

EVALUATION OF EMERGENCY RESPONSE FACILITIES FOR
FORT CALHOUN STATION - UNIT 1

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1. SUMMARY AND RECOMMENDATIONS

The Fort Calhoun Emergency Response Facility design package did not contain a sufficient amount of information to make an evaluation of the ERF's. The following areas concerning the TSC, EOF, and OSC must be addressed in more detail:

The design package does not address the functions of the TSC.

The licensee must provide more details regarding the distribution of office space in the TSC.

A detailed locational diagram is needed which identifies personnel work stations and equipment at each station.

The size of the TSC is not adequately addressed.

The radiological habitability of the TSC must be addressed.

Supplies of protective clothing, respiratory equipment, etc., located in the TSC must be addressed.

The licensee needs to provide additional information to evaluate how long it takes for the TSC to become fully functional.

The licensee failed to provide a description of the records available in the TSC and of the procedures established to insure the records are current and complete.

No information was provided on the control room and the operational support center.

Not enough detail was provided on the location of the EOF to determine whether the location facilitates carrying out the functions specified for the EOF.

The availability of protective clothing, respiratory equipment and potassium iodide for the EOF was not addressed.

More information must be provided on records availability and management.

The Omaha Public Power District proposes a data system in addition to the plant process data system that will be used to

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support the Emergency Radiation Facility functions. The computer system will acquire data from meteorological, safety, non-safety and off-site sensors. This computer system will support three sets of ERF displays, located in the Control Room, Technical Support Center (TSC), and Emergency Operations Facility (EOF). Although the basic design of the system is good, the submitted design description for this ERF data system lacks information necessary to complete an analysis of the system. Areas lacking information are as follows:

The DAS system is to be purchased as a turnkey system from one vendor. The DAS system would include a computer system and associated system hardware, operating software, training, documentation, and installation. This method can yield satisfactory results if the vendor is a reputable, reliable one and that a comprehensive design document is prepared and strictly adhered to.

The licensee states that the system will have an operational availability goal of at least 99%. However, specific details describing how this goal is to be met are not included.

Figure One in the proposal shows ERF displays present in the Control Room, TSC and EOF. No detailed description of display type or number is given. Also missing is a description of necessary hard copy units.

The licensee has stated that currently available sensors of types A,B,C,D, and E as specified by Reg. Guide 1.97 will be implemented. The licensee is unable to commit itself to meeting all requirements of Guide 1.97 by the 1982 refueling outage (Nov. 82 - Feb. 83). Existing instrumentation will be connected to the DAS system. If necessary, new instrumentation will be added to meet 1.97 requirements.

Section 9.1 describes an implementation plan for the ERF system and the plant process computer. The ERF system will be designed to display both plant and ERF data. During installation, the ERF system will be dedicated to ERF processing. The plant system processing will be gradually added to the ERF system. Whereas this provides a backup system for the plant process system, it does not provide a backup for the ERF system. Also, care should be taken such that the addition of plant data processing to the ERF data system does not degrade the response performance of the ERF system.

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No reference of a nuclear data link is made.

No description of the communication protocols is supplied.

The TSC will be equipped with fire protection facilities, but the location of the ERF data system is not known. It is not possible to conclude that the DAS would be satisfactorily protected.

Figure Two, showing a conceptual drawing of the proposed computer system, is referenced but not included in the report.

Figure Two is to show two options for integrating the ERF system with the SPDS and providing seismic backup for the SPDS, but is not included in the report.

A hierarchy of displays is proposed. The hierarchy consists of a top level display which will show the overall critical safety function status of the plant. The next level will show the individual function status and the third level will show subfunction diagnostics. No other detailed description of display formats is given.

2. TECHNICAL SUPPORT CENTER

2.1 Integration with Overall Planning

Subject not addressed.

1. The design of the Technical Support Center (TSC) addresses the following goals:
 - a. Provides plant management and technical support to plant operations personnel during emergency conditions;
 - b. Relieves the reactor operators of peripheral duties and communications not directly related to reactor system manipulations;
 - c. Prevents congestion in the control room; and
 - d. Performs EOF functions for the Alert Emergency class and for the Site Area Emergency class and General Emergency class until the EOF is functional.
2. The TSC shall be the emergency operations work area for designated technical, engineering, and senior licensee plant management personnel; any other licensee-designated personnel required to provide the needed technical support; and a small staff of NRC personnel.
3. The TSC shall have facilities to support the plant management and technical personnel who will be assigned there during an emergency and will be the primary onsite communications center for the plant during the emergency. TSC personnel shall use the TSC data system to analyze the plant steady-state and dynamic behavior prior to and throughout the course of an accident. The results of this analysis will be used to provide guidance to the control room operating personnel in the management of abnormal conditions and in accident mitigation. TSC personnel will also use the environmental and

radiological information available from the TSC data system to perform the necessary functions of the EOF when this facility is not operable.

4. Since the specific allocation of functions assigned to emergency facilities will differ from design to design, the proposal should clearly state which functions (Operations, Radiological Assessment, etc.) are assigned to the TSC.

2.2 Location

1. The TSC should:

- a. Be in the same building as the control room if possible; if not, then where is it located?

The TSC is located at the north side of the plant.

- b. Be within 2 minutes walking distance from the control room.

Adequate response.

Is the TSC within the security perimeter?

Yes

Must someone pass through security checkpoints to move from the TSC to the control room?

Subject not addressed.

What provisions have been made for passing through security checkpoints quickly and easily?

Subject not addressed.

What stairways, corridors or equipment spaces must be traversed?

No info is available on the route taken from the TSC to the control room.

Is the route between the TSC and control room exposed to air-scattered or direct radiation from the containment?

What is the maximum exposure a person will receive while walking from the control room to the TSC during a design basis accident (less than or equal to 5 rem, including all other exposures, during the course of an accident)?

Subject not addressed.

- Does the route between the control room and the TSC have a radiological monitor or are there provisions for determining exposure rates periodically?
- c. Facilitate face to face interaction with control room personnel.
- Are there additional means (e.g., closed circuit TV) between the TSC and the control room to facilitate visual as well as auditory communication?
- What are the factors that impede face-to-face interaction?
- d. Afford access to any control room information not available in TSC data system.
- How can data not available in the TSC data system be provided to the TSC?

Subject not addressed.

Subject not addressed.

Subject not addressed.

Subject not addressed.

2.3 Size

1. The TSC shall provide:

- a. Working space, without crowding, for the personnel assigned to the TSC at the maximum level of occupancy (minimum size of working space provided shall be approximately 75 sq ft/person).
- How much space is assigned to each work station?
- Is an operational sequence diagram provided that describes the interaction among operators, work stations and items of equipment?

Inadequate information. The licensee states that there is office space for 25 persons. No details regarding the distribution of this space are given.

Subject not addressed.

Is a locational diagram provided that shows where personnel work stations and items of equipment will be placed? Is the scale of the diagram provided?

Is each work station equipped for its function?

Are personnel grouped by function? Does each work station have sufficient space to carry out its assigned function?

Explain how the location of facilities and equipment is consistent with the patterns of interpersonal interaction and machine utilizations that will take place.

Who needs access to which machines?

What is the flow of information between persons and groups?

Are personnel performing related tasks located adjacent to one another?

Describe the organization of the work stations. Are they organized according to Figure 2.1?

Describe how the workspaces are designed to control traffic and noise (mechanical and conversational).

b. Space for TSC data system equipment needed to transmit data to other locations.

Subject not addressed.

Where is the data displayed?

Show how layouts of displays are coordinated with working space layouts.

How much space is available for working with maps, diagrams, drawings, etc?

Where are the maps, diagrams, drawings, etc. located?

Is there a description of the characteristics of the machines in the TSC that provides a basis for determining their compatibility with anthropometric guidelines (e.g. Van Cott & Kinkade, Human Engineering Guide to Equipment Design)?

Are the characteristics of the data display devices compatible with anthropometric guidelines?

- c. Sufficient space to repair, maintain, and service equipment, displays, and instrumentation.

Subject not addressed.

How much space is provided to allow access to backpanels for repair?

What spare modules are available?

- d. Space for unhindered access to communications equipment by all TSC personnel who need communications capabilities to perform their functions.

Subject not addressed.

Is there a description of the layout of the telephones in the TSC?

How much space is provided for each telephone? (one sq. ft. minimum)

How can a ringing telephone be easily identified (i.e., do telephones light up when ringing)?

e. Space for storage of and/or access to plant records and historical data.

Subject not addressed.

How much work space is dedicated to this task?

f. A separate room, adequate for at least three persons, to be used for private NRC consultations.

Subject not addressed.

Are three of the five NRC work stations afforded sufficient privacy for meetings and telephone conversations?

Does this room have a speaker telephone?

What size is this room? (200 sq. ft. minimum)

2. The TSC working space shall be sized for a minimum of 25 persons, including 20 persons designated by the licensee and five NRC personnel.

Subject not addressed.

How many people are assigned to the TSC by the emergency plan, including five NRC personnel?

16 including 5 NRC personnel in addition, there are 19 augmenting TSC personnel.

Is the work space adequate for these people to perform their functions?

Subject not addressed.

2.4 Structure

1. The TSC complex must be able to withstand reasonably expected adverse conditions.

Adequate response.

Can the TSC be operable during a 100-year flood?

Adequate response.

Can the TSC withstand a 100-year windstorm?

Adequate response.

Is the TSC accessible during floods and storms?

Adequate response.

2.5 Habitability

- | | |
|---|--|
| 1. The TSC shall have the same radiological habitability as the control room. | Not specified. |
| Which accidents were analyzed to determine what radiation doses would be received in the TSC during the most severe accidents? | Subject not addressed. |
| What are the whole body radiation doses during plume passage (less than or equal to 5 rem)? | Subject not addressed. |
| 2. The TSC ventilation system shall be functionally comparable to the control room system (i.e., high efficiency particulate air and charcoal filter). Automatic isolation is not required. | The TSC will be kept at positive pressure and building air will be passed through a pre filter, HEPA filter and charcoal filter. |
| Briefly describe the HVAC system filtration system. | |
| Is the decontamination capability (D.F.) of the TSC system different from the control room system? Briefly describe the difference. | Subject not addressed. |
| Is the HVAC system controlled to isolate the intake? | Yes |
| At what airborne activity level does isolation occur? | Subject not addressed. |
| How is the level determined? | Subject not addressed. |
| Where are the sensors located? | Subject not addressed. |

3. Radiation monitoring systems shall be either permanently installed or shall be dedicated portable-type instruments (e.g., dose rate and airborne radiation detectors). Detectors shall be able to detect radioiodine as low as $1E-7$ microcuries/cc. The licensee shall provide the TSC with installed radiation monitors or dedicated portable monitoring equipment.
- The TSC will be provided with an area monitor and a Particulate, Iodine and Noble Gas Monitor.
- Are dedicated dose-rate instruments, survey meters, and airborne radioactivity monitoring instruments assigned to the TSC? Yes
- Which instruments will be used? Ares Monitoring-a Victoreen Model 808D, and an Eberline Model SA-6 combined particulate, iodine and noble gas sampler which draws a sample from the HVAC duct (inlet side).
- How many of each?
- Where are they located?
- How was the type, number and placement of monitoring instruments determined? The Victoreen detects gamma radiation above 80KEV. Subject not addressed.
- What are the ranges of these instruments?
- Do the instrument ranges cover the values expected if the TSC's HVAC decontamination capability fails during a DBA?
- Who is assigned to monitor the TSC habitability? N/A
- What are the qualifications of this person? N/A
- If there is no one assigned, are there fixed instruments equipped with audible and visual alarms? Yes

At what radiation levels will these instruments alarm?	Subject not addressed.
Does the system provide a warning of the precautionary radiation levels in a timely manner to allow the TSC personnel to take protective actions?	Subject not addressed.
Are unattended instruments in continuous operation?	Subject not addressed.
How is iodine monitored?	By the Iodine Subsystem in the Eberline SA-6.
Is the detectibility for airborne I-131 as low as 1E-7 microcuries/cc?	Subject not addressed.
What is the reliability of the continuously-operating instruments, i.e., is there back-up power for the instruments? Do the instruments meet the manufacturers specifications for availability and accuracy? How often are the instruments calibrated?	Subject not addressed.
4. Supplies of protective clothing, respiratory equipment and potassium iodide shall be readily available to all TSC personnel.	Subject not addressed.
If this is not the case, how many individuals can be supplied?	Subject not addressed.
Are reserves of this equipment available in the TSC or some other nearby location?	Subject not addressed.
Where?	Subject not addressed.
Are instructions for use of KI available?	Subject not addressed.
How is the need for such supplies determined, i.e., when will personnel don respiratory equipment?	Subject not addressed.
Is the protection factor for respiratory equipment equivalent to a full face mask?	Subject not addressed.

2.6 Staffing (NUREG-0696 and PNL TSC/EOF Staffing Study)

1. The TSC shall:

- a. Be fully functional within 30 minutes of activation.

Insufficient information. Communications is stated as being fully functional within 30 minutes.

How long does it take TSC equipment to become fully functional?

- b. Consist of sufficient technical personnel needed to support the control room including individuals who can handle situations involving operations, maintenance, administration, security, Rad/chem, and communications (Figure 2.1 is an example only).

Adequate response.

Has the licensee identified the tasks that may need to be performed and specified the characteristics (e.g. skills, experience and training) of the persons needed to accomplish these tasks?

Tasks are identified in the Fort Calhoun Station Emergency Plan.

2. Allocation of tasks to personnel should be validated by an analysis of error likely situations, especially those situations that might exceed the human operator's capability in the areas of perception, memory, information integration and manipulation of controls.

Subject not addressed.

What is the total number of personnel assigned to the TSC?

11 supervisory, 19 augmenting.

Are there adequate numbers of personnel assigned to the TSC to carry out its function?

Yes

TSC ORGANIZATION

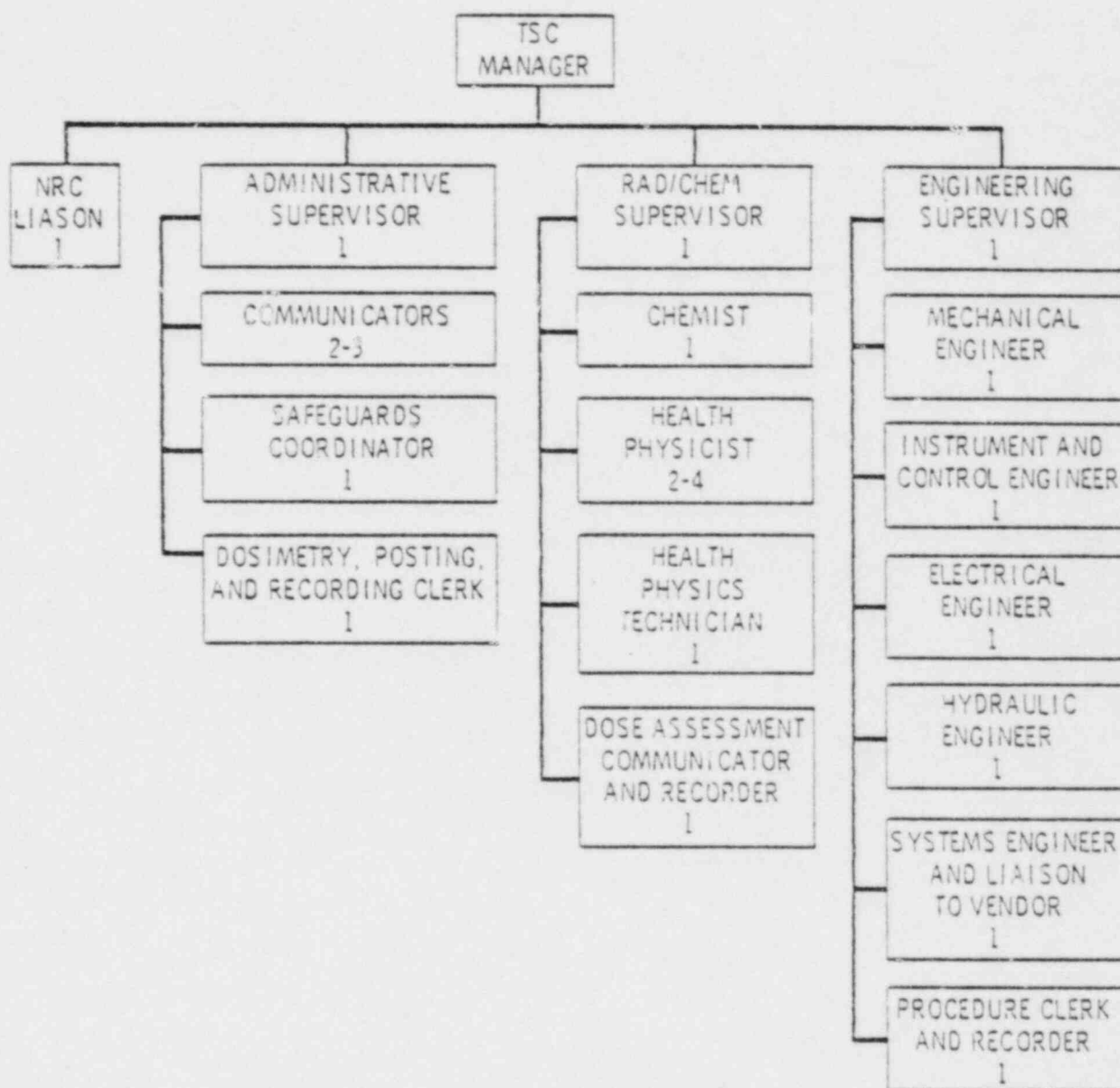


FIGURE 2.1

2.7 Communications

1. If existing licensee communications systems are to be used to meet TSC emergency requirements the licensee must demonstrate the system's ability to handle added TSC requirements under emergency conditions. Subject not addressed.
2. TSC telephone access to commercial common-carrier services must bypass any onsite or local offsite switching facilities that may be susceptible to loss of power during emergencies. Adequate response.
3. How many switchboard independent commercial telephone lines to the plant are available for use by the TSC during emergencies? Adequate response.
4. TSC voice communications must consist of a reliable primary and backup system and include:
 - a. Hotline telephone in the NRC consultation room on the ENS to the NRC Operations Center.

What is the backup system for communications to the NRC?
 - b. Dedicated telephone in NRC office space on the NRC Health Physics Network.

What is the backup system for communications to the NRC?
 - c. Dedicated telephones to the control room, CSC, and EOF.

Do these telephones provide non-interruptable service between the TSC, EOF or control room?
 - d. Dial telephones that provide access to onsite and offsite locations.

- e. Intercommunications systems between any separate work areas within the TSC.
- Is there an intercom to connect the TSC manager and supervisors?
- f. Communications to licensee mobile monitoring teams.
- g. Communications to State and local operations centers.
- h. Radio communications with onsite and offsite organizations and response groups.
5. At least two additional dial telephone lines must be provided for use by NRC personnel. Adequate response.
6. Facsimile transmission capability between the TSC, EOF and NRC Operations Center must also be provided. Adequate response.
7. Provision must be made for 24-hour per day notification to and activation of the State/local emergency response network, with 24-hour per day manning of communication links that initiate emergency response actions (NUREG-0654). Subject not addressed.
8. A coordinated communication link for fixed and mobile medical support facilities shall be provided (NUREG-0654). Adequate response.
9. Are there descriptions of how the following communications needs are met? Insufficient information.

TSC Manager with

Corporate HQ
Control Room
EOF
OSC
NRC
State/local governments
Vendors

Administrative Supervisor with

Corporate HQ
Backup communications
Security force
EOF

Rad/Chem Supervisor with

Radio to HP technicians
HP control point
CSC
Chemical laboratory
EOF
State/local governments
HPN

Engineering Supervisor with

Corporate HQ
Control Room
CSC
EOF
Vendors
NRC
Radio to corrective action teams

2.8 Instrumentation, Data System Equipment,
and Power Supplies

These methodologies are addressed in
Sections 6, 7, 8 and 9.

2.9 Technical Data and Data System

These methodologies are addressed in
sections 6, 7, 8 and 9.

2.10 Records Availability and Management

1. The TSC personnel shall have ready access to up-to-date records, operational specifications, and procedures that include but are not limited to:

Not specified.

- a. Plant meteorological data,
- b. SPD systems,
- c. Plant technical specifications,
- d. Plant operating procedures,
- e. Emergency operating procedures,
- f. Final Safety Analysis Report,
- g. Plant operating records,
- h. Plant operations reactor safety committee records and reports,
- i. Records needed to perform the functions of the EOF when it is not operational, and
- j. Up-to-date, as-built drawings, schematics, and diagrams showing conditions of plant structures and systems down to the component level, as well as in-plant locations of these systems.
- k. Checklists, guides, worksheets and other job performance aids.

2. The licensee shall have all of the above records in the TSC in current form when the facility is fully activated.

Insufficient information. Records are retrievable either via a computer system or manually. Ease of access in the TSC is not directly discussed.

What procedures have been established to update these records as necessary to ensure that they are current and complete?

Describe the method of storage and presentation of the TSC records which ensures their availability and ease of access under emergency conditions.

3.0 CONTROL ROOM

Not addressed.

3.1 Integration with Overall Planning

1. The design of the control room (CR) addresses the following goals during normal operation:

a. The control room is the onsite location from which the nuclear power plant is operated. It contains the instrumentation, controls, and displays for:

nuclear systems,
reactor coolant systems,
steam systems,
electrical systems,
safety systems, and
accident monitoring systems.

b. The control room is staffed during normal operations by a minimum of:

a shift supervisor who is a senior licensed reactor operator and whose duty station may be in the immediate vicinity outside of the control room itself;

a shift foreman who is a senior licensed reactor operator and whose duty station is in the control room;

control room operators, two licensed reactor operators, whose duty stations are in the control room;

auxiliary operators, two reactor operators, whose duty assignments are set by the shift supervisor.

2. The design of the control room addresses the following goals during emergency condition operations:

a. At the start of an emergency situation, the control room staff performs the following functions:

monitor plant parameters,
analyze abnormal conditions,
take corrective actions,
classify emergency,
make initial notification to shift supervisor,
shift foreman, and shift technical advisor,
establish initial trends in plant parameters,
establish necessary control room staff changes,
establish communications with plant emergency response teams,
establish communications with Emergency Response Facilities,
and
manage plant operations.

3.2 Staffing

1. The personnel organization in the control room is shown in Figure 3-1.
2. The succession of authority if the senior person is incapacitated or unavailable must be addressed.
3. The functional organization in the control room during an abnormal event is shown in Figure 3-2.

3.3 Communications

1. The following onsite and offsite communication links for continuous information exchange must be available.

- commercial telephone
- dedicated telephone
- radio
- plant intercom

Are these communication systems described?

2. The shift supervisor, shift foreman, and technical advisor or their designates must be immediately notified of an abnormal condition. Indicate expected average and maximum notification times.
3. After the TSC is operational, the control room staff must verify that TSC communication links with emergency teams are established and functional.
4. Verification must be made that information going to ERF's is correct.

3.4 ERF Phase

After the TSC is operational, does the Control Room staff relinquish the following functions:

- managing plant operations, and

- peripheral duties and communications not directly related to reactor system manipulations.

CONTROL ROOM ORGANIZATION

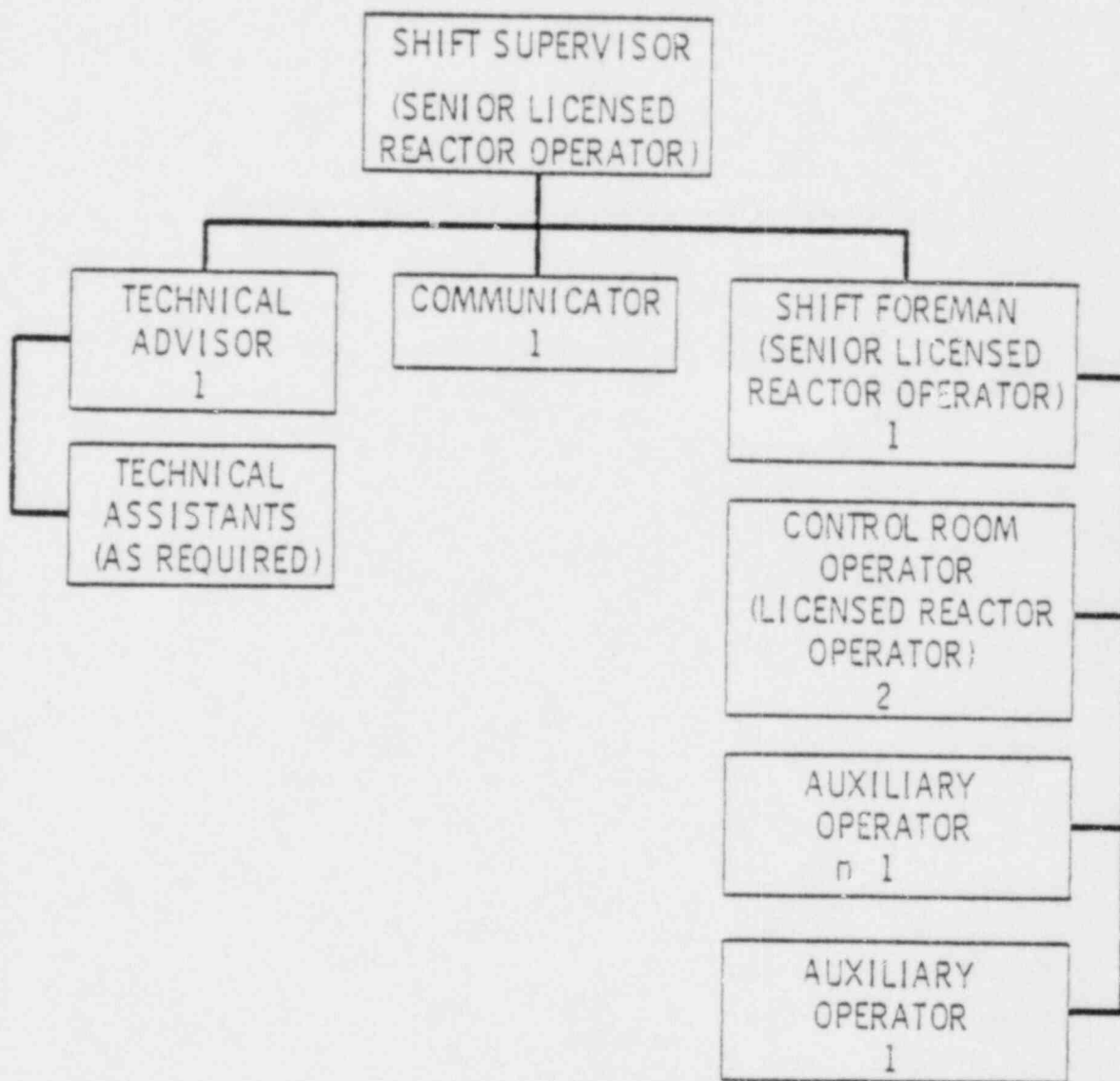
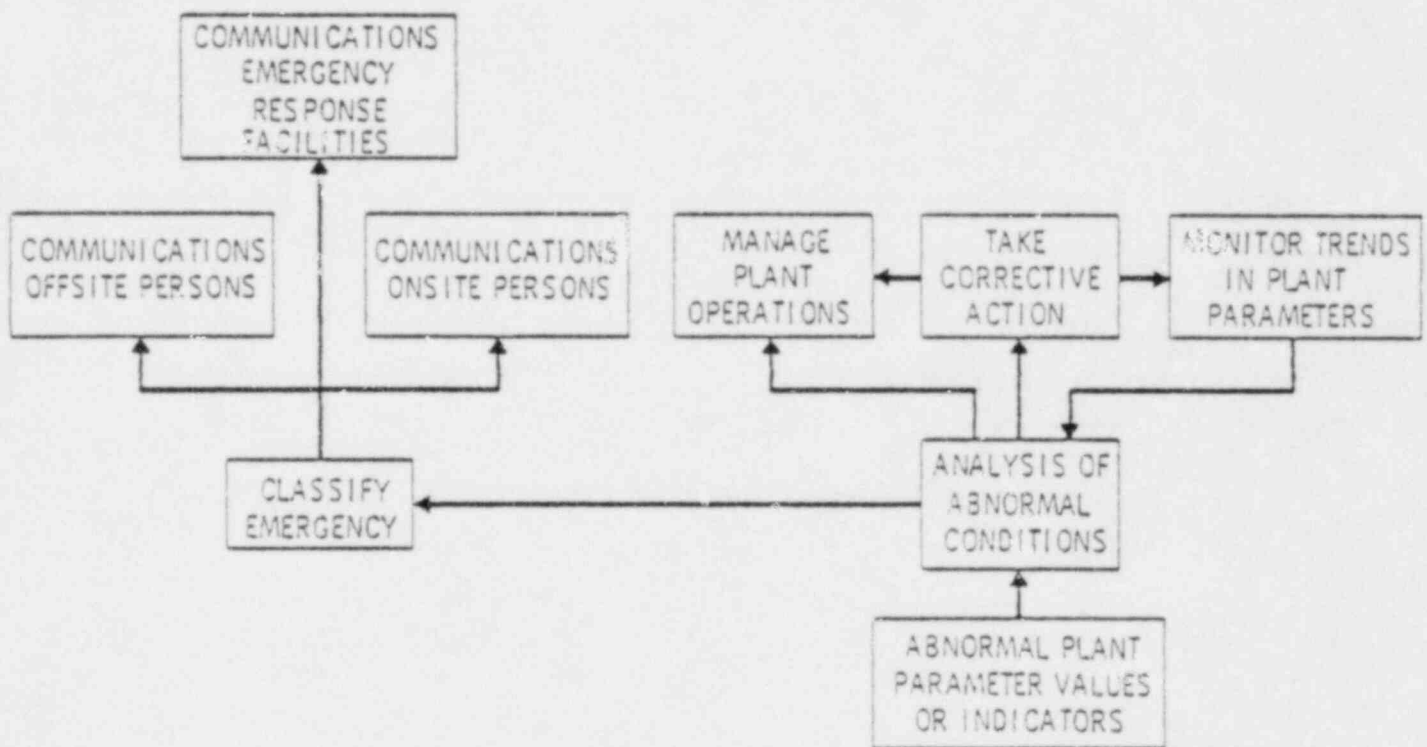


FIGURE 3.1

FUNCTIONAL ORGANIZATION - CONTROL ROOM



FUNCTIONAL UNTIL TSC OPERATIONAL

FIGURE 3.2

4. OPERATIONAL SUPPORT CENTER

Not addressed.

4.1 Integration with Overall Planning

1. The design of the Operational Support Center (OSC) addresses the following goals:
 - a. Provides a location where plant logistic support can be coordinated during an emergency, and
 - b. Restricts control room access to those support personnel specifically requested by the shift supervisor.
2. An onsite operational support center is separate from the control room and the TSC and is where licensee operations support personnel will assemble in an emergency.

Where is it located?

Describe the isolation of the OSC from the TSC and control room.

Where are the backup OSC sites and are they accessible (e.g. onsite or nearsite) and habitable?

Will the back-up OSC be habitable if the primary OSC is not?

3. Provision shall be made for an alternate health physics control point. Where is it located?
4. The health physics control point shall be immediately accessible to the OSC. (i.e., will personnel traveling from the OSC to the H.P. control point receive less than 5 rem when combined with other exposures during the course of an accident?)

5. Can personnel access storage facilities without receiving greater than 5 rem (when combined with other exposures) during the course of an accident?

4.2 Habitability

1. No specific habitability requirements are established for the CSC.

Is the CSC as habitable as the control room? Discuss.

Is the shielding comparable to the control room? Discuss.

Is the ventilation comparable to the control room? Discuss.

2. If the CSC habitability is not comparable to that of the control room, procedures shall be available for evacuation of CSC personnel in the event of a large radioactive release.

If CSC has to be evacuated, what are the criteria for evacuation?

Have key people been selected to remain onsite (or nearsite) to continue CSC functions?

Are other personnel, evacuated offsite from the CSC, available to provide additional CSC functions if required?

3. How are radiation levels determined in the CSC?

4. Emergency supplies (protective clothing, respirators, survey meters, dosimeters and KI) shall be available in the OSC for all personnel assigned at the facility.

What alternate supply arrangements have been made?

Where are equipment and supplies stored?

How does OSC staff obtain their equipment? (i.e., is it signed out, just taken, etc.)

4.3 Communications

1. There shall be a direct and dedicated primary communication link with the control room and TSC.
2. Communications with the TSC and control room shall be available at the backup OSC.
3. A dial phone shall be available in the OSC for other onsite and offsite locations.
4. Direct voice intercommunications and/or reliable direct radio communications may be used for supplementing telephone links.

4.4 Staffing

1. Personnel shall be assigned to the CSC for:

- a. Damage Control
- b. Fire Brigade
- c. First Aid
- d. Radiation Control
- e. Decontamination
- f. Radiological and Environmental Surveys
- g. Maintenance/Repairs
- h. Other Operations Personnel

2. When the CSC is activated, it shall be supervised by licensee management personnel designated in the licensee's emergency plan to perform these functions.

Who will be in charge of the CSC?

3. Team leaders shall be assigned for each functional group.

4.5 Size

1. The CSC shall be large enough to accommodate assigned personnel and equipment to be stored in the CSC (e.g. 15 sq. ft. per person for evaluative purposes only).

2. Decontamination facilities should be readily available.

Where are they located?

5. EMERGENCY OPERATIONS FACILITY

5.1 Integration with Overall Emergency Planning

1. The design of the Emergency Operations Facility (EOF) addresses the following goals:
 - a. Management of overall licensee emergency response; Adequate response.
 - b. Coordination of radiological and environmental assessment; Adequate response.
 - c. Determination of recommended public protective actions; and Adequate response.
 - d. Coordination of emergency response activities with Federal, State, and local agencies. Adequate response.
2. The EOF shall be staffed by licensee, Federal, State, local and other emergency personnel designated by the emergency plan. Adequate response.
3. Facilities shall be provided in the EOF for the acquisition, display, and evaluation of all radiological, meteorological and plant system data pertinent to determining offsite protective measures. Adequate response.
4. The licensee shall use the EOF to coordinate its emergency response activities with those of the local, State, and Federal agencies, including the NRC. Licensee personnel in the EOF will assess potential offsite effects and make appropriate protective action recommendations for the public to State and local emergency response agencies. The EOF may be used as a location for information dissemination to the public via the news media by designated spokespersons in accordance with the licensee's emergency plan. The licensee Adequate response.

also may use the EOF as the post-accident recovery management center. Since the specific allocation of functions assigned to emergency facilities will differ from design to design, the proposal should clearly state which functions (Radiological Assessment, Security, Coordination with Offsite Agencies) are assigned to the EOF.

5.2 Location, Structure and Habitability

1. The siting of the EOF should include the following criteria:

- a. Whether the location facilitates carrying out the functions specified for the EOF (i.e., determination of public protective actions to be recommended by the licensee to offsite officials, and coordination of the licensee with Federal, State, and local organizations).

Subject not addressed.

Describe the transportation network in the vicinity of the EOF adequate to assure rapid coverage of the EPZ by monitoring teams.

Subject not addressed.

Is the EOF placed in a location that is readily accessible by road to Federal, State, local government officials as well as the licensee's corporate and site operations personnel?

Not specified.

Has the selection of the EOF location been coordinated with State/local officials?

Subject not addressed.

b. What radiation doses would be expected when the EOF is accessed during DBA or other specified accident (less than or equal to 5 rem)?

Subject not addressed.

Is the EOF accessible during periods of radiation releases?

Yes, the EOF is 17 miles from the plant.

Is there an alternate EOF?

N/A

2. The EOF must be able to withstand reasonable expected adverse conditions. (e.g., 100 year floods and high winds)

Adequate response.

How would the maximum 100-year water levels and winds affect the operation of the EOF?

Not specified.

3. The EOF shall have a protection factor greater than or equal to five if located within 10 miles of TSC; no protection level is necessary if located beyond 10 miles of the TSC. Protection factor is defined in terms of the attenuation of 0.7 MeV gamma radiation.

The EOF is greater than 17 miles from the plant.

4. The EOF ventilation system shall be functionally comparable to the control room system and TSC (i.e., high efficiency particulate air filter; no charcoal) if located within 10 miles of TSC. If located beyond 10 miles from the TSC, the EOF needs no ventilation protection.
- The EOF is greater than 10 miles from the TSC.
- To what level will the HEPA filters reduce particulate levels? N/A
- Is the HVAC system controlled to permit isolation of the intake? N/A
- At what level of airborne activity is isolation performed? N/A
- How is the level determined? N/A
- Where are the sensors located? N/A
- Where is this level monitored? N/A
5. Protective clothing, respiratory equipment and potassium iodide shall be readily available to all EOF personnel.
- Subject not addressed.
- If not, how many people would be supplied? Subject not addressed.
- Are reserves of supplies available? Subject not addressed.
- Where are they located? Subject not addressed.
- How is the need for these supplies determined? (i.e., when will respiratory equipment be used?) Subject not addressed.
- Is the protection factor for respiratory equipment equivalent to a full face mask? Subject not addressed.
- Are instructions for KI use provided in the EOF? Subject not addressed.

5.3 Staffing (NUREG-0696 and PNL TSC/EOF Staffing Study)

1. The EOF shall:

- a. Be functional within one hour of activation;

Subject not addressed.

What equipment takes more than 60 minutes to become operational?

Subject not addressed.

How long does it take to fully staff the EOF?

Subject not addressed.

What is the procedure to ensure notification of the minimum EOF staff?

Subject not addressed.

- b. Include staff to engage in onsite and offsite radiological monitoring and a senior management person to be in charge of all licensee activities in the EOF. An example of additional staffing needs for the EOF are given in Figure 5-1 (from the PNL TSC/EOF Staffing Study.)

Adequate response.

- c. Has the licensee identified the tasks that may need to be performed and specified the characteristics (e.g. skills, experience and training) of the persons needed to accomplish these tasks?

The tasks are identified in the Fort Calhoun Station Emergency Plan.

2. Allocation of tasks to personnel should be validated by an analysis of error likely situations, especially those situations that might exceed the human operator's capability in the areas of perception, memory, information integration and manipulation of controls.

Subject not addressed.

What is the total number of personnel assigned to the EOF? Are there adequate numbers of personnel assigned to the EOF to carry out its function?

Adequate response.
21 licensee personnel are assigned to the EOF.

EOF ORGANIZATION

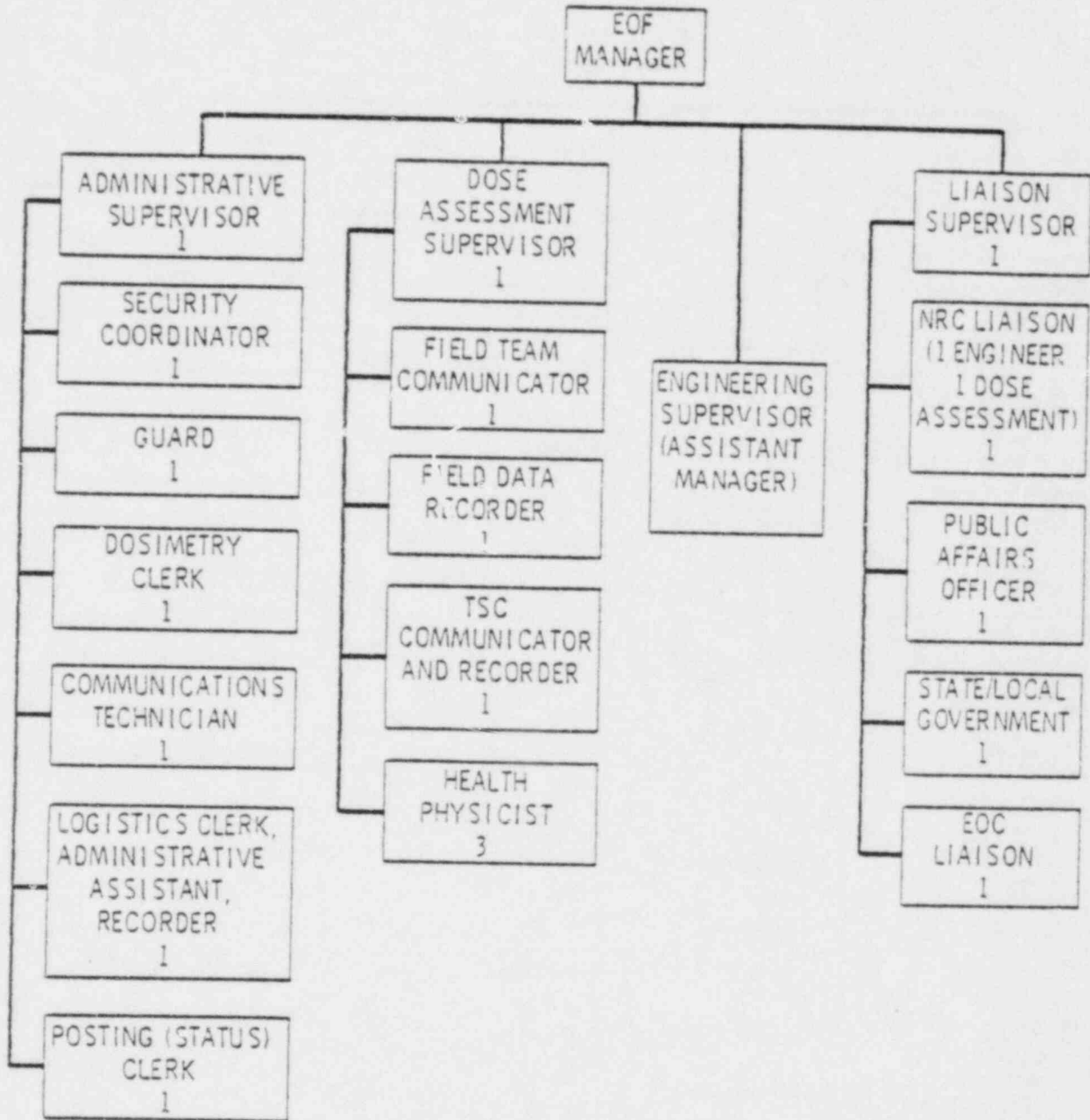


FIGURE 5.2

5.4 Size

1. The EOF building or building complex shall be large enough to provide:

a. Working space for the personnel assigned to the EOF as specified in the licensee's emergency plan, including State and local agency personnel, at the maximum level of occupancy without crowding (minimum size of total working space provided shall be approximately 75 sq ft/person);

Adequate response.
The EOF is large enough for 35 people, each having a minimum of 75 sq. ft. per person.

How much space is assigned to each work station?

Adequate response.
(Figure 3)

Is an operational sequence diagram provided that describes the interaction among EOF staff, work stations and items of equipment?

Subject not addressed.

Is a locational diagram provided that shows where personnel work stations and items of equipment will be placed? Is the scale of the diagram provided?

Adequate response.

Is each work station equipped for its function (i.e., manager, liaison, dose assessment, engineering, administration etc.)?

Insufficient information.

Are personnel grouped by function?

Yes

Does each work station have sufficient space to carry out its assigned function?

Yes

Explain how the location of facilities and equipment is consistent with the patterns of interpersonal interaction and machine utilizations that will take place.

Subject not addressed.

Who needs access to which machines?

Subject not addressed.

- | | |
|---|---------------------------|
| What is the flow of information between persons and groups? | Subject not addressed. |
| Are personnel performing related tasks located adjacent to one another? | Subject not addressed. |
| Describe the organizations of the work stations. Are they organized according to Figure 5.2? | Insufficient information. |
| Describe how the workspaces are designed to control traffic and noise (mechanical and conversational). | Subject not addressed. |
| b. Space for EOF data system equipment needed to transmit data to other locations. | Insufficient information. |
| Where is the data displayed? | |
| Are layouts of displays coordinated with working space layouts? | Not specified. |
| How much space is there for working with maps, diagrams, drawings, etc. | Not specified. |
| Where are the maps, diagrams, drawings, etc., located? | Not specified. |
| Is there a description of the characteristics of the machines in the EOF that provides a basis for determining their compatibility with anthropometric guidelines (e.g. Van Cott & Kinkade, Human Engineering Guide to Equipment Design)? | Subject not addressed. |
| Are the characteristics of the data display devices compatible with anthropometric guidelines? | Subject not addressed. |
| c. Sufficient space to perform repair, maintenance, and service of equipment, displays, and instrumentation; | Insufficient information. |

- How much space is provided to allow access to back panels for repair? Subject not addressed.
- What spare modules are available? Subject not addressed.
- Is a working station assigned for repair and maintenance? Subject not addressed.
- d. Space for unhindered access to communications equipment by all personnel who need communications capabilities to perform their functions. Insufficient information.
- Is there a description of the layout of the telephones in the EOF? Subject not addressed.
- How much space is provided for each telephone (about 1 sq. ft.)?
- How can a ringing telephone be easily identified (i.e., do phones light up when ringing)?
- e. Space for ready access to functional displays of EOF data. Adequate response.
- Is there space to display maps of the EPZ?
- f. Space for storage of plant records and historical data. Records, data and drawings may be kept in TSC if they can be displayed in the EOF by an automated method of retrieval. Adequate response.
- How much work space is dedicated to this task?
- g. Separate office space to accommodate at least five NRC personnel during periods that the EOF is activated. Adequate response.
- How much office space is allocated for NRC use (at least 250-375 sq. ft.)? 375 sq. ft.
- Does this room have a speaker telephone? Subject not addressed.

2. The EOF working space shall be large enough for at least 35 persons, including 25 persons designated by the licensee, 9 persons from NRC, and 1 person from FEMA. This minimum space shall be increased if the maximum staffing levels specified in the licensee's emergency plan, including representatives from State and local agencies, exceeds 25 persons.

Adequate response.

How many people are assigned to the EOF by the Emergency Plan including the NRC personnel and one FEMA person?

31 individuals assigned to the EOF.

Is the workspace adequate for these people to perform their functions?

Yes

Are workspaces designed to control noise and traffic and to avoid unintended dissemination of confidential information?

Insufficient information.

Are provisions made for liaison persons from offsite organizations (if desired by these organizations)?

Yes

5.5 Radiological Monitoring

1. The licensee shall provide the EOF with installed radiation monitors or dedicated, portable monitoring equipment.

Not addressed.

Are dedicated dose rate instruments, survey meters and airborne radioactivity monitoring instruments assigned to the EOF?

Which instruments will be used?

Where are instruments located?

How many of each?

How were types of, number of, and placement of monitors determined?

What range do these instruments have?

2. These systems shall continuously indicate radiation dose rates, airborne radioactivity concentrations and the presence of radioiodine as low as $1E-7$ microcuries/cc in the EOF.

Is someone assigned to monitor the EOF habitability when radiation releases are taking place?

What are the qualifications of this person?

If not, are there fixed instruments which are equipped with audible and visual alarms?

At what radiation levels will these instruments alarm?

Are unattended instruments in continuous operation?

How is iodine monitored?

Is the detection limit for airborne I-131 as low as $1E-7$ microcurries/cc?

What is the reliability of the continuously operating instruments? (i.e., is there back-up power for the instruments? Do the instruments meet the manufacturers specifications for availability and accuracy? How often are the instruments calibrated?)

3. These monitoring systems shall include local alarms with trip levels set to provide early warning to EOF personnel of adverse conditions that may affect the habitability of the EOF.

What are the trip levels of these instruments?

Does the instrument system provide a warning of precautionary radiation levels in a timely manner to allow the EOF personnel to take protective actions?

4. Does the EOF have a counting room?

What instruments are available in the counting room?

A laboratory is identified in the package, but its function and equipment are not addressed.

Where are backup counting rooms located?

Is the counting room or receiving room readily accessible to offsite EOF personnel and monitoring teams?

Is the monitoring equipment stored at the EOF? If not, where is it stored?

Supplies of protective clothing, respiratory equipment and KI shall be readily available for all personnel who may need access to the plant or may enter the airborne plume.

Are instructions for the use of KI available?

Are reserves of equipment available in the EOF or some nearby location?

Where?

How is the need for such supplies determined? i.e., when will personnel don respiratory equipment?

Is the protection factor for respiratory equipment equivalent to a full face mask?

5.6 Communications

1. EOF telephone access to commercial telephone common carrier services must bypass any local telephone switching facilities that may be susceptible to loss of power in emergencies.

Insufficient information.

How many switchboard independent commercial telephone lines are available in the EOF?

2. EOF voice communications must consist of a reliable primary and backup system and include:

Adequate response.

- a. Hotline telephone located in the NRC office space (and also in the licensee space if desired by the licensee) on the emergency notification system (ENS) to the NRC Operations Center;

Adequate response.

What is the backup system for communications to the NRC?

- b. Dedicated telephone located in the NRC office space (and also in the licensee space if desired by the licensee) on the NRC Health physics network (HPN);

Adequate response.

What is the backup system for communication to the NRC?

- c. Dedicated telephones for management communications with direct access to the TSC and the control room;

Adequate response.

Do these telephones provide non-interruptable service between EOF and TSC or control room?

- d. Dial telephones that provide access to onsite and offsite locations;

Adequate response.

- e. Intercommunications systems between work areas of the EOF, if needed for the EOF functional performance and if the EOF is comprised of separate functional areas; Adequate response.
- Is there an intercom to connect the EOF manager and supervisors?
- f. Radio communications to licensee mobile monitoring teams; Adequate response.
- Are there provisions to use commercial telephones as a backup?
- g. Communications to State and local operations centers; Adequate response.
- What are the primary and backup communications?
- Are they diverse, redundant and dedicated?
- h. Communications to facilities outside the EOF used to provide supplemental support for EOF evaluations. Adequate response.
- Are there primary and backup communications to corporate HQ?
3. The EOF communication system shall also include designated telephones (in addition to the ENS and HPN telephones) for use by NRC personnel. The licensee shall provide at least two dial telephone lines for such NRC use when the EOF is activated. The licensee shall also furnish the onsite access facilities and cables to the NRC for the ENS and HPN telephones. Adequate response.
4. Facsimile transmission capability between the EOF, the TSC, and the NRC Operations Center shall be provided. Adequate response.
- Is facsimile transmission capability installed and tested for compatibility with NRC and offsite authorities?

5. Are there descriptions of how the following communications needs are met?

Insufficient information. The communications facilities available to individual personnel are not described.

EOF manager with

- Corporate HQ
- TSC
- Control Room
- NRC
- State Government
- Local Government
- EOF Supervisors

Administrative supervisor with

- Corporate HQ
- TSC Security communication center
- Outside telephone lines
- EOF manager
- Telefax
- Photocopying

Dose assessment supervisor with

- HPN telephone
- TSC
- EOF manager
- Outside line
- Radio to monitoring teams

Engineering supervisor with

- Control Room
- TSC
- Corporate
- Outside lines
- Vendors

Liaison supervisor with

- Corporate HQ
- NRC
- State Government
- Local Government
- TV Monitor (news stations)

5.7 Instrumentation, Data System Equipment, and Power Supplies

These methodologies are addressed in Sections 6, 7, 8, and 9.

5.8 Technical Data and Data System

These methodologies are addressed in Sections 6, 7, 8, and 9.

5.9 Records Availability and Management

1. EOF personnel shall have ready access to up-to-date records, operational specifications, and procedures that include but are not limited to:

Insufficient information. The specific documents available at the EOF are not identified.

- a. Plant meteorological data.

Does the EOF have access to primary and backup meteorological data?

The licensee states that all "safety related records to comply with federal and industry codes and standards" are available.

Are dose assessment procedures designed to use either data set?

- b. Up-to-date records related to licensee, State, and local emergency response plans.

Does the EOF have up-to-date copies of State, local and Federal emergency response plans and procedures?

- c. Safety Parameter Display System.

- d. Offsite population distribution data.

- e. Plant technical specifications.

Are specifications, records, drawings, and reports the current ones (what are the most current dates)?

- f. Evacuation plans.

- g. Plant operating procedures.
- h. Environs radiological monitoring records.
- i. Emergency operating procedures.
- j. Licensee employee radiation exposure histories.
- k. Final Safety Analysis Report.
- l. Up-to-date, as-built drawings, schematics, and diagrams showing:

Conditions of plant structures and systems down to the component level, and

In-plant locations of these systems.

- m. Checklists, guides, worksheets and other job performance aids.

2. These records shall either be stored and maintained in the EOF (such as hard copy or microfiche) or shall be readily available via transmittal to the EOF from another records storage location. The method of storage and presentation of the EOF records shall ensure ease of access under emergency conditions. The records available to the EOF shall be completely updated as necessary to ensure currency and completeness.

Adequate response.

How are records stored and maintained in the EOF?

Subject not addressed.

Are records readily available for transmission to the EOF from another storage location?

Subject not addressed.

Are records stored so as to be readily and easily accessible?

Subject not addressed.

How are records updated?

Subject not addressed.

How are the records accessed?

Subject not addressed.

6. Data Acquisition System

6.1 DAS Functional Description

The function of a data acquisition system (DAS) in the context of this methodology document is to provide a basic source of data for all emergency response facilities. A functional block diagram, showing the facilities to be used for data acquisition and their functional interconnection to ERF's and other plant facilities should be provided. Figures 2 and 3 of NUREG-0696 are examples of such diagrams.

Insufficient information. A general functional description is provided in Figure 1. Reference to a Figure 2 is made, but not included.

6.2 DAS Facilities

It is anticipated that a dedicated data acquisition system, consisting of a single facility or a functionally integrated, physically distributed facility will be proposed for most sites. However, NUREG-0696 does not require that utilities provide specific, dedicated DAS facilities, only that they perform specific data acquisition functions. Some sites may propose to perform DAS functions by sharing other facilities such as the plant process control computer. In either case, any facilities used for the acquisition of any and all data relating to safety parameters and ERF's should address the following areas.

1. DAS Layout

Describe the layout of the DAS. A drawing or photograph of the system(s), showing equipment room layout and operator console(s) may be sufficient.

No physical description is provided.

2. DAS Environment

- a. Where is the DAS located?
- b. What fire protection facilities are provided?
- c. Is the room temperature controlled?
 What is the heat output of the equipment?
 What is the heat removal capacity of the air conditioning system?

Not specified.
 TSC has auto detection system, portable extinguishers, sprinklers in generator room 'Computer room has been given special HVAC considerations'.

- d. What humidity controls are provided?
- e. Concerning electrical power:

Not specified.

- What power sources are available?
- What are the DAS power requirements?
- Is the source uninterruptable?
- What is the backup source?

13.8 KV power fed w/ 200 KW stand-by diesel generator.
 Not specified.
 Yes.
 30 min. UPS w/ battery backup to DAS.

3. DAS Physical Security and Access

Not specified.

- a. Describe the security procedures which determine who may access DAS equipment.
- b. Identify the authorized personnel.
 Can the user stop the system via a normal display device?
 Can the user stop the system without entering the DAS resource restricted area or enclosure?

6.3 DAS Equipment Specifications

In order to evaluate the capability of a proposed DAS to acquire and distribute data in a manner consistent with the functional criteria in NUREG-0696, the DAS equipment configuration must be understood in detail. The following questions are to be applied to any subsystem of a dedicated, distributed DAS, as well as to any system which shares DAS functions with other plant functions.

The DAS is a dedicated system, sharing sensors with the plant process computer. Plant process functions will gradually be added to the ERF system for increased reliability.

1. Dedicated DAS

What facilities are provided for the acquisition of data to be provided for ERF's?

Not specified.

a. Specify the computer hardware configuration:

What vendor?

What model number?

What is the processor's computation speed? _____ instructions/sec.

What is the system's configuration?

Number of processors: _____

For each processor or subsystem, indicate the following:

Working storage: _____ bytes.

What type? (core, MDS, etc.)

Error detection and/or correction capability?

On-line disk storage:

Number of controllers: _____

Number of drives: _____

Total capacity: _____ bytes.

Maximum access time: _____ sec.

Minimum transfer rate: _____ bytes/sec.

Tape storage:

Drive type: (7 or 9 track)

Number of drives: _____

Maximum density: _____ bytes/inch.

Speed: _____ inches/sec.

Data Acquisition Hardware:

Number of analog
channels:_____

Sampling rate per
channel:_____samples/sec.

Resolution per
channel:_____bits.

Number of digital
channels:_____

Bits per digital
channel:_____

Data communications hardware:

Number of ports:_____

Type of ports: (RS-232,
V35, etc.)

Average data rate per
port:_____bits/sec.

- b. What software operating system is used?
- c. Will this operating system software be specially modified for use with the DAS? If so, describe the proposed modifications and their justification.
- d. Identify any other software components of the DAS and their source.

2. Additional Requirements for Non-dedicated
DAS

- a. If the plant process control computer, or any other computer facility not fully dedicated to acquisition of data for ERF's, is to be employed, the following information must be understood in addition to that specified in 6.3.1. None specified.

What facilities, hardware and software, are included in the configuration to insure that emergency response facility data acquisition functions and other functions do not interfere with and degrade each other?

Does the configuration include dual processors with separate functions?

Do programs and data for the separate functions reside in physically separate working storage and on-line storage facilities?

Does the operating system software provide for the implementation and isolation of separate functional tasks?

What user-callable system services are provided to facilitate non-cooperating, concurrent processes?

How does the operating system deal with conflicting requests for system resources?

What is the system's deadlock avoidance mechanism?

6.4 Sensor Data to be Acquired

1. Plant variables of Type A, B, C, D, and E, as specified in Regulatory Guide 1.97 Revision 2 Table 1 (BWR's) or 2 (PWR's), are required; identify any exclusions, deviations, or additions and describe the justification for each.
2. Meteorological data described in Regulatory Guide 1.23 Revision 1 is required; identify any exclusions, deviations, or additions and describe the justification for each.
3. For each automatically monitored sensor:

At what location is the data from the sensor physically obtained for the DAS?

Is isolation provided? If so, describe.

Describe the cabling between the sensor and the DAS.

If the sensor signal is not connected directly to a DAS input, describe any and all intermediate circuits and/or equipment.

At what rate is the sensor sampled: _____ samples/sec.

At what resolution is the sensor data read: _____ bits.

4. For any data which is entered by a manual process describe:

The method of entering the data.

The time required to enter the data.

Procedures which have been established for entering the data.

Verification processes used to insure the data has been entered correctly and in a timely manner.

To start with, input to new TSC display system will consist of current instrumentation for variable types A, B, C, D, E and meteorological data. If required and felt necessary, instrumentation will be later upgraded.

'Suitable isolation will be provided'. Safety system signals will come through safety grade isolators prior to entering the computer system.

Sensor data will be sampled at a rate consistent with the use of the data.

None specified.

6.5 Data to be Provided for Dose Assessment

NUREG-0696 requires that, in addition to radiological and meteorological data specified in 6.4, the output obtained from a Class A transport and diffusion (dispersion) model, described in NUREG-0654, Revision 1, Appendix 2, be displayed in the EDF. If these transport and diffusion estimates are to be sent to the EDF via the DAS, identify:

Subject not addressed.

The source of these data;

The manner in which these data enter the DAS;

The volume of data generated by the model; and

The rate at which these data are input to the DAS.

7. Data Display Systems

7.1 Functional Display Devices

Data is acquired and processed by the DAS for presentation in the TSC, the EOF, and on the SPDS displays in the control room. A functional description of the display devices used in each of these facilities is required to determine their ability to meet the requirements of NUREG-0696.

General description shown in Figure 1.

1. Displays Required

There must be a minimum of the following display units present in each ERF location.

a. Control Room Displays

The primary SPDS display must be in the control room.

Figure 1 shows ERF displays present in control room, but does not reference a SPDS.

b. TSC Displays

There must be a dedicated mimic SPDS display unit in the TSC.

Figure 1 shows ERF displays present in TSC, but does not reference a SPDS.

Since trend information must be displayed, there must be at least one graphical display unit in the TSC. If trend information is not displayed on a graphical display unit, an alternate method of display must be provided and justified.

An instrument room may contain analog trend recorders. (Pg. 3)

There must be at least one dedicated terminal available to call up and display data specifically related to TSC functions (i.e., plant system variables other than those included in the SPDS).

Display area includes work stations each equipped with two general purpose CRT consoles to provide an overview of plant parameters. (Pg. 3).

There must be at least one terminal dedicated for display of in-plant and offsite radiological variables and meteorological information, for exclusive use in performing EOF functions in the TSC.

A separate meteorological room contains a CRT with hard copy to display meteorological information, maps, calculated offsite dose off-site radiation monitor readings, release data, and other relevant information.

There must be at least one hardcopy device available for printing information displayed on the CRT's.

Insufficient information. "...printout devices will be provided..." (Pg 16)

There must be at least one hard copy device capable of displaying graphics information. It is not necessary for the graphics printer to have the resolution or color equivalent of the graphics screen.

If static pictorial records such as area maps, building drawings, component drawings or system diagrams are kept on a computer for call up, a second dedicated graphics display device must be provided for this purpose.

c. EOF Displays

There must be a dedicated mimic SPDS display unit in the EOF.

Figure 1 shows ERF displays present in EOF, but does not reference a SPDS.

There must be a dedicated display device for the monitoring function to monitor radiological, meteorological and plant variable data.

Insufficient information. Figure 3 shows a CRT display area but does not specify any details on the number of displays. State the EOF will have displays for meteorological data, radiological data and plant data. No further information is provided.

If the radiological evaluation function in the EOF is performed with the aid of a computer, there must be a dedicated terminal for this function.

There must be a dedicated display device for obtaining information needed by offsite officials.

Since trending information must be displayed, a graphical display unit is required. This unit could also be used to display graphical data related to offsite dose predictions (i.e., plume dispersion, maps).

If static pictorial records, such as area maps, building drawings, component drawings or system diagrams are kept on a computer for call-up, a second dedicated graphics display device must be provided for this purpose.

If a terminal is used for news media briefings, it must be an additional separate terminal.

There must be at least one hardcopy device available which is capable of printing the displays on the CRT's.

Insufficient information.
"..printout devices will be provided.." (Pg. 16)

There must be at least one hard copy device capable of displaying graphics information. It is not necessary for the graphics printer to have the resolution or color equivalent of the graphics screen.

2. Display Device Functional Descriptions

For each parameter specified in 6.4 and 6.5 describe:

Not specified.

- a. The information to be displayed at the TSC and the EOF.
- b. The format in which it will be displayed.
- c. The method required to initiate the display of the parameter. (i.e., operator request, continuous display, etc.)
- d. Describe the method for display of trending information.
- e. Describe the method for recall and display of historical data.

3. Display Device Hardware Description

Not specified.

What equipment is provided to display data in the ERF's?

CRT Terminals:

Vendor name / Model Number?

I/O data rates?

As a minimum CRT screen capacity should be 80 characters by 24 lines. If the screens do not meet this requirement, specify their capacity and the justification for using the smaller capacity.

Define any special function keystroke input to be used.

What is the physical screen size?

Is there control over the character brightness?

If the terminal is intelligent, describe any special features that would be used, and how.

Hardcopy printers:

Vendor name / Model number?

Print rate (lines/minute)?

What is the number of characters per line?

What is the character set available?

Does the printer have graphics capabilities that will be used? If so, what are they and how will they be used?

Is the noise level generated by the printer when it is operating acceptable for the environment in which it is located?

Graphics equipment:

Is the display hardware raster or vector driven?

If the device is vector driven, what is the addressability (number of spatial resolution points on the display screen)? 512 X 256 is the minimum acceptable.

What is the line width of vectors drawn? 0.05 inches is the maximum acceptable.

What is the speed at which vectors are drawn on the screen (full screen vectors or inches per second)? 50 full screen vectors per second is the minimum acceptable.

If the display is a raster device, what is the pixel size and resolution (number of pixels on the screen)?

If the raster device is monochrome, how many levels of gray are available? How many are actually used?

If the device is color, how many different colors may be displayed simultaneously? How many are actually used?

What is the data transfer rate to the device? (specify pixels/second, vectors/second, or bits per second).

Does the data transfer rate support the device's display capability?

What is the refresh display rate of the display device? 30 Hertz is the minimum acceptable refresh rate.

Does the device have hardware vector generation capability?

Does the device have hardware character generation capability?

4. Availability of functional display data to the ERF display systems Not specified.

- a. What is the maximum response time to queries for information required during an emergency situation? The minimum acceptable response time is three seconds for at least 90% of the queries for information.
- b. If a response takes longer than 2-3 seconds, is the operator informed that the requested operation is in progress?
- c. If the displayed data is inconsistent or faulty, how is this deficiency indicated?

5. Functional Display Format

- a. What is the primary format used for data display? (Actual examples are preferred).
- b. Is the display of sufficient quality and simplicity that it may be seen and understood from the distances required by staff location? Factors to consider:

Is the most important information grouped in the upper-right-hand quadrant of the display?

How are related items of information grouped together on the screen?

How are sub-areas of the display separated?

Insufficient information. A hierarchy of displays is proposed. Top level displays will show overall critical safety function status. Next will show individual function status and third level will show subfunction diagnostics. The displays will also incorporate a feature which allows monitoring of all critical safety functions while paging through the displays.

Does every display page have a header, and are the headers consistent?

If color is used to highlight and differentiate portions of display formats, how many different colors are used and for what purpose is each used?

What other display dimensions (reverse video, size, blinking characters, etc.) are used in the display formats and for what purpose is each used?

6. Operator Interface to System

Not specified.

- a. Can the operator call up optional displays with simple word or keystroke commands? Some examples of commands should be provided.
- b. What is the maximum time required to enter a request for information? (30 seconds should be the maximum time).
- c. What are the levels of expertise needed to operate the system?

7. Functional Display Position

Not specified.

- a. What is the number of displays in each facility (TSC and EOF)?
- b. What is the position of each display device in the room?
- c. What is the maximum number of people who must view the display in an emergency situation?
- d. What are the distances and angles at which the display must be viewed?
- e. Are there any room illumination controls which must be utilized for proper viewing of the display devices?

7.2 SPDS

1. Availability of safety parameter data for the SPDS displays

What are the safety parameters available to the SPDS?

Are there any times when any such parameters are unavailable?

Document states ERF system includes provisions for the SPDS. Presumably displays in the control room are for SPDS.

Monitor critical safety functions of core reactivity core heat removal, RCS inventory, RCS pressure, RCS heat removal, containment temperature and pressure, containment isolation and radioactivity release.

2. Recognizability of the SPDS display

What features of the SPDS display distinguish it from the other displays and devices in the ERF and control rooms?

Not specified.

3. SPDS Location

a. Describe the location of the SPDS displays in the ERF's and control room.

b. How does the location of the SPDS insure that it can be easily accessed by the staff members requiring the safety information displayed?

c. Is the SPDS physically compatible with the existing facilities?

d. Does the SPDS present a hazard or obstacle to normal operation of the ERF?

Not specified.

4. SPDS Staffing

The SPDS should require no staff in addition to that necessary for the operation of the ERF. How does the design of the SPDS insure that this is the case?

Not specified.

7.3 Other Display Devices

If display devices other than those required by NUREG-0696 (EOF, TSC, and SPDS) are connected to the DAS, describe these devices and indicate their degree of impact on DAS performance.

Not specified.

8. Data Communications

8.1 Description

Not specified.

1. Provision must be made for adequate and reliable transfer of data among the components of the Data Acquisition System, and between the Data Acquisition System and the:

Technical Support Center

Emergency Operations Facility

Safety Parameter Display System displays

Nuclear Data Link communications equipment

Meteorological Data Facility

2. Provision must also be made for access to meteorological data in the DAS by the NRC Operations Center, and certain state and local agencies, if this service is not provided by facilities other than the ERF.
3. Block diagrams should be provided to show these data paths and the methods of transmission employed.

8.2 General

Not specified.

1. Is the link capacity sufficient for the maximum required rate of transmission?
2. Can all of the data channels meet the 0.01 unavailability requirement as defined in NUREG 0696, Section 1.5, under all conditions above cold shutdown?
3. Is all powered data communications equipment on an uninterruptible power supply?
4. How are the data channels protected from unauthorized modification?

5. Are all data channels, plus equipment spares, tested as part of the periodic testing program?

8.3 Added Questions for Data Links Using EIA Standard Interfaces

Not specified.

1. Do the voltage levels and impedances conform to the standard?
2. Does the data rate adhere to the standard for the distance spanned?
3. Are cables and connectors appropriate to the standard?

8.4 Added Questions for Voice-Frequency Links

Not specified.

1. Is error detection and correction provided, if not otherwise supplied by the protocol?
2. What provision is made for testing the voice-frequency segments?
3. Is the data rate within the specification for the modems for the distance spanned?
4. Are spare modems stored on site?
5. Are there redundant data links, physically separate and without common failure mode, in all locations where there is a reasonable probability of service failure?

8.5 Applicable Standards

Not specified.

Typical standards that may be specified for serial data and control signal transmission are:

EIA Standard RS-232-C. "Interface between data terminal equipment and data communication equipment employing serial binary data interchange." August 1969.

FED-STD 1020. "Electrical characteristics of balanced voltage digital interface circuits." September 1975.

FED-STD 1030. "Electrical characteristics of unbalanced voltage digital interface circuits." September 1975.

EIA Standard RS-422-A. "Electrical characteristics of balanced voltage digital interface circuits." December 1978.

EIA Standard RS-423-A. "Electrical characteristics of unbalanced voltage digital interface circuits." September 1978

EIA Standard RS-449. "General purpose 37-position and 9-position interface for data terminal equipment and data circuit-terminating equipment employing serial binary data interchange." November 1977.

9. System Support Requirements

9.1 Documentation

1. Describe the location where documentation is stored and the personnel who require access to this documentation. The minimum documentation to be included must be a user or operators manual, functional system documentation, hardware documentation and software documentation.

It is intended that the computer system be purchased as a turnkey system. Documentation would be included with the system.

2. User Documentation

- a. Is there an operator's manual or its equivalent for each display device or facility that is adequate to explain the use of the display as well as instructions for resolving problems?
- b. Does the documentation must include as a minimum:

Table of Contents that is well indexed for easy reference?

Description of how to use the manual?

System startup procedure?

System failure procedure?

Reference to support services (both hardware and software)?

Operating instructions for each piece of equipment?

Operating instructions for each request the user may initiate and response to be received?

References to other subsystems and documents?

- c. Is the user documentation self supporting such that no other documentation is necessary to operate the system?

- d. Does the user documentation contain guidance on the limitation of instrument readings and their reliability following serious accidents?

3. Functional System Documentation

- a. What documentation describes in detail the DAS, the communications systems and the display systems from a functional perspective, as well as the means of implementation?
- b. Does this documentation have reference to all documentation for subsystems which interface to the DAS, communications equipment, and display systems?

4. Hardware Documentation

- a. What hardware documentation provides information for the engineers or technicians other than the system designer to maintain the system?
- b. Does this hardware documentation include:
 - Theory of Operation?
 - Mechanical Prints?
 - Electrical Prints?

5. Software Documentation

- a. What documentation is available to maintain and evaluate the software?
- b. What procedures are to be followed to insure that the code contains sufficient comments for efficient maintenance and verification of the software?

6. Documentation Update Procedure

- a. What procedure which has been established for maintaining the manuals and other necessary documentation to assure that any changes in the DAS. communications system or display systems are reflected in this documentation.
- b. Who will be responsible for the updates?

9.2 Training

Training for operators and maintenance personnel must be provided.

It is intended that the computer system be purchased as a turnkey system. Training of personnel would be included.

1. User Training

- a. How will operators of display systems be trained?
- b. Who will perform this training?
- c. What review of the training procedure will be followed to respond to changes in the systems?

2. Maintenance Training

- a. How will the maintenance personnel responsible for the DAS. communications equipment and display devices be trained?
- b. How will the training of personnel be verified?

9.3 Quality Assurance

1. Software Verification/Validation

- a. What verification or validation plan has been developed for the software for the DAS and display systems?

It is intended that the computer system be purchased as a turnkey system. There would be stringent acceptance tests both at the contractor facilities and at the site.

- b. Does the test plan outline procedures for testing the following error types?

Logic Errors

Documentation Errors (especially in the User documentation)

Overload Errors

Timing Errors

Throughput and Capacity Errors

Fallback and Recovery Errors

- c. Does the test plan specify the overall test and integration philosophy, strategies, and methodologies to be employed?
- d. Who will perform the independent quality assurance function?
- e. Is there an adequate method to verify that there is a correlation between output data from the DAS and readings observed by the operators in the control room? Describe this method.

A string test from the individual sensor through the necessary processors and cables to the data output device shall be a part of this method.

2. Hardware Verification/Validation

- a. What is the verification or validation plan for the hardware necessary for the DAS, communications equipment and display systems?
- b. Who will perform the independent quality assurance function on this hardware?

3. System Log

a. Will a system log be maintained?

b. Minimum information in this log should be:

All system modifications

All system failures including time, reason and resolution

All planned outages

9.4 Reliability

NUREG-0696 specifies that data systems, instrumentation, and facilities of ERF's shall operate with an unavailability factor of 0.01, be down no more than 16 hours per calendar quarter, and be restorable within 30 minutes whenever the reactor is above cold shutdown status. Furthermore, any equipment affecting SPDS shall operate with an unavailability factor of 0.2 during cold shutdown. In order to determine if DAS equipment, display devices, and communications equipment meet this criterion, the following information must be reviewed:

Report states that these requirements will be met. No specific description is given.

a. For each of the following subsystems:

DAS equipment.

Functional display devices.

SPDS display devices, and

Communications equipment.

review the following:

What is the claimed mean time between failures?

What is the claimed mean time to repair?

What is the vendor's recommended preventive maintenance schedule?

What backup systems or components are provided?

How much time is required to bring a backup system on-line?

b. How are these claims justified? (Valid examples include historical records of other users of similar equipment, vendor-provided records of long-term test runs, and records of acceptance tests run on the proposed equipment.)

9.5 Maintenance

Not specified.

In order to insure that the data systems, instrumentation, and facilities of ERF's meet the unavailability requirement the following minimum hardware and software maintenance requirements should be reviewed.

1. Hardware Maintenance

- a. What is the hardware maintenance plan?
- b. How does the plan work to assure minimum unavailability?
- c. Concerning maintenance personnel:

What personnel are identified for the DAS- communications equipment and display systems?

Where are these personnel located?

How are the personnel qualified for the hardware they will be working with?

- d. Concerning spare parts:

Where are spare parts located for minimum practical replacement time?

Where are critical items located on-site?

If spare parts are to be supplied by outside sources, what is the maximum availability delay that can be assured?

Is the quality of the spare parts equivalent to the original equipment?

- e. Is maintenance support equipment available on demand?

- f. What is the schedule and procedure for calibration and verification of test equipment?

2. Software Maintenance

- a. What is the software maintenance and re-verification plan?
- b. Who will maintain the software for the DAS and display systems?
- c. What is the procedure for providing adequate qualified backup software maintenance personnel?
- d. What is the DAS update procedure?

Does this procedure insure that:

Changes to the software are authorized?

Any changes to the software are adequately tested and validated before they are implemented?

A description and date of the change have been recorded in a manner which can be easily reviewed?