEAT_ID. Similarly, files with data concerning irradiations contain fields for the identifiers of the reactor, PLANT_ID, and the surveillance capsule, CAPSULE. A detailed description of the key identifiers is given in Sect. 2.2. Extreme care must be exercised to assign the correct identifier to each record since otherwise connection between data from different records cannot be made or are made incorrectly. To assure correct identifications, numerous cross checks are made which have the additional advantage that many mistakes are caught in this manner that have eluded conventional proofreading.

The best designed data base is useless without convenient software to extract data for any given application. The dBASE-compatible software provides the necessary tools but requires some expertise from the user for successful application. For this reason, EDB-Utilities has been written to perform many processing steps such as retrieval and selection of data, calculations, and display to the screen or printer. (Output to a plotter is being considered for later release.) This software is menu-driven so that it can be used without extensive training. A description of the EDB-Utilities is given in Appendix A.

An overview of the data flow in the PR-EDB is given in Fig. 1. The source data are first transcribed to "Raw Data Files" in dBASE format as faithfully as possible with complete references. Data entry is currently done through the keyboard. Direct transfer will be used whenever computer-readable documents are available. Any deviation from the norm, which was either reported or noted during transcription (such as the correction of obvious typographical errors) is indicated in the NOTES field. Data from every available report are included, except when the information in a later report is simply a duplication of earlier data without any changes. The dBASE format distinguishes between "character," "numerical," and "date" fields, but all data in the PR-EDB are entered as characters. This somewhat complicates the numerical manipulation of data that have to be converted to numerical form first, but gives much greater freedom to data entry. Information such as <0.001 for an upper bound or RT for room temperature can be copied from the original report without change. Missing information is always indicated by a blank in the data field, which is not

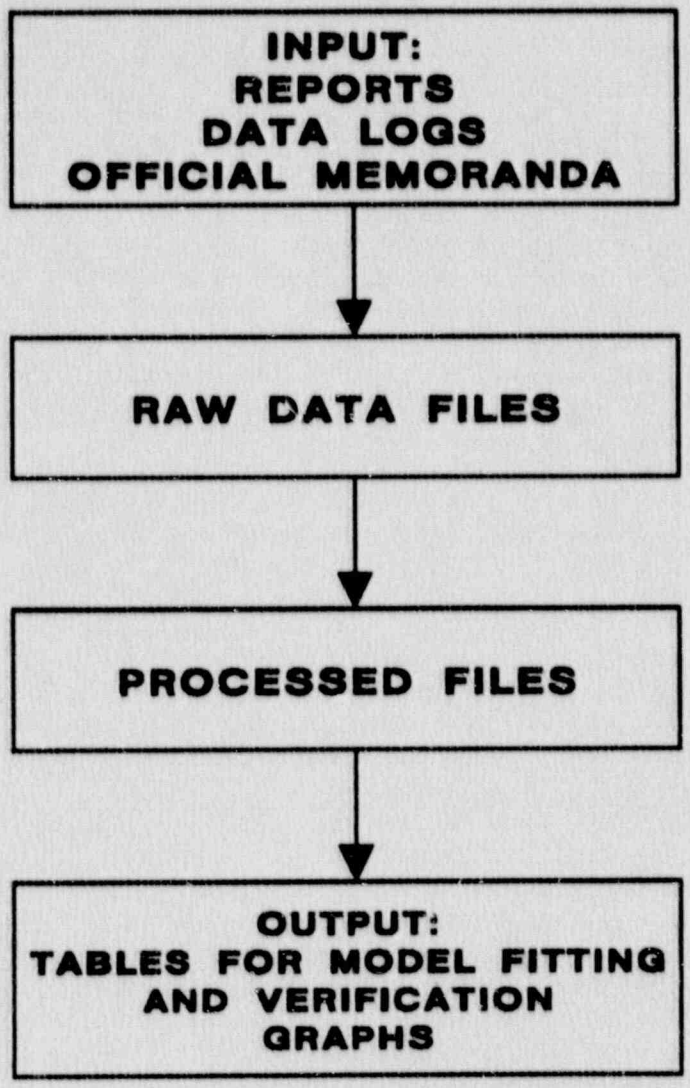

Fig. 1. Data flow in the PR-EDB.

possible in numerical or date formats. The Raw Data Files are next converted to processed files by the EDB-Utilities or other user-supplied software. Processed files will typically be in dBASE format, but ASCII-coded files can also be obtained from dBASE-compatible software for input into scientific software (e.g., numerical analysis programs written in FORTRAN), word processors, and spreadsheets. With the additional software, tables and graphs can be created for the purpose of model fitting, model verification, and other applications.

2.2 KEY IDENTIFIERS

One or more fields in each data file are occupied by "key identifiers," which provide the means for combining data from several files through "relations" that link the corresponding records in these files. These fields differ from other data fields in that the key identifiers are assigned by the manager of the data base in a manner that the same unique identifiers are used to label the data among the various data files that refer to the same experiments, materials, or source documents. The identifiers used in the reports do not always provide such unambiguous labelling. The following key identifiers are used in the current version of the PR-EDB:

1. **PLANT_ID**

   Up to six characters are used to identify the reactor in which the irradiation was performed. Only up to three characters are used at present for the identification of commercial power reactors. A list of these identifiers with full name and other information about the reactor is given in the file REAC_LST.dbf (p. 20). The reactor code in PLANT_ID is also used to identify the surveillance program as a source of data, even if these data do not refer specifically to irradiation (as in files about chemistry or heat treatment; for details see Sect. 2.4).

2. **CAPSULE**

   Up to six characters are used to identify the surveillance capsule. These are mostly identical to the identifications used in the surveillance program. Sometimes specimens are lumped together which come from different capsules with similar fluences, and in these cases special identifiers for data sets from combined capsules are assigned.

3. **HEAT_ID**

   The material identifier can have up to ten characters. A simple scheme was devised which works as follows: The coding used for the PR-EDB assigns the first letter to the material type, namely P_late, F_orging, W_eldment, H_eat-affected-zone material, or S_tandard reference material. The next 3 + 2 letters contain the reactor identifier (first three letters of PLANT_ID) plus some identification number, if more than one material is used in the same reactor (e.g., 01, 02, etc; if practical, some correspondence between the EDB and report identifications is retained, e.g., PCC101, PCC102, and PCC103 stand for D7206-1, D7206-2, and D7206-3, respectively). For standard reference materials that are not restricted to a particular reactor, other identification letters

are used, namely, SASTM for the A302B ASTM reference plate and SHSS02 for the HSST plate 02. The last four letters are reserved to distinguish between different parts of the same material (e.g., between surface and 1/2T, or between several sections of a plate) if different parts show markedly different material properties as documented in the reports. For instance, SASTM_S1 and SASTM_S2, denote pieces of the 6-in. ASTM A302B reference plate used in the Garigliano and Yankee Rowe reactors, respectively, whose baseline properties vary considerably from the same material used in Westinghouse reactors, which is denoted simply by SASTM. The file HEAT_LST.dbf (see p. 25) gives a complete list of identifiers used in HEAT_ID together with the corresponding identifiers in the surveillance reports.

It was first considered to use the identifiers given in the reports for HEAT_ID, a practice used in the MPC Data base. This, however, has proven to be impractical. Base material (plates or forgings) is usually characterized by the heat number (assigned to the ingot) or a manufacturer's number (assigned to the plate or forging after fabrication; see, for instance, BAW-1820) and one or the other, or neither, is used in reports, frequently with different choices of identification in different reports. For welds, a weld code such as SA-1585 or WF-232 is sometimes used, but the same code may be applied to different welds of the same type (BAW-1820). Alternatively, the wire heat number has been used for identification or just the heat numbers of the two plates joined by the weld. A distinct identification is rarely given for the heat-affected-zone material.

4. SPEC_ORI

Different orientations of the material test specimens may lead to substantially different property test results, thus this identifier is needed to correctly link the properties of irradiated specimens to the corresponding baseline values.

Orientations are assigned in the now customary T-L-S system as described in ASTM Standard E399*, with L the primary rolling or forging direction, or, for welds and HAZ, the direction of the weld seam; T is perpendicular to L and parallel to the plate surface, and S is perpendicular to the plate surface. The first letter describes the longitudinal direction of the specimen (perpendicular to the crack surface, if any), and the second letter describes the direction of the crack propagation (perpendicular to the notch). The orientation for each specimen set was determined as well as possible, preferably from

*Standard E399 applies formally only to CT specimens, but the extension to other types of specimens is straightforward (also see BAW-1820).

drawings, making sure that the same orientations are assigned to corresponding specimen sets. SPEC_ORI is left blank if no information is available.

5. REF_ID

In most files, each record is assigned a reference which indicates the source of the data. This is done by means of a 20-character field REF_ID. This identifier is usually a report number or a similar code which links it uniquely to the complete bibliographic information, i.e., author, title, and time of publication, which is given in the file REF_TITL.dbf (p. 43).

2.3 ORGANIZATION OF THE PR-EDB RAW DATA FILES

The current version of the PR-EDB is organized in the manner shown in Fig. 2. At the center is the file SPEC_LST.dbf (Table 2) containing a complete list of test specimen sets which are used in surveillance programs of commercial power reactors. Specimen sets are characterized by type and size of the specimen, given in SPEC_TYPE and SPEC_SIZE, and the four key identifiers PLANT_ID, CAPSULE, HEAT_ID, and SPEC_ORI, which link the sets to the other data files. Specimen sets for testing of the baseline properties of unirradiated materials are characterized by leaving the CAPSULE field blank. The data which are relevant for radiation embrittlement are distributed over three sets of data files. The first set, on the left of Fig. 2, consists of results of material property tests. Charpy, both individual tests and results of curve fittings, and tensile data are currently available (SHFT_PR.dbf, RAW_C_PR.dbf, and CV_RF_PR.dbf, for Charpy data and TEN_PR.dbf for tensile, Tables 4 through 11). Other test results, such as CT, WOL, hardness, and drop weight will be included later. The second set, at the bottom of Fig. 2, contains data describing the reactor and radiation environment for each surveillance capsule. Currently available is the file REAC_PR.dbf containing the fluence, irradiation temperature and irradiation time and the file REAC_LST.dbf, which is a list of power reactors as mentioned above. Under consideration is the addition of more detailed files containing the irradiation history, the group fluence spectra, and dosimetry to allow for fluence determination by independent investigators. Finally, the set on the right of Fig. 2 contains the information about the chemistry and fabrication of the materials used in the surveillance programs (HEAT_LST.dbf, CHEM_PR.dbf, HEAT_PR.dbf, WELD_PR.dbf, and HAZ_PR.dbf, discussed in pages 16-21).

The PR-EDB files with the suffix _LST are somewhat different from the other data files in that they provide a sort of directory of the other files and their relations to the key identifiers. SPEC_LST.dbf is a directory of surveillance capsules and baseline specimen sets. REAC_LST.dbf is a

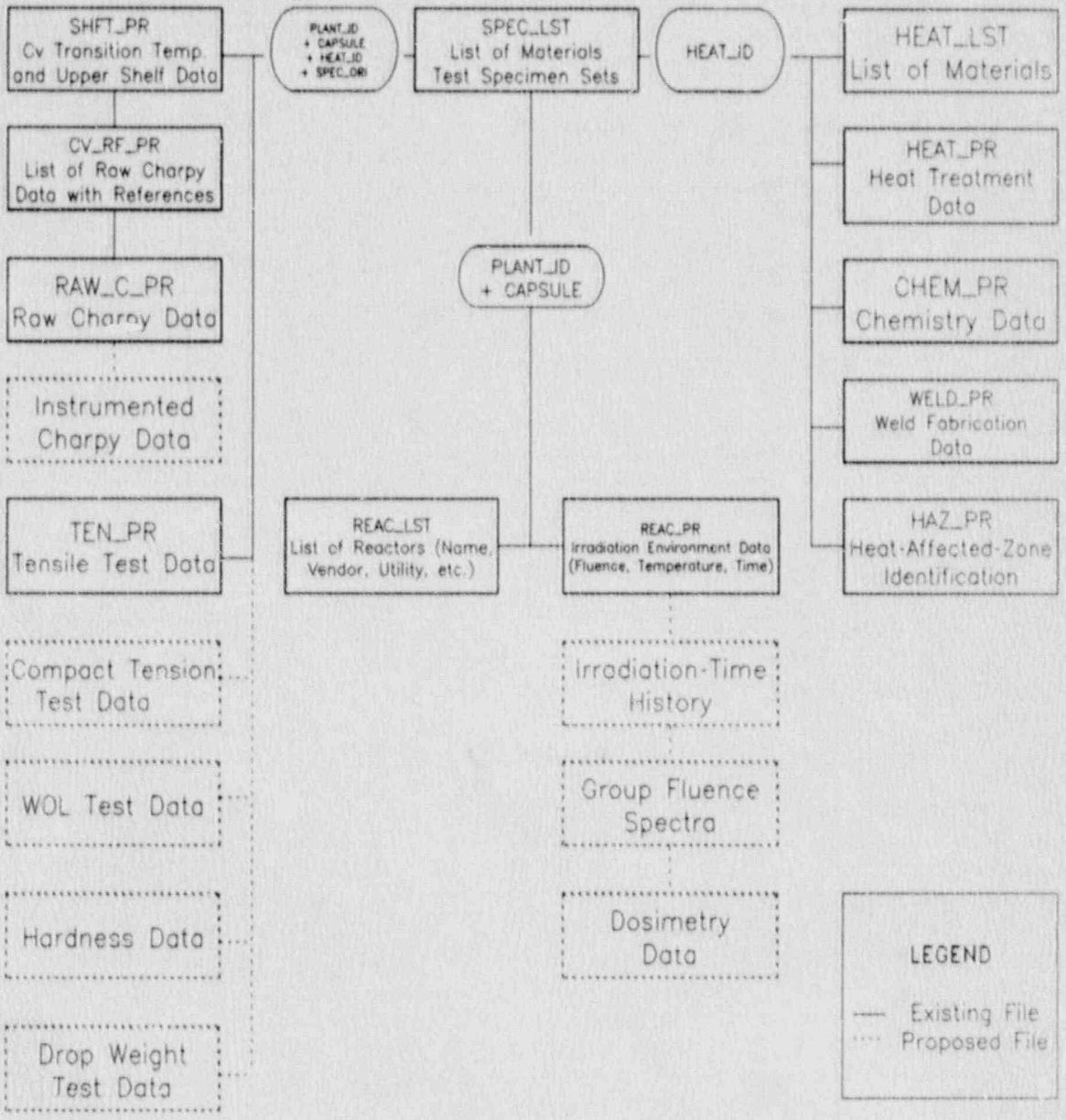

Fig. 2. Architecture of the Power Reactor Embrittlement Data Base PR-EDB.

directory of power reactors. And finally, HEAT_LST.dbf is a directory of the materials contained in the PR-EDB files. A more detailed description of these data files is given below.

2.4 LIST OF PR-EDB FILES

1. File SPEC_LST.dbf

Table 2. Structure file for SPEC_LST.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
CAPSULE	Surveillance Capsule or Experiment Identification
HEAT_ID	Identification Code for Given Material
SPEC_TYPE	Type of Specimen: Charpy (CV), TEN_sile, C_ompact T_ension, WOL
SPEC_SIZE	Size of the Specimen
SPEC_ORI	Specimen Orientation: TL, LT, TS, etc.
SPEC_POS	Specimen Position: 1/4T, 1/2T, 3/4T, etc.
NO_OF_SPEC	Number of Specimens in Capsule or Experimental Set
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

The key identifiers PLANT_ID + CAPSULE + HEAT_ID + SPEC_ORI link the specimen sets to the corresponding records in the other data files. PLANT_ID + CAPSULE identify a particular experiment (i.e., the surveillance capsule in a given reactor, and HEAT_ID + SPEC_ORI a particular material). SPEC_TYPE indicates the type of specimen; its size, if nonstandard, is listed in SPEC_SIZE. SPEC_POS indicates the layer(s) relative to the surface from which the specimens were cut. (This is 1/4T in most cases; 1/4T + 3/4T means that the set consists of a mixture of specimens cut from the 1/4T and 3/4T layers, 1/4T - 3/4T means the specimens are cut from the whole range between 1/4T and 3/4T.) Also listed is the number of specimens in each set, if available.

A partial listing of the records in SPEC_LST.dbf is given at the end of the section (p. 24).

2. File SHFT_PR.dbf

SHFT_PR.dbf (Table 3) lists transition temperatures and upper shelf energies as determined by the evaluator of the report. It lists 30 ft-lb, 50 ft-lb, and 35-mil transition temperatures (irradiated and unirradiated), and shift (difference between the two), whatever is listed in the report, and similarly for the upper shelf energy with both absolute and relative shift values. Included are also fluences (E > 1.0 MeV), taking into account the differences within the capsule between different specimen sets. Not included is the transition temperature at 50% shear since it is seldom reported and is difficult to be determined reliably. It can also be readily reconstructed from the individual Charpy test data. Also not included are transition temperatures at other energy levels or lateral expansion such as 71 ft-lb or 54 mil, which are sometimes listed in older reports. Shift values listed represent the actual differences between unirradiated and irradiated data; additional safety margins that are sometimes included in reports have been subtracted. Shift values are sometimes determined in separate graphs independent from the determination

Table 3. Structure file for SHFT_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
CAPSULE	Surveillance Capsule or Experiment Identification
HEAT_ID	Identification Code for Given Material
PROD_ID	Material Type: P_late, F_orging, W_eld, HAZ, or SRM
SPEC_ORI	Specimen Orientation: TL, LT, TS, etc.
CSP_F1	Fluence > 1 MeV at Charpy Specimen Location [n/cm^2]
UTT30	CVT at 30 ft-lb, Unirradiated Charpy Specimen
UTT50	CVT at 50 ft-lb, Unirradiated Charpy Specimen
ULE35	CVT at Lateral Expansion = 35 mils, Unirrad. Charpy Spec.
UUSE	Upper Shelf Energy, Unirradiated Charpy Specimen
ITT30	CVT at 30 ft-lb, Irradiated Charpy Specimen
ITT50	CVT at 50 ft-lb, Irradiated Charpy Specimen
ILE35	CVT at Lateral Expansion = 35 mils, Irrad. Charpy Spec.
IUSE	Upper Shelf Energy, Irradiated Charpy Specimen
DTT30	CVT Shift at 30 ft-lb
DTT50	CVT Shift at 50 ft-lb
DLE35	CVT Shift at Lateral Expansion = 35 mils
DUSE_ABS	Absolute Drop in Upper Shelf Energy
DUSE_REL	Percent Drop in Upper Shelf Energy
TEMP_U	Unit used for Temperature Data
USE_U	Unit used for Energy Data (in Upper Shelf Energy)
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

of unirradiated and irradiated test data and may, for this reason, be inconsistent with the latter. This is indicated in the notes. Fields for temperature and energy units have been added to allow entering of data in different units. (See sample output at the end of section.)

3. Files RAW_C_PR.dbf and CV_RF_PR.dbf

RAW_C_PR.dbf (Table 4) gives a complete list of individual Charpy test results (see p. 26) at the end of the section for a partial listing. The same key identifiers are used as in SHFT_PR.dbf and fluence and irradiation temperature are included which may be different for each specimen. Each set is listed only once, even if it appears in more than one report since corresponding data originate from the same Charpy test. An exception is the sets in which specimens from more than one capsule are combined; the same specimen may be listed under a single capsule and in a combination set, such as, under the capsules 1A and 1B and again under the combination A/B in the LaCrosse reactor. Fields for measuring units are again included to allow entering of data in different units. No references are listed in this file to save space since each specimen in the same set has the same reference. Instead, a third file, CV_RF_PR.dbf, is added to this set which contains only the references which are uniquely assigned to the data in RAW_C_PR.dbf by means of the key identifiers. The structure of this file is listed below (Table 5) and a partial listing of the records is given at the end of the section (p. 27).

Table 4. Structure file for RAW_C_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
CAPSULE	Surveillance Capsule or Experiment Identification
HEAT_ID	Identification Code for Given Material
PROD_ID	Material Type: P_late, F_orging, W_eld, HAZ, or SRM
SPEC_ORI	Specimen Orientation: TL, LT, TS, etc.
SPEC_ID	Specimen Identifier
TST_TEMP	Test Temperature of Specimen
TST_TEMP_U	Unit of Temperature used in TST_TEMP
IMP_E	Impact Energy of Charpy Specimen
IMP_E_U	Unit of Energy used in IMP_E
FRACT_APP	Fracture Appearance Value [% shear]
LAT_EXP	Lateral Expansion of Charpy Specimen
LAT_EXP_U	Unit of Length used in LAT_EXP
CSP_Fl	Fluence > 1 MeV at Charpy Specimen Location [n/cm^2]
CSP_TEMP	Irradiation Temperature of Charpy Specimen
CSP_TEMP_U	Unit of Temperature used in CSP_TEMP

Table 5. Structure file for CV_RF_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
CAPSULE	Surveillance Capsule or Experiment Identification
HEAT_ID	Identification Code for Given Material
PROD_ID	Material Type: P_late, F_orging, W_eld, HAZ, or SRM
SPEC_ORI	Specimen Orientation: TL, LT, TS, etc.
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

4. File TEN_PR.dbf

The file TEN_PR.dbf (Table 6) lists the results of tensile tests with separate entries for each individual test. Averages from several experiments are included if no other information is available, but are omitted if individual test data are given. Such cases are indicated in NOTES.

Table 6. Structure file for TEN_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
CAPSULE	Surveillance Capsule or Experiment Identification
HEAT_ID	Identification Code for Given Material
PROD_ID	Material Type: P_late, F_orging, W_eld, HAZ, or SRM
SPEC_ORI	Specimen Orientation: TL, LT, TS, etc.
TSP_F1	Fluence > 1 MeV at Tensile Specimen Location [n/cm^2]
TSP_TEMP	Irradiation Temperature of Tensile Specimen
TSP_TEMP_U	Unit of Temperature used for TSP_TEMP
SPEC_ID	Specimen Identifier
TST_TEMP	Test Temperature of Specimen
TST_TEMP_U	Unit of Temperature used for TST_TEMP
YSL	Lower Yield Strength of Tensile Specimen
YSL_U	Unit of Stress used in YSL
YSU	Upper Yield Strength of Tensile Specimen
YSU_U	Unit of Stress used in YSU
UTS	Ultimate Tensile Strength
UTS_U	Unit of Stress used in UTS
ULG	Ultimate Elongation of Tensile Specimen [%]
TLG	Total Elongation of Tensile Specimen [%]
RA	Reduction in Area of Tensile Specimen [%]
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

Fluences and irradiation temperatures are included and may differ from specimen to specimen as in RAW_C_PR.dbf. Units from the original reports are used as specified in the unit fields. (See p. 28 at the end of the section for a partial listing of the records in TEN_PR.dbf.)

5. File REAC_LST.dbf

For each reactor code given in PLANT_ID, the file REAC_LST.dbf (Table 7) lists the full name of the reactor, the utility, the vendor, the pressure vessel manufacturer, and the architect/engineer of the plant. (A complete listing is given on p. 29 at the end of the section.) No references are included since these data come from many different sources and are easily verifiable.

Table 7. Structure file for REAC_LST.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
REAC_TYPE	Reactor Type: PWR, BWR, or TR
REAC_NAME	Reactor Name
LOCATION	Reactor Location
PLANT_OP	Reactor Operator or Utility
PLANT_DES	Reactor Designer or Vendor
ARCH_ENG	Reactor Architect/Engineer
VESSEL_MFG	Reactor Vessel Manufacturer

6. File REAC_PR.dbf

The file REAC_PR.dbf (Table 8) lists fluences in the form of E > 1.0 MeV, E > 0.1 MeV, dpa, as well as fluence rates, irradiation temperatures, startup and removal dates, and the full-power-equivalent irradiation times. Additional information for subintervals of the irradiation time is provided under the heading of CONFIG(uration), if the radiation environment has changed drastically during the course of irradiation. Methods for the determination of irradiation temperatures and fluence uncertainties are also listed, if available. (A partial listing is given on p. 31 at the end of the section.)

Table 8. Structure file for REAC_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
CAPSULE	Surveillance Capsule or Experiment Identification
START_DATE	Date at Start of Irradiation [MM/DD/YYYY]
STOP_DATE	Date at End of Irradiation [MM/DD/YYYY]
CONFIG	Indicator for Change in Irradiation Environment
EFP_TIME	Effective Full Power Time of Irradiation
EFP_T_U	Unit of Time used for EFP_TIME
CAP_T_MIN	Minimum Irradiation Temperature at Capsule Center
CAP_T_MAX	Maximum Irradiation Temperature at Capsule Center
CAP_T_U	Unit of Temperature used for CAP_T_MAX and CAP_T_MIN
TEMP_TAG	Temperature Measured by: M_elt Wire, T_hermocouples, N_ominal
CAP_F1	Fluence > 1 MeV at Capsule Center [n/cm^2]
F1_UNC	Uncertainty of Fluence > 1.0 MeV [% Standard Deviation]
F1_RATE	Fluence Rate > 1 MeV at Capsule Center [$n/(cm^2 \cdot s)$]
CAP_FP1	Fluence > 0.1 MeV at Capsule Center [n/cm^2]
FP1_UNC	Uncertainty of Fluence > 0.1 MeV [% Standard Deviation]
CAP_DPA	Displacements per Atom of Iron at Capsule Center
DPA_UNC	Uncertainty of Displacements per Atom [% Standard Deviation]
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

7. File HEAT_LST.dbf

The file HEAT_LST.dbf (Table 9) relates the material codes given in HEAT_ID to the descriptions and heat numbers given in the surveillance reports and in the MPC data base. It also includes the ASTM material classification, the supplier of the material, and the thickness. SOURCE gives specific information about the origin of the surveillance material (if available) namely SCR-ap, if it was obtained from excess material during the fabrication of the vessel (this applies also to welds), CUTOUT for nozzle cutouts, and SIM-ulated welds, if the material was not obtained from an actual weld seam but fabricated from excess plate material using the same filler and flux. Finally, FABR_icated means, that the material was fabricated separately, as it is done for correlation materials. (A complete listing is given on p. 32 at the end of the section.)

Table 9. Structure file for HEAT_LST.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
HEAT_ID	Identification Code for Given Material
RPT_ID	Identifier Used in Surveillance Reports
HEAT_NO	Heat Number of Material Used by Supplier
PROD_ID	Material Type: P_late, F_orging, W_eld, HAZ, or SRM
MAT_ID	Material Classification: A302B, A5082, A533B1, etc.
SUPPLIER	Supplier of Material
THICKNESS	Thickness of Base Material [inches]
SOURCE	Source of Material: FABR_icated, SCR_ap, SIM_ulated Weld, CUTOUT
MPC_ID	Reference Number Assigned by Combustion Engineering (MPC)
MPC_HEAT	Material Heat Number (MPC)
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

8. File CHEM_PR.dbf

The file CHEM_PR.dbf (Table 10) lists the chemistries for the given materials together with information about the laboratory and method used, if given, and whether it is derived from test specimens or represents

Table 10. Structure file for CHEM_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
HEAT_ID	Identification Code for Given Material
PROD_ID	Material Type: P_late, F_orging, W_eld, HAZ, or SRM
MAT_ID	Material Classification: A302B, A5082, A533B1, etc.
CHEM_LAB	Chemistry Laboratory or Procedure Identification
METHOD	Method for Determining the Chemistry
SPEC_ID	Specimen Identifier
C	Weight Percent Carbon
MN	Weight Percent Manganese
P	Weight Percent Phosphorus
S	Weight Percent Sulfur
SI	Weight Percent Silicon
NI	Weight Percent Nickel
CR	Weight Percent Chromium
MO	Weight Percent Molybdenum
CU	Weight Percent Copper
V	Weight Percent Vanadium
B	Weight Percent Boron
CS	Weight Percent Cesium
TI	Weight Percent Titanium
CO	Weight Percent Cobalt
N	Weight Percent Nitrogen
O	Weight Percent Oxygen
SB	Weight Percent Antimony
AS	Weight Percent Arsenic
ZR	Weight Percent Zirconium
AL	Weight Percent Aluminum
AL_SOL	Weight Percent Aluminum in Solution
AL_INT	Weight Percent Aluminum Interstitial
PB	Weight Percent Lead
W	Weight Percent Tungsten
SN	Weight Percent Tin
ZN	Weight Percent Zinc
TA	Weight Percent Tantalum
H	Weight Percent Hydrogen
NB	Weight Percent Niobium
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

generic values given by the supplier of the material. Generic values are identified in SPEC_ID as LADLE, CHECK, or just HEAT, depending on what is revealed in the reports. The term WIRE is used if the chemistry of the filler wire rather than that of the actual weld material has been reported. Other terms listed in SPEC_ID are the identifiers of the test specimen whose chemistry was determined. Values are listed as reported without regard to consistency, but obvious duplications are sometimes omitted. (A partial listing is given on p. 39 at the end of the section.)

9. File HEAT_PR.dbf

The file HEAT_PR.dbf (Table 11) lists up to eight different steps of heat treatment with temperature ranges, duration, quench method, and an indication of whether the particular step was intended for normalizing, austenizing, tempering, or stress relief, as far as reported. The supplier of the material and the facility performing the heat treatment as well as the identification used for the ingot (HEAT_NO) and the finished material (SUPPL_ID) are also included. (A partial listing is given on p. 40 at the end of the section.)

Table 11. Structure file for HEAT_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
HEAT_ID	Identification Code for Given Material
PROD_ID	Material Type: P_late, F_orging, W_eld, HAZ, or SRM
SUPPLIER	Supplier of Material
HEAT_TREAT	Facility Performing Heat Treatment
HEAT_NO	Heat Number of Material Used by Supplier
SUPPL_ID	Identifier Used by Supplier
MINTEMP_1	Heat Treatment Minimum Temperature, Run 1
MAXTEMP_1	Heat Treatment Maximum Temperature, Run 1
RANGE_1	Heat Treatment Temperature Range, Run 1
HOURS_1	Heat Treatment Duration, Run 1 [hours]
QCHM_1	Quench Method, Run 1
ID_1	N_ormalizing, A_ustenizing, T_empering, Stress R_elief, Run 1
MINTEMP_2	Heat Treatment Minimum Temperature, Run 2
MAXTEMP_2	Heat Treatment Maximum Temperature, Run 2
RANGE_2	Heat Treatment Temperature Range, Run 2
HOURS_2	Heat Treatment Duration, Run 2 [hours]
QCHM_2	Quench Method, Run 2
ID_2	N_ormalizing, A_ustenizing, T_empering, Stress R_elief, Run 2

Table 11 (continued)

MINTEMP_3	Heat Treatment Minimum Temperature, Run 3
MAXTEMP_3	Heat Treatment Maximum Temperature, Run 3
RANGE_3	Heat Treatment Temperature Range, Run 3
HOURS_3	Heat Treatment Duration, Run 3 [hours]
QCHM_3	Quench Method, Run 3
ID_3	N_ormalizing, A_ustenizing, T_empering, Stress R_elief, Run 3
MINTEMP_4	Heat Treatment Minimum Temperature, Run 4
MAXTEMP_4	Heat Treatment Maximum Temperature, Run 4
RANGE_4	Heat Treatment Temperature Range, Run 4
HOURS_4	Heat Treatment Duration, Run 4 [hours]
QCHM_4	Quench Method, Run 4
ID_4	N_ormalizing, A_ustenizing, T_empering, Stress R_elief, Run 4
MINTEMP_5	Heat Treatment Minimum Temperature, Run 5
MAXTEMP_5	Heat Treatment Maximum Temperature, Run 5
RANGE_5	Heat Treatment Temperature Range, Run 5
HOURS_5	Heat Treatment Duration, Run 5 [hours]
QCHM_5	Quench Method, Run 5
ID_5	N_ormalizing, A_ustenizing, T_empering, Stress R_elief, Run 5
MINTEMP_6	Heat Treatment Minimum Temperature, Run 6
MAXTEMP_6	Heat Treatment Maximum Temperature, Run 6
RANGE_6	Heat Treatment Temperature Range, Run 6
HOURS_6	Heat Treatment Duration, Run 6 [hours]
QCHM_6	Quench Method, Run 6
ID_6	N_ormalizing, A_ustenizing, T_empering, Stress R_elief, Run 6
MINTEMP_7	Heat Treatment Minimum Temperature, Run 7
MAXTEMP_7	Heat Treatment Maximum Temperature, Run 7
RANGE_7	Heat Treatment Temperature Range, Run 7
HOURS_7	Heat Treatment Duration, Run 7 [hours]
QCHM_7	Quench Method, Run 7
ID_7	N_ormalizing, A_ustenizing, T_empering, Stress R_elief Run 7
MINTEMP_8	Heat Treatment Minimum Temperature, Run 8
MAXTEMP_8	Heat Treatment Maximum Temperature, Run 8
RANGE_8	Heat Treatment Temperature Range, Run 8
HOURS_8	Heat Treatment Duration, Run 8 [hours
QCHM_8	Quench Method, Run 8
ID_8	N_ormalizing, A_ustenizing, T_empering, Stress R_elief, Run 8
TEMP_U	Unit for Temperature Data
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

10. File WELD_PR.dbf

The file WELD_PR.dbf (Table 12) gives additional information for weldments such as weld method, type and heat number of the filler material, and type and lot number of the flux used. The weld code (e.g., WF-209, plus the supplier of the weld) is also included. (A partial listing is given on p. 41 at the end of the section.)

Table 12. Structure file for WELD_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
HEAT_ID	Identification Code for Given Material
WLD_TYPE	Weld Type
WLD_CODE	Identification Code used by Weld Manufacturer
HEAT_1	HEAT_ID of the Plate on one side of the Weld
HEAT_2	HEAT_ID of the Plate on the other side of the Weld
WELD_SUPLY	Supplier of Weld Material
WIRE_TYPE	Type of Weld Wire Used in the Weld
WIRE_HEAT	Weld Wire Heat Identifier
FLUX_TYPE	Type of Flux Used in the Weld
FLUX_LOT	Weld Flux Lot Identifier
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

11. File HAZ_PR.dbf

The file HAZ_PR.dbf (Table 13) identifies the base material and weldments used to prepare the heat-affected-zone specimens. (A partial listing is given on p. 42 at the end of the section.)

Table 13. Structure file for HAZ_PR.dbf

TAG	Used for Internal Operation
PLANT_ID	Reactor Identification
HEAT_ID	Identification Code for Given Material
HEAT_B	HEAT_ID of the Base Material Used in the HAZ
HEAT_W	HEAT_ID of the Weld Material Connected with the HAZ
REF_ID	Reference Identifier
PAGES	Page Number(s)
NOTES	Pertinent Information Related to Data Entries, If Needed

12. File REF_TITL.dbf

All PR-EDB files mentioned so far, with the exception of RAW_C_PR.dbf and REAC_LST.dbf, contain a reference in the field REF_ID plus page numbers for each record. The complete bibliographic listing, including author, title, report number, and date of publication, is located in the file REF_TITL.dbf (Table 14). A complete listing of this file is given on p. 43 at the end of the section.

Table 14. Structure file for REF_TITL.dbf

TAG	Used for Internal Operation
REF_ID	Reference Identifier
CONT	Continuation Tag for References Occupying More than One Record
REF_TITLE	Bibliographic Reference

13. File REF_LST.dbf

The file REF_LST.dbf lists all references used in the PR-EDB arranged according to the reactors for which the reports were written. The references are given as REF_ID; detailed information can be found in the file REF_TITL.dbf. The first two references describe the A302B ASTM and the A533B1 HSST-02 standard reference materials, respectively, and are not related to a specific reactor. A partial listing of this file is given on p. 54.

Tables 15 through 28 give partial or complete listings of the PR-EDB files discussed earlier.

Table 15. Partial listing of SPEC_LST.dbf

SPEC_LST.dbf: Page 1

TAG	PLANT_ID	CAPSULE	HEAT_ID	SPEC_TYPE	SPEC_SIZE	SPEC_ORI	SPEC_POS	NO_OF_SPEC	REF_ID	PAGES	NOTES
W	AD1		FAD101	CV		LT	1/4T		WCAP-8957	3-3; 3-7	
W	AD1		FAD101	CV		TL	1/4T		WCAP-8957	3-3; 3-7	
W	AD1		HAD101	CV			1/4T		WCAP-8957	3-3; 3-7	
W	AD1		WAD101	CV		TL	1/4T		WCAP-8957	3-3; 3-7	
W	AD1		FAD101	TEN		L	1/4T		WCAP-8957	3-3; 3-7	
W	AD1		FAD101	TEN		T	1/4T		WCAP-8957	3-3; 3-7	
W	AD1		WAD101	TEN			1/4T		WCAP-8957	3-3; 3-7	
W	AD1		FAD101	WOL		LT	1/4T		WCAP-8957	3-3; 3-7	
W	AD1		FAD101	WOL		TL	1/4T		WCAP-8957	3-3; 3-7	
W	AD1		WAD101	WOL			1/4T		WCAP-8957	3-3; 3-7	
W	AD1	N	FAD101	CV		LT	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	N	FAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	N	HAD101	CV			1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	N	WAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	N	FAD101	TEN		L	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	N	FAD101	TEN		T	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	N	WAD101	TEN			1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	N	FAD101	WOL		LT	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	N	FAD101	WOL		TL	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	N	WAD101	WOL			1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	P	FAD101	CV		LT	1/4T	12	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	FAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	HAD101	CV			1/4T	12	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	WAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	FAD101	TEN		L	1/4T	3	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	FAD101	TEN		T	1/4T	3	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	WAD101	TEN			1/4T	3	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	FAD101	WOL		LT	1/4T	3	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	FAD101	WOL		TL	1/4T	3	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	P	WAD101	WOL			1/4T	3	WCAP-8957	3-3; 3-7	CAPSULE IS IN STANDBY
W	AD1	R	FAD101	CV		LT	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	R	FAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	R	HAD101	CV			1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	R	WAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	R	FAD101	TEN		L	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	R	FAD101	TEN		T	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	R	WAD101	TEN			1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	R	FAD101	WOL		LT	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	R	FAD101	WOL		TL	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	R	WAD101	WOL			1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	S	FAD101	CV		LT	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	S	FAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	S	HAD101	CV			1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	S	WAD101	CV		TL	1/4T	12	WCAP-8957	3-3; 3-7	
W	AD1	S	FAD101	TEN		L	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	S	FAD101	TEN		T	1/4T	3	WCAP-8957	3-3; 3-7	
W	AD1	S	WAD101	TEN			1/4T	3	WCAP-8957	3-3; 3-7	

Table 16. Partial listing of SHFT_PR.dbf

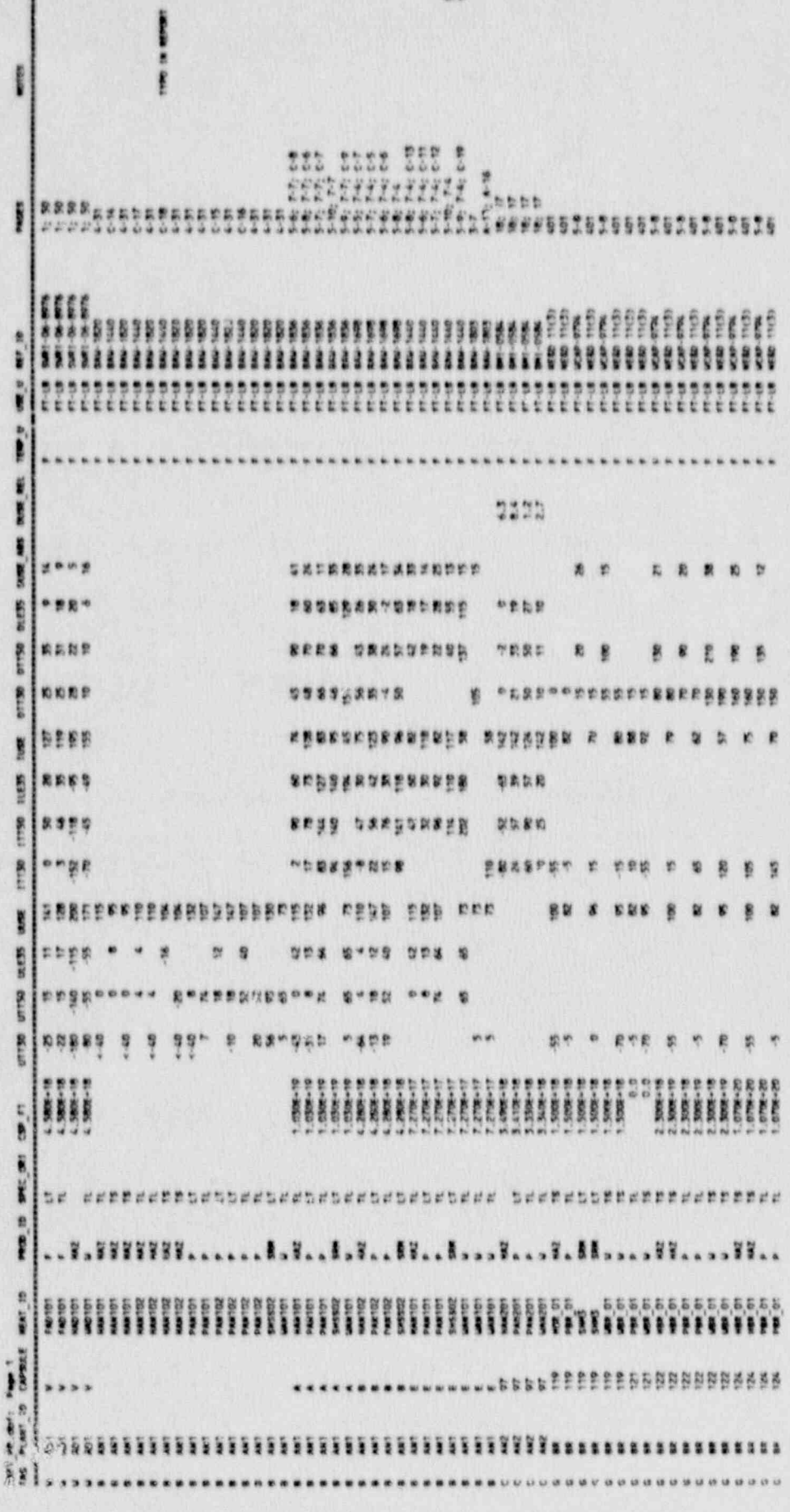

Table 17 Partial listing of RAW_C_PR.dbf

RAW_C_PR.dbf: Page 1

TAG	PLANT_ID	CAPSULE	HEAT_ID	PROD_ID	SPEC_ORI	SPEC_ID	TST_TEMP	TST_TEMP_U	IMP_E	IMP_E_U	FRACT_APP	LAT_EXP	LAT_EXP_U	CSP_F1	CSP_TEMP	CSP_TEMP_U
W	AD1		FAD101	F	LT		-100.0	F	6.5	FT-LB	0	3.0	MIL			
W	AD1		FAD101	F	LT		-100.0	F	4.0	FT-LB	0	1.0	MIL			
W	AD1		FAD101	F	LT		-100.0	F	4.0	FT-LB	0	2.5	MIL			
W	AD1		FAD101	F	LT		-20.0	F	54.0	FT-LB	14	39.0	MIL			
W	AD1		FAD101	F	LT		-20.0	F	31.5	FT-LB	9	22.0	MIL			
W	AD1		FAD101	F	LT		-20.0	F	38.5	FT-LB	14	28.0	MIL			
W	AD1		FAD101	F	LT		20.0	F	70.0	FT-LB	39	52.0	MIL			
W	AD1		FAD101	F	LT		20.0	F	77.0	FT-LB	42	57.0	MIL			
W	AD1		FAD101	F	LT		20.0	F	84.0	FT-LB	39	61.0	MIL			
W	AD1		FAD101	F	LT		50.0	F	75.0	FT-LB	20	58.0	MIL			
W	AD1		FAD101	F	LT		50.0	F	75.5	FT-LB	25	56.0	MIL			
W	AD1		FAD101	F	LT		50.0	F	60.0	FT-LB	30	47.0	MIL			
W	AD1		FAD101	F	LT		110.0	F	111.0	FT-LB	77	79.0	MIL			
W	AD1		FAD101	F	LT		110.0	F	117.5	FT-LB	80	86.0	MIL			
W	AD1		FAD101	F	LT		110.0	F	113.0	FT-LB	77	78.0	MIL			
W	AD1		FAD101	F	LT		210.0	F	138.0	FT-LB	100	90.0	MIL			
W	AD1		FAD101	F	LT		210.0	F	145.0	FT-LB	100	88.0	MIL			
W	AD1		FAD101	F	LT		210.0	F	143.0	FT-LB	100	90.0	MIL			
W	AD1		FAD101	F	TL		-50.0	F	25.0	FT-LB	10	17.0	MIL			
W	AD1		FAD101	F	TL		-50.0	F	12.5	FT-LB	6	7.0	MIL			
W	AD1		FAD101	F	TL		-50.0	F	9.0	FT-LB	5	4.0	MIL			
W	AD1		FAD101	F	TL		0.0	F	53.0	FT-LB	30	39.0	MIL			
W	AD1		FAD101	F	TL		0.0	F	49.5	FT-LB	30	36.0	MIL			
W	AD1		FAD101	F	TL		0.0	F	42.0	FT-LB	25	29.0	MIL			
W	AD1		FAD101	F	TL		50.0	F	64.0	FT-LB	36	49.0	MIL			
W	AD1		FAD101	F	TL		50.0	F	70.0	FT-LB	40	52.0	MIL			
W	AD1		FAD101	F	TL		50.0	F	80.0	FT-LB	42	58.0	MIL			
W	AD1		FAD101	F	TL		110.0	F	107.0	FT-LB	73	73.0	MIL			
W	AD1		FAD101	F	TL		110.0	F	131.0	FT-LB	100	84.0	MIL			
W	AD1		FAD101	F	TL		110.0	F	100.0	FT-LB	73	67.0	MIL			
W	AD1		FAD101	F	TL		160.0	F	123.0	FT-LB	100	81.0	MIL			
W	AD1		FAD101	F	TL		160.0	F	132.0	FT-LB	100	89.0	MIL			
W	AD1		FAD101	F	TL		160.0	F	131.0	FT-LB	100	87.0	MIL			
W	AD1		FAD101	F	TL		210.0	F	129.0	FT-LB	100	89.0	MIL			
W	AD1		FAD101	F	TL		210.0	F	130.0	FT-LB	100	82.0	MIL			
W	AD1		FAD101	F	TL		210.0	F	126.0	FT-LB	100	85.0	MIL			
W	AD1		HAD101	HAZ			-200.0	F	24.0	FT-LB	0	8.0	MIL			
W	AD1		HAD101	HAZ			-200.0	F	46.0	FT-LB	50	23.0	MIL			
W	AD1		HAD101	HAZ			-125.0	F	69.5	FT-LB	33	51.0	MIL			
W	AD1		HAD101	HAZ			-125.0	F	89.5	FT-LB	20	40.0	MIL			
W	AD1		HAD101	HAZ			-100.0	F	95.0	FT-LB	85	54.0	MIL			
W	AD1		HAD101	HAZ			-100.0	F	61.0	FT-LB	85	29.0	MIL			
W	AD1		HAD101	HAZ			-50.0	F	45.5	FT-LB	18	28.0	MIL			
W	AD1		HAD101	HAZ			-50.0	F	120.0	FT-LB	51	69.0	MIL			
W	AD1		HAD101	HAZ			-50.0	F	119.0	FT-LB	42	65.0	MIL			
W	AD1		HAD101	HAZ			0.0	F	148.0	FT-LB	85	74.0	MIL			
W	AD1		HAD101	HAZ			0.0	F	127.0	FT-LB	60	80.0	MIL			
W	AD1		HAD101	HAZ			0.0	F	195.0	FT-LB	100	86.0	MIL			
W	AD1		HAD101	HAZ			62.0	F	100.0	FT-LB	90	61.0	MIL			
W	AD1		HAD101	HAZ			62.0	F	190.0	FT-LB	100	92.0	MIL			
W	AD1		HAD101	HAZ			62.0	F	200.0	FT-LB	100	85.0	MIL			

Table 18. Partial listing of CV_RF_PR.dbf

CV_RF_PR.dbf: Page 1

TAG	PLANT_ID	CAPSULE	HEAT_ID	PROD_ID	SPEC_ORI	REF_ID	PAGES	NOTES
W	AD1		FAD101	F	LT	WCAP-8957	4-2	
W	AD1		FAD101	F	TL	WCAP-8957	4-3	
W	AD1		HAD101	HAZ		WCAP-8957	4-7	
W	AD1		WAD101	W	TL	WCAP-8957	4-6	
W	AD1	V	FAD101	F	LT	SWRI-06-8976	1; 42	
W	AD1	V	FAD101	F	TL	SWRI-06-8976	1; 41	
W	AD1	V	HAD101	HAZ		SWRI-06-8976	1; 44	
W	AD1	V	WAD101	W	TL	SWRI-06-8976	1; 43	
W	AL2		HAL201	HAZ	TL	WCAP-9228	3-8	
W	AL2		PAL201	P	LT	WCAP-9228	3-3	
W	AL2		PAL201	P	TL	WCAP-9228	3-4	
W	AL2		WAL201	W	TL	WCAP-9228	3-7	
B	AN1		HAN101	HAZ	TL	BAW-1440	C-4	
B	AN1		HAN101	HAZ	TS	BAW-1440	C-5	
B	AN1		HAN102	HAZ	TL	BAW-1440	C-8	
B	AN1		HAN102	HAZ	TS	BAW-1440	C-9	
B	AN1		PAN101	P	LT	BAW-1440	C-2	
B	AN1		PAN101	P	TL	BAW-1440	C-3	
B	AN1		PAN102	P	LT	BAW-1440	C-6	
B	AN1		PAN102	P	TL	BAW-1440	C-7	
B	AN1		WAN101	W	TL	BAW-1440	C-10	
B	AN1	A	HAN101	HAZ	TL	BAW-1836	5-3	
B	AN1	A	PAN101	P	LT	BAW-1836	5-4	
B	AN1	A	PAN101	P	TL	BAW-1836	5-4	
B	AN1	A	SHSS02	SRM	LT	BAW-1836	5-5	
B	AN1	A	WAN101	W	TL	BAW-1836	5-5	
B	AN1	B	HAN102	HAZ	TL	BAW-1698	5-3	
B	AN1	B	PAN102	P	LT	BAW-1698	5-4	
B	AN1	B	PAN102	P	TL	BAW-1698	5-3	
B	AN1	B	SHSS02	SRM	LT	BAW-1698	5-4	
B	AN1	E	HAN101	HAZ	TL	BAW-1440	5-4	
B	AN1	E	PAN101	P	LT	BAW-1440	5-4	
B	AN1	E	PAN101	P	TL	BAW-1440	5-4	
B	AN1	E	SHSS02	SRM	LT	BAW-1440	5-5	
B	AN1	E	WAN101	W	TL	BAW-1440	5-5	
W	AS1		HAS101	HAZ	TL	WCAP-9308	3-8	
W	AS1		PAS101	P	LT	WCAP-9308	3-3	
W	AS1		PAS101	P	TL	WCAP-9308	3-4	
W	AS1		WAS101	W	TL	WCAP-9308	3-7	
W	AS2		HAS201	HAZ	TL	WCAP-9330	3-8	
W	AS2		PAS201	P	LT	WCAP-9330	3-3	
W	AS2		PAS201	P	TL	WCAP-9330	3-4	
W	AS2		WAS201	W	TL	WCAP-9330	3-7	
G	BR		HBR_01	HAZ	TS	EPRI NP-2428	3-214	
G	BR		PBR_01	P	TL	EPRI NP-2428	3-207	
G	BR		WBR_01	W	TS	EPRI NP-2428	3-219	
G	BR	119	HBR_01	HAZ	TS	EPRI NP-2428	3-214	
G	BR	119	PBR_01	P	TL	EPRI NP-2428	3-208	
G	BR	119	WBR_01	W	TS	EPRI NP-2428	3-219	
G	BR	122	HBR_01	HAZ	TS	EPRI NP-2428	3-215	
G	BR	122	PBR_01	P	TL	EPRI NP-2428	3-208	
G	BR	122	WBR_01	W	TS	EPRI NP-2428	3-220	
G	BR	124	HBR_01	HAZ	TS	EPRI NP-2428	3-215	
G	BR	124	PBR_01	P	TL	EPRI NP-2428	3-208	
G	BR	124	WBR_01	W	TS	EPRI NP-2428	3-220	
G	BR	125	HBR_01	HAZ	TS	WCAP-9794	5-4	
G	BR	125	PBR_01	P	TL	WCAP-9794	5-4	

Table 19. Partial listing of TEN_PR.dbf

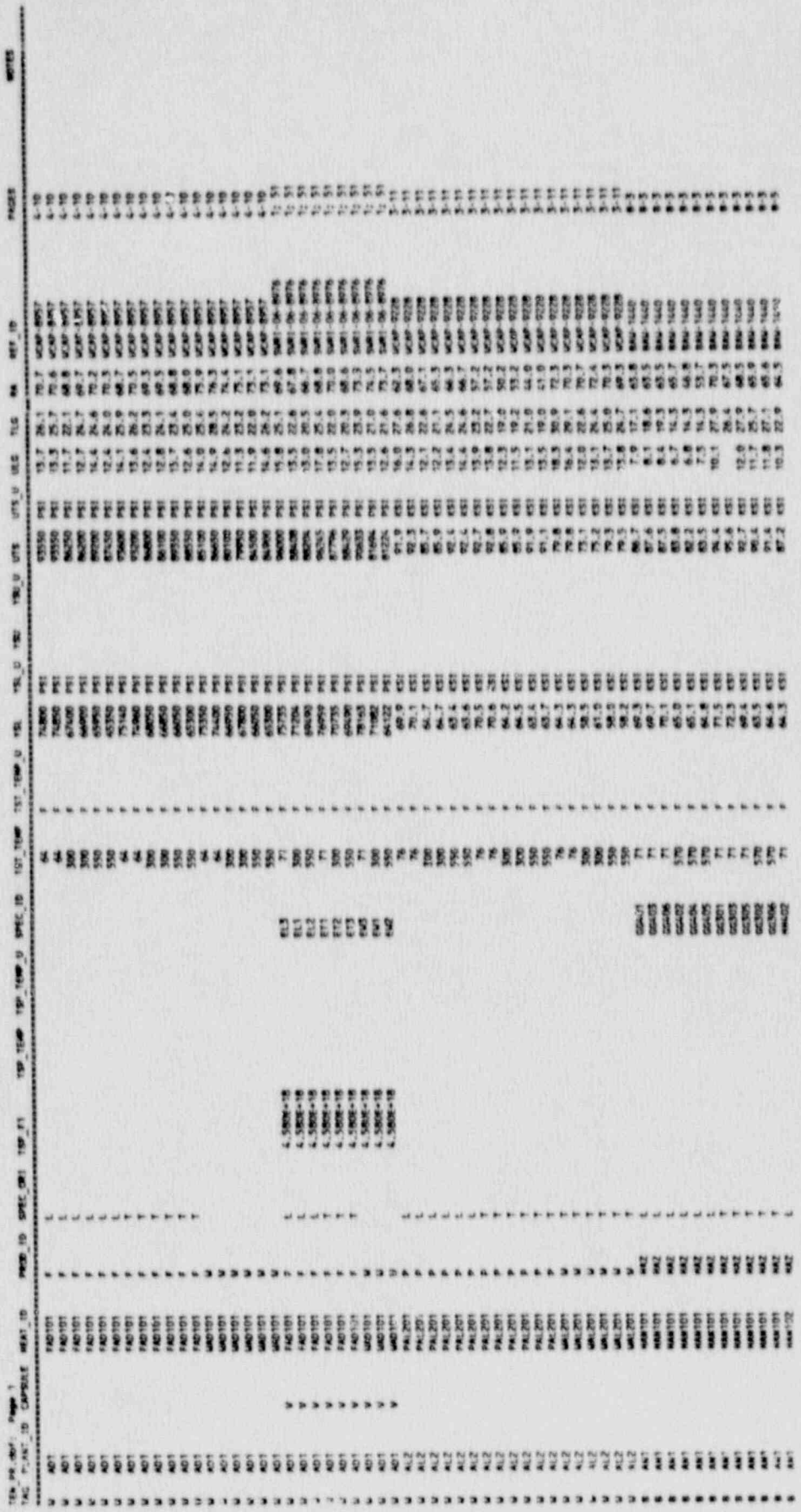

Table 20.

REAC_LST.dbf: Page 1

TAG	PLANT_ID	REAC_TYPE	REAC_NAME	LOCATION	PLANT_OP
W	AD1	PWR	Angra Dos Reis Unit 1	Itaorna, RdJ, Brazil	Furnas-Centrais Electricas S.A.
W	AL2	PWR	Almaraz Unit 2	Almaraz, Caceres, Spain	Compania Sevillana de Electricid
B	AN1	PWR	Arkansas Nuclear One, Unit 1	Russellville, Arkansas	Arkansas Power & Light Company
C	AN2	PWR	Arkansas Nuclear One, Unit 2	Russellville, Arkansas	Arkansas Power & Light Company
W	AS1	PWR	Asco Unit 1	Asco, Tarragona, Spain	Fuerzas Electricas de Cataluna,
W	AS2	PWR	Asco Unit 2	Asco, Tarragona, Spain	Fuerzas Electricas de Cataluna,
G	BF3	BWR	Browns Ferry Unit 3	Decatur, Alabama	Tennessee Valley Authority
G	BR	BWR	Big Rock Point Reactor	Charlevoix, Michigan	Consumers Power Company
W	BV1	PWR	Beaver Valley Unit 1	Shippingport, Pennsylvania	Duquesne Light Company
G	BW1	BWR	Brunswick Unit 1	Southport, North Carolina	Carolina Power & Light Company
G	BW2	BWR	Brunswick Unit 2	Southport, South Carolina	Carolina Power & Light Company
W	BZ1	PWR	Beznau Unit 1	Doettingen, Switzerland	Nordostschweizerische Kraftwerk
W	BZ2	PWR	Beznau Unit 2	Doettingen, Switzerland	Nordostschweizerische Kraftwerk
W	CAB	PWR	Jose Cabrera Reactor	Madrid, Spain	Union Electrica (UE)-Fenosa SA
W	CB1	PWR	Catawba Unit 1	Clover, South Carolina	Duke Power Company
C	CC1	PWR	Calvert Cliffs Unit 1	Lusby, Maryland	Baltimore Gas & Electric Compan
C	CC2	PWR	Calvert Cliffs Unit 2	Lusby, Maryland	Baltimore Gas & Electric Compan
W	CK1	PWR	Donald C. Cook Unit 1	Bridgman, Michigan	Indiana & Michigan Electric Com
W	CK2	PWR	Donald C. Cook Unit 2	Bridgman, Michigan	Indiana & Michigan Electric Com
W	CL1	PWR	Callaway Unit 1	Fulton, Missouri	Union Electric Company
G	CPR	BWR	Cooper	Brownville, Nebraska	Nebraska Public Power District
B	CR3	PWR	Crystal River Unit 3	Red Level, Florida	Florida Power Corporation
W	CTY	PWR	Haddam Neck	Haddam Neck, Connecticut	Connecticut Yankee Atomic Power
B	DB1	PWR	Davis-Besse Nuclear Power Station Unit 1	Oak Harbor, Ohio	Toledo Edison Company
W	DC1	PWR	Diablo Canyon Unit 1	Avila Beach, California	Pacific Gas & Electric Company
W	DC2	PWR	Diablo Canyon Unit 2	Avila Beach, California	Pacific Gas & Electric Company
G	DR1	BWR	Dresden Nuclear Plant Station Unit 1	Morris, Illinois	Commonwealth Edison Company
G	DR2	BWR	Dresden Nuclear Plant Station Unit 2	Morris, Illinois	Commonwealth Edison Company
G	DR3	BWR	Dresden Nuclear Plant Station Unit 3	Morris, Illinois	Commonwealth Edison Company
A	ERR	BWR	Elk River	Elk River, Minnesota	Rural Co-operative Power Associ
W	FA1	PWR	Joseph M. Farley Unit 1	Dothan, Alabama	Alabama Power Company
W	FA2	PWR	Joseph M. Farley Unit 2	Dothan, Alabama	Alabama Power Company
C	FC1	PWR	Fort Calhoun Station Unit 1	Fort Calhoun, Nebraska	Omaha Public Power District
G	FTZ	BWR	James A. FitzPatrick	Oswego, New York	New York Power Authority
G	GAR	BWR	Garigliano	Sessa Aurunca, Italy	Ente Nazionale per l'Energia El
W	GIN	PWR	Robert E. Ginna Nuclear Plant Unit 1	Ontario, New York	Rochester Gas and Electric Corp
G	HA1	BWR	Edwin I. Hatch Unit 1	Baxley, Georgia	Georgia Power Company
W	HB2	PWR	H. B. Robinson Unit 2	Hartsville, South Carolina	Carolina Power & Light Company
G	HM3	BWR	Humboldt Bay Power Plant Unit 3	Eureka, California	Pacific Gas & Electric Company
W	IP2	PWR	Indian Point Unit 2	Indian Point, New York	Consolidated Edison Company of
W	IP3	PWR	Indian Point Unit 3	Indian Point, New York	Consolidated Edison Company of
W	KO1	PWR	Korea Nuclear 1	Ko-Ri, Korea	Korea Electric Power Corporatio
W	KWE	PWR	Kewaunee Nuclear Power Plant	Carlton, Wisconsin	Wisconsin Public Service Corpor
A	LAC	BWR	Lacrosse Boiling Water Reactor	Genoa, Wisconsin	Dairyland Power Cooperative
W	LM2	PWR	Lemoniz Unit 2	Lemoniz, Vizcaya, Spain	Iberduero S. A.
W	MC1	PWR	W. B. McGuire Unit 1	Cornelius, North Carolina	Duke Power Company
W	MC2	PWR	W. B. McGuire Unit 2	Cornelius, North Carolina	Duke Power Company
B	MD1	PWR	Midland Unit 1	Midland, Michigan	Consumers Power Company
B	MD2	PWR	Midland Unit 2	Midland, Michigan	Consumers Power Company
G	ML1	BWR	Millstone Nuclear Power Station Unit 1	Waterford, Connecticut	Northeast Utilities Service Co
C	ML2	PWR	Millstone Nuclear Power Station Unit 2	Waterford, Connecticut	Northeast Utilities Service Co
G	MON	BWR	Monticello Nuclear Generating Plant	Monticello, Minnesota	Northern States Power Company
C	MY	PWR	Maine Yankee Nuclear Plant	Wiscasset, Maine	Maine Yankee Atomic Power Compa

Listing of REAC_LST.dbf

	PLANT_DES	ARCH_ENG	VESSEL_MFG
	Westinghouse/EBE	Gibbs & Hill/Promon	Babcock and Wilcox
ad SA	Westinghouse	Empresarios Agrupados/Gibbs & Hill Espanola	Combustion Engineering
	Babcock and Wilcox	Bechtel	Babcock and Wilcox
	Combustion Engineering	Bechtel	Combustion Engineering
S.A.	Westinghouse	Bechtel/Empresa Nacional de Ingenenay Tech (Spain)	Westinghouse
S.A.	Westinghouse	Bechtel/Empresa Nacional de Ingenenay Tech (Spain)	Westinghouse
	General Electric	Tennessee Valley Authority	General Electric
	General Electric	Bechtel	Combustion Engineering
	Westinghouse	Stone & Webster Engineering Corp.	Westinghouse
	General Electric	United Engineers and Constructors	Chicago Bridge and Iron
	General Electric	United Engineers and Constructors	Chicago Bridge and Iron
AG (NOK)	Westinghouse	Gibbs & Hill (US)/Brown Boven et Cie (Switzerland)	Societe des Forges et Ateliers du Creusot
AG (NOK)	Westinghouse	Gibbs & Hill (US)/Brown Boven et Cie (Switzerland)	Societe des Forges et Ateliers du Creusot
	Westinghouse	Gibbs & Hill	Combustion Engineering
	Westinghouse	Duke Power Company	Westinghouse
	Combustion Engineering	Bechtel	Combustion Engineering
	Combustion Engineering	Bechtel	Combustion Engineering
any	Westinghouse	American Electric Power Service Corporation	Combustion Engineering
any	Westinghouse	American Electric Power Service Corporation	Chicago Bridge and Iron
	Westinghouse	Bechtel	Combustion Engineering
	General Electric	Burns & Roe, Inc.	Combustion Engineering
	Babcock and Wilcox	Gilbert Associates, Inc.	Babcock and Wilcox
Company	Westinghouse	Stone & Webster Engineering Corp.	Combustion Engineering
	Babcock and Wilcox	Bechtel	Babcock and Wilcox
	Westinghouse	Pacific Gas & Electric Company/Bechtel	Combustion Engineering
	Westinghouse	Pacific Gas & Electric Company/Bechtel	Combustion Engineering
	General Electric	Bechtel	Babcock and Wilcox
	General Electric	Sargent & Lundy Engineers	Babcock and Wilcox
	General Electric	Sargent & Lundy Engineers	Babcock and Wilcox
tion	Allis-Chalmers	Sargent & Lundy Engineers	Pacific Coast Engineering
	Westinghouse	Southern Company Services, Inc./Bechtel	Combustion Engineering
	Westinghouse	Southern Company Services, Inc./Bechtel	Combustion Engineering
	Combustion Engineering	Gibbs & Hill	Combustion Engineering
	General Electric	Stone & Webster Engineering Corp.	Combustion Engineering
ttrica, Italy	General Electric	Ebasco Services, Inc.	Terni
	Westinghouse	Gilbert Associates, Inc.	Babcock and Wilcox
	General Electric	Southern Company Services, Inc./Bechtel	General Electric
	Westinghouse	Ebasco Services, Inc.	Combustion Engineering
	General Electric	Bechtel	Combustion Engineering
ew York	Westinghouse	United Engineers and Constructors	Babcock and Wilcox
ew York	Westinghouse	United Engineers and Constructors	Combustion Engineering
	Westinghouse	Gilbert Associates, Inc.	Westinghouse
tion	Westinghouse	Fluor Engineers, Inc.	Combustion Engineering
	Allis-Chalmers	Sargent & Lundy Engineers	Combustion Engineering
	Westinghouse	Iberduero S.A./Bechtel/Sener, S.A./INITEC	Babcock and Wilcox
	Westinghouse	Duke Power Company	Westinghouse
	Westinghouse	Duke Power Company	Westinghouse
	Babcock and Wilcox	Bechtel	Babcock and Wilcox
	Babcock and Wilcox	Bechtel	Babcock and Wilcox
any	General Electric	Ebasco Services, Inc.	Combustion Engineering
any	Combustion Engineering	Bechtel	Combustion Engineering
	General Electric	Bechtel	General Electric
ny	Combustion Engineering	Stone & Webster Engineering Corp.	Combustion Engineering

REAC_LST.dbf: Page 2

TAG	PLANT_ID	REAC_TYPE	REAC_NAME	LOCATION	PLANT_OP
W	NA1	PWR	North Anna Unit 1	Mineral, Virginia	Virginia Electric & Power Company
W	NA2	PWR	North Anna Unit 2	Mineral, Virginia	Virginia Electric & Power Company
G	NM1	BWR	Nine Mile Point Unit 1	Scribe, New York	Niagara Mohawk Power Corporation
B	OC1	PWR	Oconee Nuclear Station Unit 1	Seneca, South Carolina	Duke Power Company
B	OC2	PWR	Oconee Nuclear Station Unit 2	Seneca, South Carolina	Duke Power Company
B	OC3	PWR	Oconee Nuclear Station Unit 3	Seneca, South Carolina	Duke Power Company
G	OYS	BWR	Oyster Creek Nuclear Generating Station	Forked River, New Jersey	General Public Utilities Nuclear
C	PAL	PWR	Palisades Nuclear Plant	South Haven, Michigan	Consumers Power Company
W	PB1	PWR	Point Beach Nuclear Plant Unit 1	Two Creeks, Wisconsin	Wisconsin Electric Power Company
W	PB2	PWR	Point Beach Nuclear Plant Unit 2	Two Creeks, Wisconsin	Wisconsin Electric Power Company
W	PI1	PWR	Prairie Island Unit 1	Red Wing, Minnesota	Northern States Power Company
W	PI2	PWR	Prairie Island Unit 2	Red Wing, Minnesota	Northern States Power Company
G	PL1	BWR	Pilgrim Nuclear Power Station Unit 1	Plymouth, Massachusetts	Boston Edison Company
G	QC1	BWR	Quad Cities Nuclear Power Station Unit 1	Cordova, Illinois	Commonwealth Edison Company
G	QC2	BWR	Quad Cities Nuclear Power Station Unit 2	Cordova, Illinois	Commonwealth Edison Company
W	RI2	PWR	Ringhals Unit 2	Varberg, Sweden	Swedish State Power Board (SSPB)
B	RS1	PWR	Rancho Seco Unit 1	Clay Station, California	Sacramento Municipal Utility District
W	SA1	PWR	Salem Unit 1	Salem, New Jersey	Public Service Electric and Gas Company
W	SA2	PWR	Salem Unit 2	Salem, New Jersey	Public Service Electric and Gas Company
G	SH1	BWR	Susquehanna Unit 1	Berwick, Pennsylvania	Pennsylvania Power & Light Company
C	SL1	PWR	St. Lucie Unit 1	Hutchinson Island, Florida	Florida Power & Light Company
C	SL2	PWR	St. Lucie Unit 2	Hutchinson Island, Florida	Florida Power & Light Company
W	SO1	PWR	San Onofre Unit 1	San Clemente, California	Southern California Edison Company
W	SQ1	PWR	Sequoyah Unit 1	Soddy Daisy, Tennessee	Tennessee Valley Authority
W	SQ2	PWR	Sequoyah Unit 2	Soddy Daisy, Tennessee	Tennessee Valley Authority
W	SU1	PWR	Surry Unit 1	Gravel Neck, Virginia	Virginia Electric & Power Company
W	SU2	PWR	Surry Unit 2	Gravel Neck, Virginia	Virginia Electric & Power Company
B	TM1	PWR	Three Mile Island Nuclear Station Unit 1	Londonderry Twp., Pennsylvania	Metropolitan Edison Company
B	TM2	PWR	Three Mile Island Nuclear Station Unit 2	Three Mile Island, PA	Metropolitan Edison Company
W	TP3	PWR	Turkey Point Nuclear Power Station Unit 3	Florida City, Florida	Florida Power & Light Company
W	TP4	PWR	Turkey Point Nuclear Power Station Unit 4	Florida City, Florida	Florida Power & Light Company
W	TRO	PWR	Trojan Reactor	Prescott, Oregon	Portland General Electric Company
W	VS1	PWR	Virgil C. Summer Unit 1	Parr, South Carolina	Carolina Electric and Gas Company
G	VY	BWR	Vermont Yankee Nuclear Power Station	Vernon, Vermont	Vermont Yankee Nuclear Power Corporation
W	WB1	PWR	Watts Bar Unit 1	Spring City, Tennessee	Tennessee Valley Authority
W	WC1	PWR	Wolf Creek Unit 1	Burlington, Kansas	Kansas Gas & Electric
W	YR	PWR	Yankee Reactor, Rowe, Massachusetts	Rowe, Massachusetts	Yankee Atomic Electric Company
W	ZN1	PWR	Zion Nuclear Plant Reactor Unit 1	Zion, Illinois	Commonwealth Edison Company
W	ZN2	PWR	Zion Nuclear Plant Reactor Unit 2	Zion, Illinois	Commonwealth Edison Company

Table 20 (continued)

PLANT_DES	ARCH_ENG	VESSEL_MFG
Westinghouse	Stone & Webster Engineering Corp.	Rotterdamse Droogdok Maatdschappij (Netherlands)
Westinghouse	Stone & Webster Engineering Corp.	Combustion Engineering
General Electric	Niagara Mohawk Power Corporation	Combustion Engineering
Babcock and Wilcox	Duke Power Company/Bechtel	Babcock and Wilcox
Babcock and Wilcox	Duke Power Company/Bechtel	Combustion Engineering
Babcock and Wilcox	Duke Power Company/Bechtel	Babcock and Wilcox
General Electric	Burns & Roe, Inc./General Electric Company	Combustion Engineering
Combustion Engineering	Bechtel	Combustion Engineering
Westinghouse	Bechtel	Babcock and Wilcox
Westinghouse	Bechtel	Combustion Engineering
Westinghouse	Fluor Engineers, Inc.	Societe des Forges et Ateliers du Creusot
Westinghouse	Fluor Engineers, Inc.	Societe des Forges et Ateliers du Creusot
General Electric	Bechtel	Combustion Engineering
General Electric	Sargent & Lundy Engineers	Babcock and Wilcox
General Electric	Sargent & Lundy Engineers	Babcock and Wilcox
Westinghouse	SSPB/Gibbs & Hill/Stal-Laval Turbin AB	Rotterdamse Droogdok Maatdschappij (Netherlands)
Babcock and Wilcox	Bechtel	Babcock and Wilcox
Westinghouse	Public Service Electric and Gas Company	Combustion Engineering
Westinghouse	Public Service Electric and Gas Company	Combustion Engineering
General Electric	Bechtel	Chicago Bridge and Iron
Combustion Engineering	Ebasco Services, Inc.	Combustion Engineering
Combustion Engineering	Ebasco Services, Inc.	C-E Avery
Westinghouse	Bechtel	Combustion Engineering
Westinghouse	Tennessee Valley Authority	Westinghouse
Westinghouse	Tennessee Valley Authority	Westinghouse
Westinghouse	Stone & Webster Engineering Corp.	Rotterdamse Droogdok Maatdschappij (Netherlands)
Westinghouse	Stone & Webster Engineering Corp.	Rotterdamse Droogdok Maatdschappij (Netherlands)
Babcock and Wilcox	Gilbert Associates, Inc.	Babcock and Wilcox
Babcock and Wilcox	Burns & Roe, Inc.	Babcock and Wilcox
Westinghouse	Bechtel	Westinghouse
Westinghouse	Bechtel	Babcock and Wilcox
Westinghouse	Bechtel	Chicago Bridge and Iron
Westinghouse	Gilbert Associates, Inc.	Chicago Bridge and Iron
General Electric	Ebasco Services, Inc.	Chicago Bridge and Iron
Westinghouse	Tennessee Valley Authority	Westinghouse
Westinghouse	Bechtel/Sargent & Lundy Engineers	Combustion Engineering
Westinghouse	Stone & Webster Engineering Corp.	Babcock and Wilcox
Westinghouse	Sargent & Lundy Engineers	Babcock and Wilcox
Westinghouse	Sargent & Lundy Engineers	Babcock and Wilcox

Table 21. Partial listing of REAC_PR.dbf

REAC_PR.dbf: TAG	Plant_ID	Reactor Type / Capacity	START_DATE	STOP_DATE	CONFIG	EFP_YEAR	EFP_Y_U	CAP_T_MIN	CAP_T_MAX	CAP_T_U	TEMP_TAG	CAP_F1	F1_UNC	F1_RATE	CAP_FP1	FP1_UNC	CAP_BPA	BPA_UNC	REF_ID	PAGES	NOTES
*	AD1	V	03/01/1982	01/03/1986		358.61	D		579	F	M	4.580E+18							SAR1-DR-8976	1; 12; 32	
A	AN1	A			1 of 4	345	D					7.270E+17		2.440E+10					BAW-1836	6-3; 6-7	100. % MAY TO 7% OF FLUENCE
A	AN1	A			2 of 4	374	D					5.140E+18		9.770E+10					BAW-1836	6-3; 6-7	100. IN DBT, CYCLE 1
A	AN1	A			3 of 4	296	D					2.610E+18		9.670E+10					BAW-1836	6-3; 6-7	100. IN DBT, CYCLE 2
A	AN1	A			4 of 4	273	D					5.620E+18		1.540E+11					BAW-1836	6-3; 6-7	100. IN DBT, CYCLE 3
A	AN1	A			TOTAL			610	621	F	M	1.010E+19							BAW-1836	6-3; 6-7	
B	AN1	A			1 of 2	345	D					7.270E+17		2.440E+10					BAW-1698	6-3; 6-4	100. IN MAY TO 17% OF FLUENCE
B	AN1	B			2 of 2	374	D					4.280E+18		1.100E+10					BAW-1698	6-3; 6-4	100. IN DBT, CYCLE 1
B	AN1	B			TOTAL			580	610	F	M	4.280E+18		1.640E+10	1.900E+18				BAW-1698	5-1; 6-3	
B	AN1	B				345	D	560	580	F	M	7.270E+17		2.440E+10	1.580E+18				BAW-1440	5-1; 6-7	
B	AN1	E				2.981E+07	S					8.150E+17	B				1.170E-05	B	NUREG/CR-3519	4.1-25; 4.4-49	MEDL
B	AN1	E	08/01/1974	03/01/1976		1.69	T	550	580	F	M	5.400E+18							BMI-0584	1; 7; 23; 25	
C	AN2	W7		08/20/1982		6576	N	585		F	M	1.500E+18		6.190E+10					WCAP 11(5)	596	
G	BB	119	05/20/1965	09/18/1966		6579	N	585		F	M	2.590E+19		9.600E+11					WCAP 11(5)	596	
G	BB	122	05/20/1965	09/18/1966		18295	N	585		F	M	1.070E+20		1.400E+12					WCAP 11(5)	596	
G	BB	124	05/20/1965	05/18/1967		2.720E+08	S	585		F	M	2.270E+19		8.580E+10					WCAP-9704	4-1; 6-12; 6-15	
G	BB	125	12/01/1962	02/01/1979		26114	N	585		F	M	7.100E+18		7.500E+10					WCAP 11(5)	596	
G	BD	127	05/20/1965	06/21/1968								6.540E+18							WCAP-10867	1-1; 4-1; 5-1; 6-25	
W	BW1	U	05/01/1976	10/31/1984		1.150E+08	S	579	590	F	M	2.550E+19							WCAP-9960	5-1; 6-15; 6-20	
W	BW1	V	05/01/1976	11/30/1979		3.220E+07	J	579	590	F	M	5.720E+18	10	6.820E+10					PB-ME 75/05	1; 4	UNC. OF FLUX +/- .22
W	BZ1	R										1.800E+19							PB-ME 78/06	1; 26	
W	BZ1	S				1920	D					2.770E+18		7.760E+10					PB-ME 75/02	1; 25	
W	BZ1	V		06/07/1971								1.540E+19	9				1.980E-02	11	NUREG/CR-3519	4.1-24; 4.2-101	MEDL
W	BZ2	R	04/23/1971	07/15/1978		1.714E+08	S					5.170E+18		7.580E+10					PB-ME 75/02	25	
W	BZ2	V		07/21/1975		499	D					1.400E+19							WCAP/78/64	1-1; 5-1	
W	CAB	K						579	590	F	M	1.680E+19		1.580E+11					WCAP-10185	4-1; 5-1; 6-17; 6-24	
W	CAB	N	07/01/1968	04/30/1979		2.350E+08	S	579	590	F	M	1.430E+19							WCAP/78/64	1-1; 5-1	
W	CAB	P						570	590	F	M	3.080E+18		1.290E+11					WCAP-11527	1-1; 5-1; 6-14; 6-15	
W	CB1	Z	06/01/1985	0[illegible]/1986		0.795	T		579	F	M	6.220E+18		6.710E+10			8.470E-05		BMI-1280	1; 22; 38; 40	
C	CC1	265		05/01/1979		1075.32	D	550	580	F	M	8.060E+18		5.560E+10	1.560E-19		1.150E-02		SAR1-7534	13; 15; 16; 20; 23	REMOVED 1ST REFUELING SHUTDOWN
C	CC2	265	12/01/1976	10/15/1982		1671.4	D		558	F	M	1.800E+18		4.500E+10					SAR1-02-4779	1; 16; 18	
W	CK1	T	02/02/1975	12/25/1976		441.94	D	579	590	F	M	2.710E+18	22				4.450E-05	25	NUREG/CR-3519	4.1-24; 4.2-171	MEDL
W	CK1	Y	02/02/1975	12/24/1976		3.991E+07	S					1.500E+19		2.500E+10					SAR1-7244-001/1	9; 15; 19	
W	CK1	Y	02/02/1975	07/03/1982		1805.23	D	579	590	F	M	1.082E+19		6.010E+10					SAR1-04-8868	1; 13; 35	
W	CK2	X	05/22/1978	02/28/1986		5.273	T	579	590	F	M	6.700E+18							SAR1-7244-002/1	1; 9; 15; 18	
W	CK2	Y	05/22/1978	11/21/1982		5.24	Y		579	F	M	3.270E+18		1.210E+11					WCAP-11371/81	1-1; 5-1; 6-22; 6-28	
W	CL1	U	10/22/1984	02/28/1424		3.320E+07	S					2.300E+17		1.050E+09	5.600E+17				RMI-105-0986	5-1; 4-2; 4-5	FLU./FLUX BASED ON CU, P, 4-7
G	CM1	1	07/01/1974	09/15/1984		2.820E+08	S	580	588	F	M	1.050E+18		4.510E+10	2.370E+18				BAW-1670/81	1-1; 5-1; 6-6	
B	CR3	B		05/01/1978		268.8	D		577	F	M	6.560E+18	15	5.120E+10					BAW-1698	1-1; 5-1; 6-6	CYCLES 10-5
B	CR3	C				1482.0	D		577	F	M	7.500E+18	18	4.940E+10					BAW-1590	1-1; 5-1; 6-6	CYCLES 1-5
B	CR3	D				1733.0	D	610	621	F	M	1.080E+19	15	6.580E+10			1.580E-02		BAW-2049	1-1; 5-10; 6-8	
B	CR3	F				1876.0	D					5.160E+18	12				4.620E-05	12	NUREG/CR-3519	4.1-24; 4.2-3	MEDL
W	CY1	A	10/01/1963	05/01/1970		5.253E+07	S	550	580	F	M	2.070E+17							BMI-1070	43	
W	CY1	A				1647.5	M					2.220E+19		6.680E+10					WCAP-10256	4-1; 5-1; 6-25; 6-38	
W	CY1	D	10/01/1967	09/30/1981		5.329E+08	S		579	F	M	4.040E+18							BMI-0572	1	
W	CY1	F				2.6	T	550	590	F	M	6.060E+18	24				9.490E-05	27	NUREG/CR-3519	4.1-24; 4.2-9	MEDL
W	CY1	F	10/01/1967	04/18/1971		7.651E+07	S					2.080E+19	24				5.240E-02	27	NUREG/CR-3519	4.1-24; 4.2-15	MEDL
W	CY1	M	10/01/1967	11/01/1977		2.390E+08	S					1.290E+19		1.250E+11					BAW-1582	5-1; 6-5	
B	DB1	A				1214.4	D	610	621	F	M	5.920E+18							BAW-1854	5-1; 6-5	
B	DB1	B				943	D	610	621	F	M	1.960E+18		6.080E+10	4.450E-18				BAW-1701	5-1; 6-5	
B	DB1	F				374	D	588	610	F	M	2.980E+18		7.510E+10					WCAP-11567	5-1; 6-10; 6-20	
W	DC1	S	11/01/1984	08/31/1986		1.26	Y		579	F	M	3.510E+18			4.840E-10				WCAP-11651	5-1; 6-15; 6-19	
W	DC2	U	10/18/1985	04/05/1987		0.99	T		579	F	M	1.200E+19							WDBC-12585	1; 9; 29	
G	DR1	G2	04/15/1960	04/01/1974				550		F		1.080E+19							GEBC-12585	1; 9; 29	
G	DR1	GA-1	05/01/1963	04/01/1974				550		F		2.980E+19		2.760E+11					BCL-585-3	19; 21; 22; 52	
C	DR2	2/G1	05/27/1970	11/02/1974		839	D					2.234E+19		2.760E+11					BCL-585-3	19; 21; 22; 52	
C	DR2	2/G2	05/27/1970	11/02/1974		839	D					1.860E+19		2.760E+11					BCL-585-3	19; 21; 22; 52	
C	DR2	2/G3	05/27/1970	11/02/1974		839	D														

Table 22. Listing of HEAT_LST.dbf

HEAT_LST.dbf: Page 1

TAG	PLANT_ID	HEAT_ID	RPT_ID	HEAT_NO	PROD_ID	MAT_ID	SUPPLIER	THICKNESS	SOURCE	MPC_ID	MPC_HEAT	REF_ID	PAGES	NOTES
W		SASTM	ASTM PLATE	A0421	SRM	A302B	U.S. STEEL CORP.	6"	FABR	E20 6	A0421	ASTM D554	2; 3	
C		SHSS01	HSST 01	A10081	SRM	A533B1	LUKENS	12"	FABR	C01 4	HSST01	ORNL-4313	4; 5; 40	
B		SHSS02	HSST 02	A11951	SRM	A533B1	LUKENS	12"	FABR			BAW-1698	3-1	
W		SHSS02	HSST 02	A11951	SRM	A533B1	LUKENS	12"	FABR			SWRI-82-4770	9	
W	RD1	FAD101	ANH161	ANH161	F	A5082	LADISH	6 3/4"	SCR			WCAP-8957	3-1; A-1	
W	AD1	FAD102	ANH153 (FOR WELD)	ANH153	F	A5082	LADISH	6 3/4"	SCR			WCAP-8957	3-1; A-1	USED FOR WELD
W	AD1	HAD101	FROM ANH161	ANH161	HAZ	A5082	LADISH	6 3/4"	SIM			WCAP-8957	3-1; A-1	
W	AD1	WAD101	ANH161 AND ANH153		W	A5082		6 3/4"	SIM			WCAP-8957	3-1; A-1	
W	AL2	HAL201	FROM B9405-1		HAZ	A533B1	LUKENS	8 7/8"	SIM			WCAP-9228	2-1	
W	AL2	PAL201	B9405-1 (SURV.)	B9405-1	P	A533B1	LUKENS	8 7/8"	SCR			WCAP-9228	2-1	
W	AL2	PAL202	B9405-2 (FOR WELD)		P	A533B1	LUKENS	8 7/8"	SCR			WCAP-9228	A-1	
W	AL2	WAL201	B9405-1 AND B9405-2	83642	W	A533B1	LUKENS	8 7/8"	SIM			WCAP-9228	2-1;A-1,-2	
B	AN1	HAN101	FROM C5114-1	C5114-1	HAZ	A533B1	LUKENS	8 3/4"	SCR	B07 3	C51141	BAW-1820	4-27; 4-30	
B	AN1	HAN102	FROM C5114-2	C5114-2	HAZ	A533B1	LUKENS	8 3/4"	SCR	B08 3	C51142	BAW-1820	4-27; 4-30	
B	AN1	PAN101	C-5114-1 (SURV.)	C5114-1	P	A533B1	LUKENS	8 3/4"	SCR	B07 1	C51141	BAW-1820	4-27; 4-30	
B	AN1	PAN102	C-5114-2 (SURV.)	C5114-2	P	A533B1	LUKENS	8 3/4"	SCR	B08 1	C51142	BAW-1820	4-27; 4-30	
B	AN1	WAN101	WF-193	406L44	W	A533B1	UNION CARBIDE	8 3/4"	SCR	B07 4	WF193	BAW-1820	4-27; 4-30	LINDE 80; 8773
C	AN2	HAN201	FROM C8009-3	C8009-3	HAZ	A533B						BMI-0584	14	TENSILE INFO ONLY
C	AN2	PAN201	C8009-3 (SURV.)	C8009-3	P	A533B						BMI-0584	12	TENSILE INFO ONLY
C	AN2	PAN202	C8009-1 (FOR WELD)	C8009-1	P	A533B						BMI-0584	13	TENSILE INFO ONLY
C	AN2	PAN203	C8009-2 (FOR WELD)	C8009-2	P	A533B						BMI-0584	13	TENSILE INFO ONLY
C	AN2	WAN201	C8009-1 AND C-8009-2		W	A533B						BMI-0584	13	TENSILE INFO ONLY
W	AS1	HAS101	FROM B9605-2	B9605-2	HAZ	A533B1	LUKENS	8 7/8"	SIM			WCAP-9308	2-1	
W	AS1	PAS101	B9605-2 (SURV.)	B9605-2	P	A533B1	LUKENS	8 7/8"	SCR			WCAP-9308	2-1	
W	AS1	PAS102	B9605-1 (FOR WELD)	B9605-1	P	A533B1	LUKENS	8 7/8"	SCR			WCAP-9308	A-1	
W	AS1	WAS101	B9605-1 AND B9605-2	83650	W	A533B1	LUKENS	8 7/8"	SIM			WCAP-9308	2-1; A-1	
W	AS2	HAS201	FROM R408-1		HAZ	A533B1	LUKENS	8"	SIM			WCAP-9330	2-1	
W	AS2	PAS201	R408-1		P	A533B1	LUKENS	8"	SCR			WCAP-9330	2-1	
W	AS2	PAS202	R407-2 (FOR WELD)		P	A533B1	LUKENS	8"	SCR			WCAP-9330	A-1	
W	AS2	WAS201	R408-1 AND R407-2	4P6052	W	A533B1	LUKENS	8"	SIM			WCAP-9330	2-1; A-1	
G	BR	HBR_01	FROM S-5503-2/3	192462/3	HAZ	A302B		6"	SIM	G10 3	192462	GECR-4442	4	
G	BR	PBR_01	S-5503-2/3 (SURV.)	192462/3	P	A302B		6"	SCR	G10 1	192462	NESD 11(3)	396; 397	
G	BR	WBR_01	FROM S-5503-2/3	192462/3	W	A302B		6"	SIM	G10 2		GECR-4442	4	
W	BV1	HBV101	FROM B6907-1		HAZ	A533B1	LUKENS	9"	SIM	W01 4	B69031	WCAP-10867	4-1; A-7	
W	BV1	PBV101	B6907-1 (SURV.)	C6017-1	P	A533B1	LUKENS	9"	SCR	W01 1	B69031	WCAP-8457	2-1	
W	BV1	PBV102	B6607-1 (FOR WELD)	B6607-1	P	A533B1	LUKENS	9"	SCR			WCAP-8457	2-1; A-1	
W	BV1	PBV103	B6607-2 (FOR WELD)	B6607-2	P	A533B1	LUKENS	9"	SCR			WCAP-8457	2-1; A-1	
W	BV1	WBV101	B6607-1 AND B6607-2	305424	W	A533B1		9"	SIM			WCAP-10867	4-3	
G	BW1	PBW101	PIECE # 301, SLAB 1	C4489	P	A533B1	LUKENS		SCR			NEDO-24161	13	
G	BW1	PBW201	PIECE # 301, SLAB 1	C4887	P	A533B1	LUKENS		SCR			NEDO-24157/R1	13	
W	BZ1	HBZ101	12MD07 TREATMENT H		HAZ							PB-ME 75/03	2	
W	BZ1	PBZ101	12MD07 TREATMENT C		P					W48 1	C	PB-ME 75/03	2	
W	BZ1	PBZ102	12MD07 TREATMENT D		P					W48 2	D	PB-ME 75/03	2	
W	BZ1	WBZ101	12MD07 TREATMENT W		W					W48 3	W	PB-ME 75/03	2	
W	CAB	HCAB02	FROM B1105-2	B1105-2	HAZ	A533B1			SIM	W02 1	B11052	WENX/76/64	4-1	
W	CAB	PCAB01	B1105-1 (SURV.)	B1105-1	P	A533B1			SCR	W02 2	B11051	WENX/76/64	4-1	
W	CAB	PCAB02	B1105-2 (SURV.)	B1105-2	P	A533B1			SCR	W02 3	B11052	WENX/76/64	4-1	
W	CAB	WCAB01		1248	W	A533B1			SIM	W03 2		WENX/76/64	4-1	
W	CB1	FCB101	FORGING 05 FOR BASE	411343	F	A5082	KLOECKNER-WERKE AG	8.5"	SCR			WCAP-9734	2-1; A-1	
W	CB1	FCB102	FORGING 04 FOR WELD	527708	F	A5082	KLOECKNER-WERKE AG	8.5"	SCR			WCAP-9734	2-1; A-1	
W	CB1	HCB101	FROM FORGING 05		HAZ	A5082	KLOECKNER-WERKE AG	8.5"	SIM			WCAP-9734	2-1	
W	CB1	WCB101	FORG. 05 & FORG. 04	895075	W	A5082	KLOECKNER-WERKE AG	8.5"	SIM			WCAP-9734	2-1; A-1	
C	CC1	HCC101	D7206-3 AND D7206-1		HAZ	A533B1			SIM	CJ4 3	C44411	BMI-1280	7; 13	
C	CC1	PCC101	D7206-1 (FOR WELD)	C43S1-2	P	A533B1	LUKENS		SCR			DOCKET 50-317	34	
C	CC1	PCC102	D7206-2 (FOR WELD)	C4441-2	P	A533B1	LUKENS		SCR			DOCKET 50-317	32	
C	CC1	PCC103	D7206-3 (SURV.)	C4441-1	P	A533B1	LUKENS		SCR	C04 1	C44411	DOCKET 50-317	35	
C	CC1	WCC101	D7206-1 AND D7206-2	33A277	W	A533B1	COMBUSTION ENG.		SIM	C04 2	33A277	DOCKET 50-317	36	

Table 22 (continued)

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TAG	PLANT_ID	HEAT_ID	RPT_ID	HEAT_NO	PROD_ID	MAT_ID	SUPPLIER	THICKNESS	SOURCE	MPC_ID	MPC_HEAT	REF_ID	PAGES	NOTES
C	CC1	WCC102	D7206-1/D7206-3 HAZ		W	A53381			SIM			BMI-1280	7	USED FOR HAZ
C	CC2	HCC201	D8907-1 AND D8907-3		HAZ	A53381			SIM			SWRI-7524	6	
C	CC2	PCC201	D8907-1 (FOR WELD)	C5804-1	P	A53381	LUKENS		SCR			DOCKET 50-318	59	
C	CC2	PCC202	D8907-2 (SURV.)	C5286-1	P	A53381	LUKENS		SCR			DOCKET 50-318	62	
C	CC2	PCC203	D8907-3 (FOR WELD)	C5803-3	P	A53381	LUKENS		SCR			DOCKET 50-318	61	
C	CC2	WCC201	D8907-1 AND D8907-3	10137	W	A53381	COMBUSTION ENG.		SIM			DOCKET 50-318	63	
W	CX1	HCX101	FROM B4406-3	B4406-3	HAZ	A53381			SIM	W07 4	B44063	SWRI-7244-001/1	6	
W	CX1	PCX101	B4406-3 (SURV.)	B4406-3	P	A53381			SCR	W07 1	B44063	SWRI-7244-001/1	6	
W	CX1	WCX101	FROM B4406-3	13253	W	A53381			SIM	W07 3	13253	SWRI-7244-001/1	6	
W	CX2	HCX201	FROM C5521-2	C5521-2	HAZ	A53381		8 3/4"	SIM			WCAP-8512	2-1; A-1	
W	CX2	PCX201	C5521-2 (SURV.)	C5521-2	P	A53381	CHICAGO BRIDGE	8 3/4"	SCR			WCAP-8512	2-1; A-1	
W	CX2	PCX202	C5592-1 (FOR WELD)	C5592-1	P	A53381	CHICAGO BRIDGE	8 3/4"	SCR			WCAP-8512	2-1; A-1	
W	CX2	WCX201	C5521-2 AND C5592-1		W	A53381	CHICAGO BRIDGE	8 3/4"	SIM			WCAP-8512	2-1; A-1	
W	CL1	HCL101	FROM R2708-1		HAZ	A53381		9 5/8"	SIM			WCAP-9842	2-1	
W	CL1	PCL101	R2708-1 (SURV.)	C4499-2	P	A53381	LUKENS	9 5/8"	SCR			WCAP-9842	2-1	
W	CL1	PCL102	R2707-1 (FOR WELD)	C4344-1	P	A53381	LUKENS	9 5/8"	SCR			WCAP-9842	2-1	
W	CL1	WCL101	R2708-1 AND R2707-1	90077	W	A53381		9 5/8"	SIM			WCAP-9842	2-1; A-1	
G	CPR	HCPR01	G2802-1 AND G2802-2		HAZ	A53381			SIM			RDE-103-0986	3-6; 3-8	
G	CPR	PCPR01	G2802-2 (SURV.)	C2307-2	P	A53381			SCR			RDE-103-0986	3-6; 3-8	
G	CPR	PCPR02	G2802-1 FOR HAZ & W	C2331-2	P	A53381			SCR			RDE-103-0986	3-6; 3-8	
G	CPR	WCPR01	G2802-1 AND G2802-2	12008	W	A53381			SIM			RDE-103-0986	3-6; 3-8	FLUX 1092; LOT 3724
B	CR3	HCR301	FROM C4344-1	NN	HAZ	A53381	LUKENS	8 3/4"	SCR	B12 2	C43441	BAW-1820	4-21; 4-24	
B	CR3	HCR302	FROM C4344-2	PP	HAZ	A53381	LUKENS	8 3/4"	SCR			BAW-1820	4-21; 4-24	
B	CR3	PCR301	C4344-1 (SURV.)	NN	P	A53381	LUKENS	8 3/4"	SCR	B12 2	C43441	BAW-1820	4-21; 4-24	
B	CR3	PCR302	C4344-2 (SURV.)	PP	P	A53381	LUKENS	8 3/4"	SCR			BAW-1820	4-21; 4-24	
B	CR3	WCR301	ATYPICAL WELD		W	A53381	AM. CHAIN AND CABLE	8 3/4"	SCR	B12 3	WF2091	BAW-1820	4-21; 4-24	ERR VESSEL FLARGE
B	CR3	WCR302	WF 209-1	72105	W	A53381	AM. CHAIN AND CABLE	8 3/4"	SCR			BAW-1820	4-21; 4-24	LINDE 80; 8773
W	CTY	HCTY04	W9807-1 AND W9807-8		HAZ	A3028	LUKENS	10.5"	SCR	W04 3		WCAP-7036	4; 5	
W	CTY	PCTY01	W9807-1 (FOR WELD)		P	A3028	LUKENS	10.5"	SCR			WCAP-7036	4; 5; 12	
W	CTY	PCTY02	W9807-2 (SURV.)	A5892	P	A3028	LUKENS	10.5"	SCR	W04 1	W98072	WCAP-7036	4; 5; 12	
W	CTY	PCTY04	W9807-4 (SURV.)	A5877	P	A3028	LUKENS	10.5"	SCR	W05 2	W98074	WCAP-7036	4; 5; 12	
W	CTY	PCTY07	W9807-7 (SURV.)	A5911	P	A3028	LUKENS	10.5"	SCR	W05 3	W98077	WCAP-7036	4; 5; 12	
W	CTY	PCTY08	W9807-8 (FOR WELD)		P	A3028	LUKENS	10.5"	SCR			WCAP-7036	4; 5; 12	
W	CTY	WCTY01	W9807-1 AND W9807-8		W	A3028		10.5"	SCR	W04 2		WCAP-10236	4-1	
B	DB1	FDB101	AKJ233 (SURV.)	123x244	F	A5082	LADISH	8 3/4"	SCR			BAW-1820	4-45; 4-48	
B	DB1	FDB102	BCC241 (SURV.)	5P4086	F	A5082	LADISH	8 3/4"	SCR	B10 1	BCC241	BAW-1820	4-45; 4-48	
B	DB1	HDB101	FROM AKJ233	123x244	HAZ	A5082	LADISH	8 3/4"	SCR			BAW-1820	4-45; 4-48	
B	DB1	HDB102	FROM BCC241	5P4086	HAZ	A5082	LADISH	8 3/4"	SCR	B10 3	BCC241	BAW-1820	4-45; 4-48	
B	DB1	WDB101	WF-182-1	821544	W	A5082	UNION CARBIDE	8 3/4"	SCR	B10 4	WF1821	BAW-1820	4-45; 4-48	LINDE 80; 8754
W	DC1	HDC101	FROM B4106-3		HAZ	A53381	LUKENS	9 5/8"	SCR			WCAP-11567	4-2	
W	DC1	PDC101	B4106-1	B4106-1	P	A53381	LUKENS	9 5/8"	SCR			WCAP-8465	2-1; A-1	
W	DC1	PDC102	B4106-2	B4106-2	P	A53381	LUKENS	9 5/8"	SCR			WCAP-8465	2-1; A-1	
W	DC1	PDC103	B4106-3 (SURV.)	B4106-3	P	A53381	LUKENS	9 5/8"	SCR			WCAP-8465	2-1; A-1	
W	DC1	WDC101	B4106-1 AND B4106-3	27264	W	A53381		9 5/8"	SCR			WCAP-8465	2-1; A-1	
W	DC2	HDC201	FROM B5454-1		HAZ	A53381	LUKENS	9 5/8"	SIM			WCAP-8783	2-1	
W	DC2	PDC201	B5454-1 (SURV.)	C5161-1	P	A53381	LUKENS	9 5/8"	SCR			WCAP-8783	2-1; A-1	
W	DC2	PDC202	B5454-2 (FOR WELD)	B5454-2	P	A53381	LUKENS	9 5/8"	SCR			WCAP-8783	A-1	
W	DC2	WDC201	B5454-1 AND B5454-2	27264	W	A53381		9 5/8"	SIM			WCAP-8783	2-1; A-1	
G	DR1	HDR101		19716	HAZ	A3028				G0110		WEDC-12585	1	
G	DR1	PDR101	MELT 19716, SLAB 38	19716	P	A3028	LUKENS			G01 1	1971638	WEDC-12585	1; 9	
G	DR1	WDR101			W	A3028				G01 9		WEDC-12585	1	
G	DR2	HDR201	ESW HAZ		HAZ	A3028			SIM	G02 7	A91281	BCL-585-10	3; 5	
G	DR2	HDR202	SAW HAZ		HAZ	A3028				G02 4	A91281	BCL-585-10	3; 5	
G	DR2	PDR201	SURVEILLANCE BASE	A91281	P	A3028			SCR	G02 1	A91281	BCL-585-10	3; 5	
G	DR2	WDR201	ESW WELD		W	A3028			SIM	G02 5		BCL-585-10	3; 5	
G	DR2	WDR202	SAW WELD		W	A3028				G02 3		BCL-585-10	3; 5	
G	DR3	HDR301	ESW HAZ		HAZ	A3028				G03 8		SWRI-06-7484-003	5	

Table 22 (continued)

HEAT_LST.dbf: TAG	PLANT_ID	Page 3 HEAT_ID	MPT_ID	HEAT_ID	POOD_ID	MAT_ID	SUPPLIER	THICKNESS	SOURCE	KPC_ID	KPC_HEAT	REF_ID	PAGES	NOTES
C	DC3	CDP302	SAW HAZ		HAZ	A3028								
C	DR3	PDR301	SURVEILLANCE BASE		P	A3028				GD5 4		SWR1-06-7484-003	5	
C	DR3	WDR301	ESW WELD		W	A3028				GD5 1		SWR1-06-7484-003	5	
C	DR3	WDP302	SAW WELD		W	A3028				GD5 7		SWR1-06-7484-003	5	
A	ERR	FFR011	CODE 1-1		F	A1052	ALLIS-CHALMERS		FADR	GD5 3		SWR1-06-7484-003	5	
A	ERR	FERR12	CODE 1-2		F	A1052	SwRI	6"	FABR			SWR1-07-1599	77	FOR VESSEL FLANGE
A	ERR	FERR13	CODE 1-3		F	A1052	ALLIS-CHALMERS		SCR			SWR1-07-1599	77	PLATES IN AS-FORGED CONDITION
A	ERR	PERR21	CODE 2-1, PL. 252696	73X573	P	A2128	U.S. STEEL CORP.		FADR			SWR1-07-1599	77	TREPANNED FROM FLANGE
A	ERR	PERR31	CODE 3-1		P	A3028	ALLIS-CHALMERS	3"	FABR	EG1 1	73X573	SWR1-07-1599	77	
A	ERR	PERR32	CODE 3-2		P	A3028	LUKENS	3"	FABR	EG1 6		SWR1-07-1599	77	INITIAL SURVEILLANCE MATERIAL
A	ERR	PERR33	CODE 3-3	A5498	P	A3028	LUKENS	3"	FABR	EG1 7	A5498	SWR1-07-1599	77	PLATE STOCK USED BY SwRI
W	FA1	WFA101	FROM B6919-1	B6919-1	HAZ	A53381		9"	SIM	WG8 4	69191	WCAP-8810	2-1	
W	FA1	PFA101	B6919-1 (SURV.)	B6919-1	P	A53381	LUKENS	9"	SCR	WG8 1	B69191	WCAP-8810	2-1; A-1	
W	FA1	PFA102	B6903-2 (FOR WELD)	B6903-2	P	A53381	LUKENS	9"	SCR			WCAP-8810	A-1	
W	FA1	WFA101	B6919-1 AND B6903-2	33A277	W	A53381	COMBUSTION ENG.	9"	SIM			WCAP-11563/R1	3-3; 4-3	CODE G1.18; LINDE 0091; 3922
W	FA2	WFA201	FROM B7212-1	B7212-1	HAZ	A53381		9"	SIM			WCAP-8956	2-1	
W	FA2	PFA201	B7212-1 (SURV.)	B7212-1	P	A53381	LUKENS	9"	SCR			WCAP-8956	2-1; A-1	
W	FA2	PFA202	B7203-1 (FOR WELD)	B7203-1	P	A53381	LUKENS	9"	SCR			WCAP-8956	A-1	
W	FA2	WFA201	B7212-1 AND B7203-1		W	A53381	COMBUSTION ENG.	9"	SIM			WCAP-11438	4-3	CODE A1.40; HRAU; WIDE E9015C3
C	FC1	WFC101	D4802-2 AND D4802-3		HAZ	A53381			SIM	C06 3	D48022	TR-0-RCM-001/R1	4	
C	FC1	PFC101	D4802-2 (SURV.)	A1768-1	P	A53381	LUKENS		SCR	C09 2	D48022	TR-0-RCM-001/R1	4; 5	
C	FC1	PFC102	D4802-1 (FOR WELD)	C2585-3	P	A53381	LUKENS		SCR			TR-0-RCM-001/R1	4; 5	
C	FC1	PFC103	D4802-3 (WELD & HAZ)	A1768-2	P	A53381	LUKENS		SCR			TR-0-RCM-001/R1	4; 5	
C	FC1	WFC101	D4802-1 AND D4802-3	20291	W	A53381			SIM	C06 2	305414	TR-0-RCM-001/R1	4; 6	SEAM 6P-410; L 1492; 3633; SAW
C	FC1	WFC102	D4802-2/D4802-3 HAZ		W	A53381			SIM			TR-0-RCM-001/R1	4	USED FOR HAZ
G	GAR	FGAR01D	T8ID, RING 5 I.D.	1675	F	A336	TERNI	4.75"	SCR	G09 4	1675	WE&D 26	313; 314	
G	GAR	FGAR01OD	T8OD, RING 5 O.D.	1675	F	A336	TERNI	4.75"	SCR			WE&D 26	314	
G	GAR	FGAR02	RING 4 (FOR WELD)	2120	F	A336	TERNI	4.75"	SCR			WE&D 26	314	
G	GAR	FGAR02ID	L8ID, RING 4 I.D.	2120	F	A336	TERNI	4.75"	CUTOUT	G09 9	2120	WE&D 26	314	CUT FROM 406-KR-01A NOZZLE
G	GAR	FGAR02OD	L8OD, RING 4 O.D.	2120	F	A336	TERNI	4.75"	CUTOUT			WE&D 26	314	CUT FROM 406-KR-01A NOZZLE
G	GAR	FGAR03	RING 7 (FOR WELD)	2289	F	A336	TERNI	4.75"	SCR			WE&D 26	314	
G	GAR	FGAR04	RING 6	2686	F	A336	TERNI	4.75"	VESSEL			DPT/SM/041/R/79	6	
G	GAR	HGAR01			HAZ	A336	TERNI	4.75"	SIM			DPT/SM/041/R/79	3	
G	GAD	SASTM S2	ASTM PLATE	A0421	SRM	A3028	U.S. STEEL CORP.	6"	FADR			WE&D 26	313; 314	
G	GAR	WGAR01	RING 4 AND RING 7		W	A336		4.75"	SIM	G0914		WE&D 26	314	
W	GIH	FGIW01	125PA[illegible] (SURV.)	125P666	F	A5082	BETHLEHEM STEEL	8 7/32"	SCR	W10 1	125P666	WCAP-7254	4	
W	GIH	FGIW02	[illegible]5255 (SURV.)	125S255	F	A5082	BETHLEHEM STEEL	8 7/32"	SCR	W10 2	1255255	WCAP-7254	4	
W	GIH	[illegible]	FROM 125P666	125P666	HAZ	A5082	BETHLEHEM STEEL	8 7/32"	SCR	W09 4		WCAP-7254	4	
W	GIH	WGIW01	125P666 AND 1255255	SA-1036	W	A5082		8 7/32"	SCR	W09 3	61702	WCAP-7254	4	
G	HA1	HHA101	G-8404-2 & G-8404-1		HAZ	A53381			SIM			WCAP-7254	4	
G	HA1	PHA101	G-4804-2 (SURV.)	C4114-2	P	A53381	LUKENS		SCR			WEDC-30997	3-6; 3-7	
G	HA1	PHA102	G-4804-1 (FOR WELD)	C3985-2	P	A53381	LUKENS		SCR			WEDC-30997	3-2; 3-6	
G	HA1	WHA101	G-8404-2 & G-8404-1	1P2815	W	A53381	COMBUSTION ENG.		SCR			WEDC-30997	3-2; 3-6	
W	HB2	HHB201	W10201-1 & W10201-3		HAZ	A3028		10.75"	SIM			WEDC-30997	3-6,-7,-8	FLUX 3654
W	HB2	PHB201	W10201-4 (SURV.)	A6604-1	P	A3028	LUKENS	10.75"	SCR	V13 3		WCAP-7373	4	
W	HB2	PHB252	W10201-5 (SURV.)	B1256-1	P	A3028	LUKENS	10.75"	SCR	W12 1	W102014	WCAP-7373	4; 12	
W	HB2	PHB203	W10201-6 (SURV.)	B1250-1	P	A3028	LUKENS	10.75"	SCR	W12 2	W102015	WCAP-7373	4; 12	
W	HB2	PHB204	W10201-1 (FOR WELD)	A6623-1	P	A3028	LUKENS	10.75"	SCR	W12 3	W102016	WCAP-7373	4; 12	
W	HB2	PHB205	W10201-3 (FOR WELD)	B1255-1	P	A3028	LUKENS	10.75"	SCR			WCAP-7373	12	
W	HB2	WHB201	W10201-1 & W10201-3		W	A3028	COMBUSTION ENG.	10.75"	SCR			WCAP-7373	12	
G	HR3	HHR301	FROM A0638-2		HAZ	A3028	LUKENS		SCR	UK5 2		DOCKET 50-261	TABLE 1	BACO 3; L1092; 3617; SAW
G	HR3	PHR302	S-4201-4 (SURV.)	20239-3	P	A3028	LUKENS		SCR	G12 3		ASTM STP 481	201	
G	HR3	SHR3	S-4201-3	20192-2	P	A3028	LUKENS		SCR			GECR-4442	APP. 1	USED JOINTLY WITH SHR3
G	HR3	WHR301	FROM A0638-2		W	A3028	LUKENS		SCR			GECR-4442	APP. 1	USED JOINTLY WITH PHR302
W	IP2	HIP201	FROM B2002-3	B2002-3	HAZ	A53381		9 5/8"	SCR	G12 2		ASTM STP 481	201	
W	IP2	PIP201	B2002-1 (SURV.)	B4688-2	P	A53301	LUKENS	9 5/8"	SCR	UA6 2	B20023	WCAP-7323	4	A3028 PER DOCKET 50-247
W	IP2	PIP202	B2002-2 (SURV.)	B4701-2	P	A53301	LUKENS	9 5/8"	SCR	UA3 1	B20021	WCAP-7323	4; 12	A3028 PER DOCKET 50-247
										UA3 2	B20022	WCAP-7323	4; 12	A3028 PER DOCKET 50-247

Table 22 (continued)

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TAG	PLANT_ID	HEAT_ID	RPT_ID	HEAT_NO	PROD_ID	MAT_ID	SUPPLIER	THICKNESS	SOURCE	NPC_ID	NPC_HEAT	REF_ID	PAGES	NOTES
W	IP2	P1P203	82002-3 (SURV.)	84922-1	P	A53381	LUKENS	9 5/8"	SCR	W43 3	82023	WCAP-7323	4; 12	A3028 PER DOCKET 50-247
W	IP2	W1P201	82002-1 AND 82002-3		W	A53381	COMBUSTION ENG.	9 5/8"	SCR	W46 3	W5214	DOCKET 50-247	TABLE 1	RACD 3; L 1092; 3600; SAW
W	IP3	H1P304	FROM 82803-3	82803-3	HAZ	A53381		9"	SCR			WCAP-8475	2-1	
W	IP3	P1P301	82802-1 (SURV.)	82802-1	P	A53381	LUKENS	9"	SCR	W10 1	828021	WCAP-8475	2-1; A-1	
W	IP3	P1P302	82802-2	82802-2	P	A53381	LUKENS	9"	SCR			WCAP-8475	2-1; A-1	
W	IP3	P1P303	82802-3	82802-3	P	A53381	LUKENS	9"	SCR			WCAP-8475	2-1; A-1	
W	IP3	P1P304	82803-3 (SURV.)	82803-3	P	A53381	LUKENS	9"	SCR	W14 2	828053	SWRI-02-5212	4-1; 4-3	
W	IP3	W1P301			W	A53381	COMBUSTION ENG.	9"	SCR	W14 4	W5214	WCAP-10300	4-1,-3,-5	RACD 3; L 1092; 3692
W	KO1	FKO101	124W375VA1	124W375VA1	F				SCR			SWRI-17-5759-201	7	
W	KO1	HKO101			HAZ				SCR			SWRI-17-5759-201	7	
W	KO1	WKO101			W				SCR			SWRI-17-5759-201	7	
W	KWE	FKWE01	122X208VA1	122X208VA1	F	A5082	BETHLEHEM STEEL	6.5"	SCR	W16 1	122X208	DOCKET 50-305/C	TABLE 3	CODE B-6306
W	KWE	FKWE02	123X167VA1	123X167VA1	F	A5082	BETHLEHEM STEEL	6.5"	SCR	W16 2	123X167	DOCKET 50-305/C	TABLE 3	CODE B-6307
W	KWE	HKWE01	FROM 122X208VA1	122X208VA1	HAZ	A5082		6.5"	SCR	W15 4	122X208	WCAP-8107	2-1; A-1	
W	KWE	WKWE01	122X208 AND 123X167	1P3571	W	A5082	COMBUSTION ENG.	6.5"	SCR	W16 3	1P3571	DOCKET 50-305/C	TABLE 1	84 WED; L 1092; 3958; SAW
A	LAC	HLAC01	FROM WP1056		HAZ	[illegible]		4"	SCR			WELD 8	98; 99	
A	LAC	PLAC01	WP1054 (SURV.)	A5848	P	A3028	LUKENS	4"	SCR	A02 1	WP1054	DOCKET 50-409	4	
A	LAC	PLAC02	WP1055 (SURV.)	A5848	P	A3028	LUKENS	4"	SCR	A02 2	WP1055	DOCKET 50-409	4	
A	LAC	PLAC03	WP1056 (SURV.)	A5852	P	A3028	LUKENS	4"	SCR	A01 3	WP1056	DOCKET 50-409	4	CODE LC1
A	LAC	PLAC04	WP1057		P	A3028	LUKENS	4"	SCR			DOCKET 50-409	4	
A	LAC	PLAC05	WP1058		P	A3028		4"	SCR			DOCKET 50-409	4	
A	LAC	SLAC01	CORRELATION MATERIAL	W31438	SRM	A3028	U.S. STEEL CORP.	4"	FABR	A02 7	W31438	SWRI-02-3467	6	
A	LAC	WLAC01	WP1057 AND WP1058		W	A3028	ALLIS-CHALMERS	4"	SCR	E02 2		SWRI-02-3467	A-6	
W	LM2	FLM201	123J398		F	A5082	BETHLEHEM STEEL	9.5"	SCR			WCAP-9329	2-1	
W	LM2	FLM202	122J333 (FOR WELD)		F	A5082	BETHLEHEM STEEL	9.5"	SCR			WCAP-9329	A-1	
W	LM2	HLM201	FROM 123J398		HAZ	A5082	BETHLEHEM STEEL	9.5"	SCR			WCAP-9329	2-1	
W	LM2	WLM201	123J398 AND 122J333	442002	W	A5082		9.5"	SCR			WCAP-9329	2-1; A-1,2	L 80; 3960; MA-MO-MI
W	MC1	HMC101	FROM 85012-2	85012-2	HAZ	A53381		9 5/8"	SCR			WCAP-9195	2-1	
W	MC1	PMC101	85012-1 (SURV.)	85012-1	P	A53381	LUKENS	9 5/8"	SCR			WCAP-9195	2-1; A-1	
W	MC1	PMC102	85012-2 FOR W & HAZ	85012-2	P	A53381	LUKENS	9 5/8"	SCR			WCAP-9195	2-1; A-1	
W	MC1	PMC103	85012-3 FOR WELD		P	A53381	LUKENS	9 5/8"	SCR			WCAP-9195	2-1; A-1	
W	MC1	WMC101	85012-2 AND 85012-3		W	A53381		9 5/8"	SCR			WCAP-9195	2-1; A-1	CODE M1.22
W	MC2	FMC201	FORGING 05 (SURV.)	526840	F	A5082			SCR			WCAP-11029	4-1; 4-2	
W	MC2	HMC201	FROM FORGING 05		HAZ	A5082			SCR			WCAP-11029	4-1,-2;A-7	
W	MC2	WMC201		895075	W	A5082			SCR			WCAP-11029	4-1; 4-2	
B	MD1	FMD101	ABZ196	ABZ196	P	A5082	LADISH	8 3/4"	SCR			BAW-1543/R2	A-11	
B	MD1	HMD101		532598	HAZ	A5082		8 3/4"	SCR			BAW-1543/R2	B-14	
B	MD1	WMD101	WF 209-1		W	A5082		8 3/4"	SCR			BAW-1543/R2	A-11	
B	MD1	WMD102	WF 70		W	A5082		8 3/4"	SCR			BAW-1543/R2	A-11	
B	MD2	FMD201	828243	828243	P	A5082	LADISH	8 3/4"	SCR			BAW-1543/R2	A-12	
B	MD2	HMD2[illegible]		828243	HAZ	A5082		8 3/4"	SCR			BAW-1543/R2	B-15	
B	MD2	WMD201	WF 336		W	A5082		8 3/4"	SCR			BAW-1543/R2	A-12	
G	ML1	HML101	FROM G-2002-6	C1079-1	HAZ	A3028	LUKENS		SCR			WEDC-30833	3-2,-8,-17	
G	ML1	PML101	G-2002-6 (SURV.)	C1140-1	P	A3028	LUKENS		SCR			WEDC-30833	3-2,-8,-15	
G	ML1	PML102	G-2002-4	85015-2	P	A3028	LUKENS		SCR			WEDC-30833	3-2,-8,-15	
G	ML1	PML103	G-2002-5	C1079-1	P	A3028	LUKENS		SCR			WEDC-30833	3-2,-8,-15	BASE PLATE
G	ML1	WML101	FROM G-2002-6		W	A3028			SCR			WEDC-30833	3-2,-8,-16	
C	ML2	HML201	C-506-1 AND C-506-3	C5667-1	HAZ	A53381	LUKENS	5"	SCR	C03 4	C56671	TR-4-RCM-008	3; 4; 8	
C	ML2	PML201	C-506-1 (SURV.)	C5667-1	P	A53381	LUKENS	5"	SCR	C03 2	C56671	TR-4-RCM-008	3; 4; 8	BASE
C	ML2	PML202	C-506-2, FOR WELD	C5667-2	P	A53381	LUKENS	5"	SCR			TR-4-RCM-068	3; 4; 8	
C	ML2	PML203	C-506-3, WELD & HAZ	A5518-1	P	A53381	LUKENS	5"	SCR			TR-4-RCM-008	3; 4; 8	
C	ML2	WML201	C-506-2 AND C-506-3	90136	W	A53381		5"	SCR	C03 3	90136	TR-4-RCM-008	3; 4;	GENERIC NAME FOR SURV. WELD
C	ML2	WML201ID	C-506-2 AND C-506-3		W	A53381		5"	SCR			TR-4-RCM-008	3; 4; 8;52	L 0091, 7998, HT. 90136 I.D.
C	ML2	WML201OD	C 506-2 AND C-506-3		W	A53381		5"	SCR			TR-4-RCM-008	3; 4; 8;52	L 0091, 3999, HT. 10137 O.D.
C	ML2	WML202	C-506-1 AND C-506-3		W	A53381		5"	SCR			TR-4-RCM-008	3; 4; 8	USED FOR HAZ
G	MON	HMON01			HAZ	A53381			SCR			BMI-0483	7	
G	MON	PMON01	PIECE NO. 1-14	"2220-1	P	A53381	LUKENS		SCR			WEDO-24197	1; 8	

Table 22 (continued)

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TAG	PLANT_ID	HEAT_ID	RPT_ID	AEAT_NO	PROD_ID	MAT_ID	SUPPLIER	THICKNESS	SOURCE	NPC_ID	NPC_HEA*	REF_ID	PAGES	NOTES
G	MON	UNKN01			W	A53381			SCR			BMI-8483	6	
C	MY	MNY_01	D-8406-1 & D-8406-2	08406-1	HAZ	A53381	LUKENS	9 11/16"	SCR	C01 3	084062	CR 75-269	1;A-2,3,5	
C	MY	PNY_01	D-8406-1 (SURV.)	08406-1	P	A53381	LUKENS	9 11/16"	SCR	C01 1	084061	CR 75-269	1; A-2, -5	
C	MY	PNY_02	D-8406-2 (FOR HAZ)	08406-2	P	A53381	LUKENS	9 11/16"	SCR			CR 75-269	A-3; A-4	
C	MY	PNY_03	D-8406-3	08406-3	P	A53381	LUKENS	9 11/16"	SCR			CR 75-269	A-3; A-4	
C	MY	PNY_11	D-8407-1 (FOR WELD)	08407-1	P	A53381	LUKENS	9 11/16"	SCR			CR 75-269	A-3; A-4	
C	MY	PNY_12	D-8407-2	08407-2	P	A53381	LUKENS	9 11/16"	SCR			CR 75-269	A-3; A-4	
C	MY	PNY_13	D-8407-3 (FOR WELD)	08407-3	P	A53381	LUKENS	9 11/16"	SCR			CR 75-269	A-3; A-4	
C	MY	WNY_01	D-8407-1 & D-8407-3		W	A53381		9 11/16"	SIM	C01 2	0840713	CR 75-269	1;A-2,3,5	SAW
C	MY	WNY_02	D-8406-1/-2 (HAZ)		W	A53381		9 11/16"	SCR			CR 75-317	A-4	
W	MA1	FMA101	FRG 03 990400/292332	990400	F	A5082	RHEINSTAHL HUETTEN	10"	SCR	W42 2	990400	DOCKET 50-338	TABLE 1	
W	MA1	FMA102	FRG 04 990311/298244	990311	F	A5082	RHEINSTAHL HUETTEN	10"	SCR			DOCKET 50-338	TABLE 1	
W	MA1	MMA101	FROM FORGING 03	990400	HAZ	A5082		10"	SIM	W42 3	990400	WCAP-8771	2-1; A-1	
W	MA1	WMA101			W	A508[illegible]		10"	SIM	W42 4		DOCKET 50-338	TABLE 5	FLUX - SMIT 80; LOT 1211; SAW
W	MA2	FMA201	FRG 06 990496/292424	990496	F	A5082	RHEINSTAHL HUETTEN	10"	SCR			DOCKET 50-339	TABLE 5	
W	MA2	FMA202	FRG 05 990533/297355	990533	F	A5082	RHEINSTAHL HUETTEN	10"	SCR			DOCKET 50-339	TABLE 5	
W	MA2	MMA201	FROM FORGING 04	990496	HAZ	A5082		10"	SIM			WCAP-8772	2-1; A-1	
W	MA2	WMA201			W	A5082		10"	SIM			DOCKET 50-339	TABLE 7	FLUX - LW 320; LOT 2e; SAW
G	MM1	MWM101			HAZ	A302B1			SIM			DOCKET 50-220	III-2	
G	MM1	PWM101	G-8-4 (SURV.)	P2130	P	A302B1	LUKENS		SCR			DOCKET 50-220	III-1	SEE TABLE 9
G	MM1	PWM102	G-307-5	P2074	P	A302B1	LUKENS		SCR			DOCKET 50-220	TABLE 9	
G	MM1	PWM103	G-307-4	P2076	P	A302B1	LUKENS		SCR			DOCKET 50-220	TABLE 9	
G	MM1	PWM104	G-307-10	P2091	P	A302B1	LUKENS		SCR			DOCKET 50-220	TABLE 9	
G	MM1	PWM105	G-8-1	P2112	P	A302B1	LUKENS		SCR			DOCKET 50-220	TABLE 9	
G	MM1	PWM106	G-8-3 (SURV.)	P2130	P	A302B1	LUKENS		SCR			DOCKET 50-220	III-1	SEE TABLE 9
G	MM1	WMM101			W	A302B1			SIM			DOCKET 50-220	III-1	DEPTH OF 1-1/16" FROM W ROOT
B	OC1	MOC101	FROM C2800-2	C2800-2	HAZ	A3028	LUKENS	8 3/4"	SCR	B01 3	C28002	BAW-1820	4-3; 4-6	
B	OC1	MOC102	FROM C3265-1	C3265-1	HAZ	A3028	LUKENS	8 3/4"	SCR	B02 3	C32651	BAW-1820	4-3; 4-6	
B	OC1	POC101	C2800-2 (SURV.)	C2800-2	P	A3028	LUKENS	8 3/4"	SCR	B01 2	C28002	BAW-1820	4-3; 4-6	
B	OC1	POC102	C3265-1 (SURV.)	C3265-1	P	A3028	LUKENS	8 3/4"	SCR	B02 2	C32651	BAW-1820	4-3; 4-6	
B	OC1	WOC101	WF-112	406L44	W	A3028	UNION CARBIDE	8 3/4"	SCR	B02 4	WF112	BAW-1820	4-3; 4-6	LINDE 80; SA88
B	OC2	FOC201	AAW-163 (SURV.)	3P2359	F	A5082	LADISH	8 3/4"	SCR	B05 2	AAW163	BAW-1820	4-9; 4-12	
B	OC2	FOC202	AUG-164 (SURV.)	4P1885	F	A5082	LADISH	8 3/4"	SCR			BAW-1820	4-9; 4-12	
F	OC2	MOC201	FROM AAW 163		HAZ	A5082	LADISH	8 3/4"	SCR	B05 3	AAW163	BAW-1820	4-9; 4-12	
	OC2	MOC202	FROM AUG-164		HAZ	A5082	LADISH	8 3/4"	SCR			BAW-1820	4-9; 4-12	
J	OC2	WOC201	WF-209-1	72105	W	A5082	AM. CHAIN AND CABLE	8 3/4"	SCR	B04 4	WF2091A	BAW-1820	4-9; 4-12	LINDE 80; 8773
B	OC3	FOC301	AWE-191 (SURV.)	522194	F	A5082	LADISH	8 3/4"	SCR	B05 1	AWE191	BAW-1820	4-33; 4-36	
B	OC3	FOC302	AWS-192 (SURV.)	522314	F	A5082	LADISH	8 3/4"	SCR	B05 4	AWS192	BAW-1820	4-33; 4-36	BAW-1543/82 - HT. 522314K
B	OC3	MOC301	FROM AWE-191	522[illegible]4	HAZ	A5082	LADISH	8 3/4"	SCR	B05 3	AWE191	BAW-1820	4-33; 4-36	
B	OC3	MOC302	FROM AWS-192	522314	HAZ	A5082	LADISH	8 3/4"	SCR	B06 4	AWS192	BAW-1820	4-33; 4-36	
B	OC3	WOC301	WF-209-1	72105	[illegible]	A5082	AM. CHAIN AND CABLE	8 3/4"	SCR	B05 5	WF2091B	BAW-1820	4-33; 4-36	LINDE 80; 8773
G	OYS	MOYS01	FROM G-308-1		HAZ	A302B1	LUKENS		SCR			BCL-382-85-1/R1	6; 7	
G	OYS	POYS01	G-308-1	T1937-1	P	A302B1	LUKENS		CUTOUT			BCL-382-85-1/R1	6; 7	
G	OYS	WOYS01	FROM G-308-1		W	A302B1	LUKENS		SCR			BCL-382-85-1/R1	6; 7	
C	PAL	MPAL01	D3803-3 AND D3803-2	D3803-2	HAZ	A3028			SCR	C05 4	852942	BCL-585-12	6; B-2	
C	PAL	PPAL01	D3803-1 (SURV.)	D3803-1	P	A3028			SCR	C05 1	852942	BCL-585-12	6; B-2	
C	PAL	PPAL02	D3803-2 (WELD)	D3803-2	P	A3028			SCR			BCL-585-12	6; B-2	
C	PAL	PPAL03	D3803-3 (HAZ)	D3803-3	P	A3028			SCR			BCL-585-12	6; B-2	
C	PAL	WPAL01			W	A3028	COMBUSTION ENG.		SCR	C05 3	27204	DOCKET 50-255	17	L 1092, 3833; WI 200, W-0591A
C	PAL	WPAL02	D3803-2/D3803-3 HAZ		W	A3028			SCR			BCL-585-12	6; B-2	WELD USED FOR HAZ
W	PB1	MPB101	FROM A9811	A9811	HAZ	A3028		6.75"		W19 4	A9811	WCAP-7513	2-1	
W	PB1	PPB101	A9811 (SURV.)	A9811	P	A3028	LUKENS	6.75"	SCR	W19 1	A9811	WCAP-7513	2-1; A-1	
W	PB1	PPB102	C1423 (SURV.)	C1423	P	A3028	LUKENS	6.75"	SCR	W19 2	C1423	WCAP-7513	2-1; A-1	
W	PB1	WPB101	A9811 AND C1423	SA-1263	W	A3028	[illegible] * WILCOX	6.75"		W19 3	72445	WCAP-7513	2-1; A-1	
W	PB2	FPB201	122W195VA1 (SURV.)	122W195VA1	F	A5082	BETHLEHEM STEEL	6.5"	SCR	W20 2	122W195	WCAP-7712	4	
W	PB2	FPB202	123V500VA1 (SURV.)	123V500VA1	F	A[illegible]5082	BETHLEHEM STEEL	6.5"	SCR	W20 1	123V500	WCAP-7712	4	
W	PB2	MPB201	FROM 122W195VA1	1225195	HAZ	A5082		6.5"	SIM	W20 4	122W195	WCAP-7712	4	

Table 22 (continued)

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FAC	PLANT_ID	HEAT_ID	APT_ID	HEAT_ID	PROD_T	MAT_ID	SUPPLIER	THICKNESS	SOURCE	MPC_ID	MPC_HEAT	REF_ID	PAGES	NOTES
W	PBZ	WPBZ01	123V195 AND 123V500	WF-193	W	A5082	COMBUSTION ENG.	6.5"	SIM	W20 3	40644	WCAP-7712	4	
W	PIT	FP1101	FRG C, 21918/38566	21918	F	A5085	CREUSOT-LOIRE	6.692"	SCR	W26 2	21918	DOCKET 50-282	5	
W	PIT	HP1101	FROM FORGING C	21918	HAZ	A5085	CREUSOT-LOIRE	6.692"	SIM	W23 4	21918	WCAP-8086	4-1; A-1	
W	PIT	WP1101			W	A5085	CREUSOT-LOIRE	6.692"	SIM	W24 3	1752	DOCKET 50-282	3	FLUX UM 80, 1230; SAW
W	PIZ	FP1201	FRG D, 22642/21918	22642	F	A5085	CREUSOT-LOIRE	6.692"	SCR	W26 1	22642	DOCKET 50-306	11	
W	PIZ	HP1201	FROM FORGING D	22642	HAZ	A5085	CREUSOT-LOIRE	6.692"	SIM	W25 4	22642	WCAP-8193	4-1; A-1	
W	PIZ	WP1201			W	A5085	CREUSOT-LOIRE	6.692"	SIM	W26 3	2721	DOCKET 50-306	9	
G	PL1	HPL101			HAZ				SIM			SWRI-02-5951	7	
G	PL1	PPL101			P				SCR			SWRI-02-5951	7	
G	PL1	WPL101			W				SIM			SWRI-02-5951	7	
G	QC1	HQC101	ESW HAZ		HAZ	A3028			SCR	G05 7		BMI-0275	3	
G	QC1	HQC102	SAW HAZ		HAZ	A3028			SCR	G05 4		BMI-0275	3	
G	QC1	PQC101	SURVEILLANCE BASE		P	A3028			SCR	G05 2	A01601	BMI-0275	3	
G	QC1	WQC101	ESW WELD		W	A3028			SCR			BMI-0275	3	
G	QC1	WQC102	SAW WELD		W	A3028			SCR	G05 3		BMI-0275	3	
G	QC2	HQC201	ESW HAZ		HAZ				SCR	G07 7	C33072	BMI-0275	3	
G	QC2	HQC202	SAW HAZ		HAZ				SCR	G07 4	C33072	BMI-0275	3	
G	QC2	PQC201	SURVEILLANCE BASE	C3307-2	P				SCR	G07 1	C33072	BMI-0275	3	
G	QC2	WQC201	ESW WELD		W				SCR	G07 5		BMI-0275	3	
G	QC2	WQC202	SAW WELD		W				SCR	G07 3		BMI-0275	3	
W	RIZ	FR1201	FRG 03 990710/294525	990709	F	A5082	RHEINSTAHL HUETTEN	7.75"	SCR			WCAP-8216	2-1; A-1	
W	RIZ	FRI202	FORGING 04 FOR WELD		F	A5082	RHEINSTAHL HUETTEN	7.75"	SCR			WCAP-8216	2-1; A-1	
W	RIZ	HR1201	FROM FORGING 05		HAZ	A5082		7.75"	SIM			WCAP-8216	2-1	
W	RIZ	WR1201	FORGINGS 03 AND 04		W	A5082		7.75"	SIM			WCAP-8216	2-1; A-1	
B	RS1	HRS101	FROM C-5062-1	C5062-1	HAZ	A533B1	LUKENS	8 3/4"	SCR	B11 2	C50621	BAW-1820	4-39; 4-42	
B	RS1	HRS102	FROM C-5070-1		HAZ	A533B1	LUKENS	8 3/4"	SCR			BAW-1820	4-39; 4-42	
B	RS1	PRS101	C-5062-1 (SURV.)	C5062-1	P	A533B1	LUKENS	8 3/4"	SCR	B11 1	C50621	BAW-1820	4-39; 4-42	
B	RS1	PRS102	C-5070-1 (SURV.)	C5070-1	P	A533B1	LUKENS	8 3/4"	SCR			BAW-1820	4-39; 4-42	
B	RS1	WRS101	WF-193	406L44	W	A533B1	UNION CARBIDE	8 3/4"	SCR	B11 3	WF193	BAW-1820	4-39; 4-42	LINDE 80; 8773
W	SA1	HSA101	FROM B2402-2	B2402-2	HAZ	A533B1	LUKENS	9"	SIM			WCAP-8511	2-1	A533B1 PER WCAP-8511
W	SA1	PSA101	B2402-1 (SURV.)	C1354	P	A533B1	LUKENS	9"	SCR	W27 1	24021	DOCKET 50-272	TABLE 5	A533B1 PER WCAP-8511
W	SA1	PSA102	B2402-2 (SURV.)	C1354	P	A533B1	LUKENS	9"	SCR	W27 2	B24022	DOCKET 50-272	TABLE 5	A533B1 PER WCAP-8511
W	SA1	PSA103	B2403-3 (SURV.)	C1397	P	A533B1	LUKENS	9"	SCR	W27 3	B24023	DOCKET 50-272	TABLE 5	A533B1 PER WCAP-8511
W	SA1	PSA104	B2403-1 (WELD & HAZ)	C1356	P	A533B1	LUKENS	9"	SCR			DOCKET 50-272	TABLE 5	A533B1 PER WCAP-8511
W	SA1	WSA101	B2402-2 AND B2403-1		W	A533B1		9"	SIM			WCAP-8511	2-1	M2.03; L 1092, 3617; W7753A
W	SA2	HSA201	FROM B4712-2	B4712-2	HAZ	A533B1			SCR			WCAP-10492	4-1	
W	SA2	PSA201	B4712-2 (SURV.)	B4712-2	P	A533B1			SCR			WCAP-10492	4-1	
W	SA2	PSA202	B4712-1 (SURV.)	B4712-1	P	A533B1			SCR			WCAP-10492	4-1	
W	SA2	WSA201	B4712-1 AND B4712-2		W	A533B1			SCR			WCAP-10492	4-1	
C	SL1	HSL101	C-B-2 AND C-B-3		HAZ	A533B1			SCR	C07 4		TR-F-MCM-004	4; 60; C-8	
C	SL1	PSL101	C-B-2 (SURV.)	C5927-2	P	A533B1	LUKENS		SCR	C07 2	C59352	DOCKET 50-335	31	PIECE NO. 215-03C
C	SL1	PSL102	C-B-1 FOR HAZ	C5935-1	P	A533B1	LUKENS		SCR			DOCKET 50-335	27	PIECE NO. 215-03B
C	SL1	PSL103	C-B-3 FOR WELD & HAZ	C5935-3	P	A533B1	LUKENS		SCR			DOCKET 50-335	29	PIECE NO. 215-03A
C	SL1	WSL101	C-B-1/C-B-3 FOR WELD	90136	W	A533B1			SCR	C07 3	90136	DOCKET 50-335	30	L 3091, 3999; A-4; SAW
C	SL1	WSL102	C-B-2/C-B-3 FOR HAZ		W	A533B1			SCR			TR-F-MCM-004	4	
C	SL2	HSL201			HAZ				SCR			BAW-1880	3-1	
C	SL2	PSL201	SURVEILLANCE BASE		P				SCR			BAW-1880	3-1	
C	SL2	WSL201			W				SCR			BAW-1880	3-1	
W	SO1	HSO101			HAZ	A30.?	LUKENS	10.5"	CUTOUT	W28 3	W76019	WCAP-9520	4-1; A-5	
W	SO1	PSO101	W7601-1 (SURV.)	19585	P	A302b	LUKENS	10.5"	SCR	W29 1	W76011	DOCKET 50-206	TABLE 1	
W	SO1	PSO102	W7601-8 (SURV.)	A3099	P	A3028	LUKENS	10.5"	SCR	W29 2	W76018	DOCKET 50-206	TABLE 1	
W	SO1	PSO103	W7601-9 (SURV.)	A3119	P	A3028	LUKENS	10.5"	SCR	W29 3	W76019	DOCKET 50-206	TABLE 1	
W	SO1	WSO101			W	A3028		10.5"	CUTOUT	W28 2		WCAP-9520	4-1; A-5	NOZZLE CUTOUT OF SEAM 6-B6W
W	SO1	FSO101	FRG 04 980919/281587	980919	F	A5082	RHEINSTAHL HUETTEN	8.5"	SCR			WCAP-8233	2-1; A-1	
W	SO1	FSO102	FORGING 05 FOR WELD		F	A5082	RHEINSTAHL HUETTEN	8.5"	SCR			WCAP-8233	2-1; A-1	
W	SO1	HSO101	FROM FORGING 04		HAZ	A5082		8.5"	SIM			WCAP-8233	2-1	
W	SO1	WSO101	FORGINGS 04 AND 05		W	A5082		8.5"	SIM			WCAP-8233	2-1; A-1	

Table 22 (continued)

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TAG	PLANT_ID	HEAT_ID	RPT_ID	HEAT_NO	PROD_ID	MAT_ID	SUPPLIER	THICKNESS	SOURCE	RPC_ID	RPC_HEAT	REF_ID	PAGES	NOTES
W	SG2	FSG201	FRG 05 288757/961057	288757	F	A5082	RHEINSTAHL HUETTEN	8.5"	SCR			WCAP-8513	2-1; A-1	
W	SG2	FSG202	FORGING 04 FOR WELD		F	A5082	RHEINSTAHL HUETTEN	8.5"	SCR			WCAP-8513	2-1; A-1	
W	SG2	HSG201	FROM FORGING 05	288757	HAZ	A5082		8.5"	SIM			WCAP-8513	2-1	
W	SG2	WSG201	FORGINGS 05 AND 04		W	A5082		8.5"	SIM			WCAP-8513	2-1; A-1	
W	SU1	HSU101	FROM C4415-1	C4415-1	HAZ	A53381		7 7/8"	SIM	W31 3		WCAP-11415	4-1	
W	SU1	PSU101	C4415-1 (SURV.)	C4415-1	P	A53381		7 7/8"	SCR	W31 1	C44151	WCAP-11415	4-1; 4-3	
W	SU1	PSU102	C4326-1	C4326-1	P	A53381		7 7/8"	SCR			WCAP-11415	4-1; 4-3	
W	SU1	WSU101	SA-1526	SA-1526	W	A53381	BABCOCK & WILCOX	7 7/8"	SIM	W31 2	299L44	DOCKET 50-280/2	TABLE 1	L 80, 8506; SAW
W	SU2	HSU201	FROM C4339-1	C4339	HAZ	A53381	LUKENS	7 2/3"	SIM	W32 4	C43391	DOCKET 50-281	TABLE 5	
W	SU2	PSU201	C4339-1 (SURV.)	C4339	P	A53381	LUKENS	7 2/3"	SCR	W32 1	C43391	DOCKET 50-281	TABLE 5	
W	SU2	PSU202	C4208-2 FOR WELD	C4208	P	A53381	LUKENS	7 2/3"	SCR			DOCKET 50-281	TABLE 5	
W	SU2	WSU201			W	A53381	BABCOCK & WILCOX	7 2/3"	SIM	W32 3	0227	DOCKET 50-281	TABLE 1	GRAU LO, LW320; SAW
B	TM1	HTM101	FROM C-2789-2	C2789-2	HAZ	A3028	LUKENS	8 3/4"	SCR	B09 3	C27892	BAW-1820	4-15; 4-18	
B	TM1	WTM102	FROM C-3307-1	C3307-1	HAZ	A3028	LUKENS	8 3/4"	SCR			BAW-1820	4-15; 4-18	
B	TM1	PTM101	C-2789-2 (SURV.)	C2789-2	P	A3028	LUKENS	8 3/4"	SCR	B09 1	C27892	BAW-1820	4-15; 4-18	
B	TM1	PTM102	C-3307-1 (SURV.)	C3307-1	P	A3028	LUKENS	8 3/4"	SCR			BAW-1820	4-15; 4-18	
B	TM1	WTM101	WF-25	299L44	W	A3028	UNION CARBIDE	8 3/4"	SCR	B09 4	WF25	BAW-1820	4-15; 4-18	LINDE 80; 8X50
B	TM2	HTM201	C1946-2 (SURV.)	C1946-2	P	A53381	LUKENS	8 3/4"	SCR			BAW-1543/R2	A-6	
B	TM2	PTM202	C1937-2 (SURV.)	C1937-2	P	A53381	LUKENS	8 3/4"	SCR			BAW-1543/R2	A-6	
B	TM2	WTM201	WF-182-1		W	A53381		8 3/4"	SCR			BAW-1543/R2	A-6	
W	TP3	FTP301	123P461VA-1 (SURV.)	123P461VA1	F	A5082	BETHLEHEM STEEL	7 7/8"	SCR	W35 2	123P461	WCAP-7656	4; 37	
W	TP3	FTP302	1235266VA-1 (SURV.)	1235266VA1	F	A5082	BETHLEHEM STEEL	7 7/8"	SCR	W35 1	1235266	WCAP-7656	4; 37	
W	TP3	HTP301	FROM 123P461VA-1	123P461VA1	HAZ	A5082		7 7/8"	SCR	W34 3		WCAP-7656	4; 38	
W	TP3	WTP301	123P461/1235266	SA1101	W	A5082		7 7/8"	SCR	W34 2		WCAP-7656	4; 37	
W	TP4	FTP401	1225180VA-1 (SURV.)	1225180	F	A5082	BETHLEHEM STEEL	7 7/8"	SCR	W37 1	1225180	SWR1-02-4221	8; 10	
W	TP4	FTP402	123P481VA-1 (SURV.)	123P481	F	A5082	BETHLEHEM STEEL	7 7/8"	SCR	W37 2	123P481	SWR1-02-4221	8; 10	
W	TP4	HTP401	FROM 1[illegible]-S180VA-1	1225180	HAZ	A5082		7 7/8"	SCR	W36 3		SWR1-02-4221	8	
W	TP4	WTP401	122[illegible]60/123P481	SA1094	W	A5082		7 7/8"	SCR	W36 2		SWR1-02-4221	8	
W	TR0	HTR001	F[illegible]M C5583-1	C5583-1	HAZ	A53381			SCR	W33 3	C55831	WCAP-10861	4-1; A-7	
W	TRC	PTR001	C5583-1; PLATE 9-1	C5583-1	P	A53381	LUKENS		SCR	W33 1	C55851	DOCKET 50-344	TABLE 5	
W	TR0	WTR0P*		53966	W	A53381			SCR	W33 2	53966	DOCKET 50-344	TABLE 1	L 124, 934; SAW
W	VS1	H[illegible]101	FROM A9154-1	A9154-1	HAZ	A53381		8"	SIM			WCAP-9234	2-1	
W	[illegible]	PVS101	A9154-1 (SURV.)	A9154-1	P	A53381		8"	SCR			WCAP-9234	2-1; A-1	
[illegible]	VS1	PVS102	C9923-2 FOR WELD	C9923-2	P	A53381		8"	SCR			WCAP-9234	2-1; A-1	
W	VS1	WVS101	A9154-1 AND C9923-2	4P4784	W	A53381		8"	SIM			WCAP-9234	2-1; A-1	
G	VY	HVY_01			HAZ	A53381						BCL-585-84-3	8	
G	VY	PVY_01	SURVEILLANCE BASE	C3017-2	P	A53381			SCR			BCL-585-84-3	8	PIECE MARKED 1-14; 3/47
G	VY	WVY_01			W	A53381						BCL-585-84-3	8	DEPTH OF 1-1/8" FROM WELD ROOT
W	WB1	FWB101	FRG. 05, 527536	527536	F	A5082		8.5"	SCR			WCAP-9298	2-1; A-1	
W	WB1	FWB102	FRG. 04 (FOR WELD)	528522	F	A5082		8.5"	SCR			WCAP-9298	2-1	
W	WB1	HWB101	FROM FORGING 05	527536	HAZ	A5082		8.5"	SIM			WCAP-9298	2-1	
W	WB1	WWB101	FRG. 05 AND FRG. 04		W	A5082		8.5"	SIM			WCAP-9298	2-1; A-1	
W	WC1	HWC101	FROM R2508-3		HAZ	A5338[illegible]		9 5/8"	SIM			WCAP-11553	4-1; A-15	
W	WC1	PWC101	R2508-3 (SURV.)	C4935-2	P	A53381		9 5/8"	SCR			WCAP-10015	2-1; A-1	
W	WC1	PWC102	R2508-1 FOR WELD	88759-2	P	A53381		9 5/8"	SCR			WCAP-10015	2-1; A-1	
W	WC1	PWC103	R2508-2		P	A53381		9 5/8"	SCR			WCAP-10015	A-2	
W	WC1	WWC101	R2508-3 AND R2508-1	90146	W	A53381		9 5/8"	SIM			WCAP-10015	2-1; A-1	
W	YR	PYR_01	MELT 1928., MARK 8	19281-2	P	A3028		8 1/8"	SCR	W38 3	19281	JBE 12	B08	LUKENS ID
W	YR	SASTM S1	ASTM PLATE	A0421	SRH	A3028	U.S. STEEL CORP.	8"	FABR	E1115		JBE 12	B08	
W	ZN1	HZN101	FROM 87835-1	87835-1	HAZ	A53381		9 3/4"	SCR	W39 4	878351	WCAP-8064	2-1	
W	ZN1	PZN101	87835-1 (SURV.)	87835-1	P	A53381		9 3/4"	SCR	W39 2	878351	WCAP-8064	2-1	
W	ZN1	WZN101	2 PCS. OF 87835-1	WF209-1	W	A53381		9 3/4"	SCR	W39 3	72105	WCAP-8064	2-1; A-1	WELD HEAT PER DOCKET 50-295
W	ZN2	HZN201	FROM C4007-1	C4007-1	HAZ	A53381		9 3/4"	SCR	WA1 4	C40071	WCAP-8132	2-1	
W	ZN2	PZN201	C4007-1 (SURV.)	C4007-1	P	A53381		9 3/4"	SCR	WA1 1	C40071	SWR1-06-6701-001	7	
W	ZN2	WZN201	2 PCS. OF C4007-1	WF209-1	W	A53381		9 3/4"	SCR	WA1 3	72105	WCAP-8132	2-1; A-1	HEAT, DR 50-295

Table 23. Partial

CHEM_PD.dbf: Page 1

TAG	PLANT_ID	HEAT_ID	PROD_ID	MAT_ID	CHEM_LAB	METHOD	SPEC_ID	C	MN	P	S	SI	NI	CR	MO
W	AD1	FAD101	F	A5082	WESTINGHOUSE		HEAT								
W	AD1	FAD101	F	A5082	B&W		HEAT								
W	AD1	FAD101	F	A5082	LADISH		HEAT	0.210	0.600	0.012	0.009	0.230	0.740	0.320	0.560
W	AD1	WAD101	W	A5082	B&W		HEAT	0.130	1.400	0.005	0.005	0.310	0.560	0.150	0.490
W	AL2	PAL201	P	A53381			HEAT	0.260	1.330	0.009	0.018	0.220	0.560	0.060	0.530
W	AL2	WAL201	W	A53381			HEAT	0.150	1.130	0.004	0.011	0.190	0.040	0.050	0.620
B	AN1	PAN101	P	A53381	LUKENS		HEAT	0.210	1.320	0.010	0.016	0.200	0.520	0.190	0.570
B	AN1	PAN102	P	A53381	LUKENS		HEAT	0.210	1.320	0.010	0.016	0.200	0.520	0.190	0.570
B	AN1	SHSS02	SRM	A53381			HEAT	0.230	1.390	0.013	0.013	0.210	0.640		0.500
B	AN1	WAN101	W	A53381			HEAT	0.065	1.500	0.016	0.008	0.420	0.590		0.360
B	AN1	WAN101	W	A53381	UCC		HEAT	0.090	1.490	0.016	0.016	0.510	0.590	0.060	0.390
C	AN2	PAN201	P	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	131	0.078		0.012			0.559		
C	AN2	PAN201	P	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	14M	0.077		0.013			0.548		
C	AN2	PAN201	P	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	21U	0.075		0.015			0.545		
C	AN2	PAN201	P	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	264	0.078		0.015			0.555		
C	AN2	PAN201	P	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	257	0.078		0.014			0.559		
C	AN2	WAN201	W	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	315	0.046		0.008			0.090		
C	AN2	WAN201	W	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	344	0.047		0.008			0.088		
C	AN2	WAN201	W	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	37J	0.045		0.008			0.075		
C	AN2	WAN201	W	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	3?6	0.044		0.008			0.082		
C	AN2	WAN201	W	A5338	BATTELLE	ICAP, MO-BLUE-PHOTO FOR P	33J	0.045		0.008			0.081		
W	AS1	PAS101	P	A53381			HEAT	0.240	1.560	0.008	0.015	0.230	0.560	0.030	0.600
W	AS1	WAS101	W	A53381			HEAT	0.150	1.250	0.011	0.013	0.170	0.270	0.040	0.500
W	AS2	PAS201	P	A53381			HEAT	0.220	1.370	0.007	0.008	0.270	0.610	0.030	0.560
W	AS2	WAS201	W	A53381			HEAT	0.150	1.290	0.005	0.007	0.150	0.050	0.020	0.530
G	BR	PBR_01	P	A3028			HEAT	0.300	1.420	0.016	0.018	0.250	0.180	0.130	0.510
G	BR	WBR_01	W	A3028			HEAT	0.120	1.250	0.014	0.012	0.280	0.100	0.190	0.530
W	BV1	PBV101	P	A53381			HEAT	0.200	1.310	0.010	0.015	0.180	0.540	0.140	0.550
W	BV1	WBV101	W	A53381			HEAT	0.110	1.370	0.018	0.006	0.270	0.620	0.015	0.480
W	BV1	WBV101	W	A53381			DW63	0.124	1.420	0.008	0.004	0.277	0.637	0.029	
G	BV1	PBV101	P	A53381	LUKENS		HEAT	0.250	1.400	0.007	0.016	0.270	0.600		0.560
G	BV2	PBV201	P	A53381	LUKENS		HEAT	0.230	1.500	0.010	0.015	0.270	0.560		0.570
W	BZ1	PBZ101	P				HEAT	0.185	1.160	0.014	0.011	0.190	0.710	0.240	
W	BZ1	PBZ101	P				HEAT								
W	BZ1	PBZ102	P				HEAT	0.185	1.160	0.014	0.011	0.190	0.710	0.240	
W	BZ1	PBZ102	P				HEAT								
W	BZ1	SASTM	SRM				HEAT	0.240	1.340	0.011	0.023	0.230			0.510
W	CAB	PCAB01	P	A53381			HEAT	0.200	1.290	0.013	0.022	0.250	0.500		0.490
W	CAB	PCAB02	P	A53381			HEAT	0.210	1.240	0.011	0.020	0.240	0.530		0.480
W	CAB	SASTM	SRM	A3028			HEAT	0.240	1.340	0.011	0.023	0.230	0.180		0.510
W	CAB	WCAB01	W	A53381			HEAT	0.170	1.250	0.015	0.011	0.320	0.110		0.530
W	CAB	WCAB01	W	A53381			W5		1.510	0.021		0.245	0.063		0.210

NOTE: Due to the large number of fields and limited page space, not all fields are displayed here.

listing of CHEM_PR.dbf

CU	V	B	CB	TI	CO	N	AS	ZR	AL	AL_SOL	AL_INT	PB	W	SN	REF_ID	PAGES	NOTES
.040				<0.01		0.007			-.009						SWRI-06-8976	9	AL = -.009 ?
	0.010				0.010								<0.01	-.009	WCAP-8957	A-1; A-2	SN = -.009 ?
.030	<0.01			0.020	<0.01	.0138			<0.01						SWRI-06-8976	9	
.060	0.002			<0.01	0.007	0.007	0.034	<.001	0.042				<0.01	<0.01	WCAP-8957	A-1; A-2	
.050	0.005			<0.01	0.005	0.003	0.004	<.001	<.001				<0.01	0.004	WCAP-9228	A-2	PLATE B9405-1
.150					0.012								<0.01	0.001	WCAP-9228	A-2	HEAT NO. 83642, FLUX LOT 3536
.150					0.012										BAW-1820	4-29; 4-30	
.170															BAW-1820	4-29; 4-30	
.190															BAW-1836	3-5	HEAT A1195-1; PER ORNL-4463 ?
.280															BAW-1836	3-4	MF-193; PER QUAL. TEST REPORT
	0.009														BAW-1820	4-29; 4-30	USED FOR DATA ANALYSIS
	0.008														BMI-0584	16	HEAT C8009-3
	0.006														BMI-0584	16	HEAT C8009-3
	0.008														BMI-0584	16	HEAT C8009-3
	0.009														BMI-0584	16	HEAT C8009-3
	0.009														BMI-0584	16	HEAT C8009-3
	0.009														BMI-0584	16	HEAT C8009-1
	0.006														BMI-0584	16	C8009-1
	0.004														BMI-0584	16	HEAT C8009-1
	0.007														BMI-0584	16	HEAT C8009-1
.040	0.004			<0.01	0.003	0.010	0.004	<.001					<0.01	0.001	WCAP-9308	A-2	PLATE B9605-2
.040	0.004			<0.01	0.007	0.011	0.006	0.002	0.004				0.010	0.004	WCAP-9308	A-2	HEAT NO. 83650, FLUX LOT 1122
.050	0.005			<0.01	0.012	0.008	0.005	<.001	0.028				<0.01	0.004	WCAP-9330	A-2	PLATE R408-1
.020	0.005			<0.01	0.007	0.013	<.001	<.001	<.001				<0.01	0.001	WCAP-9330	A-2	HEAT NO. 4P6051, FLUX LOT 0145
.100	0.020														WCAP-9794	4-2	HEAT 192462
.270	0.030														WCAP-9794	4-2	
.200	0.001				0.014	0.004			0.028					0.010	WCAP-10867	4-3	PLATE B6903-1
.260	0.001				0.014	0.014			0.010					0.008	WCAP-10867	4-3	AS DEPOSITED WELD
.230	0.008				0.009				0.028					0.010	WCAP-10867	4-3	AS DEPOSITED WELD
.120															NEDO-24161	5; 8	PIECE NO. 301; HEAT NO. C4489
.120															NEDO-24157/R1	9; 13	PIECE NO. 301; HEAT NO. C4887
.076					0.018										PB-ME 75/03	13	
.092															PB-ME 75/03	13	ADDITIONAL EVALUATION
.076					0.018										PB-ME 75/03	13	
.092															PB-ME 75/03	13	ADDITIONAL EVALUATION
															PB-ME 75/03	13	
.140															WCAP-10185	4-3	PLATE B1105-1
.110															WCAP-10185	4-3	PLATE B1105-2
.200															WCAP-10185	4-3	
.220															WCAP-10185	4-3	
.230															WCAP-10185	4-3	

Table 24. Partial listi

HEAT_PR.dbf: Page 1

TAG	PLANT_ID	HEAT_ID	PROD_ID	SUPPLIER	HEAT_TREAT	HEAT_NO	SUPPL_ID	MINTEMP_1	MAXTEMP_1	RANGE_1	HOURS_1	QCHR_1	ID_1	MINTEMP_2	MAXTEMP_2	RANGE_2
C		SRSS01	SRM	LUKENS	COMBUSTION ENG.	A10081	HSST01	1600	1750		4.00	AC	R	1500	1650	
W	AD1	FAD101	F	LADISH		ANN161		1590		10	3.00	WD	A	1250		10
W	AD1	FAD101	F	LADISH			ANN161	1590		10	3.00	WD	A	1250		10
W	AD1	WAD101	W	B&W				1150		25	21.00	FC	R			
W	AL2	PAL201	P	LUKENS			B94051	1600		25	4.00	WD	A	1225		25
W	AL2	WAL201	W	LUKENS		83642		1100	1150		13.00	FC	R			
B	AR1	PAR101	P			C51141		1550	1600		4.50	BQ	A	1200	1225	
B	AR1	PAR101	P	LUKENS	LUKENS	C5114-1	C5114-1	1650	1700		1 H/IN	WD	A	1200		
B	AR1	PAR101	P	LUKENS		C5114-1		1650	1770		1 H/IN	WD	A	1200		
B	AR1	PAR102	P			C51142		1550	1600		4.50	BQ	A	1200	1225	
B	AR1	PAR102	P	LUKENS	LUKENS	C5114-2	C5114-2	1650	1700		1 H/IN	WD	A	1200		
B	AR1	PAR102	P	LUKENS		C5114-2		1650	1770		1 H/IN	WD	A	1200		
B	AR1	SHSS02	SRM	LUKENS	COMBUSTION ENG.	A11951	KSST02	1675		75			N	1600		75
B	AR1	SHSS02	SRM	LUKENS	COMBUSTION ENG.	A11951	KSST02	1600		75	4.00	WD	A	1225		25
B	AR1	WAR101	W				WF193	1100	1150		27.50	FC	R			
B	AR1	WAR101	W	UNION CARBIDE	UNION CARBIDE	406L44	WF 193	1100	1150		29.00	FC	R			
B	AR1	WAR101	W				WF-193	1100	1150		29.00	FC	R			
W	AS1	PAS101	P	LUKENS			B96052	1600		25	4.00	WD	A	1225		25
W	AS1	WAS101	W	LUKENS		83650		1140		25	22.00	FC	R			
W	AS2	PAS201	P	LUKENS			R4081	1600		25	4.00	WC	A	1225		25
W	AS2	WAS201	W	LUKENS		4P6052		1140		25	6.00	FC	R			
G	BR	PBR_01	P	LUKENS	COMBUSTION ENG.	192462/3	S55032	1650	1750			WD	A	1200	1250	
G	BR	WBR_01	W	COMBUSTION ENG.	COMBUSTION ENG.	192462	S55032	1125		25	20.00	FC	R			
W	BV1	PBV101	P	LUKENS	COMBUSTION ENG.	C63171	B69031	1500	1650		4.00	WD	A	1200	1250	
W	BV1	PBV101	P	LUKENS		C63171	B69031	1550	1650		4.00	WD	A	1220	1250	
W	BV1	WBV101	W	LUKENS	COMBUSTION ENG.			1150		25	15.00	FC	R			
W	BV1	WBV101	W	COMBUSTION ENG.		305424		1125	1175		40.00	FC	R			
G	BW1	PBW101	P	LUKENS		C4489	PIECE 301	1650		25	5.50	WD	A	1220		10
G	BW2	PBW201	P	LUKENS		C4887	PIECE 301	1650		25	5.50	WD	A	1220		10
W	CAB	PCAB01	P				B11051	1550	1600		4.00	WC	A	1225		
W	CAB	PCAB02	P				B11052	1550	1600		4.00	WC	A	1225		
W	CAS	SASTM	SRM	U.S. STEEL	U.S. STEEL	C40071	ASTM PLATE	1650			4.00	WD	A	1200		
W	CAB	WCAB01	W					1150			24.00	FC	R			
W	CB1	FCB101	F	ROTTERDAM		411343	FORGING 05	1679	1697		3.50	WD	A	1220	1247	
W	CB1	FCB101	F			411343	FORGI.	[illegible]	1697		3.50	WD	A	1220	1247	
W	CB1	WCB101	W	ROTTERDAM		B95075				25	15.00	FC	R			
W	CB1	WCB101	W			B95075		1.	1165		15.00	FC	R			
C	CC1	PCC103	P	LUKENS	COMBUSTION ENG.	C44611	D72063	1575		25	4.00	WD	A	1225		25
C	CC1	WCC101	W	COMBUSTION ENG.		33A277		1125		25	40.00		R			
C	CC2	PCC202	P	LUKENS	COMBUSTION ENG.	C52861	D89072	1575		25	4.00	WD	A	1225		25
C	CC2	WCC201	W	COMBUSTION ENG.		10137		1125		25	40.00		R			
W	CK1	PCK101	P				B44063	1600			4.00	WD	A	1225		

NOTE: Due to the large number of fields and limited page space, not all fields are displayed here.

isting of HEAT_PR.dbf

ANGE_2	HOURS_2	QCHK_2	ID_2	MINTEMP_3	MAXTEMP_3	RANGE_3	HOURS_3	QCHK_3	ID_3	TEMP_U	REF_ID	PAGES	NOTES
	4.00	BD	A	1200	1250		4.00	AC	T	F	ORNL-4313	5; 19-32	
0	4.50	AC	T	1150		25	21.00	FC	B	F	WCAP-8957	A-1	
0	4.50	AC	T	1150		25	21.00	FC	B	F	SWRI-06-8976	9	
										F	WCAP-8957	A-1	
5	4.00		T	1150		25	40.00	FC	B	F	WCAP-9228	A-1	
										F	WCAP-9228	A-1	
	5.00	BD	T	1100	1150		40.00	FC	B	F	BAW-1440	3-3	PER CERTIFICATE OF TEST
	1 8/16	AC	T	1550	1600		4.50	BD	A	F	BAW-1820	4-30	PROBABLY SECOND AUS. AND TEMP.
	1 8/16	AC	T	1100	1150		60.00	FC	B	F	BAW-1543/R2	A-7	
	5.00	BD	T	1100	1150		40.00	FC	B	F	BAW-1698	3-3	PER CERTIFICATE OF TEST
	1 8/16	AC	T	1550	1600		4.50	BD	A	F	BAW-1820	4-30	PROBABLY SECOND AUS. AND TEMP.
	1 8/16	AC	T	1100	1150		60.00	FC	B	F	BAW-1543/R2	A-7	
5	4.00	BD	A	1225		25	4.00	FC	T	F	BAW-1698	3-1; 3-4	PER IDENTIFICATION CARD
0	4.00	FC	T	1125		25	40.00	FC	B	F	BAW-1820	4-30	
										F	BAW-1440	3-3	PER WELD CERTIFICATION
										F	BAW-1820	4-30	
										F	BAW-1543/R2	A-7	
5	4.00	AC	T	1140		25	28.75	FC	B	F	WCAP-9308	A-1	
										F	WCAP-9308	A-1	PLATES B9605-2 AND B9605-1
0	4.00	AC	T	1140		25	29.00	FC	B	F	WCAP-9330	A-1	
										F	WCAP-9330	A-1	PLATES B408-1 AND B407-2
		FC	T	1600		25	4.00	BD	A	F	GECR-4442	C-2; C-3	
										F	GECR-4442	C-3; D-1	PLATES B55032 AND B55033
	4.00	AC	T	1125		25	40.00	FC	B	F	WCAP-8457	A-1	
	4.00	AC	T	1125	1175		40.00	FC	B	F	DOCKET 50-334	TABLE 4	
										F	WCAP-8457	2-1; A-1	
										F	DOCKET 50-334	TABLE 1	
0	5.50	AC	T	1150		25	50.00	FC	B	F	NEDO-24161	6; 7; 13	
0	5.50	AC	T	1150		25	50.00	FC	B	F	NEDO-24157/R1	6; 7; 13	
	4.00	AC	T	1150			24.00	FC	B	F	WENX/76/64	4-1	
	4.00	AC	T	1150			24.00	FC	B	F	WENX/76/64	4-3	
	6.00	AC	T							F	WENX/76/64	4-1; 4-4	
										F	WCAP-10185	4-3	
	6.00	AC	T	1140		25	22.00	FC	B	F	WCAP-9734	2-1; A-1	
	6.00	AC	T	1115	1165		22.00	FC	B	F	WCAP-11527	4-1; 4-4	
										F	WCAP-9734	A-1	
										F	WCAP-11527	4-3; 4-4	
	4.00		T	1150		25	40.00	FC	B	F	DOCKET 50-317	4; 6; 35	
										F	DOCKET 50-317	6; 36	
	4.00	T		1150		25	40.00	FC	B	F	DOCKET 50-318	4; 6; 62	
										F	DOCKET 50-318	6; 63	
	4.00	AC	T	1150			40.00	FC	B	F	SWRI-02-4770	9	

Table 25. Partial listing of WELD_PR.dbf

WELD_PR.dbf: Page 1

TAG	PLANT_ID	HEAT_ID	WLD_TYPE	WLD_CODE	HEAT_1	HEAT_2	WELD_SUPLY	WIRE_TYPE	WIRE_HEAT	FLUX_TYPE	FLUX_LOT	REF_ID	PAGES	NOTES
W	AD1	WAD101	SAW		FAD101	FAD102	BBW					SWRI-06-8976	5; 9	JOINED LOWER 8 INTEL. FORGING
W	AL2	WAL201	SAW		PAL201	PAL202	COMBUSTION ENG.	B-4	85642	L0091	3536	WCAP-9228	A-1; A-2	FROM SEAM NO. 101-106
B	AM1	WAM101		WF-193			BBW		406L44	L80	8773	BAW-1820	4-30	
C	AN2	WAN201			PAN202	PAN203						BMI-0584	15	FROM PLATES CP09M-1 & CB09P-2
W	AS1	WAS101	SAW		PAS101	PAS102	COMBUSTION ENG.	B-4	85650	L0091	1122	WCAP-9308	A-1; A-2	FROM PLATES W9405-2 & B9405-1
W	AS2	WAS201	SAW		PAS201	PAS202	COMBUSTION ENG.	B-4	4P6052	L0091	0145	WCAP-9530	A-1; A-2	FROM PLATES B6B8-1 AND B6B7-2
G	BP	WBP_01			PBP_01	PBP_01	COMBUSTION ENG.					GEDR-4442	C-1	FROM PLATES 19246-2 & 19246-3
W	BV1	WBV101	SAW		PBV102	PBV105	COMBUSTION ENG.	B-4	305424	L1092	5889	WCAP-8457	2-1; A-1	FROM PLATES B66071 AND B66072
W	CAB	WCAB01	SAW		PCAB01	PCAB02						WERX/76/66	4-1	FROM PLATES B1105-1 & B1105-2
W	CB1	WCB101	SAW		PCB101	PCB102	ROTTERDAM	GRAU LO	895075	L4520	P46	WCAP-9734	A-1	FORGS. 04, 527738 & 05, 411343
C	CC1	WCC101	SAW		PCC101	PCC102	COMBUSTION ENG.	B-4	33A277	L0091	3922	DOCKET 50-317	5; 36	PLATES D-7206-1 AND D-7206-2
C	CC2	WCC201	SAW		PCC201	PCC203	COMBUSTION ENG.	B-4	10137	L0091	3995	DOCKET 50-318	5; 63	PLATES D-8907-1 AND D-8907-3
W	CK1	WCK101			PCK101							SWRI-02-4770	7	
W	CK2	WCK201	SAW		PCK201	PCK202	CHICAGO BRIDGE					SWRI-06-8888	6; 8; 10	JOINING INTER. 11 LOWER PLATES
W	CL1	WCL101			PCL101	PCL102	COMBUSTION ENG.	B-4	99077	L124	1061	WCAP-9842	A-1	PLATES #27081 & #27071
G	CPR	WCPR01					COMBUSTION ENG.	1-233 ABC	120085	1092	3724	WEE-103-0966	3-8	TANDEM WELD W/HEAT 27204
B	CR3	WCR301	SAW	ATYPICAL			AM.CHAINECABLE			L80	8773	BAW-1820	4-24	ATYPICAL WELD
B	CR3	WCR302	SAW	WF 209-1			AM.CHAINECABLE		72105	L80	8773	BAW-1820	4-34	WF-209-1
W	CTY	WCTY01			PCTY01	PCTY08	COMBUSTION ENG.					BMI-0372	A-4	FROM PLATES W9807-1 & W9807-8
B	DB1	WDB101	SAW	WF-182-1	FDB101	FDB102	BBW		821144	L80	6754	BAW-1820	4-48	WF-193
W	DC1	WDC101	SAW		PDC101	PDC103	COMBUSTION ENG.		27204	L1092	3714	WCAP-11567	4-5	
W	DC2	WDC201	SAW		PDC201	PDC202	COMBUSTION ENG.		12008	L1092	3869	WCAP-11851	4-3	TANDEM WIRE PROCESS
G	DR1	WDR1D1										WEDC-12585	1	
G	DR2	WDR201	ESW									SWRI-06-6901-002	7	
G	DR2	WDR202	SAW									SWRI-06-6901-002	7	
G	DR3	WDR301	ESW									SWRI-06-7484-003	5	
G	DR3	WDR302	SAW									SWRI-06-7484-003	5	
W	FA1	WFA101	SAW		PFA101	PFA102	COMBUSTION ENG.	B-4	33A277	L0091	3922	WCAP-11563/R1	4-3	
W	FA2	WFA201	SAW		PFA201	PFA202	COMBUSTION ENG.	A1,A0	BOLA			WCAP-11438	4-3	MAN. METAL ARC, E8018C3 FILLER
C	FC1	WFC101	SAW		PFC102	PFC103	LUKENS		20291	L1092	3833	TR-D-MCH-001/R1	4; 6	D4802-1 & D4802-3; HEAK WF-410
G	GAR	WGAR01			FGAR02	FGAR03						WESD 26	314	HEATS 1675 AND 2686
W	GTN	WGTN01	SAW	SA-1036	FGTN01	FGTN02	BBW			L80		BAW-1803	3-3; 3-6	
G	HA1	WHA101					COMBUSTION ENG.	1-308 G/J	1P2815		3854	WEDC-30097	3-8	PLATES G-4804-1 AND G-4804-2
W	HB2	WHB201	SAW		PHB204	PHB205	COMBUSTION ENG.	RACD 3	W5214	L1092	3617	DOCKET 50-261	TABLE 1	HEAT W5214/W7753A
W	IP2	WIP201	SAW		PIP201	PIP203	COMBUSTION ENG.	RACD5	W5214	L1092	3600	DOCKET 50-247	TABLE 1	HEAT W5214 + NI 200, W7048A
W	IP3	WIP301	SAW				COMBUSTION ENG.	RACD 3	W5214	L1092	3692	WCAP-10300	4-5	WIRE HEAT 8W7753A
W	KD1	WKD101										SWRI-17-7517-219	6; 11	"CORE REGION WELD METAL"
W	KWE	WKWE01	SAW		FKWE01	FKWE02	COMBUSTION ENG.	B-4	1P3571	L1092	3958	DOCKET 50-305/C	TABLE 1	
A	LAC	WLAC01			PLAC03		ALLIS CHALMERS		3C78	A0X20X200	#5458	DOCKET 50-409	2; 3; 7	MANUAL ARC OR SUBMERGED, MS. 3
W	LM2	WLM201	SAW		FLM202	FLM202	BBW	NA-MO-N1	442002	L80	8968	WCAP-9529	A-1; A-2	FORGINGS 123J398 A/D 122J333
W	MC1	WMC101			PMC101	PMC102	COMBUSTION ENG.					WCAP-9195	2-1	
W	MC2	WMC201	SAW		PMC201			GRAU LO	895075		P46	WCAP-11029	4-1; 4-2	
G	ML1	WML101	SAW		PML103		COMBUSTION ENG.	RACD 3	W5214	L1092	3617	DOCKET 50-245	3; 22	HEAT (I-5214, W7753)
C	ML2	WML201D	SAW		PML202	PML205	COMBUSTION ENG.	B-4	90156	L0091	3998	DOCKET 50-336	TABLE 3.2	PLATES C506-2 & C516-3; I.D.
C	ML2	WML201OD	SAW		PML202	PML203	COMBUSTION ENG.	B-4	10137	L0091	3999	DOCKET 50-336	TABLE 3.3	PLATES C506-2 & C516-3; O.D.
G	MON	WMON01					CHICAGO BRIDGE					BMI-0483	6	
C	MY	WMY_01	SAW		PMY_11	PMY_13	LUKENS					WCAP-9875	4-4; 4-5	PLATES D8407-1 AND D8407-3
C	MY	WMY_02	SAW		PMY_01	PMY_02	LUKENS					WCAP-9875	4-4; 4-5	PLATES D8406-1 AND D8406-2
W	NA1	WNA101	SAW		FNA101		ROTTERDAM	SMIT 40	25531	SMIT 90	1211	DOCKET 50-338	TABLE 3	
W	NA2	WNA201	SAW		FNA201		ROTTERDAM	S[illegible]MO	716126	L4520	26	DOCKET 50-339	TABLE 7	
G	NM1	WNM101	SAW		PNM101		LUKENS					DOCKET 50-220	III-1	
B	OC1	WOC101	SAW	WF-112			BBW		406L44	L80	8688	BAW-1820	4-6	
B	OC2	WOC201	SAW	WF-209-1			AM.CHAINECABLE		72105	L80	8773	BAW-1820	4-12	WF-209-1
B	OC3	WOC301	SAW	WF-209-1			AM.CHAINECABLE		72105	L80	8773	BAW-1820	4-36	WF-209-1
C	PAL	WPAL01					COMBUSTION ENG.	RACD 3	3277	L1092	5833	T-CE-7752	TABLE A-1	
W	PB1	WPB101	SAW	SA-[illegible]263	FPB101	FP[illegible]102	BBW			L80		BAW-1803	3-3; 3-6	SA-1263
W	PB2	WPB201	SAW	W-[illegible]95	FPB201	FPB202	BBW			L80		BAW-1803	3-3; 3-6	WF-193

Table 26. Partial listing of HAZ_PR.dbf

HAZ_PR.dbf: Page 1

TAG	PLANT_ID	HEAT_ID	HEAT_B	HEAT_W	REF_ID	PAGES	NOTES
W	AD1	HAD101	FAD101	WAD101	WCAP-8957	3-1	W-HAZ OF ANH161
W	AL2	HAL201	PAL201	WAL201	WCAP-9228	2-1	FROM W-HAZ OF PLATE B9405-1
B	AN1	HAN101	PAN101		BAW-1440	3-2	FROM PLATE C-5114-1 LONG.
B	AN1	HAN102	PAN102		BAW-1698	3-2	FROM PLATE C-5114-2 LONG.
C	AN2	HAN201	PAN201		BMI-0584	14	FROM HEAT C-8009-3
W	AS1	HAS101	PAS101	WAS101	WCAP-9308	2-1	FROM W-HAZ OF PLATE B9605-2
W	AS2	HAS201	PAS201	WAS201	WCAP-9330	2-1	FROM W-HAZ OF PLATE B408-1
G	BR	HBR_01	PBR_01	WBR_01	GECR-4442	4	MADE FROM TEST WELD MATERIAL
W	BV1	HBV101	PBV101	WBV101	WCAP-10867	4-1	FROM WITHIN HAZ OF PL. B6903-1
W	BZ1	HBZ101			PB-ME 75/03	2	
W	CAB	HCAB02	PCAB02	WCAB01	WCAP-10185	4-1	FROM WELD HAZ MATERIAL
W	CB1	HCB101	PCB101	WCB101	WCAP-9734	2-1	FROM W-HAZ OF FORGING 05
C	CC1	HCC101	PCC103	WCC102	BMI-1280	7	FROM D7206-3 SIDE OF WELD
C	CC2	HCC201		WCC201	SWRI-7524	6; 29	FROM D8907-1 AND D8907-3
W	CK1	HCK101	PCK101	WCK101	SWRI-02-4770	7	FROM B4406-3 SIDE OF WELD
W	CK2	HCK201	PCK201	WCK201	WCAP-8512	2-1	FROM W-HAZ OF C5521-2
W	CL1	HCL101	PCL101	WCL101	WCAP-9842	2-1	FROM W-HAZ OF R2708-1
G	CPR	HCPR01		WCPR01	MDE-103-0986	3-6	FROM G2802-1 AND G2802-2
B	CR3	HCR301	PCR301		BAW-1898	3-2	FROM C4344-1, HEAT NN
B	CR3	HCR302	PCR302		BAW-1898	3-2	FROM C4344-2, HEAT PP
W	CTY	HCTY04		WCTY01	WCAP-7036	5	FROM W9807-1 AND W9807-8
B	DB1	HDB101	FDB101		BAW-1882	3-2	FROM HEAT BCC241
B	DB1	HDB102	FDB102		BAW-1882	3-2	FROM HEAT AKJ233
W	DC1	HDC101	PDC103	WDC101	WCAP-8465	2-1	FROM WITHIN HAZ OF B4106-3
W	DC2	HDC201	PDC201	WDC201	WCAP-8783	2-1	FROM W-HAZ OF B5454-1
G	DR1	HDR101			NEDC-12585	1	
G	DR2	HDR201		WDR201	BCL-585-10	5; B	ESW HAZ
G	DR2	HDR202		WDR202	BCL-585-10	5; B	SAW HAZ
G	DR3	HDR301	PDR301	WDR301	SWRI-06-7484-003	5	ESW HAZ
G	DR3	HDR302	PDR301	WDR302	SWRI-06-7484-003	5	SAW HAZ
W	FA1	HFA101	PFA101	WFA101	WCAP-8810	2-1	FROM W-HAZ OF B6919-1
W	FA2	HFA201	PFA201	WFA201	WCAP-8956	2-1	FROM W-HAZ OF B7212-1
C	FC1	HFC101		WFC102	TR-O-MCM-001/R1	4	FROM D4802-2 AND D4802-3
G	GAR	HGAR01		WGAR01	DPT/SN/041/R/79	3	
W	GIN	HGIN01	FGIN01	WGIN01	WCAP-7254	4	FROM W-HAZ OF 125P666
G	HA1	HHA101		WHA101	NEDC-30997	3-6; 3-19	FROM G-8404-2 AND G-8404-1
W	HB2	HHB201		WHB201	WCAP-7373	4	FROM W10201-1 AND W10201-3
G	HM3	HHM301			DOCKET 50-133	TABLE III	
W	IP2	HIP201	PIP203	WIP201	WCAP-7323	4	FROM HAZ OF B2002-3
W	IP3	HIP304	PIP304		WCAP-8475	2-1	FROM W-HAZ OF B2803-3
W	KO1	HKO101		WKO101	SWRI-17-5759-201	7	FROM W-HAZ
W	KWE	HKWE01	FKWE01	WKWE01	WCAP-8107	2-1	FROM W-HAZ OF 122X208VA1
A	LAC	HLAC01	PLAC03	WLAC01	NE&D B	96; 97; 99	FROM NP-1056
W	LM2	HLM201	FLM201	WLM201	WCAP-9329	2-1	FROM W-HAZ OF 123J398
W	MC1	HMC101	PMC102	WMC101	WCAP-9195	2-1	FROM W-HAZ OF B5012-2
W	MC2	HMC201	FMC201	WMC201	WCAP-11029	4-1; 4-2; A-7	FROM W-HAZ OF FORGING 05
G	ML1	HML101	PML102	WML101	NEDC-30833	3-2; 3-3; 3-17	FROM PLATE G-2002-6
C	ML2	HML201	PML201	WML202	TR-N-MCM-008	3; 4; B	FROM C-506-1 AND C-506-3
G	MON	HMON01	PMON01	WMON01	BMI-0483	6; 7	
C	MY	HMY_01		WMY_02	CR 75-317	B; A-4	FROM D-8406-1 AND D-8406-2
W	NA1	HNA101	FNA101	WNA101	WCAP-8771	2-1; A-1	FROM W-HAZ OF FORGING 03
W	NA2	HNA201	FNA201	WNA201	WCAP-8772	2-1; A-1	FROM W-HAZ OF FORGING 04
G	NM1	HNM101			DOCKET 50-220	II-1; III-2	
B	OC1	HOC101	POC101		BAW-1421/R1	3-1; 3-2	FROM HEAT C2800-2
B	OC1	HOC102	POC102		BAW-1436	3-1; 3-2	FROM HEAT C3265-1
B	OC2	HOC201	FOC201		BAW-1437	A-4	FROM HEAT AAW-163
B	OC2	HOC202	FOC202		BAW-1437	A-4	FROM HEAT AWG-164

Table 27. Listing of REF_TITL.dbf

REF_TITL.dbf: Page 1

REF_ID	CONT	REF_TITLE
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ACNP-66513	2	Evaluation of Radiation Effects, ACNP-66513, Allis-Chalmers, Bethesda, MD,
ACNP-66513	3	February 1966.
ASTM DS54	1	J. R. Hawthorne, Radiation Effects Information Generated on the ASTM Reference
ASTM DS54	2	Correlation Monitor Steels, ASTM DS54, American Society for Testing and
ASTM DS54	3	Materials, Philadelphia, PA, 1974.
ASTM STP 481	1	L. E. Steele and C. Z. Serpan, Jr., Analysis of Reactor Vessel Radiation Effects
ASTM STP 481	2	Surveillance Programs, Chapters 1 and 4, ASTM STP 481, American Society for
ASTM STP 481	3	Testing and Materials, Philadelphia, PA, 1966.
BAW-1421	1	A. L. Lowe, Jr., L. A. Hassler, H. S. Palme, and C. F. Zurlippe, Analysis of
BAW-1421	2	Capsule OCI-F from Duke Power Company Oconee Unit 1 Reactor Vessel Materials
BAW-1421	3	Surveillance Program, BAW-1421, Babcock & Wilcox, Lynchburg, VA, August 1975.
BAW-1421/R1	1	A. L. Lowe, Jr., L. A. Hassler, H. S. Palme, and C. F. Zurlippe, Analysis of
BAW-1421/R1	2	Capsule OCI-F from Duke Power Company Oconee Unit 1 Reactor Vessel Materials
BAW-1421/R1	3	Surveillance Program, BAW-1421, Rev. 1, Babcock & Wilcox, Lynchburg, VA,
BAW-1421/R1	4	September 1975.
BAW-1436	1	A. L. Lowe, Jr., et al., Analysis of Capsule OCI-E Duke Power Company Oconee
BAW-1436	2	Nuclear Station Unit 1 Reactor Vessel Materials Surveillance Program, BAW-1436,
BAW-1436	3	Babcock & Wilcox, Lynchburg, VA, September 1977.
BAW-1437	1	Analysis of Capsule OCII-C from Duke Power Company Oconee Nuclear Station,
BAW-1437	2	Unit 2, Reactor Vessel Materials Surveillance Program, BAW-1437, Babcock &
BAW-1437	3	Wilcox, Lynchburg, VA, May 1977.
BAW-1438	1	A. L. Lowe, Jr., et al., Analysis of Capsule OCIII-A from Duke Power Company
BAW-1438	2	Oconee Nuclear Station Unit 3, BAW-1438, Babcock & Wilcox, Lynchburg, VA, July
BAW-1438	3	1977.
BAW-1439	1	A. L. Lowe, Jr., et al., Analysis of Capsule TMI-1E from Metropolitan Edison
BAW-1439	2	Company Three Mile Island Nuclear Station - Unit 1, Reactor Vessel Materials
BAW-1439	3	Surveillance Program, BAW-1439, Babcock & Wilcox Co., Lynchburg, VA,
BAW-1439	4	January 1977.
BAW-1440	1	A. L. Lowe, Jr., et al., Analysis of Capsule ANI-E from Arkansas Power & Light
BAW-1440	2	Company Arkansas Nuclear One - Unit 1, Reactor Vessel Materials Surveillance
BAW-1440	3	Program, BAW-1440, Babcock & Wilcox, Lynchburg, VA, April 1977.
BAW-1543/R2	1	A. L. Lowe, K. E. Moore, and J. D. Aadland, Integrated Reactor Vessel Material
BAW-1543/R2	2	Surveillance Program, BAW-1543, Rev. 2, Babcock & Wilcox, Lynchburg, VA,
BAW-1543/R2	3	February 1984.
BAW-1638	1	A. L. Lowe, Jr., W. A. Pavinich, J. K. Schmotzer, and C. L. Whitmarsh, Analysis
BAW-1638	2	of Capsule V Virginia Electric & Power Company North Anna Unit No. 1 Reactor
BAW-1638	3	Vessel Materials Surveillance Program, BAW-1638, Babcock & Wilcox, Lynchburg,
BAW-1638	4	VA, March 1981.
BAW-1679/R1	1	A. L. Lowe, Jr. et al., Analyses of Capsule CR3-B, Florida Power Corporation,
BAW-1679/R1	2	Crystal River Unit 3, Reactor Vessel Materials Surveillance Program, BAW-1679,
BAW-1679/R1	3	Rev. 1, Babcock & Wilcox, Lynchburg, VA, June 1982.
BAW-1697	1	A. L. Lowe, Jr., et al., Analysis of Capsule OCIII-B from Duke Power Company
BAW-1697	2	Oconee Nuclear Station Unit 3 Reactor Vessel Materials Surveillance Program,
BAW-1697	3	BAW-1697, Babcock & Wilcox Co., Lynchburg, VA, October 1981.
BAW-1698	1	A. L. Lowe, Jr., et al., Analysis of Capsule ANI-B from Arkansas Power & Light
BAW-1698	2	Company's Arkansas Nuclear One, Unit 1, Reactor Vessel Materials Surveillance
BAW-1698	3	Program, BAW-1698, Babcock & Wilcox, Lynchburg, VA, November 1981.
BAW-1699	1	Analysis of Capsule OCII-A from Duke Power Company Oconee Nuclear Station, Unit
BAW-1699	2	2, Reactor Vessel Materials Surveillance Program, BAW-1699, Babcock & Wilcox,
BAW-1699	3	Lynchburg, VA, December 1981.
BAW-1701	1	A. L. Lowe, Jr., et al., Analyses of Capsule TE1-F, The Toledo Edison Company,
BAW-1701	2	Davis-Besse Nuclear Power Station Unit 1, Reactor Vessel Material Surveillance
BAW-1701	3	Program, BAW-1701, Babcock & Wilcox, Lynchburg, VA, January 1982 (Rev. 1, Toledo
BAW-1701	4	Edison, August 1982).
BAW-1702	1	A. L. Lowe, Jr., et al., Analyses of Capsule RS1-B, Sacramento Municipal Utility
BAW-1702	2	District, Rancho Seco Unit 1, Reactor Vessel Materials Surveillance Program,
BAW-1702	3	BAW-1702, Babcock & Wilcox, Lynchburg, VA, February 1982.
BAW-1718	1	A. L. Lowe, Jr., J. D. Aadland, W. A. Pavinich, and C. L. Whitmarsh, Fracture
BAW-1718	2	Toughness Test Results from Capsule CR3-B Florida Power Corporation Crystal
BAW-1718	3	River Unit 3, Reactor Vessel Material Surveillance Program, BAW-1718, Babcock &
BAW-1718	4	Wilcox Co., Lynchburg, VA, March 1982.
BAW-1719	1	A. L. Lowe, Jr., J. D. Aadland, J. E. Ewing, and W. A. Pavinich, Fracture
BAW-1719	2	Toughness Test Results from Capsule TE1-F, the Toledo Edison Company,
BAW-1719	3	Davis-Besse Nuclear Power Station Unit 1, Reactor Vessel Material Surveillance
BAW-1719	4	Program, BAW-1719, Babcock & Wilcox, Lynchburg, VA, March 1982.
BAW-1792	1	A. L. Lowe, Jr., et al., Analyses of Capsule RS1-D, Sacramento Municipal Utility
BAW-1792	2	District, Rancho Seco Unit 1, Reactor Vessel Material Surveillance Program,
BAW-1792	3	BAW-1792, Babcock & Wilcox Co., Lynchburg, VA, October 1983.
BAW-1794	1	A. L. Lowe, Jr., et al., Analysis of Capsule V Virginia Electric & Power Company
BAW-1794	2	North Anna Unit No. 2 Reactor Vessel Materials Surveillance Program, BAW-1794,
BAW-1794	3	Babcock & Wilcox, Lynchburg, VA, October 1983.

Table 27 (continued)

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BAW-1803	2	Neutron Radiation on Linde 80 Submerged-Arc Welds, BAW-1803, Babcock & Wilcox
BAW-1803	3	Co., Lynchburg, VA, January 1984.
BAW-1820	1	J. D. Aadland, Babcock & Wilcox Owner's Group 177-Fuel Assembly Reactor Vessel
BAW-1820	2	and Surveillance Program Materials Information, BAW-1820, Babcock & Wilcox,
BAW-1820	3	Lynchburg, VA, December 1984.
BAW-1834	1	A. L. Lowe, Jr., et al., Analyses of Capsule TE1-B, The Toledo Edison Company,
BAW-1834	2	Davis-Besse Nuclear Power Station Unit 1, Reactor Vessel Material Surveillance
BAW-1834	3	Program, BAW-1834, Babcock & Wilcox, Lynchburg, VA, May 1984.
BAW-1836	1	A. L. Lowe, Jr., et al., Analyses of Capsule AN1-A Arkansas Power & Light
BAW-1836	2	Company, Arkansas Nuclear One, Unit 1, Reactor Vessel Material Surveillance
BAW-1836	3	Program, BAW-1836, Babcock & Wilcox, Lynchburg, VA, July 1984.
BAW-1837	1	J. D. Aadland, et al., Analysis of Capsule OC1-A, Duke Power Company Oconee
BAW-1837	2	Nuclear Station, Unit 1, BAW-1837, Babcock & Wilcox, Lynchburg, VA, August 1984.
BAW-1880	1	A. L. Lowe et al., Analysis of Capsule W-83 Florida Power and Light Company
BAW-1880	2	St. Lucie Plant Unit No. 2 Reactor Vessel Material Surveillance Program,
BAW-1880	3	BAW-1880, Babcock & Wilcox, Lynchburg, VA, September 1985.
BAW-1882	1	A. L. Lowe, Jr., et al., Analyses of Capsule TE1-A, The Toledo Edison Company,
BAW-1882	2	Davis-Besse Nuclear Power Station Unit 1, Reactor Vessel Material Surveillance
BAW-1882	3	Program, BAW-1882, Babcock & Wilcox, Lynchburg, VA, September 1985.
BAW-1898	1	A. L. Lowe et al., Analysis of Capsule CR3-C Florida Power Corporation Crystal
BAW-1898	2	River Unit 3 Reactor Vessel Material Surveillance Program, BAW-1898, Babcock &
BAW-1898	3	& Wilcox, Lynchburg, VA, March 1986.
BAW-1899	1	A. L. Lowe et al., Analysis of Capsule CR3-D Florida Power Corporation Crystal
BAW-1899	2	River Unit 3 Reactor Vessel Material Surveillance Program, BAW-1899, Babcock &
BAW-1899	3	Wilcox, Lynchburg, VA, March 1986.
BAW-2049	1	A. L. Lowe et al., Analysis of Capsule CR3-F Florida Power Corporation Crystal
BAW-2049	2	River Unit-3, Reactor Vessel Material Surveillance Program, BAW-2049, Babcock &
BAW-2049	3	Wilcox, Lynchburg, VA, September 1988.
BCL-382-85-1/R1	1	M. P. Manahan, L. M. Lowry, R. O. Wooton, and M. P. Failey, Final Report on
BCL-382-85-1/R1	2	Examination, Testing, and Evaluation of Specimens from the 210-degree Irradiated
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BCL-382-85-1/R1	5	October 1985.
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BCL-585-10	2	Vessel Surveillance Program: Unit No. 2 Capsule Basket Assembly No. 5,
BCL-585-10	3	BCL-585-10, Battelle Columbus Laboratories, Columbus, OH, May 8, 1979.
BCL-585-12	1	J. S. Perrin, et al., Final Report on Palisades Nuclear Plant Reactor Pressure
BCL-585-12	2	Vessel Surveillance Program: Capsule A-240, BCL-585-12, Battelle Columbus
BCL-585-12	3	Laboratories, Columbus, OH, March 1979.
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WCAP-8512	1	J. A. Davidson, S. E. Yanichko, and J. H. Phillips, American Electric Power
WCAP-8512	2	Company Donald C. Cook Unit No. 2 Reactor Vessel Radiation Surveillance Program,
WCAP-8512	3	WCAP-8512, Westinghouse Electric Corporation, Pittsburgh, PA, November 1975.
WCAP-8513	1	J. A. Davidson, J. H. Phillips, and S. E. Yanichko, Tennessee Valley Authority
WCAP-8513	2	Sequoyah Unit No. 2 Reactor Vessel Radiation Surveillance Program, WCAP-8513,
WCAP-8513	3	Westinghouse Electric Corporation, Pittsburgh, PA, November 1975.
WCAP-8631	1	S. E. Yanichko, J. H. Phillips, and S. L. Anderson, Analysis of Capsule T from
WCAP-8631	2	the Florida Power and Light Company Turkey Point Unit No. 3 Reactor Vessel
WCAP-8631	3	Radiation Surveillance Program, WCAP-8631, Westinghouse Electric Corporation,
WCAP-8631	4	Pittsburgh, PA, December 1975.
WCAP-8739	1	S. E. Yanichko and S. L. Anderson, Analysis of Capsule S from the Wisconsin
WCAP-8739	2	Electric Power Company and Wisconsin Michigan Power Company Point Beach Nuclear
WCAP-8739	3	Plant Unit No. 1 Reactor Vessel Radiation Surveillance Program, WCAP-8739,
WCAP-8739	4	Westinghouse Electric Corporation, Pittsburgh, PA, November 1976.
WCAP-8771	1	J. A. Davidson and J. H. Phillips, Virginia Electric and Power Company North
WCAP-8771	2	Anna Unit No. 1 Reactor Vessel Radiation Surveillance Program, WCAP-8771,
WCAP-8771	3	Westinghouse Electric Corporation, Pittsburgh, PA, September 1976.
WCAP-8772	1	J. A. Davidson, Virginia Electric and Power Company North Anna Unit No. 2
WCAP-8772	2	Reactor Vessel Radiation Surveillance Program, WCAP-8772, Westinghouse Electric
WCAP-8772	3	Corporation, Pittsburgh, PA, November 1976.
WCAP-8783	1	J. A. Davidson and S. E. Yanichko, Pacific Gas and Electric Company Diablo
WCAP-8783	2	Canyon Unit No. 2 Reactor Vessel Radiation Surveillance Program, WCAP-8783,
WCAP-8783	3	Westinghouse Electric Corporation, Pittsburgh, PA, December 1976.
WCAP-8810	1	J. A. Davidson, J. H. Phillips, and S. E. Yanichko, Southern Alabama Power
WCAP-8810	2	Company Joseph M. Farley Nuclear Plant Unit No. 1 Reactor Vessel Radiation
WCAP-8810	3	Surveillance Program, WCAP-8810, Westinghouse Electric Corporation, Pittsburgh,
WCAP-8810	4	PA, December 1976.
WCAP-8908	1	S. E. Yanichko, S. L. Anderson, and K. V. Scott, Analysis of Capsule V from the
WCAP-8908	2	Wisconsin Public Service Corporation Kewaunee Nuclear Plant Reactor Vessel
WCAP-8908	3	Radiation Surveillance Program, WCAP-8908, Westinghouse Electric Corporation,
WCAP-8908	4	Pittsburgh, PA, January 1977.
WCAP-8916	1	J. A. Davidson, S. L. Anderson, and K. V. Scott, Analysis of Capsule V from
WCAP-8916	2	Northern States Power Company Prairie Island Unit No. 1, Reactor Vessel
WCAP-8916	3	Radiation Surveillance Program, WCAP-8916, Westinghouse Electric Corporation,
WCAP-8916	4	Pittsburgh, PA, August 1977.
WCAP-8956	1	J. A. Davidson and S. E. Yanichko, Alabama Power Company Joseph M. Farley
WCAP-8956	2	Nuclear Plant Unit No. 2 Reactor Vessel Radiation Surveillance Program,
WCAP-8956	3	WCAP-8956, Westinghouse Electric Corporation, Pittsburgh, PA, August 1977.
WCAP-8957	1	J. A. Davidson and S. E. Yanichko, Furnas-Centrais Electricas S.A. Angra Dos
WCAP-8957	2	Reis Unit No. 1 Reactor Vessel Radiation Surveillance Program, WCAP-8957,
WCAP-8957	3	Westinghouse Electric Corporation, Pittsburgh, PA, May 1977.
WCAP-9195	1	J. A. Davidson and S. E. Yanichko, Duke Power Company William B. McGuire Unit
WCAP-9195	2	No. 1 Reactor Vessel Radiation Surveillance Program, WCAP-9195, Westinghouse
WCAP-9195	3	Electric Corporation, Pittsburgh, PA, November 1977.
WCAP-9212	1	J. A. Davidson, S. E. Yanichko, and S. L. Anderson, Analysis of Capsule V from
WCAP-9212	2	Northern States Power Company Prairie Island Unit No. 2, Reactor Vessel
WCAP-9212	3	Radiation Surveillance Program, WCAP-9212, Westinghouse Electric Corporation,
WCAP-9212	4	Pittsburgh, PA, November 1977.
WCAP-9228	1	P. J. Fields, J. A. Davidson, and S. E. Yanichko, Central Nuclear de Almaraz
WCAP-9228	2	Almaraz Unit No. 2 Reactor Vessel Radiation Surveillance Program, WCAP-9228,
WCAP-9228	3	Westinghouse Electric Corporation, Pittsburgh, PA, December 1977.

Table 27 (continued)

REF_TITL.dbf: Page 11

REF_ID	CONT	REF_TITLE
WCAP-9234	1	J. A. Davidson and S. E. Yanichko, South Carolina Electric and Gas Company
WCAP-9234	2	Virgil C. Summer Nuclear Plant Unit No. 1 Reactor Vessel Radiation Surveillance
WCAP-9234	3	Program, WCAP-9234, Westinghouse Electric Corporation, Pittsburgh, PA,
WCAP-9234	4	January 1978.
WCAP-9298	1	J. A. Davidson, Tennessee Valley Authority Watts Bar Unit No. 1 Reactor Vessel
WCAP-9298	2	Radiation Surveillance Program, WCAP-9298, Westinghouse Electric Corporation,
WCAP-9298	3	Pittsburgh, PA, July 1978.
WCAP-9308	1	P. J. Fields, J. A. Davidson, and S. E. Yanichko, Fuerzas Electricas de Cataluna
WCAP-9308	2	ASCO Unit No. 1 Reactor Vessel Radiation Surveillance Program, WCAP-9308,
WCAP-9308	3	Westinghouse Electric Corporation, Pittsburgh, PA, July 1978.
WCAP-9329	1	P. J. Fields, J. A. Davidson, and S. E. Yanichko, Iberduero S.A. Lemoniz Unit
WCAP-9329	2	No. 2 Reactor Vessel Radiation Surveillance Program, WCAP-9329, Westinghouse
WCAP-9329	3	Electric Corporation, Pittsburgh, PA, August 1978.
WCAP-9330	1	P. J. Fields, J. A. Davidson, and S. E. Yanichko, Fuerzas Electricas de Cataluna
WCAP-9330	2	ASCO Unit No. 2 Reactor Vessel Radiation Surveillance Program, WCAP-9330,
WCAP-9330	3	Westinghouse Electric Corporation, Pittsburgh, PA, August 1978.
WCAP-9331	1	J. A. Davidson, S. L. Anderson, and R. P. Shogan, Analysis of Capsule T from the
WCAP-9331	2	Wisconsin Electric Power Company Point Beach Nuclear Plant Unit No. 2 Reactor
WCAP-9331	3	Vessel Radiation Surveillance Program, WCAP-9331, Westinghouse Electric
WCAP-9331	4	Corporation, Pittsburgh, PA, August 1978.
WCAP-9339	1	P. J. Fields and S. L. Anderson, Analysis of Capsule H from the Connecticut
WCAP-9339	2	Yankee Reactor Vessel Radiation Surveillance Program, WCAP-9339, Westinghouse
WCAP-9339	3	Electric Corporation, Pittsburgh, PA, September 1978.
WCAP-9357	1	S. E. Yanichko and S. L. Anderson, Analysis of Capsule R from the Wisconsin
WCAP-9357	2	Electric Power Company Point Beach Nuclear Plant Unit No. 1 Reactor Vessel
WCAP-9357	3	Radiation Surveillance Program, WCAP-9357, Westinghouse Electric Corporation,
WCAP-9357	4	Pittsburgh, PA, August 1978.
WCAP-9469	1	J. A. Davidson, S. L. Anderson, and W. T. Kaiser, Analysis of Capsule U from
WCAP-9469	2	Portland General Electric Company Trojan Reactor Vessel Radiation Surveillance
WCAP-9469	3	Program, WCAP-9469, Westinghouse Electric Corporation, Pittsburgh, PA, May 1979.
WCAP-9491	1	J. A. Davidson, S. L. Anderson, and W. T. Kaiser, Analysis of Capsule T from the
WCAP-9491	2	Indian Point Unit No. 3 Reactor Vessel Radiation Surveillance Program, WCAP-9491
WCAP-9491	3	Westinghouse Electric Corporation, Pittsburgh, PA, April 1979.
WCAP-9520	1	S. E. Yanichko, S. L. Anderson, and W. T. Kaiser, Analysis of Capsule F from the
WCAP-9520	2	Southern California Edison Company San Onofre Reactor Vessel Radiation
WCAP-9520	3	Surveillance Program, WCAP-9520, Westinghouse Electric Corporation, Pittsburgh,
WCAP-9520	4	PA, May 1979.
WCAP-9635	1	S. E. Yanichko, S. L. Anderson, R. P. Shogan, and R. G. Lott, Analysis of
WCAP-9635	2	Capsule R from the Wisconsin Electric Power Company Point Beach Nuclear Plant
WCAP-9635	3	Unit No. 2 Reactor Vessel Radiation Surveillance Program, WCAP-9635,
WCAP-9635	4	Westinghouse Electric Corporation, Pittsburgh, PA, December 1979.
WCAP-9678	1	S. E. Yanichko, S. L. Anderson, and W. T. Kaiser, Analysis of Capsule Y from the
WCAP-9678	2	Public Service Electric and Gas Company Salem Unit No. 1 Reactor Vessel
WCAP-9678	3	Radiation Surveillance Program, WCAP-9678, Westinghouse Electric Corporation,
WCAP-9678	4	Pittsburgh, PA, February 1980.
WCAP-9717	1	S. E. Yanichko, S. L. Anderson, and W. T. Kaiser, Analysis of Capsule Y from the
WCAP-9717	2	Alabama Power Company Farley Unit No. 1, Reactor Vessel Radiation Surveillance
WCAP-9717	3	Program, WCAP-9717, Westinghouse Electric Corporation, Pittsburgh, PA, June 1980
WCAP-9734	1	S. E. Yanichko, Duke Power Company Catawba Unit No. 1 Reactor Vessel Radiation
WCAP-9734	2	Surveillance Program, WCAP-9734, Westinghouse Electric Corporation, Pittsburgh,
WCAP-9734	3	PA, July 1980.
WCAP-9794	1	S. E. Yanichko, S. L. Anderson, R. P. Shogan, and R. G. Lott, Analysis of
WCAP-9794	2	Capsule 125 from the Consumers Power Company Big Rock Point Nuclear Plant
WCAP-9794	3	Reactor Vessel Radiation Surveillance Program, WCAP-9794, Westinghouse Electric
WCAP-9794	4	Corporation, Pittsburgh, PA, September 1980.
WCAP-9842	1	L. R. Singer, Union Electric Company Callaway Unit No. 1 Reactor Vessel
WCAP-9842	2	Radiation Surveillance Program, WCAP-9842, Westinghouse Electric Corporation,
WCAP-9842	3	Pittsburgh, PA, May 1981.
WCAP-9860	1	S. E. Yanichko et al., Analysis of Capsule V from the Duquesne Light Company
WCAP-9860	2	Beaver Valley Unit No. 1 Reactor Vessel Radiation Surveillance Program,
WCAP-9860	3	WCAP-9860, Westinghouse Electric Corporation, Pittsburgh, PA, January 1981.
WCAP-9875	1	S. E. Yanichko, S. L. Anderson, R. P. Shogan, and R. G. Lott, Analysis of the
WCAP-9875	2	Maine Yankee Reactor Vessel Second Accelerated Surveillance Capsule, WCAP-9875,
WCAP-9875	3	Westinghouse Electric Corporation, Pittsburgh, PA, March 1981.
WCAP-9877	1	S. E. Yanichko, S. L. Anderson, and W. T. Kaiser, Analysis of Capsule T from
WCAP-9877	2	Northern States Power Company Prairie Island Unit No. 2, Reactor Vessel
WCAP-9877	3	Radiation Surveillance Program, WCAP-9877, Westinghouse Electric Corporation,
WCAP-9877	4	Pittsburgh, PA, March 1981.

Table 28. Partial listing of REF_LST.dbf

REF_LST.dbf: Page 1

TAG	PLANT_ID	REF_ID
*		ASTM D554
*		ORNL-4313
*	AD1	SWRI-06-8976
*	AD1	WCAP-8957
*	AL2	WCAP-9228
*	AN1	BAW-1440
*	AN1	BAW-1543/R2
*	AN1	BAW-1698
*	AN1	BAW-1803
*	AN1	BAW-1820
*	AN1	BAW-1836
*	AN1	NUREG/CR-3319
*	AN2	BMI-0584
*	AS1	WCAP-9308
*	AS2	WCAP-9330
*	BR	EPRI NP-2428
*	BR	GECR-4442
*	BR	NE&D 11(3)
*	BR	WCAP-9794
*	BV1	DOCKET 50-334
*	BV1	WCAP-10867
*	BV1	WCAP-8457
*	BV1	WCAP-9860
*	BW1	NEDO-24157/R1
*	BW1	NEDO-24161
*	BW2	NEDO-24157/R1
*	BZ1	PB-ME 75/02
*	BZ1	PB-ME 75/03
*	BZ1	PB-ME 78/06
*	BZ2	NUREG/CR-3319
*	BZ2	PB-ME 75/02
*	CAB	EPRI NP-2428
*	CAB	WCAP-10185
*	CAB	WENX/76/64
*	CB1	WCAP-11527
*	CB1	WCAP-9734
*	CC1	BMI-1280
*	CC1	DOCKET 50-317
*	CC2	DOCKET 50-318
*	CC2	SWRI-7524

APPENDIX A. PRELIMINARY SOFTWARE AND PROCESSING

A.1 INTRODUCTION

The software described in this appendix is the current implementation of a system that provides the user of the PR-EDB with the necessary tools to process the data and to create a variety of tables, fits, and graphs for reports and verification of irradiation embrittlement predictions. The present version is far from complete; many important tasks remain which are not yet part of this software package and must be performed through the dBASE or compatible software. In particular, any direct editing of data and the elimination of duplicate records can currently be done only through calls to dBASE. Also, the combination of data from several different files by means of key identifiers needs to be done through dBASE. Software to facilitate these tasks will be part of later updates.

The current version of the software package EDB-Utilities has been written in the Clipper language, which allows compilation of dBASE procedures and has facilities for menu and help screens so that the user can usually run the program without additional instructions. A detailed user's manual will be available in the near future. The program package provides the means for a number of file-manipulation tasks, including the display of data on the computer screen and hardcopy to a printer. The dBASE and related software, such as Clipper, lack the facility for extensive mathematics/statistics calculations and scientific graphs. Some plotting and fitting programs are written in FORTRAN using the IMSL and GRAFMATIC libraries and require ASCII files as input. The ASCII files for the plotting program can be created through the EDB-Utilities file-manipulation feature. Another ASCII file that is needed for input to the fitting of raw Charpy data, RAW_C_PR.dat, has been created from the file RAW_C_PR.dbf and is part of the PR-EDB set of diskettes. Also included is the ASCII file RAW_C_RS.dat, which contains the results of the Monte Carlo uncertainty analysis and can be used as input for the multiple fitting program.

The primary output device for graphic presentations by the EDB-Utilities is the monitor screen in EGA format. (Other formats, e.g., VGA, are considered for future releases.) Utilities are available to transfer the screen picture to the printer, for instance, GRAFPLUS (Sect. A.7). Creating output for plotting devices (e.g., HP plotters) is not part of the current version of the EDB_Utilities but is being considered for future releases.

A.2 EDB-UTILITIES SOFTWARE PACKAGE

The EDB-Utilities package has been designed to provide the end user of the Embrittlement Data Base with convenient means to manipulate, view, plot, and fit the data that are given in dBASE format. There are four major options that can be selected from the first menu (Fig. A.1).

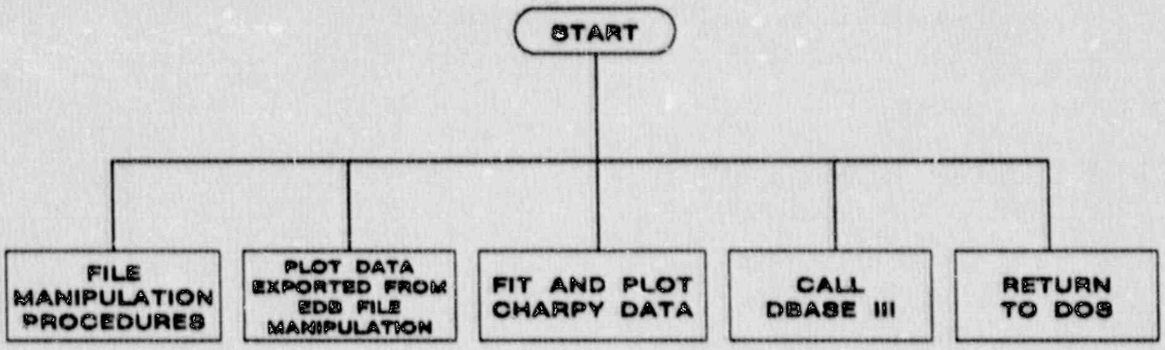

Fig. A.1. Major options selected from first menu.

1. File-Manipulation Procedures. This option is not restricted to PR-EDB files; any file in dBASE format can be processed. Specifically, the following operations can be performed:

   a. Retrieve a file for manipulation
   b. Add or delete fields
   c. Use numerical data for calculations and place results in user-defined fields
   d. Add or delete records
   e. Reorder records
   f. Display or export data
   g. Save working file

   A detailed explanation of the different operations will be given in Sect. A.3.

2. Plot Data Exported from EDB files. Numerical data from dBASE files can be exported to ASCII files, as described in Sect. A.3.7, and can be represented in scatter plots with automatic scaling and labeling. Specific curves can be added to the graph as an option. Details are given in Sect. A.4.

3. Fit and Plot Charpy Impact Data from EDB files. Raw Charpy impact data from the file RAW_C_PR.dbf, once in ASCII format, can be fitted to a hyperbolic tangent curve and the results plotted. A Monte Carlo uncertainty analysis program is included which determines the uncertainties in the fitting parameters given the uncertainties in impact energy and test temperature of the original data. The following options are provided:

   a. Single-curve fitting and plotting
   b. Multiple-curve fitting and plotting
   c. Monte Carlo uncertainty analysis
   d. Extracting selected Charpy sets

   Details are given in Sect. A.5.

4. Run dBASE III PLUS. This option allows the user to run the dBASE program without exiting EDB-Utilities, provided dBASE III PLUS has been properly installed. The user can, in this manner, easily switch between different options and edit or perform other tasks in dBASE for which no provisions are given in the EDB-Utilities package. Note that all fields in the PR-EDB files are character fields, and any numerical manipulation of data must first use the VAL(...) function to obtain numbers, and convert the results back to character strings using STR(...).

A.3 FILE-MANIPULATION PROCEDURES

File-manipulation procedures are shown schematically in Fig. A.2.

A.3.1 General Considerations

The PR-EDB consists of a number of data files in dBASE format. Each file can be considered as a table of data; the columns of the table are called Data Fields and the rows, Records. Each data field has a given length FIELD_LEN, a unique identifier FIELD_NAME, and a FIELD_TYPE, which declares the data as either "character," or "numeric," or "date" fields, and this information is coded in a special manner at the head of the dBASE files.

All data fields in the PR-EDB are of character type; this allows one to use blanks for missing data and also the introduction of scientific notation, for which dBASE III PLUS has no provisions. However, the actual data types must be provided in some way to processing codes in order to perform calculations, comparisons, and orderings. For this reason, a "structure file" is assigned to each data file which has the same name but the extension .str instead of .dbf (e.g., REAC_PR.dbf has the structure file REAC_PR.str). A structure file has the same first five fields as a dBASE structure file, but in addition a field F_T for the actual field type, which can be C for character, N for numeric, S for scientific notation, and

D for date. It also has a field DESC which contains a detailed description of the data field plus the type of units used in brackets [...]. This information is displayed in menu screens concerning data fields and is used to label the axes in the plots that are generated in the plotting option of EDB-Utilities.

All file-manipulation procedures, such as changing data fields or records, reordering, and displaying are never performed on the original data file; the input file is first copied to a "working file" WORK.dbf, and the associated structure file, to STRUCT.dbf. A dBASE-type structure file TMPS.dbf is also needed for some file-manipulation procedures. After performing the desired procedures, the working files may be saved to new files, or the old files may be overwritten. The working files remain in the directory and can be accessed again by the EDB-Utilities, even after the program has been temporarily terminated. The original files remain as they are unless overwritten by the user.

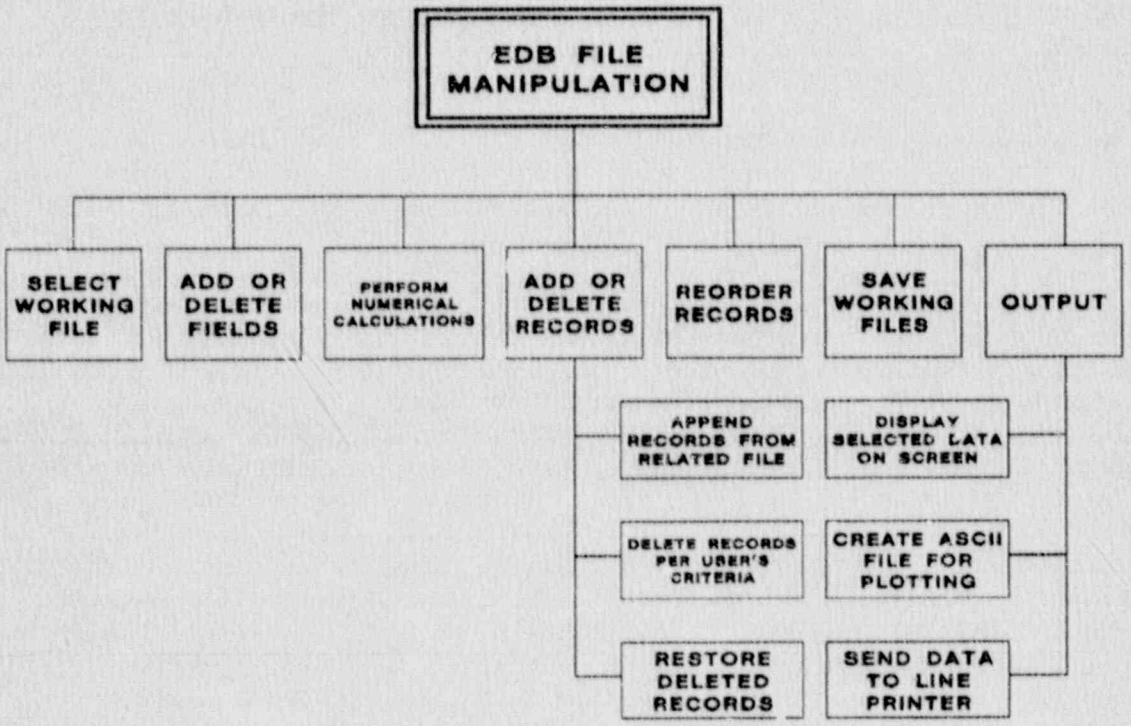

Fig. A.2. EDB-Utilities file-manipulation procedures.

A.3.2 Retrieval of Files for Manipulation

Any dBASE file can be processed by the manipulation option of EDB, including the structure files. The input files need not be PR-EDB files (i.e., containing only character fields), but the working file WORK.dbf has this property. A new structure file is created if an associated structure file is not present or is incompatible with the input file. Field names used in the EDB files are listed in a file STR_ALL.dbf, and this file is used to put information in the new structure file for such field names. Other information must be entered by the user, who can also change the information from STR_ALL.dbf, if necessary. The new structure file is saved if none was previously available, but old files are not overwritten, even if they are incompatible. The working file WORK.dbf has no associated index file. However, an index file can be used with the input file to ensure the proper order in the working file.

A.3.3 Addition or Deletion of Fields

Fields can be added to the working file for storing the results of calculations, and only these fields can be used for this purpose. However, fields added in a previous run to a file that was subsequently saved can still be used for results after later retrieval of the file. Any field can also be deleted including ones that had been added previously. Both additions and deletions become final only after the modification command is given; tentative additions and/or deletions can be aborted, if necessary.

A.3.4 Addition and Deletion of Records

Records can be deleted from the working file according to conditions entered by the user. This step is done using the option "Select Records From Working File." Note that the deletion of records in dBASE is a two-step procedure; first records to be deleted are marked and following that the marked records are completely eliminated. The marked records can be restored as long as the final elimination step has not been executed. Consequently, there are two options in the selection procedure, namely deletion (marking) of records and restoring (unmarking). All records can be deleted if the restoration option is entered before deleting any records. Both procedures are done for records that satisfy conditions that are entered by the user in the menu screens provided. Using suitable sequences of deletions and restorations, practically all selection criteria can be satisfied (see Examples, Sect. A.6). After the selection procedure is completed, all deleted (i.e., marked) records are removed (eliminated) and can no longer be restored. Selections can also be aborted in case of an error.

Records can be added to the working file by appending them from another dBASE file. This file need not be a PR-EDB file or a saved working file and may have numerical or date fields. All data are again converted into character fields before appending. Data are appended according to the field names, which must be the same in the working and the added file.

A.3.5 Calculations

A variety of numerical operations can be performed on fields of numerical- or scientific-type data, with the results entered into user-defined scientific fields. Only one operation at a time can be performed, namely addition, subtraction, multiplication, division, exponentiation plus exponential function, and logarithm. More complicated formulas can be calculated in a properly chosen sequence of operations using, perhaps, some auxiliary fields for temporary storage. A warning is given for improper operations such as division by zero, and a blank record is given as a result. A blank is also given if one of the operations has a blank record, indicating missing data.

A.3.6 Reordering

No index files are associated with the working file, but records can be sorted in any manner by entering the ordering criteria in the menu screen provided. The chosen arrangement can be saved in an output file, if desired.

A.3.7 Display and Export

The data in the working file can be displayed on the screen or printed. A menu is provided which allows the selection of fields to be displayed or printed in any desired order. For printing, the user must supply the number of characters per line and the number of lines per page. The fields will be distributed over several pages if the width of the output exceeds the number of lines permitted, and, of course, if there are more records than the number of lines per page. The data can also be saved in an output file that is formatted in a manner suitable for subsequent plotting with the EDB-Utilities plotting program.

A.3.8 Save Working File

The working file and the associated structure file can be saved by copying them under a user-specified name. A warning will be given if a file under this name already exists, but overwriting an existing file is permitted, destroying the old file in the process.

A.4 PLOTTING PROGRAM

The data input for the plotting program (Fig. A.3) is prepared by the file-manipulation procedures and exported to special plot files as described in the previous Sect. A.2. Data from up to ten different files can be put in the same plot with different symbols assigned to each data set. Once the plotting program has been called from the main menu, the following information must be given:

1. The name of the structure file that was associated with the working file from which the data set was prepared. The sole purpose of this file is to provide the information about which data fields should be used for the x- and y-coordinates, respectively. Thus, any structure file may be used which has the corresponding numerical data fields in it, even if another working file was used to create the plot input. The field names used for coordinates must be common to all plot files for the same plot but other fields may differ.

2. The plot title. The title will appear in large letters on top of the plot.

3. Data fields for the coordinates. The user selects these fields from an input screen that shows the numerical fields in the structure file. The descriptions and units given in the structure file will be used for labeling the coordinate axes.

4. Names of the plot files and associated descriptions. The data descriptions will be used for (optional) legends that can be placed at any desired location in the plot and will appear in the same sequence as they are entered in the screen. Blanks as descriptions will be ignored in the legend.

5. Curves. Certain types of curves can be placed on the plots in addition to the data points. The user selects the desired type of curves from the menu screen and may also enter legends for these curves.

6. Symbols and colors. An option is provided for selecting symbols and colors (for color monitors and printers) for the different data sets and the curves. Dashes of different densities can be selected for the curves.

Once the input is given, a picture of the plot will appear on the screen. Scaling and labeling of the axes are automatic, using the information from the input data and structure files. The user will be asked to place the legend at some location in the plot where it does not interfere with the data points and curves. The plot may then be sent to the printer if the necessary connections are in place.

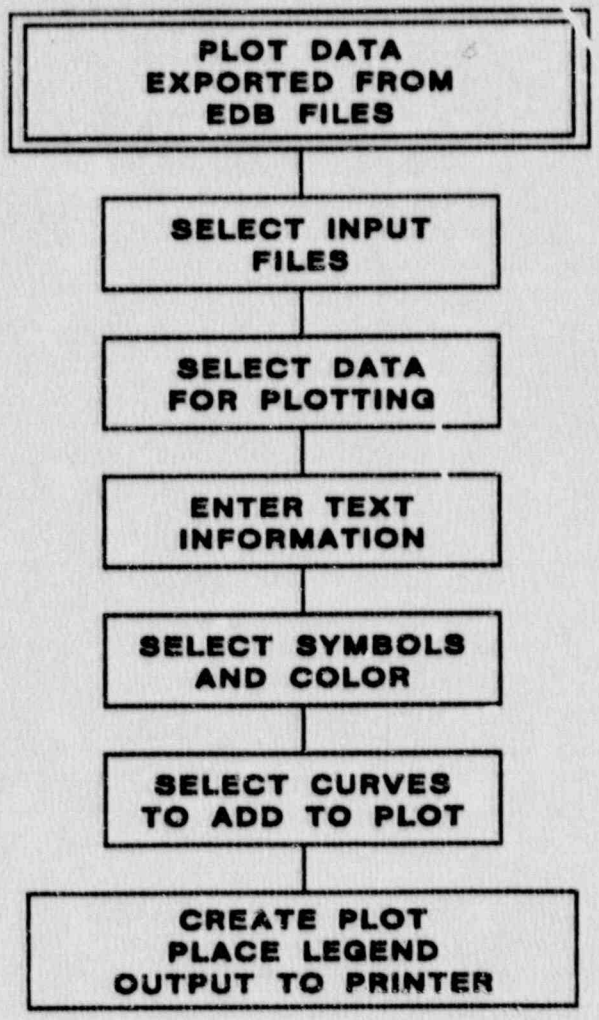

Fig. A.3. Flowchart for EDB-Utilities plotting program.

All input data for the plot, including information about curves, symbols, and colors, are saved and can be used with subsequent plots. The user can choose to use the same plot data again, with a possible change in curves, symbols, colors, and the placement of the legend. The input information may also be changed selectively or completely erased (this applies only to the information that is generated during the plotting procedure, such as name of input files, title, and legends, but not to the data files which remain intact).

A.5 CHARPY FITTING AND PLOTTING

Procedures for fitting and plotting of raw Charpy data are shown schematically in Fig. A.4.

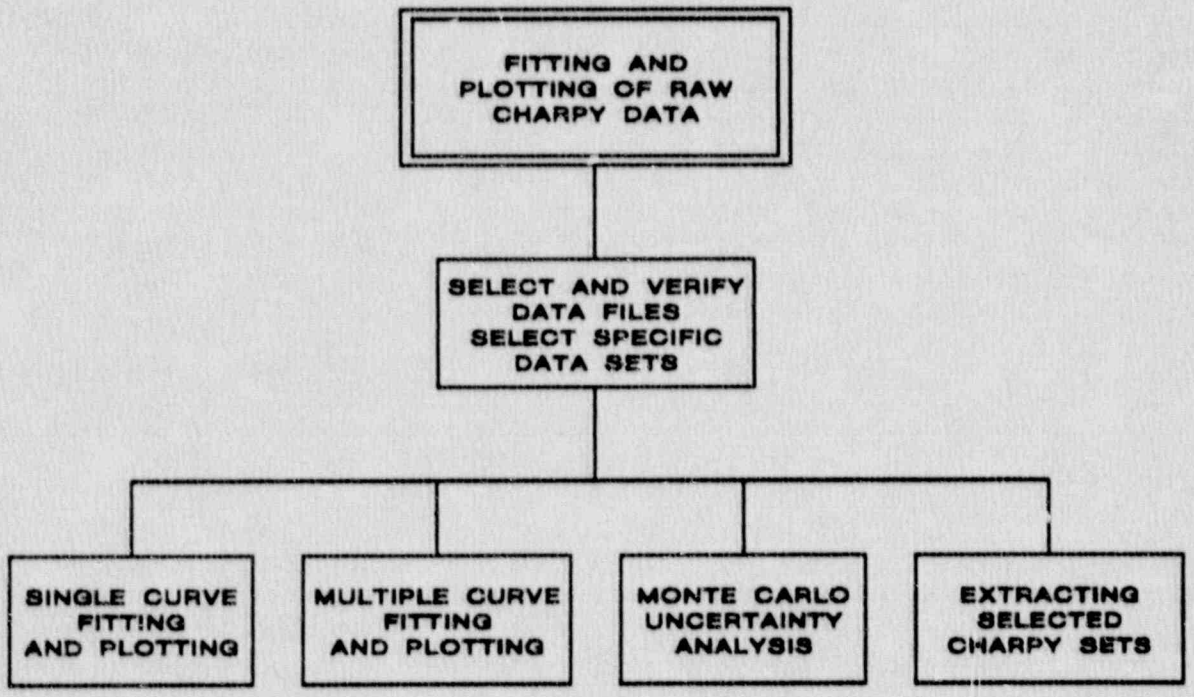

Fig. A.4. Procedures for fitting and plotting raw Charpy data.

A.5.1 General Considerations

The EDB-Utilities software allows the creation of fits and plots for any given set of raw Charpy data using the hyperbolic tangent function. Each set of raw Charpy data is uniquely identified by the keys PLANT_ID + CAPSULE + HEAT_ID + SPEC_ORI, and all data points having the same combination of these four identifiers are combined into the same set, unless the sequence of data records is interrupted by a record that contains different key identifiers. The program requires an input file in ASCII format, RAW_C_PR.dat, that was created from the PR-EDB file RAW_C_PR.dbf. All data are converted to U.S. units, the unit fields are removed, and a one-character field is added in front of SPEC_ID. If this field contains an asterisk, the record will be excluded from processing; this feature is useful for removing outliers. No outliers are tagged in

this way in the attached files, but an example is given below (see Figs. A.7 and A.8). The modified file was then converted to ASCII format using the dBASE command "Copy to RAW_C_PR.dat SDF."

The fitting procedure is completely automated. Upper and lower shelf values are restricted by adding a penalty proportional to the deviation from initial estimates to avoid unphysical fits. A first inspection of the points is made to obtain a rough estimate for the initial values of the curve parameters. A nonlinear least-squares fitting program ZSSQ from the IMSL library is used to determine the best fit, which is then plotted and appears on the screen, including data points with automatic scaling and labeling of the axes in both U.S. and international units. The plots can be sent to the printer, including a summary of transition temperatures and upper shelf data (in international units). All internal calculations are done in international units, centigrade and joule. Currently, no options are available to fit and plot lateral expansion or fracture appearance versus test temperature data. A detailed report of the fitting and uncertainty analysis will be available in the near future.

As stated in Sect. A.2, Item 3, there are four options for this part of the program.

A.5.2 Single-Curve Fitting and Plotting

In this option, the selected data sets are fitted and plotted, one at a time, with optional printing of the results. Titles and subtitles for the plots can be either given individually or at the start of the procedure, with the key identifiers serving as subtitles. The user has the option to skip any data set and to terminate the procedure without reading the whole input file.

A.5.3 Multiple-Curve Fitting and Plotting

With this option, up to ten different fits can be placed into one plot which is useful for comparing data before and after irradiation. The user enters the overall title and legends for the individual fits. Default legends can be used which contain the name of the capsule and the total fluence (>1.0 MeV). Legends can be placed by the user at a suitable free spot in the plot.

A.5.4 Monte Carlo Uncertainty Analysis

Uncertainties for the fitting parameters are needed to determine accuracy and credibility of the transition temperature and upper shelf data. A covariance matrix of the fitting parameters is part of any least-squares procedure, but these covariances are not used for uncertainty analysis in the EDB-Utilities. The unavoidable linearization used for determining the covariances disregards second-order effects, and there is no possibility to account for uncertainties in test temperature. A more reliable procedure is the use of random variations of the input data (Monte Carlo procedure); such variations can be applied to both impact energy and test temperature,

and the results reflect more accurately the influences of nonlinearities. The necessary computing time is, of course, increased by a large factor but remains manageable for today's computers. Because this option is completely automated, including printing the plots, a fairly large amount of data sets can be processed overnight or over a weekend. Nonphysical results and results that deviate substantially from the mean are eliminated from the sampling. This has the added advantage that fits can be obtained even after some tries have failed initially.

The user enters the (one-standard deviation) uncertainties for the impact energy and test temperature and the number of iterations. Unsuccessful iterations (i.e., the ones rejected by the program as nonphysical or inconsistent with the rest) are not counted; however, the total number of tries may not exceed five times the specified iteration number. Also needed is the number of sets to be skipped at the beginning of the input data file and the number to be processed. Processing is done, one set at a time, in sequence, starting after the specified number of sets have been skipped. A more specific selection can be obtained by using, as the input data file, the one created by the selection procedure (Sect. A.5.5). Continuous plotting and printing can be chosen as an option, with the user providing the common title and the key identifiers as a subtitle.

Three output files are created by the procedure, the names of which are either entered by the user or assigned by default. The "Summary Output File" (default name FORT15; the 15 in FORT15 is the unit number of the FORTRAN output file) is a list which contains the set number, key identifiers, fluence, irradiation temperature, transition temperature at 41 J and 68 J (30 ft-lb and 50 ft-lb), upper and lower shelf energy (all in international units), the number of specimens in the set, and the number of successful iterations for each processed set. The "Covariance Output File" (default name FORT16) contains mean values, standard deviations, and correlations for all fitting parameters which include the transition temperature at the center of the curve and 1/slope, which is one-half of the impact energy range of the transition region. The "EDB_dBASE Output File" (default name FORT17) is intended for conversion to a dBASE file whose data are an alternative to the file SHFT_PR. This file can also be used as an "auxiliary" input file in the multiple fitting option (Sect. 5.3). Its data are given in U.S. units. A "status report" listing the results from all successful and unsuccessful iterations is placed on the screen during the procedure. The screen output can be redirected to a file as an option.

The complete file RAW_C_PR.dat has been processed with this program, with 10 J and 4°C as input uncertainties for impact energy and test temperature, respectively, and 200 iterations. The summary and dBASE output files, RAW_C_PR.sum and RAW_C_RS.dat, respectively, are included in the data disks. The dBASE version of RAW_C_RS.dat (RAW_C_RS.dbf) is also included in the package. The covariance file, which is very large and of limited usefulness, is not included, but a sample printout is given with the examples.

A.5.5 Extracting Selected Charpy Sets

The raw data files for individual Charpy sets are quite large and thus require long search times in sequential access. It is, therefore, convenient and saves time to copy small subsets from a larger file, if such subsets are processed repeatedly. This is accomplished through the data-selection option. The user specifies the selection criteria and may, in addition, skip certain sets and terminate the procedure without going through the rest of the input file. No processing is done during this option, but the user-specified output file (default FORT20) can now serve as an input file for any subsequent processing step.

A.5.6 Selection of Input Files and Data Sets

The four options require essentially the same input information that is requested in several input screens:

1. Names of input data files, primary and auxiliary. The primary input file is RAW_C_PR.dat which is included in the package and given as default at the menu. The user may change this name to that of any other data file that contains raw Charpy data in the same format, for instance, one obtained from the selection procedure described in Sect. A.5.5. The multiple-fitting option permits the use of an additional, "auxiliary" input file that contains the values of the fitting parameters as generated by the Monte Carlo uncertainty analysis as EDB-dBASE output file. The file RAW_C_RS.dat is included in the package and appears as default. Its use is optional and allows the user to bypass the least-squares fitting, speeding up the process and avoiding problems with convergence. The data sets in the primary and auxiliary files need not be identical or in the same sequence.

2. Selection criteria. Reactors and materials can be selected for processing by entering the selection criteria in the appropriate menu screen. These criteria are not used in Monte Carlo uncertainty analysis. The Monte Carlo uncertainty analysis is designed to process a large number of data sets in sequence without user intervention. Consequently, only the starting number and the number of sets to be processed can be given. The number associated with each set can be found in the (ASCII) file RAW_CPY.SUM. These numbers are entered in the input screen as discussed in Sect. A.5.4.

3. Selection of symbols and colors. This is essentially the same procedure as for plots in Sect. A.4, Item 6. Data points that are excluded from the fitting procedure can be plotted using different symbols. Such points can also be completely eliminated from the plot by using the empty symbol (zero symbol) for rejected data points.

A.6 EXAMPLES

The following examples are intended as exercises for the user of the EDB-Utilities to guide the user through the various options and to show typical applications of these processing steps. It is assumed that the user will try to duplicate the sequence of processing steps which are listed in the following pages and to verify the results. The reader of this report who is only interested in the capabilities of the EDB-Utilities may have difficulty in understanding the listing of processing steps without running the program and may safely skip these parts, concentrating on the general introductions and resulting tables and graphs.

The EDB-Utilities program is started by typing EDB. The user then selects the various options as indicated below.

A.6.1 File-Manipulation Procedures with Plots

In the following example, the relation between shift in transition temperature and upper-shelf energy drop will be investigated. This example was chosen because it makes use of most of the file-manipulation features and needs only one PR-EDB raw data file SHFT_PR.dbf. For more in-depth investigations, chemistry data need to be added which would require additional processing with dBASE software. Also, the proposed manipulation of the data file could be done, perhaps faster, directly in dBASE by someone familiar with the software. However, the creation of the plot file and the actual plotting requires the EDB-Utilities software.

This example compares the values given in DTT30 for the shift of transition temperature at 30 ft-lb with the relative upper-shelf drop given in DUSE_REL in percent. However in many reports, these values are not listed directly and only the transition temperatures, UTT30 and ITT30, and upper shelf energies, UUSE and IUSE, for unirradiated and irradiated conditions are given, from which the shift values can easily be calculated. Thus, two new fields are added to the input file, DTT and DUSE, which will contain either the reported or calculated value, whatever is available, with preference for the directly reported value. The values for base material (plates, forgings, and standard reference materials) and welds will be separated. Heat-affected-zone data will be ignored.

Using the file-manipulation option, the following sequence of procedures will be performed:

Retrieve:	SHFT_PR.dbf
Delete records:	PROD_ID = HAZ
	TEMP_U <> F*
	USE_U <> FT-LB
	(data with non-U.S. units are eliminated;
	conversion to U.S. units is another possibility)

*The symbol <> (abbreviation for < or >) stands for "not equal". Symbols are listed as they appear on the menu screen (and dBASE commands).

Add two user-defined fields: Name and description as follows

DTT	Shift in Transition Temperature @ 30 ft-lb [degree F]
DUSE	Upper Shelf Drop [Percent] (text in brackets [] are units for the plot)

Save working file: to a temporary file (e.g., TMP0)

Delete records: DUSE_REL <= 0
(use reported USE_REL with positive drop only)

Calculate: DUSE = DUSE_REL + 0 (put DUSE_REL into DUSE)

Save working file: to another temporary file (e.g., TMP01)

Retrieve: TMP0.dbf

Delete records: DUSE_REL <> 0 (retain records without DUSE_REL)
UUSE <= 0
IUSE <= 0 (eliminate missing UUSE and IUSE values)

Calculate: DUSE = UUSE - IUSE
DUSE = DUSE / UUSE
DUSE = DUSE * 100
(put calculated values (UUSE - IUSE)/UUSE * 100 to DUSE)

Delete records: DUSE <= 0 (eliminate negative USE drop)

Add records: From TMP01.dbf

The working file now contains both reported and calculated relative drop values for USE with preference for reported values and negative drop values eliminated. A similar sequence can be performed for shift in transition temperature:

Save working file: to a temporary file (e.g., TMP1)

Delete records: DTT30 <= 0

Calculate: DTT = DTT30 + 0 (puts DTT30 into DTT)

Save working file: to another temporary file (e.g., TMP11)

Retrieve: TMP1.dbf

Delete records: DTT30 <> 0 (eliminate reported DTT30)

Calculate: DTT = ITT30 - UTT30 (put calculated shift into DTT)

Delete records: DTT <= 0 (eliminate negative shift)

Add records: From TMP11.dbf

The working file now contains all the desired values for transition temperature shift and upper shelf drop in the two newly created fields DTT and DUSE. These values are ready for printing and plotting. Through the processes of deleting and adding, the original sequence of records has been destroyed. It may be desirable to put the records in some new order before printing (the order of records is immaterial for plotting), for instance, through:

Reorder records: DTT - ASCENDING

By sending selected fields of the working file to the printer, one obtains the list in Table A.1. For plotting, it may be desirable to have different symbols for base materials and welds. This can be accomplished by selecting subsets of records from the file before exporting them to the plot files. First, the working file must be saved to a permanent file:

Save working file:	to DTT_US.dbf
Delete records:	PROD_ID = W (for base material)
Export to plot file:	to BASE.dat
Retrieve:	DTT_US.dbf
Delete records:	PROD_ID <> W (for weld material)
Export to plot file:	to WELD.dat

The data are now ready for plotting. After selecting the plotting option, the following input must be entered:

Title: Shift in Transition Temperature versus Upper Shelf Drop

Structure File: DTT_US (any of the temporary files will do also)

Coordinates: DTT for x-coordinate, DUSE for y-coordinate

Input files and legends: BASE.dat - Base Material
WELD.dat - Weld Material

The present plot needs no additional curves, but suitable symbols and colors may be selected. Following that, the plot is created automatically. The last step is to put the legends at an appropriate place after prompting. The finished plot is shown in Fig. A.5. There seems to be a near linear relation between transition temperature shift and upper shelf drop for low shift values, although the USE drop appears to level off at high shift values. No obvious distinctions between base metal and welds can be seen. The data scatter is rather large and suggests further investigation of additional factors which may influence the relation between CVT shift and USE drop.

Table A.1. Transition temperature shifts versus upper shelf drop from example, Sect. A.6.1. Data are arranged according to increasing transition temperature shift

Shift in Transition Temperature vs. Upper Shelf: Page 1

PLANT_ID	CAPSULE	HEAT_ID	PROD_ID	SPEC_ORI	CSP_F1	UTT30	ITT30	DTT30	DTT	UUSE	IUSE	DUSE_REL	DUSE
DB1	A	FDB101	F	TL	1.290E+19	-26	-24	2	2.000E+00	140	127		9.286E+00
DR2	3	WDR201	W	TL	1.300E+16	-10	-8	2	2.000E+00	101	96		4.950E+00
NA2	V	WNA201	W	TL	2.410E+18	-26	-24	2	2.000E+00	115	92		2.000E+01
CB1	Z	WCB101	W	TL	3.080E+18	-35	-30	5	5.000E+00	128	123		3.906E+00
NA2	V	FNA201	F	TL	2.410E+18	60	69	9	9.000E+00	75	62		1.733E+01
AD1	V	WAD101	W	TL	4.580E+18	-80	-70	10	1.000E+01	171	155		9.357E+00
FA2	U	WFA201	W	TL	5.610E+18	-30	-20	10	1.000E+01	144	132		8.333E+00
AN2	97	WAN201	W	TL	3.340E+18		10	10	1.000E+01		142	2.7	2.700E+00
BR	119	SHM3	SRM	LT	1.500E+18	0	15	15	1.500E+01	96	70		2.708E+01
BR	121	WBR_01	W	TS	0.0	-70	-55	15	1.500E+01	95	92		3.158E+00
OC3	B	FOC302	F	TL	3.120E+18	-9	10	19	1.900E+01	112	100		1.071E+01
VY	300	PVY_01	P	LT	4.300E+16	8	27	19	1.900E+01	148	128		1.351E+01
KWE	R	FKWE02	F	LT	2.070E+19	-50	-30	20	2.000E+01	157	153		2.548E+00
PB2	V	FPB201	F	LT	4.740E+18	-55	-35	20	2.000E+01	145	135		6.897E+00
PI1	P	FPI101	F	LT	1.250E+19	-25	-5	20	2.000E+01	158	142		1.013E+01
WC1	U	WWC101	W	TL	3.390E+18	-50	-30	20	2.000E+01	100	92		8.000E+00
SL2	WB3	PSL201	P	TL	1.600E+18	40	61		2.100E+01	117	111		5.128E+00
CR3	B	PCR301	P	TL	1.000E+18	16	37	21	2.100E+01	94	89		5.319E+00
NA1	V	FNA101	F	TL	2.490E+18	46	65	21	2.100E+01	85	75		1.176E+01
AN2	97	PAN201	P	LT	3.410E+18		24	21	2.100E+01		142	8.4	8.400E+00
TRO	U	WTRO01	W	TL	3.880E+18	2	24	22	2.200E+01	103	81		2.410E+00
ZN1	T	PZN101	P	TL	1.800E+18	25	50		2.500E+01	119	114		2.564E+00
AD1	V	FAD101	F	LT	4.580E+18	-25	0	25	2.500E+01	141	127		9.929E+00
AD1	V	FAD101	F	TL	4.580E+18	-22	3	25	2.500E+01	128	119		7.031E+00
GIN	V	FGIN01	F	LT	4.900E+18	-40	-15	25	2.500E+01	183	160		1.257E+01
SQ2	T	FSQ201	F	TL	2.200E+18	0	25	25	2.500E+01	88	82		6.818E+00
PL1	1	PPL101	P	LT	2.300E+17			25	2.500E+01			10.0	1.000E+01
CR3	B	WCR301	W	TL	1.170E+18	36	64		2.800E+01	76	70		7.895E+00
CR3	B	WCR301	W	TL	1.170E+18	36	64	28	2.800E+01	79	70		1.139E+01
DB1	A	FDB102	F	TL	1.290E+19	16	44	28	2.800E+01	127	118		7.087E+00
QC2	13	WQC201	W	TL	1.690E+16	-30	0		3.000E+01	125	107		1.440E+01
CL1	U	PCL101	P	LT	3.270E+18	-20	10	30	3.000E+01	104	93		1.058E+01
GIN	T	FGIN01	F	LT	1.750E+19	-40	-10	30	3.000E+01	183	143		2.186E+01
VS1	U	WVS101	W	TL	6.390E+18	-55	-25	30	3.000E+01	91	87		4.396E+00
WC1	U	PWC101	P	LT	3.390E+18	-20	10	30	3.000E+01	148	145		2.027E+00
OC3	B	FOC301	F	TL	3.120E+18	-9	12	32	3.200E+01	148	125		1.554E+01
OC1	A	POC102	P	TL	8.950E+18	18	39	34	3.400E+01	108	106		1.852E+00
SL2	WB3	PSL201	P	LT	1.600E+18	3	38		3.500E+01	133	118		1.128E+01
AN1	B	PAN102	P	LT	4.280E+18	-13	22	35	3.500E+01	147	123		1.633E+01
ML1	2	WML101	W	TS	3.300E+17	-45	-10	35	3.500E+01	112	75		3.304E+01
PB2	R	FPB201	F	LT	2.010E+19	-45	-10	35	3.500E+01	145	140		3.448E+00
PI2	T	FPI201	F	TL	1.050E+19	0	35	35	3.500E+01	108	93		1.389E+01
KO1	T	FKO101	F	TL	9.800E+18			35	3.500E+01	168	139	17.3	1.730E+01
PI1	P	FPI101	F	TL	1.250E+19	-27	10	37	3.700E+01	143	136		4.895E+00
ZN2	U	PZN201	P	LT	2.000E+18	37	75		3.800E+01	128	121		5.469E+00
DR2	4	PDR201	P	LT	9.500E+18	0	39	39	3.900E+01	153	117		2.353E+01
NA1	V	FNA101	F	LT	2.490E+18	-6	33	39	3.900E+01	135	122		9.630E+00
OC3	B	SHSS02	SRM	LT	3.120E+18	56	95	39	3.900E+01	130	96		2.615E+01
BR	127	SHM3	SRM	LT	7.100E+18	0	40	40	4.000E+01	96	82		1.458E+01
QC2	12	PQC201	P	LT	1.270E+19	-15	25	40	4.000E+01	135	123		8.889E+00
VS1	U	PVS101	P	LT	6.390E+18	-20	20	40	4.000E+01	133	131		1.504E+00
DR1	G4-1	WDR101	W	TS	1.000E+19	0	43	43	4.300E+01	110	91		1.727E+01
QC2	18	WQC201	W	TL	6.600E+16			43	4.300E+01			27.0	2.700E+01
OC2	C	WOC201	W	TL	1.020E+18	4	49		4.500E+01	67	54		1.940E+01
MC1	U	PMC101	P	LT	4.140E+18	5	50	45	4.500E+01	140	133		5.000E+00
SU2	X	PSU201	P	TL	3.020E+18	5	50	45	4.500E+01	105	95		9.524E+00
OC3	A	WOC301	W	TL	8.100E+17	45	93		4.800E+01	66	54		1.818E+01
AN1	A	PAN101	P	LT	1.030E+19	-31	17	48	4.800E+01	132	108		1.818E+01
ZN2	U	SHSS02	SRM	LT	2.000E+18	50	100		5.000E+01	124	111		1.048E+01
DR2	5	PDR201	P	LT	1.900E+19	0	50	50	5.000E+01	139	127		8.633E+00
MC1	U	PMC101	P	TL	4.140E+18	0	50	50	5.000E+01	101	100		9.901E+01
SA2	T	PSA201	P	LT	2.560E+18	30	80	50	5.000E+01	122	115		5.738E+00
SU1	T	PSU101	P	LT	2.500E+18	-10	40	50	5.000E+01	125	120		4.000E+00
AN2	97	PAN201	P	TL	3.330E+18		60	50	5.000E+01		124	1.2	1.200E+00
CX2	Y	WCX201	W	TL	5.550E+18			50	5.000E+01			9.0	9.000E+00
CTY	H	PCTY07	P	LT	1.790E+18	-30	23	53	5.300E+01	120	117		2.500E+00
BR	119	WBR_01	W	TS	1.500E+18	-70	-15	55	5.500E+01	95	80		1.579E+01
PI2	T	FPI201	F	LT	1.050E+19	-25	30	55	5.500E+01	150	133		1.133E+01
QC2	G14	PQC201	P	LT	4.140E+19	-15	40	55	5.500E+01	135	119		1.185E+01
SU2	X	PSU201	P	LT	3.020E+18	-5	50	55	5.500E+01	125	120		4.000E+00
CPR	1	WCPR01	W	TL	2.300E+17	-10	45	55	5.500E+01	112	85	24	2.400E+01
PL1	1	WPL101	W	TL	2.300E+17			55	5.500E+01			18.0	1.800E+01
CTY	H	PCTY02	P	LT	1.790E+18	-50	7	57	5.700E+01	135	130		3.704E+00
DR2	2	WDR202	W	TL	1.870E+19	-13	45		5.800E+01	71	70		1.408E+00
DR3	G10	PDR301	P	LT	9.250E+18	-10	48		5.800E+01	135	115		1.481E+01
HA1	1	PHA101	P	LT	2.400E+17	-70	-12	58	5.800E+01	139	131		5.755E+00
ML1	2	PML101	P	LT	3.300E+17	15	73	58	5.800E+01	106	88		1.698E+01

Table A.1 (continued)

Shift in Transition Temperature vs. Upper Shelf: Page 2

PLANT_ID	CAPSULE	HEAT_ID	PROD_ID	SPEC_ORI	CSP_FT	UTT30	ITT30	DTT30	DTT	UUSE	IUSE	DUSE_REL	DUSE
RS1	D	PRS101	P	TL	6.600E+18	4	62	58	5.800E+01	90	88		2.222E+00
CC1	263	WCC101	W	TL	6.000E+18	-50	9	59	5.900E+01	160	119		2.563E+01
DR3	14	PDR301	P	LT	1.020E+18	-10	50		6.000E+01	135	112		1.704E+01
ZN1	T	PZN101	P	LT	1.800E+18	-5	55		6.000E+01	140	132		5.714E+00
BR	127	PBR_01	P	TL	7.100E+18	-5	55	60	6.000E+01	82	73		1.098E+01
CC1	263	PCC103	P	LT	6.000E+18	8	68	60	6.000E+01	138	115		1.667E+01
OC1	A	POC102	P	LT	8.950E+18	-5	55	60	6.000E+01	141	137		2.837E+00
PI2	T	WPI201	W	TL	1.050E+19	-75	-15	60	6.000E+01	103	92		1.068E+01
PI2	V	WPI201	W	TL	5.490E+18	-75	-15	60	6.000E+01	103	100		2.913E+00
SA1	T	SHSS02	SRM	LT	2.560E+18	50	110	60	6.000E+01	123	115		6.504E+00
SQ2	T	FSQ201	F	LT	2.200E+18	-70	-10	60	6.000E+01	134	118		1.194E+01
SU2	X	SHSS02	SRM	LT	3.020E+18	40	100	60	6.000E+01	125	115		8.000E+00
ZN1	U	PZN101	P	TL	8.920E+18	25	85	60	6.000E+01	117	102		1.282E+01
CK1	T	PCK101	P	LT	1.800E+18	5	65	60	6.000E+01	130	108	16.0	1.600E+01
CK1	T	SHSS02	SRM	LT	1.800E+18	45	105	60	6.000E+01	120	120	15.0	1.500E+01
FC1	W225	PFC101	P	LT	5.100E+18	22	82	60	6.000E+01	138	119	13.0	1.300E+01
DR2	4	WDR202	W	TL	6.400E+18	-13	50	63	6.300E+01	71	51		2.817E+01
OC3	B	WOC301	W	TL	3.120E+18	45	109		6.400E+01	66	49		2.576E+01
OC3	B	WOC301	W	TL	3.120E+18	45	109	64	6.400E+01	66	49		2.576E+01
MC2	V	FMC201	F	LT	3.060E+18	-75	-10	65	6.500E+01	156	134		1.410E+01
OC2	U	POC201	P	LT	3.510E+18	5	70	65	6.500E+01	144	124	15	1.500E+01
ZN1	T	SHSS02	SRM	LT	1.800E+18	42	108		6.600E+01	124	106		1.452E+01
AN1	A	PAN101	P	TL	1.030E+19	17	83	66	6.600E+01	96	83		1.354E+01
DC1	S	SHSS02	SRM	LT	2.980E+18	46	112	66	6.600E+01	124	123		8.065E+01
CTY	H	PCTY04	P	LT	1.790E+18	-24	43	67	6.700E+01	126	122		3.175E+00
CAB	P	PCAB02	P	LT	1.430E+19	-24	44	68	6.800E+01	125	123		1.600E+00
SL1	97	PSL101	P	LT	5.500E+18	8	76	68	6.800E+01	139	107	23.0	2.300E+01
CC2	263	WCC201	W		8.060E+18			69	6.900E+01			23	2.300E+01
BR	122	PBR_01	P	TL	2.300E+19	-5	65	70	7.000E+01	82	62		2.439E+01
CL1	U	WCL101	W	TL	3.270E+18	-55	15	70	7.000E+01	112	101		9.821E+00
MC2	V	FMC201	F	TL	3.060E+18	-25	45	70	7.000E+01	94	85		9.574E+00
SA2	T	PSA201	P	TL	2.560E+18	10	80	70	7.000E+01	97	89		8.247E+00
SQ1	T	FSQ101	F	LT	2.740E+18	-35	35	70	7.000E+01	116	98		1.552E+01
SU1	T	SHSS02	SRM	LT	2.500E+18	45	115	70	7.000E+01	123	105		1.463E+01
CK1	T	PCK101	P	TL	1.800E+18	20	90	70	7.000E+01	94	84	10.0	1.000E+01
CK2	X	WCK201	W	TL	8.530E+18			70	7.000E+01			15	1.500E+01
ML2	W97	PML201	P	LT	3.780E+18	38	108	70	7.000E+01	131	94	28.0	2.800E+01
SL1	97	PSL101	P	TL	5.500E+18	16	86	70	7.000E+01	103	78	24.0	2.400E+01
DC2	U	PDC201	P	TL	3.510E+18	26	99	73	7.300E+01	95	94	1	1.000E+00
CPR	1	PCPR01	P	LT	2.300E+17	-66	8	74	7.400E+01	129	112	13	1.300E+01
SL1	97	WSL101	W	TL	5.500E+18	-53	21	74	7.400E+01	144	100	31.0	3.100E+01
DR1	G4-1	SNM3	SRM	LT	1.000E+19	10	85	75	7.500E+01	70	58		1.714E+01
HB2	T	PHB203	P	LT	4.110E+19	30	105	75	7.500E+01	114	105		7.895E+00
SQ1	U	FSQ101	F	TL	1.080E+19	45	120	75	7.500E+01	72	58		1.944E+01
SU2	V	PSU201	P	LT	1.880E+19	-5	70	75	7.500E+01	125	121		3.200E+00
SU2	V	PSU201	P	TL	1.880E+19	5	80	75	7.500E+01	105	94		1.048E+01
ZN2	T	PZN201	P	LT	8.700E+18			75	7.500E+01			19.0	1.900E+01
ML2	W97	WML201	W	TL	3.780E+18	-30	46	76	7.600E+01	132	98	26.0	2.600E+01
CTY	D	PCTY04	P	LT	2.220E+19	-24	54	78	7.800E+01	126	110		1.270E+01
OC1	E	WOC101	W	TL	1.500E+18	-5	75		8.000E+01	64	55		1.406E+01
OC1	G1	WOC101	W	TL	8.900E+18	10	90		8.000E+01	100	85		1.500E+01
FA1	U	WFA101	W	TL	1.650E+19	-80	0	80	8.000E+01	149	108		2.752E+01
FA1	Y	WFA101	W	TL	5.830E+18	-80	0	80	8.000E+01	149	130		1.275E+01
PI1	R	FPI101	F	LT	4.030E+19	-25	55	80	8.000E+01	158	145		8.228E+00
SQ2	T	WSQ201	W	TL	2.200E+18	-75	5	80	8.000E+01	112	110		1.786E+00
CK1	T	WCK101	W		1.800E+18	-90	-10	80	8.000E+01	110	80	27.0	2.700E+01
ZN1	X	PZN101	P	TL	1.500E+19			80	8.000E+01			21.0	2.100E+01
CC2	263	PCC202	P	LT	8.060E+18			84	8.400E+01			21	2.100E+01
FA1	Y	PFA101	P	LT	5.830E+18	-30	55	85	8.500E+01	140	128		8.571E+00
PI2	R	FPI201	F	TL	4.420E+19	0	85	85	8.500E+01	108	98		9.259E+00
ZN1	U	PZN101	P	LT	8.920E+18	-5	80	85	8.500E+01	140	120		1.429E+01
CK2	X	PCK201	P	LT	1.050E+19			85	8.500E+01			33	3.300E+01
YR	W1	SASTM S1	SRM		0.220E+19	15		85	8.500E+01	87	62	17	1.700E+01
PI1	R	FPI101	F	TL	4.030E+19	-27	60	87	8.700E+01	143	129		9.790E+00
CC1	263	SHSS01	SRM	LT	5.900E+18	39	127	88	8.800E+01	135	109		1.926E+01
IP3	T	PIP301	P	LT	2.920E+18	-2	87	89	8.900E+01	132	119		9.848E+00
DR2	2	PDR201	P	LT	2.980E+19	0	90		9.000E+01	153	109		2.876E+01
FA1	U	PFA101	P	TL	1.650E+19	15	105	90	9.000E+01	90	82		8.889E+00
GIN	V	SASTM	SRM	LT	4.900E+18	40	130	90	9.000E+01	78	65		1.667E+01
PB1	S	PPB101	P	LT	7.050E+18	-45	45	90	9.000E+01	107	92		1.402E+01
PB2	V	SHSS02	SRM	LT	4.740E+18	45	135	90	9.000E+01	125	95		2.400E+01
TRO	X	PTR001	P	LT	1.770E+19	-15	75	90	9.000E+01	116	102		1.207E+01
ZN1	X	PZN101	P	LT	1.200E+19			90	9.000E+01			23.0	2.300E+01
ZN2	T	PZN201	P	TL	1.100E+19			90	9.000E+01			15.0	1.500E+01
MY	W263	PMY_01	P	TL	6.600E+18	15	108	93	9.300E+01	115	96		1.652E+01
KWE	V	SHSS02	SRM	LT	5.590E+18	45	140	95	9.500E+01	123	109		1.138E+01
PB1	S	SASTM	SRM	LT	7.050E+18	40	135	95	9.500E+01	78	68		1.282E+01

Table A.1 (continued)

Shift in Transition Temperature vs. Upper Shelf: Page 3

PLANT_ID	CAPSULE	HEAT_ID	PROD_ID	SPEC_ORI	CSP_FI	UTT30	ITT30	DTT30	DTT	UUSE	IUSE	DUSE_REL	DUSE
GC2	12	WGC201	W	TL	1.250E+19	-30	65	95	9.500E+01	125	89		2.880E+01
SU2	X	WSU201	W	TL	3.020E+18	-18	75	95	9.500E+01	90	70		2.222E+01
TR0	X	PTR001	P	TL	1.770E+19	8	103	95	9.500E+01	84	76		9.524E+00
ML2	W97	PML201	P	TL	3.780E+18	17	113	96	9.600E+01	108	79	27.0	2.700E+01
CR3	D	PCR301	P	TL	7.500E+18	16	113	97	9.700E+01	94	72		2.340E+01
MY	W263	PMY_01	P	LT	6.600E+18	0	97	97	9.700E+01	140	113		1.929E+01
RS1	B	WRS101	W	TL	3.990E+18	-14	85		9.900E+01	68	51		2.500E+01
RS1	B	WRS101	W	TL	3.990E+18	-14	85	99	9.900E+01	68	51		2.500E+01
FA1	X	WFA101	W	TL	2.800E+19	-80	20	100	1.000E+02	149	115		2.282E+01
PB1	T	PPB101	P	LT	2.110E+19	-45	55	100	1.000E+02	107	95		1.121E+01
PI2	R	FPI201	F	LT	4.420E+19	-25	75	100	1.000E+02	150	127		1.533E+01
PI2	R	WPI201	W	TL	4.420E+19	-75	25	100	1.000E+02	103	91		1.165E+01
SA1	T	PSA101	P	LT	2.560E+18	-20	80	100	1.000E+02	108	89		1.759E+01
SA1	T	PSA102	P	LT	2.560E+18	-25	75	100	1.000E+02	116	103		1.121E+01
CK2	Y	PCK201	P	TL	7.010E+18			100	1.000E+02			20.0	2.000E+01
ZN2	T	SHSS02	SRM	LT	1.000E+19			100	1.000E+02			29.0	2.900E+01
ZN1	T	WZN101	W	TL	1.800E+18	7	108		1.010E+02	63	56		1.111E+01
DR2	4	WDR201	W	TL	9.500E+18	-10	93	103	1.030E+02	101	80		2.079E+01
FA2	U	PFA201	P	LT	5.610E+18	-23	80	103	1.030E+02	130	94		2.769E+01
CK2	X	PCK201	P	TL	1.050E+19			103	1.030E+02			27	2.700E+01
AN1	E	WAN101	W	TL	7.270E+17	5	110		1.050E+02	73	58		2.055E+01
DR3	G14	PDR301	P	LT	2.060E+19	-10	95	105	1.050E+02	135	106		2.148E+01
FA1	U	PFA101	P	LT	1.650E+19	-30	85	105	1.050E+02	140	110		2.143E+01
FA1	X	PFA101	P	TL	2.800E+19	15	120	105	1.050E+02	90	80		1.111E+01
PB1	R	PPB101	P	LT	2.220E+19	-45	60	105	1.050E+02	107	100		6.542E+00
PB2	T	SHSS02	SRM	LT	9.450E+18	49	154	105	1.050E+02	124	109		1.210E+01
CK1	Y	PCK101	P	LT	1.340E+19			105	1.050E+02			20.0	2.000E+01
YR	W2	SASTM S1	SRM		0.254E+19	15		105	1.050E+02	87	62	17	1.700E+01
PB1	V	WPB101	W	TL	3.500E+18	-45	65		1.100E+02	65	54		1.692E+01
CA8	K	WCA801	W	TL	1.400E+19	-20	90	110	1.100E+02	102	85		1.667E+01
CTY	D	WCTY01	W	TL	2.200E+19	-50	60	110	1.100E+02	105	83		2.095E+01
DC1	S	WDC101	W	TL	2.980E+18	-67	43	110	1.100E+02	98	87		1.122E+01
PI1	V	SHSS02	SRM	LT	5.210E+18	49	159	110	1.100E+02	124	91		2.661E+01
SA1	Y	PSA103	P	LT	8.910E+18	-50	60	110	1.100E+02	130	113		1.308E+01
SU1	V	PSU101	P	LT	1.940E+19	-10	100	110	1.100E+02	125	116		7.200E+00
CK1	Y	SHSS02	SRM	LT	1.200E+19			110	1.100E+02			28.0	2.800E+01
YR	W1	PYR_01	P	LT	0.220E+19	10		110	1.100E+02	77	62	18	1.800E+01
YR	W2	PYR_01	P	LT	0.254E+19	10		110	1.100E+02	77	62	18	1.800E+01
OC2	A	WOC201	W	TL	3.370E+18	4	118		1.140E+02	67	47		2.985E+01
OC2	A	WOC201	W	TL	3.370E+18	4	118	114	1.140E+02	67	48		2.836E+01
CK1	Y	PCK101	P	TL	1.060E+19			115	1.150E+02			19.0	1.900E+01
ZN1	T	WZN101	W	TL	3.060E+18	4	116	116	1.160E+02	64	56		1.250E+01
PI1	R	WPI101	W	TL	4.030E+19	-57	60	117	1.170E+02	79	75		5.063E+00
IP3	T	PIP304	P	TL	2.920E+18	60	178	118	1.180E+02	67	58		1.343E+01
CR3	D	WCR301	W	TL	7.500E+18	36	155	119	1.190E+02	79	68		1.392E+01
DR3	G10/11	WDR301	W	TL	8.640E+18	40	160		1.200E+02	70	60		1.429E+01
BV1	U	PBV101	P	LT	6.540E+18	-5	115	120	1.200E+02	134	99		2.612E+01
CA8	P	PCA801	P	LT	1.430E+19	-50	70	120	1.200E+02	103	85		1.748E+01
CR3	F	WCR301	W	TL	1.080E+19	36	156	120	1.200E+02	79	64		1.899E+01
PB1	T	SASTM	SRM	LT	2.110E+19	40	160	120	1.200E+02	78	69		1.154E+01
SO1	F	PSO102	P	LT	5.140E+19	10	130	120	1.200E+02	97	71		2.680E+01
SU2	V	SHSS02	SRM	LT	1.880E+19	45	165	120	1.200E+02	125	102		1.840E+01
MY	1	PMY_01	P	LT	1.300E+19	0	120	120	1.200E+02	140	96	31.0	3.100E+01
ZN1	X	SHSS02	SRM	LT	1.400E+19			120	1.200E+02			32.0	3.200E+01
CR3	C	WCR301	W	TL	6.560E+18	36	158	122	1.220E+02	79	63		2.025E+01
TM1	E	WTM101	W	TL	1.080E+18	-56	68		1.240E+02	81	64		2.099E+01
FC1	W225	SHSS01	SRM	LT	5.100E+18	27	151	124	1.240E+02	128	102	21.0	2.100E+01
GC1	G1	PGC101	P	LT	1.190E+19	-30	95		1.250E+02	105	85		1.905E+01
DB1	B	WDB101	W	TL	5.920E+18	-11	114	125	1.250E+02	70	57		1.857E+01
PI2	V	SHSS02	SRM	LT	5.490E+18	45	170	125	1.250E+02	123	102		1.707E+01
SA1	Y	SHSS02	SRM	LT	8.910E+18	50	175	125	1.250E+02	123	103		1.626E+01
TP3	V	SASTM	SRM	LT	1.229E+19	35	160	125	1.250E+02	76	60		2.105E+01
DB1	F	WDB101	W	TL	2.290E+18	-11	116		1.270E+02	72	65		9.722E+00
DB1	F	WDB101	W	TL	2.290E+18	-11	116		1.270E+02	70	64		8.571E+00
DB1	F	WDB101	W	TL	2.290E+18	-11	116	127	1.270E+02	75	65		1.333E+01
DR1	G2	PDR101	P	TS	1.200E+19	85	212	127	1.270E+02	70	56		2.000E+01
ZN2	U	WZN201	W	LT	2.000E+18	-10	118		1.280E+02	69	50		2.754E+01
CR3	F	PCR301	P	TL	1.080E+19	16	144	128	1.280E+02	94	71		2.447E+01
CC2	263	SHSS01	SRM	LT	8.060E+18			128	1.280E+02			37	3.700E+01
PB2	T	WPB201	W	TL	9.470E+18	0	130		1.300E+02	66	56		1.515E+01
BV1	V	PBV101	P	LT	2.550E+18	-5	125	130	1.300E+02	134	114		1.493E+01
DR3	G14	WDR301	W	TL	1.780E+19	40	170	130	1.300E+02	70	59		1.571E+01
SO1	F	SASTM	SRM	LT	5.140E+19	40	170	130	1.300E+02	78	62		2.051E+01
SQ1	U	FSQ101	F	LT	1.080E+19	-35	95	130	1.300E+02	116	92		2.069E+01
ZN1	U	SHSS02	SRM	LT	8.920E+18	42	172	130	1.300E+02	124	88		2.903E+01
FA2	U	PFA201	P	TL	5.610E+18	-13	120	133	1.330E+02	95	69		2.737E+01
DR1	G2	PDR101	P	LS	1.200E+19	60	194	134	1.340E+02	110	80		2.727E+01

Table A.1 (continued)

Shift in Transition Temperature vs. Upper Shelf; Page 4

PLANT_ID	CAPSULE	HEAT_ID	PROD_ID	SPEC_CD1	CSP_FT	UTT30	ITT30	DTT30	DTT	UUSE	IUSE	DUSE_REL	DUSE
BR	127	WBR_01	W	TS	7.100E+18	-70	65	135	1.350E+02	95	70		2.632E+01
BV1	U	PBV101	P	TL	6.540E+18	20	155	135	1.350E+02	80	78		2.500E+00
FA1	X	PFA101	P	LT	2.800E+19	-30	105	135	1.350E+02	140	116		1.857E+01
IP3	T	PIP304	P	LT	2.920E+18	33	170	137	1.370E+02	105	96		8.571E+00
CAB	P	SASTM	SRM	LT	1.430E+19	40	178	138	1.380E+02	65	62		4.615E+00
GIN	V	WGIN01	W	TL	5.980E+18	-25	115		1.400E+02	80	53		3.375E+01
BV1	V	PBV101	P	TL	2.550E+18	20	160	140	1.400E+02	80	75		6.250E+00
CAB	K	PCAB01	P	LT	1.400E+19	-50	90	140	1.400E+02	103	89		1.355E+01
CTY	D	SASTM	SRM	LT	2.200E+19	40	180	140	1.400E+02	78	61		2.179E+01
GIN	T	SASTM	SRM	LT	1.750E+19	40	180	140	1.400E+02	78	61		2.179E+01
GIN	V	WGIN01	W	TL	4.900E+18	-25	115	140	1.400E+02	80	51		3.625E+01
IP3	Y	SHSS02	SRM	LT	8.050E+18	50	190	140	1.400E+02	123	98		2.033E+01
KWE	R	SHSS02	SRM	LT	2.070E+19	45	185	140	1.400E+02	123	95		2.276E+01
SQ1	T	WSQ101	W	TL	2.740E+18	-85	55	140	1.400E+02	111	78		2.973E+01
IP3	T	WIP301	W	TL	2.920E+18	-55	88	143	1.430E+02	120	91		2.417E+01
RS1	D	WRS101	W	TL	6.600E+18	-14	130		1.440E+02	68	53		2.206E+01
ZN2	U	WZN201	W	LT	2.820E+18	-23	122		1.450E+02	68	48		2.941E+01
ZN2	U	WZN201	W	LT	2.820E+18	-23	122		1.450E+02	68	48		2.941E+01
PB2	T	WPB201	W	TL	9.450E+18	0	145	145	1.450E+02	65	56		1.385E+01
SQ1	F	WSQ101	W	TL	5.140E+19	-20	125	145	1.450E+02	99	80		1.919E+01
SU1	V	SHSS02	SRM	LT	1.940E+19	45	190	145	1.450E+02	123	100		1.870E+01
SU2	V	WSU201	W	TL	1.880E+19	-20	125	145	1.450E+02	90	60		3.333E+01
IP2	Y	PIP203	P	LT	4.720E+18			145	1.450E+02			29.0	2.900E+01
GIN	T	WGIN01	W	TL	1.750E+19	-25	125		1.500E+02	80	53		3.375E+01
BR	124	PBR_01	P	TL	1.070E+20	-5	145	150	1.500E+02	82	70		1.663E+01
BV1	V	WBV101	W	TL	2.550E+18	-60	90	150	1.500E+02	112	88		2.143E+01
GIN	T	WGIN01	W	TL	1.750E+19	-25	125	150	1.500E+02	80	55		3.125E+01
HB2	T	SASTM	SRM	TL	4.110E+19	65	215	150	1.500E+02	40	37		7.500E+00
IP3	Y	PIP304	P	TL	8.050E+18	60	210	150	1.500E+02	67	57		1.493E+01
MY	1	SHSS01	SRM	LT	1.300E+19	15	165	150	1.500E+02	130	100	23.0	2.300E+01
AN1	A	WAN101	W	TL	1.030E+19	5	156	151	1.510E+02	73	45		3.836E+01
PB2	R	SHSS02	SRM	LT	2.010E+19	49	200	151	1.510E+02	124	98		2.097E+01
RS1	D	WRS101	W	TL	6.600E+18	-14	138	152	1.520E+02	68	53		2.206E+01
DR3	14	WDR301	W	TL	7.710E+18	40	195		1.550E+02	70	64		8.571E+00
QC1	G1	WQC102	W	TL	7.200E+18	-30	125		1.550E+02	72	52		2.778E+01
BV1	U	WBV101	W	TL	6.540E+18	-60	95	155	1.550E+02	112	83		2.589E+01
CAB	N	PCAB01	P	LT	3.680E+19	-50	105	155	1.550E+02	105	83		2.095E+01
CAB	N	SASTM	SRM	LT	3.680E+19	60	195	155	1.550E+02	78	55		2.949E+01
PAL	W290	PPAL01	P	TL	1.090E+19	25	180	155	1.550E+02	102	84		1.765E+01
SA2	T	WSA201	W	TL	2.560E+18	-30	125	155	1.550E+02	111	79		2.883E+01
PI1	P	SHSS02	SRM	LT	1.250E+19	49	205	156	1.560E+02	124	85		3.145E+01
HC1	U	WHC101	W	TL	4.140E+18	-5	155	160	1.600E+02	112	75		3.304E+01
PI2	T	SHSS02	SRM	LT	1.050E+19	45	205	160	1.600E+02	123	88		2.846E+01
SQ1	U	WSQ101	W	TL	1.080E+19	-85	75	160	1.600E+02	111	82		2.613E+01
TP3	T	WTP301	W	TL	7.050E+18	12	176		1.640E+02	66	62		6.061E+00
GIN	R	WGIN01	W	TL	1.170E+19	-25	140		1.650E+02	80	51		3.625E+01
PB1	R	WPB101	W	TL	2.170E+19	-45	120		1.650E+02	65	53		1.846E+01
PB1	S	WPB101	W	TL	8.510E+18	-45	120		1.650E+02	65	54		1.692E+01
PB2	V	WPB201	W	TL	7.330E+18	0	165		1.650E+02	66	42		3.636E+01
FA2	W	PFA201	P	LT	1.540E+19	-23	142	165	1.650E+02	130	102		2.154E+01
FA2	W	PFA201	P	TL	1.540E+19	-13	152	165	1.650E+02	95	76		2.000E+01
PB1	R	WPB101	W	TL	2.220E+19	-45	120	165	1.650E+02	65	51		2.154E+01
PB1	S	WPB101	W	TL	7.050E+18	-45	120	165	1.650E+02	65	52		2.000E+01
PB2	V	WPB201	W	TL	4.740E+18	0	165	165	1.650E+02	65	42		3.538E+01
SA1	Y	WSA101	W	TL	8.910E+18	-135	30	165	1.650E+02	104	75		2.788E+01
SU1	T	WSU101	W	TL	2.500E+18	-15	150	165	1.650E+02	70	53		2.429E+01
SU1	T	WSU101	W	TL	2.880E+18	-15	152		1.670E+02	70	53		2.429E+01
QC2	G15	WQC201	W	TL	3.820E+19	-30	140	170	1.700E+02	125	80		3.600E+01
DC2	U	WDC201	W	TL	3.510E+18	-13	160	174	1.740E+02	121	85	30	3.000E+01
DB1	A	WDB101	W	TL	1.290E+19	-11	164	175	1.750E+02	72	62		1.389E+01
KWE	V	WKWE01	W	TL	5.590E+18	-50	125	175	1.750E+02	126	82		3.492E+01
PAL	W290	PPAL01	P	LT	1.090E+19	0	175	175	1.750E+02	135	112		2.774E+01
QC1	G6	WQC101	W	TL	3.560E+19	10	185	175	1.750E+02	100	75		2.500E+01
ZN2	T	WZN201	W	LT	1.100E+19			175	1.750E+02			36.0	3.600E+01
IP3	Y	WIP301	W	TL	8.050E+18	-55	125	180	1.800E+02	120	68		4.333E+01
PB1	T	WPB101	W	TL	2.110E+19	-45	135	180	1.800E+02	65	55		1.538E+01
PI2	R	SHSS02	SRM	LT	4.420E+19	45	225	180	1.800E+02	123	77		3.740E+01
QC1	G5	PQC101	P	LT	4.040E+19	-30	150	180	1.800E+02	106	73		3.113E+01
TP3	V	WTP301	W	TL	1.229E+19	10	190	180	1.800E+02	65	48		2.615E+01
MY	2	PMY_01	P	LT	8.830E+19	0	185	185	1.850E+02	140	85		3.929E+01
PI1	R	SHSS02	SRM	LT	4.030E+19	49	235	186	1.860E+02	124	86		3.065E+01
ZN1	U	WZN101	W	TL	8.920E+18	7	195	188	1.880E+02	68	49		2.794E+01
BR	122	WBR_01	W	TS	2.300E+19	-70	120	190	1.900E+02	95	57		4.000E+01
QC1	A	WQC101	W	TL	8.950E+18	-5	186	191	1.910E+02	64	52		1.875E+01
MY	2	PMY_01	P	TL	8.840E+19	15	210	195	1.950E+02	115	71		3.826E+01
IP2	Y	WIP201	W		5.890E+18			195	1.950E+02			42.0	4.200E+01
KD1	T	WKD101	W	TL	9.800E+18			195	1.950E+02	66	47	29.0	2.900E+01

Table A.1 (continued)

Shift in Transition Temperature vs. Upper Shelf; Page 5

PLANT_ID	CAPSULE	HEAT_ID	PROD_ID	SPEC_ORI	CSP_F1	UTT30	ITT30	DTT30	DTT	UUSE	IUSE	DUSE_REL	DUSE
ZN1	X	WZN101	W	TL	1.500E+19			195	1.950E+02			31.0	3.100E+01
ZN1	U	WZN101	W	TL	1.020E+19	4	203		1.990E+02	64	52		1.875E+01
CX1	Y	WCX101	W		1.060E+19			200	2.000E+02			36.0	3.600E+01
DR3	14	WDR302	W	TL	6.150E+18	-45	160		2.050E+02	65	45		3.077E+01
PAL	A240	PPAL01	P	LT	4.500E+19	0	205	205	2.050E+02	165	95		4.242E+01
PAL	A240	PPAL01	P	TL	4.600E+19	25	230	205	2.050E+02	105	68		3.524E+01
GC2	G16	WGC202	W	TL	2.630E+19	15	220	205	2.050E+02	87	41		5.287E+01
DR3	G12	WDR302	W	TL	2.060E+19	-45	163		2.080E+02	65	42		3.538E+01
DR2	5	WDR202	W	TL	4.600E+19	-13	195	208	2.080E+02	71	52		2.676E+01
GC2	12	WGC202	W	TL	9.000E+18	15	195	210	2.100E+02	90	51		4.333E+01
CAB	N	WCAB01	W	TL	3.680E+19	-20	200	220	2.200E+02	102	62		3.922E+01
MY	W263	WMY_01	W	TL	6.800E+18	-30	192	222	2.220E+02	105	59		4.381E+01
TP4	T	WTP401	W		7.580E+18	0	224		2.240E+02	68	43		3.676E+01
YR	08	SASTM S1	SRM		5.000E+19	15	240	225	2.250E+02	87	66		4.713E+01
YR	08	SASTM S1	SRM		5.000E+19	15		225	2.250E+02	87	66	47	4.700E+01
BR	124	WBR_01	W	TS	1.070E+20	-70	160	230	2.300E+02	95	65		3.158E+01
PB2	R	WPB201	W	TL	2.010E+19	0	230	230	2.300E+02	65	47		2.769E+01
PB2	R	WPB201	W	TL	2.340E+19	0	235		2.350E+02	66	48		2.727E+01
KWE	R	WKWE01	W	TL	2.070E+19	-50	185	235	2.350E+02	126	78		3.810E+01
FC1	W225	WFC101	W	TL	5.100E+18	-28	210	238	2.380E+02	98	64	34.0	3.400E+01
SU1	V	WSU101	W	TL	1.940E+19	-15	225	240	2.400E+02	70	50		2.857E+01
DR3	G16	WDR302	W	TL	1.200E+19	-45	205	250	2.500E+02	65	41		3.692E+01
YR	06	SASTM S1	SRM		7.000E+19	15	275	260	2.600E+02	87	44		4.943E+01
YR	06	SASTM S1	SRM		7.000E+19	15		260	2.600E+02	87	44	49	4.900E+01
GC1	G7	WGC102	W	TL	2.370E+19	-30	235	265	2.650E+02	72	49		3.196E+01
MY	1	WMY_01	W	TL	1.300E+19	-30	240	270	2.700E+02	105	57	45.0	4.500E+01
PAL	W290	WPAL01	W	LT	1.090E+19	-85	205	290	2.900E+02	118	64		4.576E+01
YR	01	SASTM S1	SRM		9.000E+19	15	325	310	3.100E+02	87	42		5.172E+01
YR	02	SASTM S1	SRM		9.000E+19	15	325	310	3.100E+02	87	42		5.172E+01
YR	02	SASTM S1	SRM		9.000E+19	15		310	3.100E+02	87	42	52	5.200E+01
YR	08	PYR_01	P	LT	5.000E+19	10	330	320	3.200E+02	76	46		3.947E+01
YR	08	PYR_01	P	LT	5.000E+19	10		320	3.200E+02	77	46	40	4.000E+01
MY	2	WMY_01	W	TL	8.840E+19	-30	315	345	3.450E+02	[illegible]	50		5.327E+01
PAL	A240	WPAL01	W	LT	4.600E+19	-85	265	350	3.500E+02	[illegible]	54		5.500E+01
YR	06	PYR_01	P	LT	7.000E+19	10	370	360	3.600E+02	[illegible]	45		4.079E+01
YR	06	PYR_01	P	LT	7.000E+19	10		360	3.600E+02	77	44	42	4.200E+01
YR	01	PYR_01	P	LT	9.000E+19	10	410	400	4.000E+02	76	45		4.079E+01
YR	02	PYR_01	P	LT	9.000E+19	10	410	400	4.000E+02	76	45		4.079E+01
YR	02	PYR_01	P	LT	9.000E+19	10		400	4.000E+02	77	42	45	4.500E+01

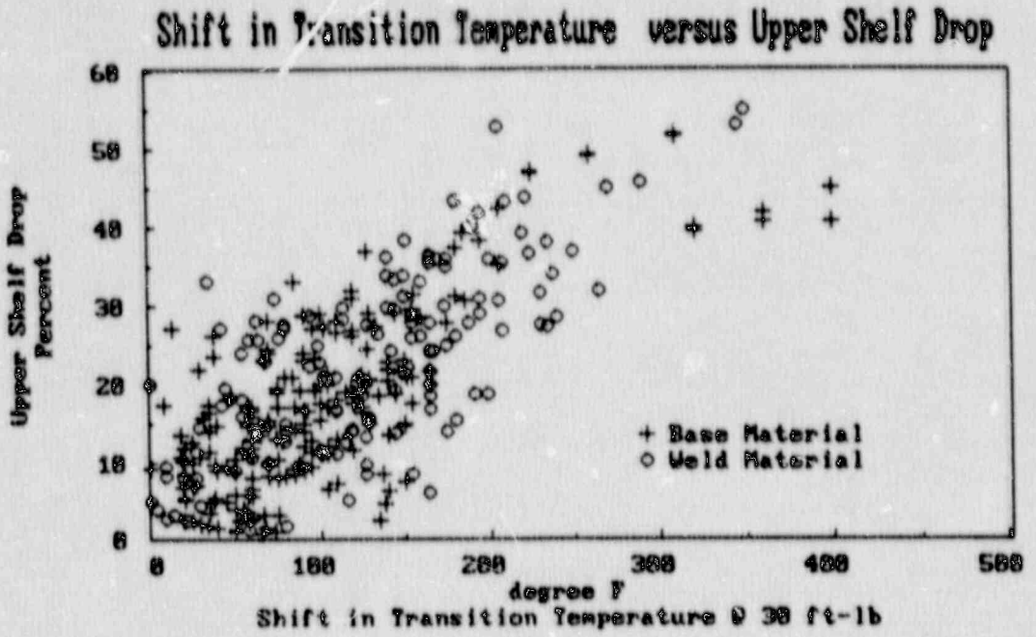

Fig. A.5. Graph of transition temperature shift versus upper shelf drop from example, Sect. A.6.1.

A.6.2 Charpy Fitting and Plotting

In this example, the Charpy fitting and plotting procedures will be applied to the weld data for the Zion Unit 2 reactor. The corresponding raw Charpy data are at the end of the file RAW_C_PR.dat, resulting in long waiting times when these sets are processed. For this reason - and, of course, to demonstrate this feature - these sets are first copied to a file ZN2.dat with the aid of the option "Extracting Selected Charpy Sets." After choosing this option, the output file name ZN2.DAT is entered, followed by entering, in the menu screen for selecting sets, the key ZN2 for PLANT_ID and the letter W for PROD_ID (or HEAT_ID). During the run of the program, the three sets baseline (CAPSULE is blank) and capsules T and U appear on the screen for confirmation. The output file (with a modification, see below) is listed in Table A.2.

Table A.2. File ZN2.dat obtained from RAW_C_PR.dat. Note the added asterisk at the front of specimen W40 tagging it as an outlier

WZN2		WZN201	W	LT		-100.0	10.0	17	7		
WZN2		WZN201	W	LT		-100.0	11.0	13	8		
WZN2		WZN201	W	LT		-60.0	17.0	23	14		
WZN2		WZN201	W	LT		-60.0	20.0	33	16		
WZN2		WZN201	W	LT		-60.0	14.0	23	12		
WZN2		WZN201	W	LT		-25.0	35.0	58	32		
WZN2		WZN201	W	LT		-25.0	25.0	47	23		
WZN2		WZN201	W	LT		-25.0	32.0	42	27		
WZN2		WZN201	W	LT		10.0	37.0	55	33		
WZN2		WZN201	W	LT		10.0	40.0	61	38		
WZN2		WZN201	W	LT		10.0	41.0	71	40		
WZN2		WZN201	W	LT		40.0	47.0	65	43		
WZN2		WZN201	W	LT		40.0	51.0	71	48		
WZN2		WZN201	W	LT		40.0	76.0	100	63		
WZN2		WZN201	W	LT		40.0	43.5	57	40		
WZN2		WZN201	W	LT		75.0	60.0	95	58		
WZN2		WZN201	W	LT		75.0	62.0	97	57		
WZN2		WZN201	W	LT		75.0	56.5	97	53		
WZN2		WZN201	W	LT		210.0	69.0	100	69		
WZN2		WZN201	W	LT		210.0	69.5	100	70		
WZN2		WZN201	W	LT		210.0	62.0	100	61		
WZN2		WZN201	W	LT		300.0	68.0	100	65		
WZN2		WZN201	W	LT		300.0	72.0	100	68		
WZN2		WZN201	W	LT		300.0	70.0	100	61		
WZN2	T	WZN201	W	LT	W34	71.0	12.5	15	13	1.100E+19	579
WZN2	T	WZN201	W	LT	W33	135.0	22.0	35	18	1.100E+19	579
WZN2	T	WZN201	W	LT	*W40	180.0	88.0	100	76	1.100E+19	579
WZN2	T	WZN201	W	LT	W35	185.0	40.0	80	38	1.100E+19	579
WZN2	T	WZN201	W	LT	W39	235.0	36.5	80	34	1.100E+19	579
WZN2	T	WZN201	W	LT	W38	300.0	43.5	100	43	1.100E+19	579
WZN2	T	WZN201	W	LT	W37	350.0	44.5	100	47	1.100E+19	579
WZN2	T	WZN201	W	LT	W36	400.0	42.5	100	45	1.100E+19	579
WZN2	U	WZN201	W	LT	W45	50.0	16.5	10	13	2.800E+18	550
WZN2	U	WZN201	W	LT	W47	73.0	20.5	20	21	2.800E+18	550
WZN2	U	WZN201	W	LT	W42	125.0	31.0	65	30	2.800E+18	550
WZN2	U	WZN201	W	LT	W41	200.0	45.0	99	42	2.800E+18	550
WZN2	U	WZN201	W	LT	W44	285.0	48.0	100	[illegible]	2.800E+18	550
WZN2	U	WZN201	W	LT	W43	345.0	50.0	100	49	2.800E+18	550
WZN2	U	WZN201	W	LT	W46	350.0	46.5	100	71	2.800E+18	550
WZN2	U	WZN201	W	LT	W48	400.0	50.0	100	53	2.800E+18	550

The user can now test the other three options using the newly created file as an input file instead of the given default RAW_C_PR.dat. Figures A.6, A.7, and A.8 show the resulting plots for the three sets, with appropriate titles and subtitles entered by the user on prompts from the screen. Note that the fit for capsule T did not converge; inspection shows an outlier of 88-ft-lb impact energy at 180°F, which is inconsistent with the rest of the data. This point can be eliminated from the fitting by placing an asterisk in front of the specimen identifier W40, as shown in Table A.2. This can be done with any editor that works on ASCII files (e.g., EDLIN) if no better is available. Figure A.9 shows the resulting fit after this change. Note that the excluded point appears as a black square at the top of the graph.

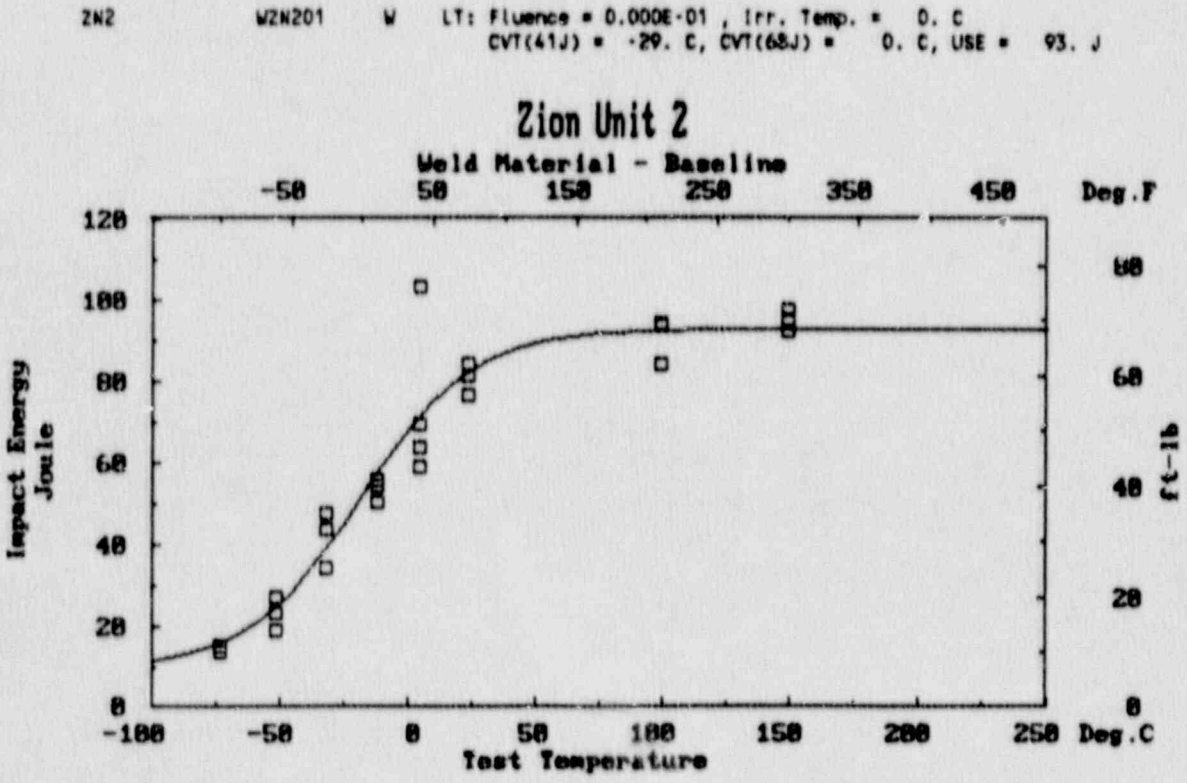

Fig. A.6. Charpy fit for Zion Unit 2 weld material - baseline.

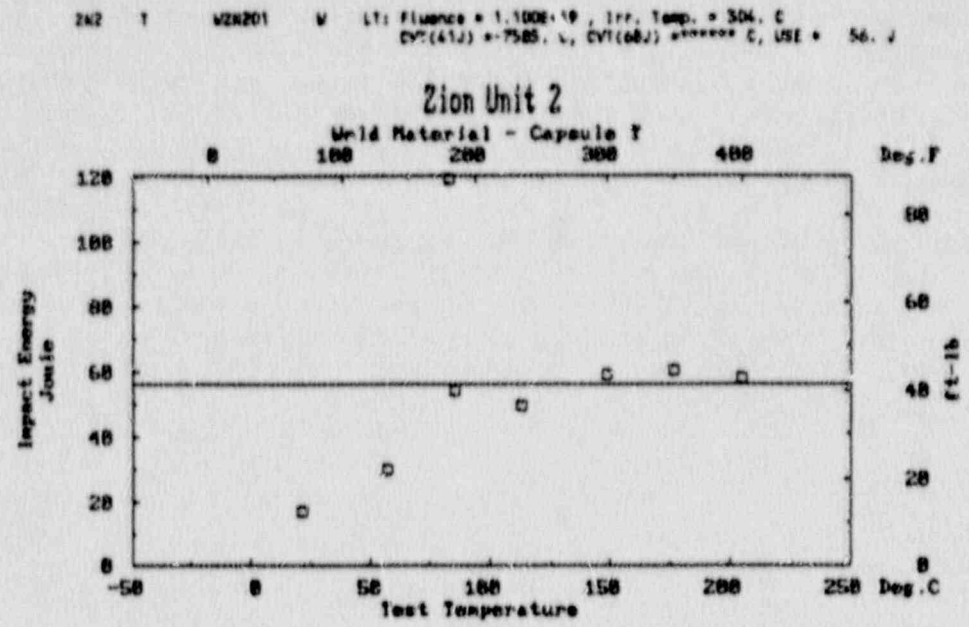

Fig. A.7. Charpy fit for Zion Unit 2 weld material - Capsule T. Fit has not converged due to an outlier.

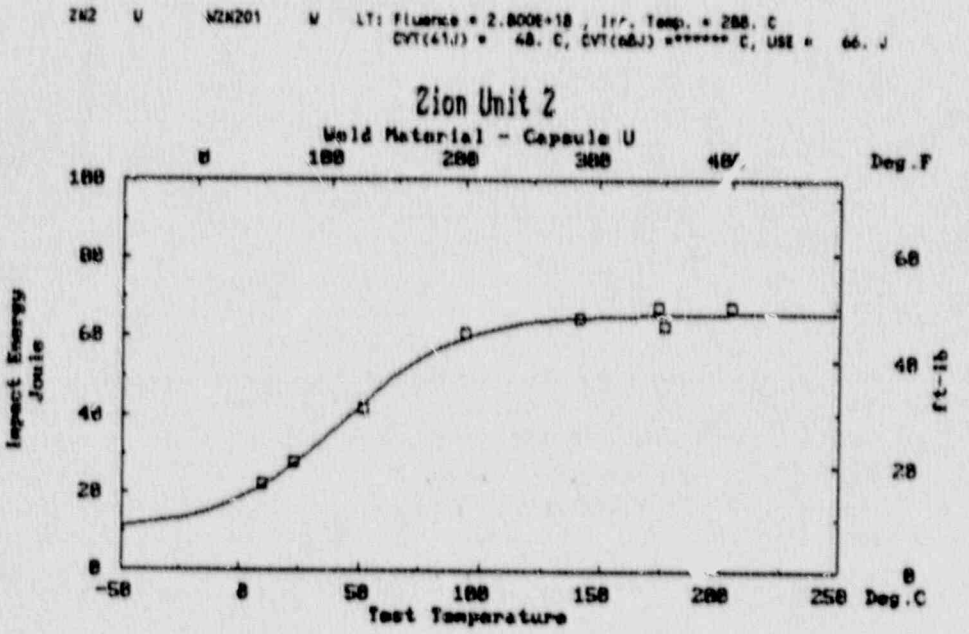

Fig. A.8. Charpy fit for Zion Unit 2 weld material - Capsule U.

ZN2 T WZN201 W LT: Fluence = 1.100E+19 , Irr. Temp. = 304. C
CVT(41J) = 70. C, CVT(68J) ******* C, USE = 58. J

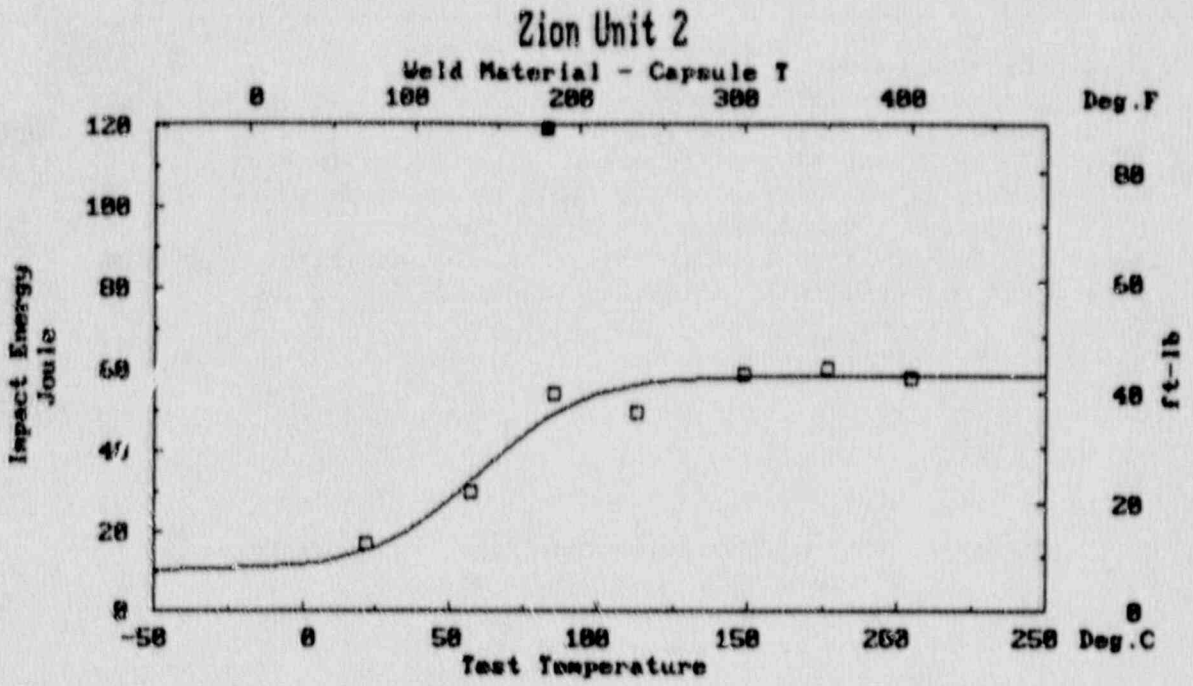

Fig. A.9. Data from Fig. A.7 after the outlier at the top of the graph is eliminated.

The modified input file can now be used for the two other options. On the input screens for the Monte Carlo uncertainty analysis, several default options are already provided including the input file, title, input uncertainties, number of iterations, and output files. To process all the sets, the number of skipped sets must, of course, be 0 and the number of processed sets 3. Please make sure that the correct input file ZN2.dat is chosen. During the run of the program, a summary of each single fit appears on the screen including a parameter "INFO" which indicates whether the fit was successful or not and the reason for failing. A list explaining the different INFO values is given in Table A.3. Sample screen outputs are shown in Tables A.4 and A.5. The first output at the start for the set in capsule T shows the failure to determine CV" at 50 ft-lb. Such data are first rejected for 20% of the prescribed iterations; once it becomes established that this is due to the low upper shelf, CVT at 50 ft-lb is ignored, as shown in the subsequent screen output; there is still a high failure rate due to other causes, as indicated in Table A.5. The three output files are listed in Tables A.6, A.7, and A.8. The EDB-dBASE file may be used as an auxiliary file for the multiple-curve fitting and plotting procedure. The user may choose to obtain a plot for each processed set. A sample is shown in Fig. A.10.

Table A.3. Key to the information tag INFO in the screen output for Monte Carlo uncertainty analysis

INFO > 0	Regular Output
= 0	Fitting did not converge
= -1	Inconsistent with previous values, skipped
= -2	Inconsistent with first value, first value ignored
= -3	CVT @ 30 ft-lb or 50 ft-lb could not be determined (ignored after failure in 20% of the iterations)
= -4	Failure to find initial value for fitting, fitting aborted
= -5	Fit not physically possible, rejected

Table A.4. Sample screen output from the Monte Carlo uncertainty analysis - start.
The first 20 fits are rejected because of failure to obtain transition temperature at 68 J (50 ft-lb), INFO = -3

```
ZN2  T     WZX201    W  LT: Fluence = 1.100E+19 , Irr. Temp. = 304.

LSE= 10., USE=  58., SLOPE= 0.0286, TMID=  60., CVT41=  70., CVT68=***** -3
LSE= 10., USE=  59., SLOPE= 0.0213, TMID=  45., CVT41=  58., CVT68=***** -3
LSE=  9., USE=  59., SLOPE= 0.0252, TMID=  64., CVT41=  75., CVT68=***** -3
LSE= 10., USE=  62., SLOPE= 0.0146, TMID=  76., CVT41=  90., CVT68=***** -3
LSE=  9., USE=  61., SLOPE= 0.0741, TMID=  71., CVT41=  73., CVT68=***** -3
LSE= 10., USE=  44., SLOPE= 0.0002, TMID=*****, CVT41=*****, CVT68=***** -5
LSE= 11., USE=  56., SLOPE= 0.0587, TMID=  51., CVT41=  57., CVT68=***** -3
LSE= 10., USE=  53., SLOPE= 0.0203, TMID=  67., CVT41=  91., CVT68=***** -3
LSE= 10., USE=  62., SLOPE= 0.0167, TMID=  86., CVT41=  97., CVT68=***** -3
LSE= 10., USE=  64., SLOPE= 0.0083, TMID=  41., CVT41=  59., CVT68=***** -3
LSE= 10., USE=  55., SLOPE= 0.0141, TMID=  18., CVT41=  46., CVT68=***** -3
LSE= 10., USE=  76., SLOPE= 0.0000, TMID=*****, CVT41=*****, CVT68=***** -5
LSE= 10., USE=  57., SLOPE= 0.0147, TMID=  54., CVT41=  75., CVT68=***** -3
LSE= 10., USE=  56., SLOPE= 0.0198, TMID=  31., CVT41=  55., CVT68=***** -3
LSE= 10., USE=  56., SLOPE= 0.0198, TMID=  31., CVT41=  50., CVT68=***** -3
LSE= 10., USE=  49., SLOPE= 0.0340, TMID=  46., CVT41=  65., CVT68=***** -3

ZN2  T     WZN201    W  LT : Iteration number    0 out of  100
```

Table A.5. Sample screen output from the Monte Carlo uncertainty analysis - continuation. Failure to obtain transition temperatures at 68 J (50 ft-lb) is now ignored

```
LSE= 11., USE= 63., SLOPE= 0.0204, TMID=  65., CVT41=  65., CVT68=*****  2
LSE=  9., USE= 68., SLOPE= 0.0184, TMID=  76., CVT41=  76., CVT68=*****  2
LSE= 10., USE= 61., SLOPE= 0.0147, TMID=  60., CVT41=  60., CVT68=*****  2
LSE=  9., USE= 56., SLOPE= 0.0703, TMID=  82., CVT41=  82., CVT68=***** -1
LSE= 17., USE= 53., SLOPE= 2.9786, TMID=  60., CVT41=  60., CVT68=***** -5
LSE= 30., USE= 51., SLOPE=19.1053, TMID= 110., CVT41= 110., CVT68=***** -5
LSE= 10., USE= 61., SLOPE= 0.0207, TMID=  56., CVT41=  67., CVT68=*****  2
LSE= 23., USE= 56., SLOPE=67.3105, TMID=  68., CVT41=  68., CVT68=***** -5
LSE= 10., USE= 69., SLOPE= 0.0160, TMID=  97., CVT41=  68., CVT68=*****  0
LSE= 10., USE= 51., SLOPE= 0.0412, TMID=  40., CVT41=  54., CVT68=***** -1
LSE=  9., USE= 51., SLOPE= 1.7939, TMID=  41., CVT41=  41., CVT68=***** -5
LSE= 10., USE= 59., SLOPE= 0.0424, TMID=  50., CVT41=**56*, CVT68=***** -1
LSE= 10., USE= 59., SLOPE= 0.0169, TMID=  59., CVT41=  75., CVT68=*****  2
LSE= 10., USE= 76., SLOPE= 0.0118, TMID=  80., CVT41=  75., CVT68= 164.  2
LSE=  9., USE= 76., SLOPE= 0.0118, TMID=  80., CVT41=  75., CVT68= 164.  2
LSE=  9., USE= 60., SLOPE= 0.0632, TMID=  63., CVT41=  67., CVT68=***** -1
LSE= 23., USE= 49., SLOPE= 2.0703, TMID=  94., CVT41=  94., CVT68=***** -5
LSE= 10., USE= 54., SLOPE= 0.0195, TMID=  49., CVT41=  72., CVT68=*****  2
LSE= 10., USE= 76., SLOPE= 0.0125, TMID=  73., CVT41=  68., CVT68= 152.  2
LSE= 10., USE= 58., SLOPE= 0.0318, TMID=  43., CVT41=  53., CVT68=***** -1
LSE= 10., USE= 57., SLOPE= 0.0226, TMID=  48., CVT41=  63., CVT68=*****  2
LSE= 10., USE= 59., SLOPE= 0.0252, TMID=  59., CVT41=  70., CVT68=*****

ZN2   T     WZN201    W  LT : Iteration number   59 out of  100
```

Table A.6. Sample output of the summary file

```
PR-EDB - Hyperbolic Tangent Fits of Raw Charpy Data
Impact Energy Uncertainty =  10.0 J
Test Temperature Uncertainty =   4.0 Degree C
Number of Successful Iterations =   10, Maximum =   50
```

Set No.	Reactor	Caps	Material ID	Type	Or.	Fluence	Irr.Temp. Deg.C	CVT(41J) Deg.C	CVT(68J) Deg.C	USE Joule	LSE Joule	Spec No.	Iter No.
1	ZN2		WZN201	W	LT	0.000E-01	0.	-21.6 ± 7.2	1.6 ± 3.4	92.6 ± 3.2	10.1 ± 2.5	24	10
2	ZN2	T	WZN201	W	LT	1.100E+19	304.	71.8 ±11.9	0.0 ±-1.0	61.5 ± 8.9	10.4 ± 0.7	7	10
3	ZN2	U	WZN201	W	LT	2.800E+18	288.	52.6 ±14.4	0.0 ±-1.0	70.5 ± 8.8	10.2 ± 0.3	8	10

Table A.7. Sample output of the covariance file

PR-EDB - Hyperbolic Tangent Fits of Raw Charpy Data
Impact Energy Uncertainty = 10.0 J
Test Temperature Uncertainty = 4.0 Degree C
Number of Successful Iterations = 10, Maximum = 50

ZN2 WZN201 W LT: Fluence = 0.000E-01 , Irr. Temp. = 0. C
No. of Specimen = 24, No. of Iterations = 10

Parameter	Mean	Std.Dev.	Correlation Coefficients				
Lower Shelf Energy	10.1	2.5					
Upper Shelf Energy	92.6	2.2	-0.258				
CVT at Midpoint	-16.8	6.3	0.341	0.460			
1/slope (degree C)	42.6	9.4	-0.793	0.248	-0.634		
CVT at 41 Joule	-27.6	7.2	0.415	0.185	0.953	-0.786	
CVT at 68 Joule	1.6	3.4	-0.332	0.332	0.632	-0.006	0.585

ZN2 T WZN201 W LT: Fluence = 1.100E+19 , Irr. Temp. = 304. C
No. of Specimen = 7, No. of Iterations = 10

Parameter	Mean	Std.Dev.	Correlation Coefficients				
Lower Shelf Energy	10.4	0.7					
Upper Shelf Energy	61.5	8.9	-0.055				
CVT at Midpoint	59.8	16.9	0.056	0.707			
1/slope (degree C)	52.0	15.4	-0.188	0.281	0.106		
CVT at 41 Joule	71.8	11.9	-0.039	0.048	0.657	0.278	
CVT at 68 Joule	0.0	-1.0	0.000	0.000	0.000	0.000	0.000

ZN2 U WZN201 W LT: Fluence = 2.800E+18 , Irr. Temp. = 288. C
No. of Specimen = 8, No. of Iterations = 10

Parameter	Mean	Std.Dev.	Correlation Coefficients				
Lower Shelf Energy	10.2	0.3					
Upper Shelf Energy	70.5	8.8	-0.030				
CVT at Midpoint	50.6	22.2	-0.113	0.800			
1/slope (degree C)	82.6	22.6	-0.220	0.504	0.490		
CVT at 41 Joule	52.6	14.4	-0.146	0.411	0.873	0.348	
CVT at 68 Joule	0.0	-1.0	0.000	0.000	0.000	0.000	0.000

Table A.8. Sample output of the EDB-dBASE file

ZN2		WZN201	W	LT	0.000E-01	0	-17	13	35	6	68	2	7.	2.0.0130	24	10	
ZN2	T	WZN201	W	LT	1.100E+19	579	161	21	0	-1	45	7	8.	140.0.0107	7	10	
ZN2	U	WZN201	W	LT	2.800E+18	550	127	26	0	-1	52	6	7.	123.0.0067	8	10	

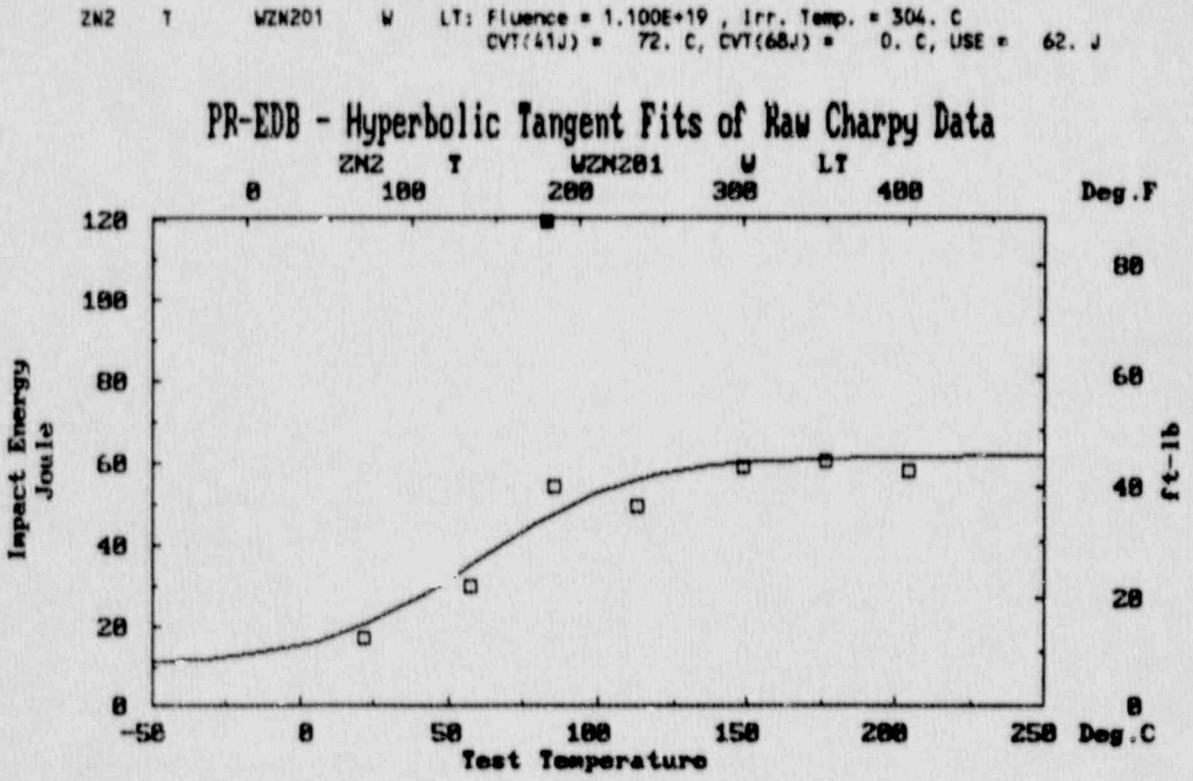

Fig. A.10. Same data as in Fig. A.7. Note the slight difference in the fitting curve as a result of the Monte Carlo Procedure.

All three fitting curves and the corresponding data points can be combined in one plot with the multiple fitting and plotting procedure. Figure A.11 shows a sample output for appropriately chosen text in title and legends. No auxiliary input file was used for this example.

```
ZN2          WZN201    W   LT: Fluence = 0.000E-01 , Irr. Temp. =   0. C
                               CVT(41J) =  -29. C, CVT(68J) =    0. C, USE =   93. J

ZN2   T      WZN201    W   LT: Fluence = 1.100E+19 , Irr. Temp. = 304. C
                               CVT(41J) =   70. C, CVT(68J) = ****** C, USE =   58. J

ZN2   U      WZN201    W   LT: Fluence = 2.800E+18 , Irr. Temp. = 288. C
                               CVT(41J) =   48. C, CVT(68J) = ****** C, USE =   66. J
```

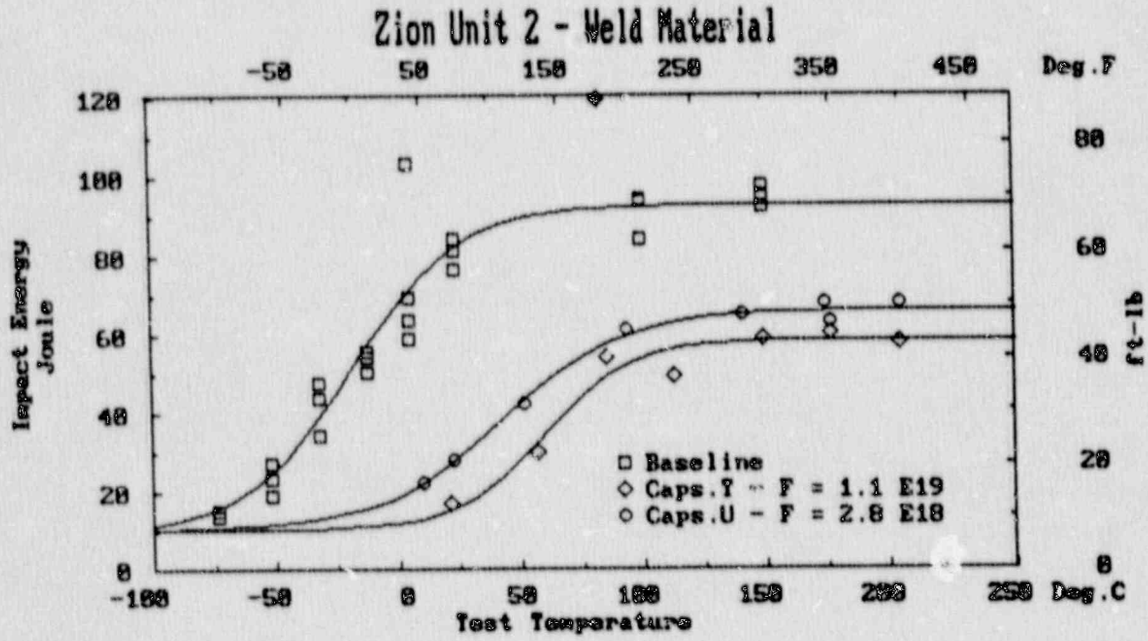

Fig. A.11. Combination graph of Zion Unit 2 weld material, baseline plus Capsules T and U.

A.7 INSTALLATION

Running the EDB-Utilities with data files requires an IBM-compatible PC, preferably with 80286 (AT) or 80386 processor, and a hard disk. At least 512 kb RAM is recommended. A matching co-processor 80287/80387 is also required. The graphics programs are written for an EGA screen with 640 x 350 pixel resolution. Versions for monochrome and color monitors are available. For hardcopy of the graphics, a utility is necessary which transfers the EGA screen to the printer on the Shift-PrtScr command. (This command is part of the software, and it does not need to be given externally.) The GRAFPLUS utility by Jewell Technologies, Inc., is used in our installation.

The PR-EDB package consists of two disks for the software including the essential data files for running the EDB-Utilities labeled System #1 and System #2. Four disks contain the data files of the PR-EDB, two of which contain the large raw Charpy data file RAW_C_PR.dbf and its ASCII equivalents RAW_C_PR.dat and RAW_C_RS.dat which are the primary and auxiliary files, respectively, for use in the Charpy fitting and plotting programs. The System disks and Data disks should be copied into a suitable directory on the hard disk. Also loaded should be the dBASE programs (dBASE III PLUS or IV) or a path specified so that dBASE can be reached from the EDB directory. About 10 Mb disk space should be available for running the EDB-Utilities plus data, but less may be needed if only part of the data files are used. A disk containing the results of the examples is also included. These data should be loaded after all other input data, and the plots and fits can be obtained without the preprocessing steps described in Sect. A.6.

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11. ABSTRACT (200 words or less)

Data concerning radiation embrittlement of pressure vessel steels in commercial power reactors have been collected from available surveillance reports. The purpose of this NRC-sponsored program is to provide the technical bases for voluntary consensus standards, regulatory guides, standard review plans, and codes. The data can also be used for the exploration and verification of embrittlement prediction models. The data files are given in dBASE III Plus format and can be accessed with any personal computer using the DOS operating system. Menu-driven software is provided for easy access to the data including curve fitting and plotting facilities. This software has drastically reduced the time and effort for data processing and evaluation compared to previous data bases.

The current compilation of the Power Reactor Embrittlement Data Base (PR-EDB, version 1) contains results from surveillance capsule reports of 78 reactors with 381 data points from 110 different irradiated base materials (plates and forgings) and 161 data points from 79 different welds. Results from heat-affected-zone materials are also listed. Electric Power Research Institute (EPRI), reactor vendors, and utilities are in the process of providing back-up quality assurance checks of the PR-EDB and will be supplementing the data base with additional data and documentation. Periodic updates of data and software will be released to authorized users. Future updates will also include results from irradiations in materials test reactors.

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