SOFTWARE RELEASE NOTICE

1. SRN Number:	
2. Project Title: HAZINFO V.1.0	Project No.
3. SRN Title:	
4. Originator/Requestor:	Date: 6/13/2000

5. Summary of Actions

- ☐ Release of new software
- ☐ Release of modified software:
  - ☐ Enhancements made
  - ☐ Corrections made
- ☐ Change of access software
- ■ Software Retirement

6. Persons Authorized Access

Name	Read Only/Read-Write	Addition/Change/Delete

7. Element Manager Approval: N. Sridhar Date: 6/15/2000

8. Remarks:

See memo attached regarding cancellation of this software.

SOFTWARE
DEVELOPMENT PLAN

3/13

TWRS-P HAZARD INFORMATION DATABASE (HAZINFO) SOFTWARE DEVELOPMENT PLAN

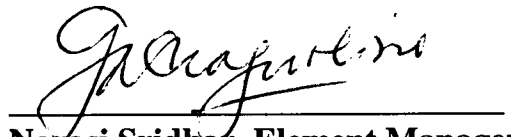
by

Vijay Jain

CNWRA
San Antonio, Texas

Version 1.0

Approved by:



Narasi Sridhar, Element Manager
CNWRA

7/12/99

Date

Reviewed
6/6/2000

4/13

1. TWRS-P HAZARD INFORMATION DATABASE SOFTWARE (HAZINFO) DEVELOPMENT PLAN

This Software Development Plan (SDP) describes the project plans for developing a custom software related to BNFL Inc. proposed vitrification facility at Hanford, Washington. The SDP covers new code development, modification, maintenance, and all other activities resulting in software products and documents. The work will be conducted under subtask 2.1 of the Nuclear Regulatory Commission (NRC) Tank Waste Remediation System—Privatization (TWRS-P) program established at the Center for Nuclear Waste Regulatory Analyses (CNWRA).

1.1 SCOPE

The main objective of this proposed task is to develop a custom hazard information database application software, tailored to the TWRS-P facility, that will help the NRC staff in

- Reviewing the construction authorization request (CAR), and
- Planning and conducting integrated design inspections at the BNFL Inc. facility

The initial efforts will be directed towards the development of a preliminary module that would contain publicly available information on the pretreatment building of the TWRS-P facility. The scope of pretreatment database development includes

- Familiarization with BNFL Inc. proposed technologies
- Familiarization with CNWRA pretreatment chemistry report
- Preparation of a list of structures, systems and components (SSC) associated with pretreatment facility
- Preparation of a list of hazards associated with SSCs
- Using Microsoft Access, the development of the database structure for each SSC. The database will, at a minimum, include information on type of hazard (radiological, chemical, criticality, fire, etc.), severity level, process constraints, specifications, alarms, and lesson learned from other facilities
- Data input and testing of the functionality of the application
- Development of process models, using Microsoft Excel or OLI System, Inc. software, that will link chemical composition of the contents in various components to potential hazards

2. BASELINE ITEMS

The deliverable items of this software development activity include the following

- Application software capable of running in a local network

- Test data tables and other objects
- Users manual

3. PROJECT MANAGEMENT

TWRS-P principal investigator (PI) for the subtask 20-1403-201 will be responsible for managing this activity. PI will coordinate work with PIs from other subtasks such as 20-1403-102, 20-1403-104, and 20-1403-106, review progress of the software development, write reports, and interact with the NRC PO on a regular basis.

4. DEVELOPMENT PROCEDURES

4.1 HARDWARE AND SOFTWARE RESOURCES

The hardware used for initial demonstration and testing will be a desktop PC at the CNWRA premises. The processor will, at minimum be a Pentium II. PI will direct this activity and will obtain coding help from CNWRA staff or consultant having coding experience in Microsoft Access. A NRC staff member will provide technical assistance in formulating the basic design of the software and required coding efforts. Several CNWRA staff members will be involved in the design and development of the database software and in identifying and modifying software requirements, the nature of the input information and the nature of the report generation. During the development of the custom software, it is expected that active interaction of the staff personnel with the software developer will take place.

4.2 SOFTWARE DEVELOPMENT LIFE CYCLE

The initial plans are to develop this software application in a phased approach in order to better identify uncertainties and risks and to demonstrate progress in risk minimization and utilization of the software by NRC staff for reviewing and tracking hazards information from the privatized BNFL Inc. facility for treatment of Hanford high-level waste (HLW) for producing vitrified glass product. Cost schedule and resources required for the work will be included in TWRS-P plan and will be tracked regularly to ensure risks to the project are minimized. Since the facility will consist of three major buildings where this treatment will occur, the initial plan is to have a modularized software that will provide separate, but yet integrated, hazards information for each of these three buildings.

Beginning work will involve a successful demonstration of the proof of concept for such an information handling system for one system within the pretreatment building, namely the cesium ion exchange system. The components of this system, as currently proposed by BNFL Inc., consist of several vessels (tanks) for storing and delivering several chemicals such as low-activity waste (LAW) feed, caustic solution, nitric acid, treated LAW, and four cesium ion exchange columns, among others. Each of these components will have properties associated with the functioning of the component. Example properties are (i) material of construction, (ii) type and nature of feed material, (iii) type and nature of reacting chemicals, (iv) type and nature of chemical products, (v) expected maximum and normal type and, (vi) inventory of radionuclides, maximum and typical operating capacity, associated pumps, valves, agitators, etc. The software will also provide the user specific hazards information associated with any particular component within this cesium ion exchange system, such as the agitators, pumps, etc., including any relevant information

regarding lessons learned from similar operations elsewhere in the world. The information will be able to be selectively viewed and printed, as needed, based on the cycle of operation of the ion exchange, namely loading, caustic rinsing, demineralized water rinsing, nitric acid elution, demineralized water acid rinsing.

This example in the hazards information database is planned to be available to NRC staff by the end of August 1999 for general concept and design evaluation. Modifications, as required, to this example will be completed by September 1999.

On acceptance of the general concept and design of the above database and approval by NRC to proceed on development of similar modules, CNWRA will proceed on the design and development of other relevant systems and activities that are carried out within the pretreatment building. These are, for example, low-activity waste feed evaporation, precipitation and ultra-filtration processes, and the technetium ion-exchange process. The prototype of the pretreatment hazards information module will be ready for testing by the end of December 1999.

The task activity for the design and development of other major modules for the LAW and HLW buildings will continue through 2000. The testing activity will be conducted simultaneously throughout the development stage. This development activity is planned for completion in September 2000. After final testing by the NRC staff, the software will be released for use in November 2000 in time for the review of the CAR submitted by BNFL Inc.

4.3 CODING

This software will be developed using Microsoft Access 7.0. The coding will be accomplished using the coding features provided by access basic procedures, functions, etc. The basic building block will be the creation of relational tables that would contain several fields of information related to the TWRS-P activities and structures, systems, and components that are important to safety and are safety related.

Queries will be created to extract specific information, on demand. Several input and output forms will be created that will enable the user to selectively input information to the database and review the information that is available in the database. Several reports will also be generated which will aid the user to view the information on the monitor and to print the selected information, as desired.

A complete documentation of the database that includes the properties of all database objects will be made using the Access documentation feature.

4.4 ACCEPTANCE TESTING AND ANALYSIS

Acceptance testing will be performed throughout the execution of this task both at CNWRA and NRC by persons other than the developer of the code, to demonstrate that the computer code and software meets its specified requirements as documented in the SRD. This section shall address

- Recording of test case and test inputs
- Revision and retesting
- Analyzing and recording of test results

5.0 CONFIGURATION MANAGEMENT PLAN

Because the design and structure of the database will be continually evolving, a scientific notebook will be used to document the changes. Once a preliminary design and structure has been "frozen," further modifications will be documented through an appropriate documentation process. The Software Change report (SCR) will be prepared by CNWRA staff to identify and correct problems or make other minor changes in configured software or software documentation. The usage of the SCR will conform to the requirements of Procedure TOP-018, page 24. Any changes to the baseline code and user input/output forms and reports will also be recorded in the SCRs.

The versions that undergo substantial revisions will be archived.

6.0 REFERENCES

The source for all the basic information for the data tables in the database will be the various BNFL Inc. reports. These are

BNFL Inc. 1997. *Initial Safety Analysis Report.* BNFL–5193–ISAR–01. Revision 0. Richland, WA: BNFL Inc.

BNFL Inc. 1997b. *Safety Requirements Document.* BNFL–5193–SRD–01. Revision 0. Richland, WA: BNFL Inc.

BNFL Inc. 1997c. *Hazard Analysis Report.* BNFL–5193–HAR–01. Revision 0. Richland, WA: BNFL Inc.

BNFL Inc. 1998. *Technical Report A-2.* BNFL–5193–TR–01. Revision 0. Richland, WA: BNFL Inc.

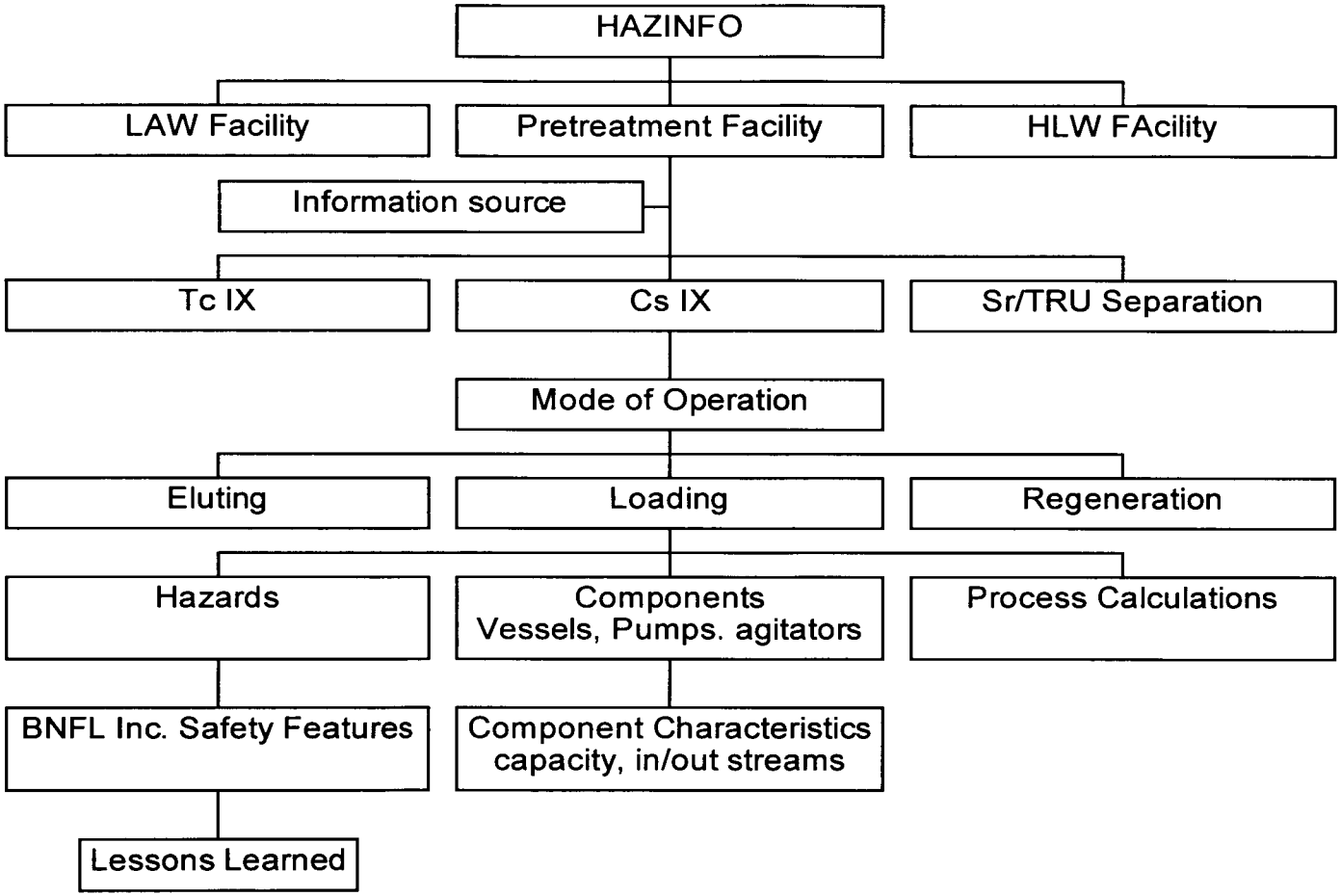
BNFL Inc. 1999. *Design Safety Features February 1999.* RPT–W375–RU00001. Revision 0. Richland, WA: BNFL Inc.

7.0 APPENDICES

The conceptual design for the contents of this custom software is shown in Appendix A. It is realized that this basic design block will change with time as the BNFL Inc. design proceeds from preconceptual to conceptual to actual design and the CAR submittal.

APPENDIX A

APPENDIX A


HAZINFO
LAW Facility
Pretreatment Facility
HLW FAcility
Information source
Tc IX
Cs IX
Sr/TRU Separation
Mode of Operation
Eluting
Loading
Regeneration
Hazards
Components
Vessels, Pumps. agitators
Process Calculations
BNFL Inc. Safety Features
Component Characteristics
capacity, in/out streams
Lessons Learned

REQUIREMENT DESCRIPTION

10/13

TWRS-P HAZARD INFORMATION DATABASE (HAZINFO) SOFTWARE REQUIREMENTS DESCRIPTION

by

Vijay Jain

CNWRA
San Antonio, Texas

Version 1.0

Approved by:

Narasi Sridhar, Element Manager	**Date**
CNWRA	

1. TWRS-P HAZARD INFORMATION DATABASE SOFTWARE (HAZINFO) REQUIREMENTS DESCRIPTION

1.1 TWRS-PROJECT BACKGROUND

The proposed BNFL Inc. TWRS-P facility at Hanford, Washington will be used to vitrify the low-activity waste (LAW) and high-level waste (HLW) contained in 177 tanks at the Hanford site. BNFL Inc. has proposed to carry this work in three separate buildings. In the pretreatment building, the radioactive waste tank contents will be evaporated to reduce the water content, radioactive cesium and technetium and transuranics/Sr will be separated by ion exchange, precipitation, and ultrafiltration processes, respectively and the treated waste that is separated into LAW and HLW components will be inventoried for further transportation to the LAW and HLW buildings. In the LAW building, the pre-treated radioactive waste will be mixed with glass-forming chemicals which will then be fed into a joule-heated melter to contain the radioactive species in molten glass. The melter product will be poured into specially designed stainless steel containers and the containers then transported to container storage building. Similar activity will occur in the HLW building.

A Memorandum of Understanding has been established between the DOE and the NRC for Phase I activities. This memorandum enables the Nuclear Regulatory Commission (NRC) to acquire sufficient knowledge of the physical and operational situation at the Hanford waste tanks and of the processes, technology, and hazards involved in Phase I activities to (i) assist the U.S. Department of Energy (DOE) in performing reviews in a manner consistent with the NRC regulatory approach, and (ii) be prepared to develop an effective regulatory program for the possible licensing of DOE contractor-owned and contractor-operated facilities during Phase II. To date, NRC staff have generated and submitted technical comments to the Regulatory Unit of DOE (DOE RU) on BNFL Inc. technical submittals. These have included the standards requirements document (SRD), the Integrated safety management plan (ISMP), and the design safety features (DSF) document. The hazards analysis report (HAR) and the initial safety analysis report (ISAR) were two main components of ISMP. The CNWRA staff also provided technical comments to NRC on these documents. The contents of these documents were often inter-related and, in general, voluminous. The contents included preliminary process flow diagrams (PFDs) that contained technical data significant for hazards analysis, but were often included in "oversized" sheets that were often difficult to share by multiple staff at the same time.

At present, BNFL Inc. is directing their technical efforts for a more detailed design of the TWRS-P facility. By about November 2000, BNFL Inc. will submit a construction authorization request (CAR) that would include a preliminary safety analysis report.

1.2 SOFTWARE FUNCTIONS

The planned electronic database software application will be custom-developed to address the inefficiencies that were encountered in reviews thus far conducted. This customized application software will include detailed information on the structures, systems, and components (SSCs) that are important to safety and are safety-related in the TWRS-P facility. It is expected that this electronic database will help NRC staff in identifying and characterizing the hazards associated with the SSCs during the evaluation of Construction Authorization Request (CAR) and during subsequent inspection of the design changes and construction of the facility. It is also expected that this database will help NRC staff in tracking progress by BNFL Inc. in eliminating and or minimizing the consequences of such hazards. The software will be called HAZINFO.

The main function of this proposed software is to develop a custom hazard information database application software, tailored to the TWRS-P facility, that will help the NRC staff in

- Reviewing the CAR and,
- Planning and conducting integrated design inspections at the BNFL Inc. facility

2. TECHNICAL BASIS: PHYSICAL MODEL

The sources of data for the proposed software will be the information presented by BNFL Inc. in various technical documents, such as SRD, the ISMP technical report, and the DSF document. The HAR and the ISAR were two main components of ISMP. The contents include preliminary PFDs that have technical data significant for hazards analysis. Additional information are also currently available from topical meetings and other technical discussions. However, the design and safety approaches are constantly being revised as more knowledge becomes available about the proposed design.

The crucial function of the proposed database is the inquiry, on a selected basis, about the qualitative and quantitative nature of the SSCs that are relied upon for safety. The results will include an information presentation that will provide the user the associated hazards and estimating risks.

It is envisioned at this time that physical process model(s) such as H_2 generation from the given tank conditions, precipitation of radionuclides, redox condition in glass, will also be developed to provide information on range of safe operational conditions and potential unsafe operational conditions. Such information will become part of this software when such process models are developed, tested, and confirmed. The models will be developed using Microsoft Excel or OLI Systems, Inc. software.

3. COMPUTATIONAL APPROACH

The task will be accomplished in a step-wise approach by executing three separate modular activities. These are the custom software development for (i) pretreatment hazard information, (ii) LAW hazard information and, (iii) HLW hazard information. Initial work will be focused on the development of the pretreatment hazard information.

It is anticipated that NRC staff will be actively involved throughout the development of HAZINFO. Proposed activity will be revised based on initial testing of the HAZINFO by the NRC staff.

3.1 DATA FLOW AND USER INTERFACE

For each of the building modules, the user could selectively input and update information on the various SSCs, hazards, risks, and lessons learned. The data input will be through a form designed for simplicity. The restrictions for the user, as required, will be a part of the HAZINFO design. For example, the user will be able to view the data, but will not be given access to modify or input new information. The HAZINFO will be updated on a quarterly basis as new information becomes available from the TWRS-P project.

As appropriate, the SSCs will also be categorized with respect to the particular sub-process that takes place at a given time. For example, for the ion exchange process that separates cesium from the tank waste, it is realized that six separate unit operations might occur at any particular time. For each of these

sub-processes, the user will be able to examine the SSCs that are relied on for safety at various levels of detail. The controls that are relied on for safety (be it passive, active, or administrative, or a combination of any of these), can also be examined for their reliability and the associated risks in case of failure.

The primary mode of user interface will be through (i) buttons that can be activated by clicking on them, (ii) a drop-down list from which the user can make a selection and, (iii) a series of choices in the form of boxes from which the user can select a choice. These objects will be created and coded using Access Basic programming language. The general data flow is provided in the Appendix.

3.2 HARDWARE AND SOFTWARE REQUIREMENTS

The target platform for this software will be PC with typical current-day configuration. (Pentium II processor or greater with 64Mb RAM and 3Gb hard drive or greater).

The operating system will be Windows NT under a net-worked environment.

The programming will be accomplished using Microsoft Access 7.0 using Access Basic language.

3.3 GRAPHICS REQUIREMENTS

No special graphics are required for the development and use of this application software.

3.4 PRE- AND POST-PROCESSORS

No pre- or post processors are required for the development and use of this application software.

4.0 REFERENCES

None.

5.0 APPENDICES

None.