# C-E OWNERS GROUP

# GENERIC INFORMATION AND

# CONTROL CHARACTERISTICS REVIEW

BASED ON THE

COMBUSTION ENGINEERING EMERGENCY

PROCEDURE GUIDELINES [CEN-152, REVISION 02]

AUGUST, 1985

## LEGAL NOTICE

## EXECUTIVE SUMMARY

CEN-307, "Generic Operator Information and Control Requirements Review", documents the process and results of a task analysis conducted on the Combustion Engineering Emergency Procedure Guidelines (CEN-152, Rev. 02) in order to identify the operator information and control requirements needed to support operations in accordance with the Emergency Procedure Guidelines. This work was funded by the Combustion Engineering Owner's Group in order to assist the task participants in meeting their NUREG-0700, "Guidelines for Detail Control Room Design Review", and NUREG-0899, "Guidelines for Development of Emergency Operating Procedures", requirements.

The task analysis was conducted according to standard human factor methods and techniques. In accordance with an agreement reached with C-E Owner's Group and the NRC in an August 29, 1984 meeting, the task analysis took as its starting point the Combustion Engineering Emergency Procedure Guidelines (CEN-152, Rev. 02). Systematic itioning of the EPG steps into the individual actions permitted the identification of the specific informational and control requirements needed to support the operators in conducting the required tasks. The characteristics (e.g., range, accuracy, response time, type of control, type of display, etc.) were identified in order to insure their suitability for supporting task execution.

CEN-307 provides a systematic documentation of the analysis, beginning at the Emergency Procedure Guidelines and proceeding through to the results. The result of the analysis is a consolidated list of information and control requirements which are needed to support operations in accordance with the Emergency Procedure Guidelines. This list identifies the functional characteristics of each of the requirements.

This document also provides a method, and each utility receives a software package which supports conversion of the generic document to a plant specific information and controls review. Once the plant specific conversion has been completed, the plant specific consolidated list can be compared with the

inventory of instruments and controls available in the particular plant control room. Achieving a satisfactory comparison between this plant specific consolidated list and the control room inventory will assist the task participants in meeting the NUREG-0700 and NUREG-0899 requirements.

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## 1.0 PURPOSE

The purpose of this document is to provide a list of generic information and control requirements and characteristics which would be required to support operator tasks conducted in the C-E Emergency Procedure Guidelines (EPG's), CEN-152. These information and control requirements can be used by C-E Owners Group (CEOG) participants (FP&L, NU, SCE, BG&E) as supporting information for their detailed control room design review (DCRDR) and upgraded emergency operating procedures (EOP's) efforts. Systematic development of operator information and control characteristics is required by NRC regulations in support of DCRDR and EOP efforts.

This document provides the basis for completing a review of operator information and control requirements on a plant-specific basis. Conducting this work on a generic basis reduces the amount of effort to complete the work on a plant-specific effort, provides the CEOG participants with a uniform approach, and provides documentation for information and control characteristics.

## 2.0 BACKGROUND AND SCOPE

NUREG-0700, "Guidelines for Control Room Design Reviews", and NUREG-0899, "Guidelines for Preparation of Emergency Operating Procedures", recommend the development of operator information and control needs which are required to support emergency operations in the control room. While not prescriptive regarding methodology, both NUREGs refer to function and task analysis as an acceptable method for developing these information and control (I&C) requirements. Until recently there has been considerable confusion regarding the definition of function review and task analysis and its use in developing I&C requirements.

In a meeting with the NRC on August 29, 1984, the CEOG achieved an agreement (reference 19, also contained in Appendix J) with the NRC which acknowledged the extensive development process which led to the C-E EPGs (CEN-152). The agreement stipulated that the C-E EPGs constitute an adequate function analysis for emergency operations. However, the NRC felt that in many instances, there was insufficient task specification for the development of either generic or plant-specific I&C requirements. Nevertheless, the use of the EPGs as a starting point for developing I&C requirements minimizes the amount of work to develop those requirements.

This document provides the methodology for performing a task analysis based on the CEN-152 (Revision 02) guidelines for the purpose of developing generic operator I&C requirements. The basis for the task analysis is a carefully described reference plant and the tasks derived from each step of the EPGs. Justification for the characteristics (e.g., range, units, type of display, accuracy, discrete or continuous, etc.) are based on, in as much as possible, primary source documents such as best estimate transient analysis, FSAR analysis and basic design documentation. Input from reactor operators was also a primary source for development of I&C characteristics.

## 3.0 METHODOLOGY

This section describes and explains the methodology used to develop the I&C requirements and characteristics as well as the justification for those characteristics. Broadly speaking, the C-E EPGs are taken as a starting point from which a task analysis methodology is used to develop I&C requirements and characteristics based on a specified reference plant. Figure 3.1 is a flowchart of the basic process. The elements of Figure 3.1 are fully developed below.

### 3.1 THE MULTIDISCIPLINARY TEAM

A multidisciplinary team of people with design, analysis, human factors, training, and operation expertise was used to perform the task specification and analysis. This section describes the duties, organization and qualifications of the multidisciplinary team members.

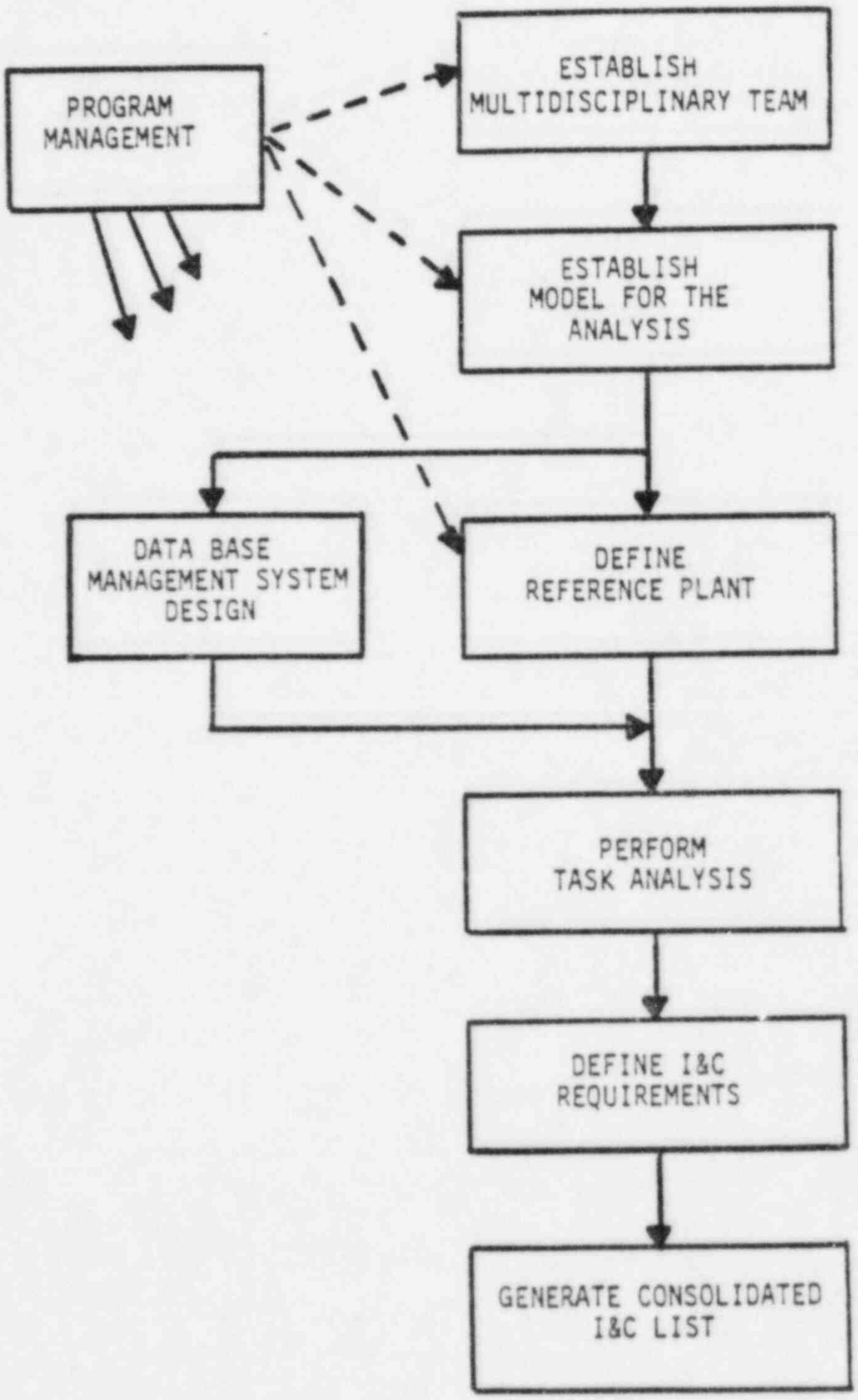
#### 3.1.1 Duties

The primary duties of the human factors specialists were to develop the analytical model for conducting the entire project, contribute to the data base management system design, assist in overall program coordination, conduct the task analysis and information and control specification, and provide input to the periodic technical review meetings. The human factors specialist was instrumental in designing the task analysis model which guided the conduct of the program. In so doing, the human factors specialist defined the work process for conducting the task analysis. The other principle duties were to participate in the development of the elements of human action required to execute each task and to conduct an ongoing comprehensive technical review of the program products.

The human factors specialist technical review provided assurance that standard human factors methods and principles were being observed and that the product (information and control specifications) were logically derived from the task analysis process.

FIGURE 3.1

GENERIC ICCR PROCESS



The operations specialist (senior reactor operator) on the team participated in the actual task analysis, specification of information and control requirements, and the periodic technical review of program products. The principal duties of the operations specialist was to assist in developing the units of human action required to execute each task and to participate in the comprehensive and periodic technical review. The operations specialist participation in the periodic and comprehensive technical review provided assurance that all primary and alternate information and control elements required for the execution of the emergency task were properly identified and specified.

The analysis and design specialists on the team were responsible for program management, actual conduct of task analysis, information and control specification, data base management system design and development, and technical review. The analysis and design specialists who participated in the team have had extensive experience in the design and development of the generic Combustion Engineering Emergency Procedure Guidelines (CEN-152) and plant specific emergency operating procedures. The instrumentation and control engineer on the team participated in the development of specifications for information and control capabilities and in the comprehensive and periodic technical review function.

### 3.1.2 Team Organization

Figure 3.2 depicts the organization of the multidisciplinary team and identifies by name the reporting relationship of each team member.

### 3.1.3 Credentials

The resumes for each team member shown in Figure 3.2 are attached in Appendix K. Inspection of the resumes will reveal that the appropriate team members meet the qualifications stipulated in Section 2.1 of NUREG-0801 (Evaluation Criteria for Detailed Control Room Design Review). Specifically, Dr. Richard Shannon and Mr. J. B. Winter of Advanced Resource Development Corporation and

Mr. Robert Pearce of C-E meet the criteria of Section 2.1.1.1, Human Factors Specialist; Mr. Paul Kramarchyk and Mr. Pete Dellarco, Senior Reactor Operators, meet the criteria of Section 2.1.1.2, Reactor Operator; Mr. Steven Ryder meets the criteria of Section 2.1.1.3 Instrumentation and Control Engineer; and, the other team members meet the general criteria of Section 2.1.1.4, Other Disciplines.

The SROs who functioned as operations subject matter experts (SMEs) are also qualified trainers. Thus, they brought additional valuable broad background to the analysis.

## 3.2 TASK ANALYSIS MODEL

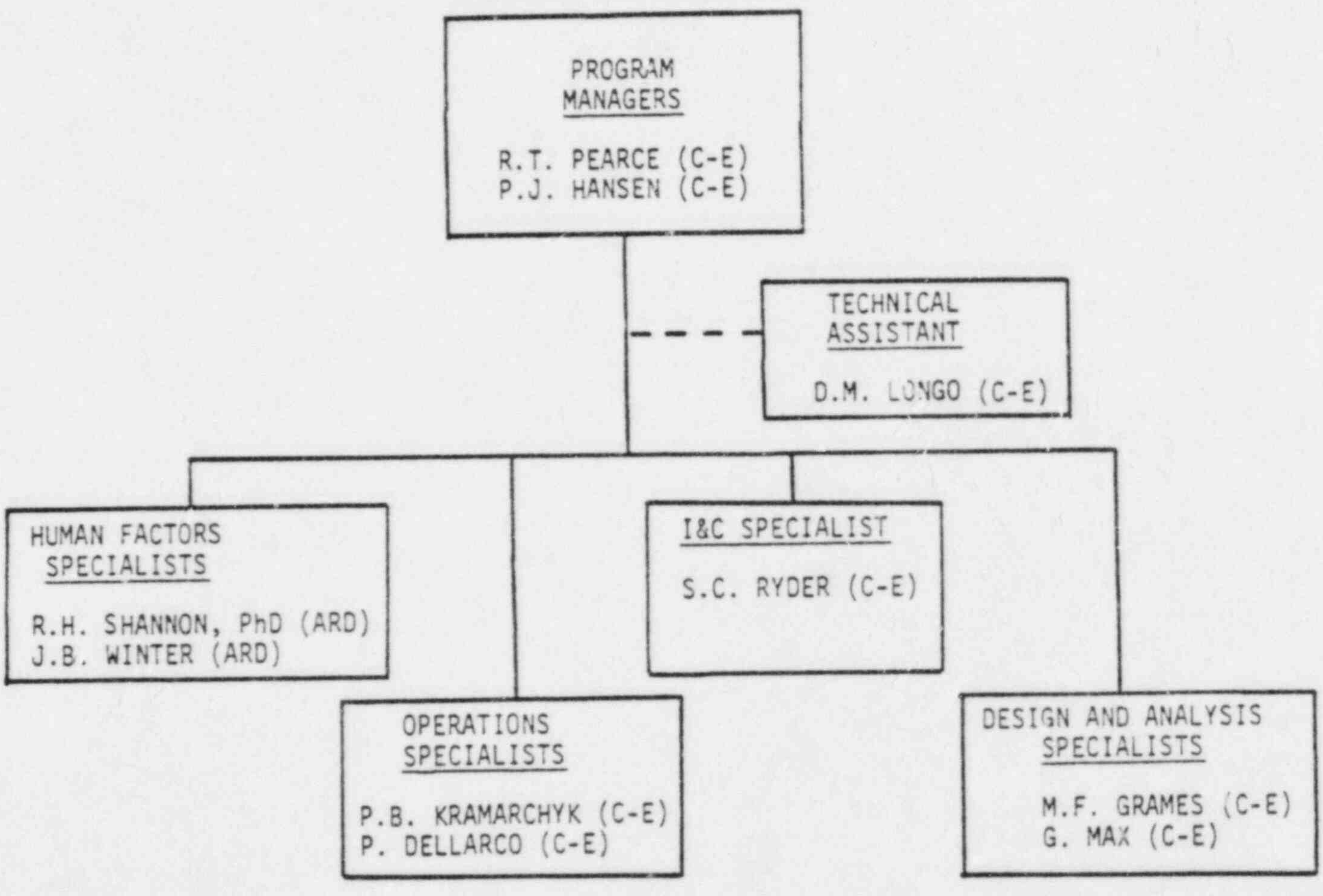
This section describes the model, or framework, which was developed for the Combustion Engineering Generic Instrumentation and Controls Characteristics Review (ICCR). The purpose of the model is to provide the assumptions, scope, definitions, and framework for conducting the analysis. The purpose of the analysis is to logically and systematically develop the information and control functions required in a generic control room in order to support operations in accordance with the Combustion Engineering Emergency Procedure Guidelines. The analytical model developed for this project uses many traditional task analysis methods, definitions, and assumptions.

### 3.2.1 General Method of the Generic ICCR

Nuclear power plant control room instrumentation and controls are the primary hardware interface between the human and machine for operations conducted from the control room. The Generic ICCR is an independent analysis (i.e., unconstrained by existing control room design) of this interface in order to determine its appropriate characteristics. Systematic determination of these interface characteristics provides a basis for determining the adequacy of an existing control room design with respect to its ability to support accident mitigation.

FIGURE 3.2

GENERIC ICCR ORGANIZATION CHART



The general method is a top-down analysis which begins with a set of high level operational goals. These operational goals are designed in a way so as to represent a complete set of processes and activities needed to insure public safety during a nuclear power plant accident. In this analysis, these top level goals are referred to as safety functions. A safety function may be accomplished or fulfilled utilizing one or more methods available in the power plant. Each method is comprised of a combination of equipment and operator actions. For example, "RCS Heat Removal" is a safety function. This function is needed during a variety of power plant accidents in order to transfer the core decay heat from the reactor coolant system to some other heat sink. "RCS Heat Removal" may be accomplished using a number of different methods available in the plant. The safety functions are more fully defined in Section 3.2.6.

The analysis proceeds by partitioning the safety functions into the various means for accomplishing each safety function. These means are referred to as "success paths". Each success path is a combination of hardware and operator actions which can be used to fulfill or restore a safety function. Success paths are more fully defined in Section 3.2.6. The success paths are then analyzed to determine the operator interfaces required to implement that success path. The interfaces are comprised of either control room information or control functions which are used to monitor and operate the success path.

In actuality the analytical process partitions success path operation into units of activity referred to as tasks. A task is a unit of control room operator work which may require the collection of plant information, the operation of plant systems (success paths), or both. A task is characterized by being a relatively small unit of work which lends itself to further partitioning and analysis and by being a unit of work which is comprised of approximately the same sequential elementary human actions regardless of the operational sequence in which that task appears. The chief criterion for the development of tasks is that the task should define the information and/or control functions needed by the operator to perform that unit of work. Further definition for tasks is provided in Section 3.2.6.

Next, each task was further partitioned into the units of human activity which need to be sequentially accomplished in order to execute the task. This analysis was conducted considering the complete context (i.e., all of the accident scenarios) of the task. The chief criterion for developing these task elements was that each should further refine and identify the information and control requirements needed by the operator to execute the task in the context of all of the operational sequences in which that task appears. Further definition of task elements is provided in Section 3.2.6.

Finally, a set of characteristics describing the functional requirements for each information or control need was identified. These characteristics consist of such things as range, accuracy, response time, etc. The rationale for identifying each of the functional characteristics was documented. Further definition of these information and control requirements characteristics is provided in Section 3.2.6.

Once the functional characteristics had been assigned for all the identified information and control requirements, these requirements and their characteristics were sorted (using the data base management system developed for this project) according to the particular plant component and system associated with that requirement. This sort was necessary since that particular information or control requirement (e.g., determination of pressurizer level, operation of an auxiliary feedwater pump) may have been identified and analyzed in a number of different tasks. Thus, a variety of functional characteristics may have been specified for the same information or control requirement depending on the operational sequence in which the task appeared. Sorting the tasks by affected component and system provided a basis for creating a composite set of functional characteristics for each identified information and control requirement. Using the composite functional characteristics, a final consolidated listing of all of the information and control requirements and their associated characteristics was developed. This consolidated listing is actually a comprehensive list of the information and control requirements needed to support control room operations in accordance with the Combustion Engineering Emergency Procedure Guidelines. This entire process is more fully documented and described below.

### 3.2.2 Scope of the Task Analysis

The purpose of conducting this task analysis was to identify the information and control requirements (and their respective characteristics) needed to support operations in accordance with the Combustion Engineering Emergency Procedure Guidelines (C-E EPGs), CEN-152, Revision 02. The analysis accomplishes this goal by systematically examining the interface between the operator and the plant hardware. Thus, such an analysis must be conducted in the context of a specific plant design. For this purpose, a reference plant design was chosen.

This analysis was conducted to identify information and control requirements only and only those information and control requirements needed in the power plant control room to conduct operations in accordance with the C-E EPGs. Requirements and characteristics were identified for only those systems, sub-systems, and components which are operated in the C-E EPGs. In summary, the analysis covered operations described in the C-E EPGs, CEN-152, Revision 02, to operate equipment defined in the reference plant (Appendix D) as conducted from the power plant control room.

### 3.2.3 The Reference Plant

The reference plant on which the task analysis was based is described in part in Appendix D. This description includes an example narrative for one of the systems used in the C-E EPGs, a basic flow diagram for that system, and a listing and descriptions of the major components including valves, pumps, heat exchangers, piping, breakers, buses, tanks, vessels, and other special components.

The complete set of systems included in the reference plant description are those used to conduct activities in accordance with the C-E EPGs. These systems were determined by a thorough review of the EPGs. The level of detail provided in the reference plant description example (Appendix D) is consistent with the level of detail utilized in the C-E EPGs and is adequate for identifying the elemental plant operations (e.g., operation of a valve, monitoring of a level) used in this analysis for determining the information and control requirements.

The reference plant used was the same reference plant utilized in CEN-128, "Response of C-E Nuclear Steam Supply System to Transients and Accidents" (Reference 1), which is a 2700 MW(t) C-E NSSS. CEN-128 provides additional detail with respect to the design of that reference plant. This reference plant was chosen because of its representativeness for the task analysis CEOG participants.

The reference plant description provides a hardware context in which to conduct the generic task analysis. It further provides a basis for comparison with a plant's specific design. Such a comparison is necessary for determining the differences in design between that used and the generic task analysis and that needed for a plant specific analysis. Where there are differences in design, a review of the tasks and information and control characteristics specified in the generic document must be conducted in order to ascertain its plant specific applicability.

### 3.2.4 Information and Control Characteristics Identified in the Analysis

This section identifies and defines the information and control functional characteristics which were developed in this analysis. The characteristics chosen for development were those which when taken together provide an adequate functional description of an information or control requirement from the standpoint of permitting an operator to efficiently and competently execute the associated task. The characteristics are defined below:

#### Functional Characteristics for Control Systems

Type of Control - Control systems can be divided into those which provide discrete functions, those which provide continuous control functions, and those which fall in neither category. Discrete control functions are those which provide the ability to obtain a finite or limited number of state changes in a plant component or parameter. Continuous control functions provide the ability to adjust a plant component or parameter over some continuum.

Mode of Control - A control system may provide for direct remote-manual control of a component or parameter or it may provide for the interpolation of an automatic feature. For example, direct remote-manual control could be the discrete or continuous ability to manipulate a valve (i.e., open, shut or over some range). Automatic control might be provided in a scheme where the operator would adjust a setpoint which would be automatically maintained by the control system positioning a valve or adjusting the speed of a pump. Some control schemes can be accomplished using either manual or automatic operation. Automatic in the context of this analysis does not include equipment which is operated on the basis of design setpoints which require no operator activity (e.g., reactor trip, CIAS, etc.). This analysis assumes a pre-existing functional allocation in which such automatic functions have already been allocated to the machine. The purpose of this analysis is to identify information and control requirements needed to support human activities in the control room, not automatic features which require no operator input.

Range of Control - This characteristic identifies the range over which a component or parameter may be controlled. For a discrete control function, the range consists of the various states which the control function may achieve. For a continuous control function, the range is the limits of the continuum over which that parameter or component must be controlled.

Units of Control Range - This characteristic identifies the units (e.g., percent, gpm, inches) associated with the range identified in the previous characteristic.

Reaction Time - This characteristic defines the time of response permissible for the control function. Reaction time is defined as the time from which the control function is manipulated by the operator until the plant component achieves the desired state (e.g., valve position, pump on or off). Reaction time does not necessarily

refer to the control function achieving a desired plant or parameter condition. These plant or parameter conditions (e.g., core reactivity, RCS flow) may have response time characteristics which are not susceptible to operator control given the current plant design.

Availability - This characteristic refers to special engineering requirements which may obtain for a control function relating to the importance of that control function. Two types of engineering requirements are identified in this analysis. Post-loop requirement refers to the need to have that control function available following a loss of offsite power. This applies if that control function must be powered from on-site vital electrical power. Post-DBA refers to the fact that some portion of that control function must be operable inside the harsh containment environment which would prevail following a steam-line break or a LOCA inside containment.

Characteristics for Information Requirements

Type of Display - This characteristic identifies whether an information display needs to provide a value, a value trend, or status information. Value displays provide point indications over some continuous range. Trend displays provide information about the trend of a parameter over time. Status displays provide indication regarding the state of a parameter or component.

Range of Display - This characteristic identifies the minimum range over which a value, trend, or status must be displayed. For a status indication, the range is the discrete states which the status indication can assume. It is anticipated that the range of actual control room display will often be greater than that required in this analysis. In fact, good human engineering practice will require that the range for many displays be greater than that stipulated in order to ensure that the device not be pegged during operations. However, in order to keep the analysis generic, this consideration was not included.

Units of Range - This characteristic identifies the units of the range specified in the previous characteristic.

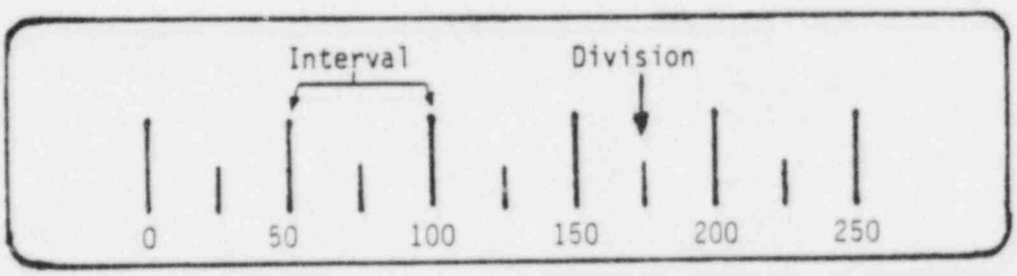
Accuracy of Display - This characteristic specifies the maximum inaccuracy which can be tolerated while permitting the operator to successfully execute a task. Accuracy is specified in percent of the range required for this information display. The status indications have no accuracy requirements since they display discrete information which is unambiguous.

Reaction Time - This characteristic identifies the response time needed by the operator to successfully execute the task. Response time is measured in seconds. For value and trend informational displays, response time is the time required for the information display to achieve 90% of the actual parameter change following a step change of the parameter. For example, if a parameter were to change from zero to 100 and the reaction time were specified as zero to one second, then the informational display would achieve a reading of 90 within one second following the actual parameter step change. For status indications, reaction time is defined as the time between the state change of the parameter or component and its reflection in the information display.

Availability - This characteristic refers to special engineering requirements for information displays. Post-loop refers to the need to have this informational display available following a loss of offsite power in order to execute the respective task. Thus, it requires that the information function be powered from onsite vital electrical power. Post-DBA refers to the need to have this informational display available to the operator following a steam-line break or a LOCA inside containment where some portion of that informational display (e.g., the transmitter) is located inside the containment building.

Intervals - This characteristic specifies requirements for the visual display for value or trend indicators. The display face is divided over the entire information or control range by major scale markings. The spaces these major scale markings create are referred to as intervals. Intervals in the consolidated report are specified in the number of units which separate the markings, e.g., if intervals = 20, there will be markings at 0, 20, 40, 60, etc. Major scale markings are labeled alpha-numerically. The requirement for these scale markings is determined considering the range of the information display, the required resolution for information displayed, and certain human factors principles.

Divisions - This characteristic refers to the minor scale markings which divide the space between the interval markings referred to in the previous characteristic for value and trend indications. Individual divisions are not labeled alpha-numerically. The number of divisions between intervals is determined considering the required resolution of information for this display.




Example illustrating intervals of 50 and 1 Division

Values for the number of intervals and divisions for any display are provided as minimum suggested graduations. Other graduation assignments may be equally valid for the range presented by the Information and Control Characteristics Review consolidated listings. DCRDR HED's should only be created if a comparison indicates the control room display hardware does not support operator tasks in a

direct and practical way according to the results of the plant specific task analysis and certain human factors principles.

The characteristics defined above are further defined and explained in Appendix E of this document. Appendix E also defines the scheme for coding these characteristics for the purpose of data entry in the data base management system.

### 3.2.5 Combustion Engineering Emergency Procedure Guidelines (C-E EPGs) and Event Scenarios

Based on NRC/Human Factors Engineering Branch concurrence at the August 29, 1984, CEOG and NRC meeting, this analysis took as its starting point the C-E EPGs, CEN-152, Revision 02. The results of this meeting are documented in NRC meeting minutes. The meeting minutes are provided in Appendix J. During this meeting, the NRC acknowledged that the C-E EPGs provide an adequate functional analysis for emergency operations as defined in NUREG-0899 and NUREG-0737, Supplement 1 (References 17 and 22). However, the NRC indicated that in many instances the C-E EPGs do not provide sufficient task specifically for identifying information and control requirements. This analysis provides that additional task specification and identifies the information and control requirements in the context of an existing design (the reference plant) presuming an existing functional allocation (i.e., the design activity during which design functions are assigned for accomplishment by human, machine, or some combination of human-machine).

The C-E EPGs are based on the ten safety functions defined in Section 3.2.6. The safety functions provide a framework for designing, organizing, and prioritizing information in the guidelines. The C-E EPGs are designed to provide the basis for developing detailed guidance for managing all power plant transients which result in either a reactor trip or an engineered safeguards feature actuation. This design is consistent with the requirements of NUREG-0899 (Reference 17). The guidance provided in the C-E EPGs can be divided into four sections.

The first section is the standard post-trip actions (SPTA). The SPTA is the entry procedure for the guideline system. It provides the operator actions which are to be executed by the operator during the first few minutes following the initiation of any plant transient which results in a trip or a safeguards actuation. The SPTA provides guidance for stabilizing most transients and permits the operator to assess the status and trend of the plant.

The second section of the C-E EPGs is diagnostics. Because diagnostics are highly plant specific and depend on operator training, plant design, control room arrangement, presence or absence of a SPDS, etc., diagnostics was not addressed in the generic task analysis.

The third section of the C-E EPGs contains the optimal recovery guidelines. There are six optimal recovery guidelines in Revision 02 of the C-E EPGs. They are reactor trip recovery, loss of coolant accident recovery, excess steam demand event recovery, steam generator tube rupture recovery, loss of forced circulation recovery, and loss of feedwater recovery. Each of these guidelines is designed to provide a strategic approach for mitigating classes of events (e.g., small and large LOCAs are addressed by the LOCA recovery guideline). Each event class is identified by a specific symptom set.

The fourth section of the C-E EPGs is the functional recovery guideline. The functional recovery guideline is designed to provide guidance for events which are misdiagnosed by the operator, for events which the operator is unable to diagnose, and for events which present complex symptom pictures due to

multiple plant failures, instrument malfunctions, or the occurrence of novel events. The functional recovery guideline (FRG) provides guidance for the maintenance and/or restoration of the safety functions using all of the available success paths regardless of the initiating event or its subsequent consequences.

The guidance portion of the SPTA consists of a set of criteria which would prevail following an uncomplicated reactor trip accompanied by a set of remedial short-term actions which the operator would take in an attempt to stabilize the plant transient. Task listings were developed for both the criteria and the alternative actions in the SPTA.

The guidance portion of each optimal recovery guideline is comprised of guidance steps, supplementary information (i.e., notes, precautions, warnings) and a safety function status check. The safety function status check is a set of criteria which is periodically reviewed against plant conditions to determine the adequacy of core cooling and to assist in confirming that the EPG in use corresponds to the plant symptom set. Task listing were developed for each of these optimal recovery guideline sections.

The function recovery guideline is comprised of an entry procedure, a safety function status check, resource assessment trees, and a recovery guideline for each generic plant success path. Each of the success path recovery guidelines consists of guideline steps, success criteria, and supplementary information (i.e., notes, precautions, and warnings). Task listings were developed for each of these portions of the functional recovery guideline. Task listings were not developed for the long-term actions portion of the FRG because this section of the guideline is general and does not entail any specific task sequences.

A set of plant transient scenarios was chosen to provide a context for exercising the EPGs on the reference plant. The scenarios were chosen so as to provide a broad range of exercising the EPGs. The scenarios were selected from three general sources. First, the optimal recovery guidelines of the EPGs address certain broad categories of scenarios. These are uncomplicated

reactor trip recovery, loss of coolant accident, steam generator tube ruptures, excess steam demand events, loss of forced circulation, and loss of feedwater. Transient event scenarios were selected to address all of these classes of events.

Second, a substantial number and variety of plant simulation thermo-hydraulic and nuclear transient analyses have been conducted over the years for a number of purposes. These analyses are documented in a number of topical reports prepared by Combustion Engineering as well as in the Chapter 6 and Chapter 15 analyses in Final Safety Analysis Reports. References 1 through 15 provide a listing of these documented transient analyses. These analyses were consulted and referenced extensively during the development of task listings, the breakdown of tasks into task elements, and the development of information and control requirements and characteristics for those task elements. Thus, the analyses provide for a broad and extensive exercising of the EPGs in the context of the reference plant as well as providing an objective basis for determining an adequate range of functional characteristics for the identified information and control requirements.

Third, the multi-disciplinary team, especially the Senior Reactor Operator Subject Matter Experts, provided input to the scenario development which contributed in two ways: one, the Subject Matter Experts provided input on aspects of the event scenarios not addressed in the nuclear and thermo-hydraulic computer simulations; and, two, the Subject Matter Experts on the Multi-Disciplinary Team inserted additional complexity into the event scenarios and the task analysis by considering the possibility of minor supporting and control system failures, parameter variations, and multiple failures. A combination of these three sources of scenarios provided a broad exercising of the Emergency Procedure Guidelines on the reference plant.

### 3.2.6 Definitions and Assumptions

This section provides a number of definitions and assumptions utilized in the task analysis model.

### Information and Control Requirements

The purpose of the task analysis is to identify the information and control requirements needed in a control room to operate the reference plant in accordance with the C-E EPGs. Information and control requirements are the individual units of the analysis results. For example, an information requirement might be identified as the ability to determine pressurizer level. Similarly, a control requirement might be identified as the ability to control the operation of an auxiliary feedwater pump.

### Information and Control Requirement Characteristics

In addition to identifying the individual information display or control schemes required, this analysis identifies the minimum functional characteristics needed for each requirement. The functional characteristics describe the features needed for each informational display or control scheme in order to permit execution of the task in a competent and timely fashion. For example, the characteristics described in this analysis for an informational display are type of display, range of display, accuracy of display, the units of display, reaction time of the display, availability of the display, display divisions, and display intervals. It is anticipated that many of the characteristics developed generically will change during the plant specific conversion of this document.

### Functional Allocation

Functional allocation refers to a traditional design process during which required functions of the design are assigned to be accomplished by either the human or the machine or some combination of both. This allocation is determined by considering the tasks which must be conducted to complete the design function and the suitability of the human and machine for conducting those tasks. In this analysis, the functional allocation is presumed to exist in the existing design as described in the reference plant (Appendix D). Thus, the functions which are task analyzed herein are those which require human activities to fulfill the required design functions for emergency operations.

Functions

The term function as used in this analysis refers to a set of safety functions defined by W. R. Corcoran, M. T. Cross, J. F. Church, and N. J. Porter, in Reference 20. As defined by Corcoran, et al., the safety functions are a complete set of the actions which must be accomplished to preserve public safety following an unexpected power plant transient. Table 3.1 provides a definition for each of the safety functions. The first five safety functions on this list are referred to as anti-core-melt safety functions. Their purpose is to reduce core heat output and to ensure core heat removal in order to prevent damage to the core. The next three safety functions have the purpose of ensuring that any radioactivity which may be released from the reactor coolant system is contained inside the containment building. The ninth safety function on Table 3.1, Maintenance of Vital Auxiliaries, is a function which cuts across all the safety functions and provides the supporting systems which enable the other nine safety functions. The tenth safety function in Table 3.1, Indirect Radioactivity Release Control, is intended to control the release of radioactivity from sources outside the containment building. This safety function is not addressed in the C-E EPGs, and therefore is not addressed in this task analysis effort. The C-E EPGs use the safety functions as a framework for designing, organizing, and prioritizing the guideline information. The safety functions are defined at a somewhat higher conceptual level than is typically the case in traditional function/task analyses. However, each EPG step has as its purpose the fulfillment or restoration or one or more of the safety functions.

Each safety function can be fulfilled or restored using two or more methods. These methods are referred to as success paths. The success path is a combination of human action and plant hardware functioning. Most guideline steps in the C-E EPGs have the intention of monitoring or activating one or more success paths in order to restore or fulfill a safety function. Thus, the success paths delineate the interface between human action and operation of plant systems and equipment.

TABLE 3.1

DEFINITIONS OF SAFETY FUNCTIONS

| Safety Function | Purpose |
|---|---|
| Reactivity control | Shut reactor down to reduce heat production |
| RCS inventory control | Maintain a coolant medium around core |
| RCS pressure control | Maintain the coolant in the proper state |
| Core heat removal | Transfer heat from core to a coolant |
| RCS heat removal | Transfer heat from the core coolant |
| Containment isolation | Close openings in containment to prevent radioactivity releases |
| Containment temperature and pressure control | Maintain environment to prevent containment and equipment |
| Combustible gas control | Remove and redistribute hydrogen to prevent or minimize the effects of hydrogen explosion inside containment |
| Maintenance of vital auxiliaries | Maintain operability of systems to support safety systems |
| Indirect radioactivity release control | Contain miscellaneous stored radioactivity to protect public and avoid distracting operators from core protection |

FIGURE 3.3

HIERARCHY OF SAFETY FUNCTIONS

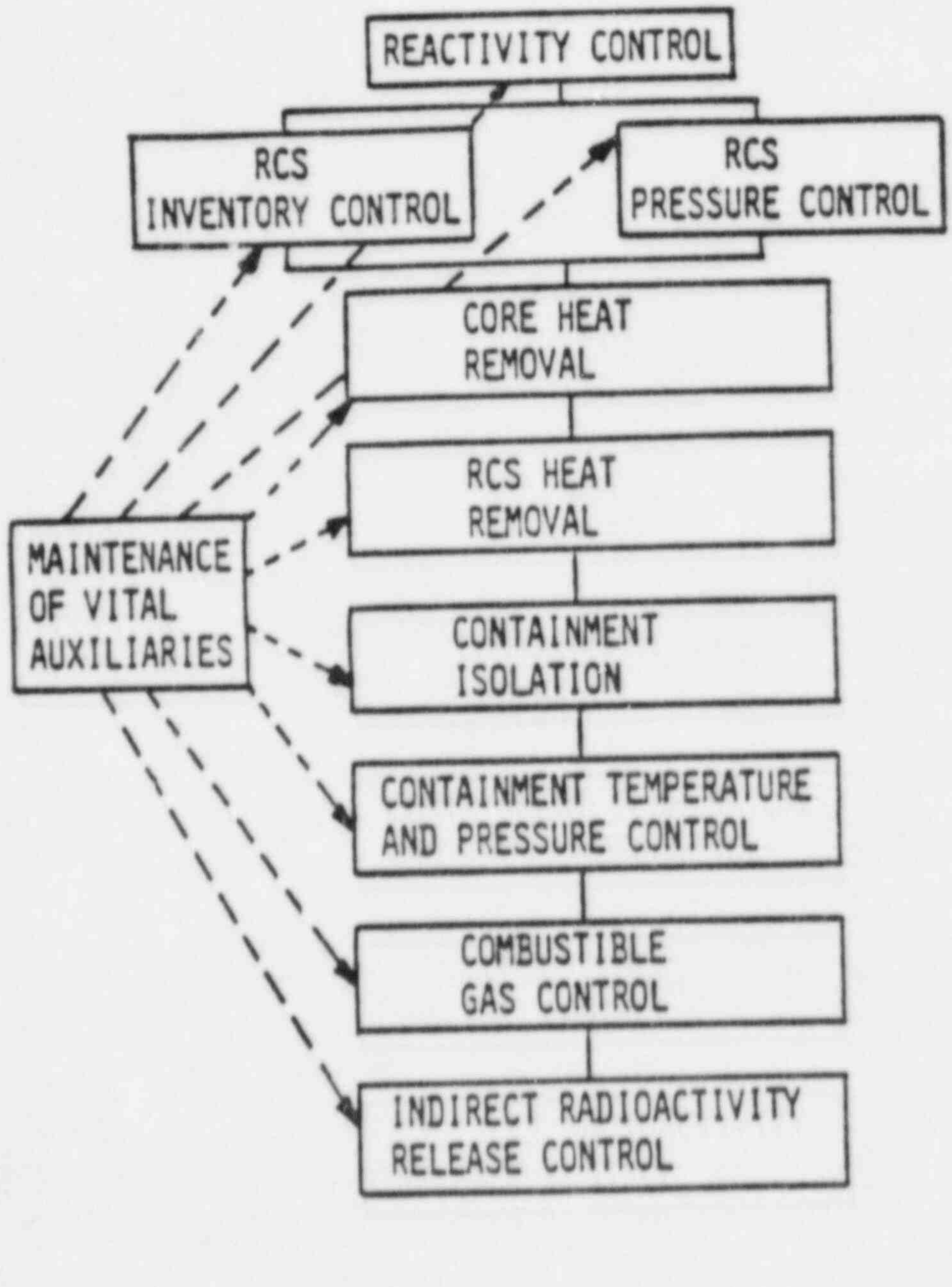


Figure 3.3 illustrates the hierarchical relationship of the safety functions. Safety functions at the top of the hierarchy are associated with plant parameters which can change quickly. For example, the reactivity control safety function is associated with the reactivity of the core. Core reactivity can change nearly instantaneously. Safety functions located at the top of the hierarchy are also associated with plant conditions which must be achieved in order to permit the fulfillment of functions located at a lower level in the hierarchy. For example, under most circumstances, RCS inventory and pressure control must be maintained before core and RCS heat removal may be achieved. Note that maintenance of vital auxiliaries is not located on the hierarchy, but rather supports the functioning of each of the other nine safety functions.

Task

In general terms, a task analysis consists of analyzing <u>what</u> has to be done (functions) into <u>how</u> it gets done. Tasks describe how work gets done. In this analysis, tasks describe the human action which must be carried out to monitor or activate equipment in order to achieve the various safety functions. A task is defined as a meaningful unit of work which can be performed by one or more operators to produce an identifiable output in connection with a stated purpose or goal. Tasks are selected in a manner which is independent of the scenario in which a task may appear. That is, no matter what EPG or portion of an EPG a task may appear in, it consists of the same sequence of human actions in order to execute the task.

Tasks are constructed according to a prescribed format. Each task is begun with a well-defined verb from the verb list (see below) followed by the object of the verb, which may be a plant parameter or a plant component, sub-system, or system. The task statement may include a clarifying clause as well. For example, the task "Ensure (verb) proper MFW pump (object) operation" observes the prescribed format. A task is initiated by a cue which may consist of a procedural step, a plant alarm, the operator noting a plant condition, or some other cue. Table 3.2 provides a set of criteria for task development.

TABLE 3.2

CRITERIA FOR DEVELOPING TASK STATEMENTS

1. Tasks are a small, conveniently analyzable unit of work conducted in the control room with respect to systems identified in the Reference Plant description.

2. A task is a unit of control room work which is independent of the preceding or following task. That is, its contents and sequence of activities will remain the same regardless of the operational transient in which the task appears.

3. A task statement is begun with one of the task verbs identified in the verb list followed by the object of the verb. The object of the verb may be a parameter (e.g., "Determine pressurizer level") or a component, system or subsystem (e.g., "Align the SIS for cold leg injection" or "Ensure proper HPSI pump operation").

4. Tasks are comprised of 15 or fewer units of human actions (task elements).

5. Tasks should be identifiable with no more than one plant system or subsystem.

6. The purpose of the task (usually implicit) is to maintain or restore one or more related safety functions.

Task Element

Task elements are the units of human activity which comprise a task. A task element is defined as the smallest unit into which work can be divided without analyzing separate motions, movements, and mental processes. A task element is usually performed by no more than one operator. The task elements constitute a scenario of actions that must be carried out in order to accomplish a given task. Task elements are written in the same format as tasks and utilizing the verb-object construction with verbs from the verb list. Task elements are written at the level of detail which points directly to an information or control requirement.

Task elements may overlap with defined tasks. Overlap may occur when a task element from one task may also legitimately be used as a task which can stand alone for a given purpose. An example of overlap is the task "Determine containment pressure." This task can be conceptualized as having purpose and being capable of standing alone, though it may also be used as an element of other larger, more complex tasks, e.g., "Ensure proper containment spray operation." Table 3.3 provides criteria for developing task elements.

Typically, task elements are listed in a task in their anticipated order of occurrence. However, task elements may also be used to indicate alternative ways of accomplishing a specific activity. For example, there are a number of methods for determining if a pump is operating properly. An operator might read pump motor current, breaker status, controller status, discharge pressure, suction pressure, discharge flow, etc. Depending on the task, task elements might be developed for each of these methods to provide a listing of alternative ways of monitoring pump operation. In this analysis, task elements are used to represent alternative methods for obtaining plant information while acknowledging that all of these methods (information requirements) may not be available or even desirable in a particular power plant control room.

TABLE 3.3

CRITERIA FOR DEVELOPMENT OF TASK ELEMENTS

1. Task elements follow the same verb - object format as task statements. The verbs are chosen from the task element verbs on the verb list.

2. Task elements are elementary human actions needed to accomplish a particular task.

3. Task elements are written only for human actions in the control room which require the use of a control room information or control function. A task statement may be used as a task element inside another task of greater complexity. When this is done, the analyst must insure that the information and control characteristics developed for the simpler task are appropriate in the context of the more complex task.

4. Task element verbs may be divided into sensory - cognitive or behavioral. These categories are related, respectively, to information and control requirements.

5. Each task element refers to one and only one information or control requirement.

Task Listings

With the exception of steps which are administrative in nature, each EPG step has as its purpose the restoration or fulfillment of one or more safety functions. Each step can also be partitioned into one or more tasks. A task listing provides a sequential partitioning of EPG steps into the appropriate tasks. A task listing is provided for each EPG. Appendix B contains a portion of the task listing for the loss of forced circulation EPG.

Each EPG step is summarized according to the safety functions which are affected by that step. Each step is partitioned into the task which constitute that step and those tasks are listed in their anticipated sequence of occurrence. Tasks are listed which pertain to both the actions necessary to carry out the EPG step and the actions required to obtain feedback information on the success of the EPG step. In the optimal recovery guidelines, task listings are developed for the EPG step section, the safety function status check, and for the supplementary information section (i.e., precautions, warnings, notes). In the functional recovery guideline, task listings are developed for each recovery guideline section, each recovery guideline acceptance criteria (these are identical with the safety function status check criteria), the supplementary information for each recovery guideline, and for each of the resource assessment trees. Thus, the task listings provide a summarization of each guideline in terms of a listing of the task which constitute that guideline. A task listing also constitutes the first level of partitioning of an EPG into a greater level of detail.

Task Inventory

The task inventory is a reference data file which provides the location of each instance of occurrence of a task throughout the EPG system. A sample page from the task inventory is included in Appendix C. The task inventory is a five column locater data file. The first column is a two-digit code which indicates the system associated with that task; the second column is a four-digit task code which is unique to a particular task; the third column is a two-digit number which corresponds to the EPG in which that task is located;

the fourth column is the task sequence number which is the three-digit number which indicates the sequential order of appearance of that task in a task listing; and, finally, the fifth column is a four-character alpha-numeric code for the section of an EPG (i.e., EPG step number, supplementary information item number, or acceptance criteria item number) in which that task appears. Thus, the task inventory provides a complete index of each instance of appearance of a task throughout the guideline system.

Verb Lists

A set of well-defined verbs are used to create tasks and task elements in accordance with the format prescribed. Using well-defined verbs ensures a consistent and reliable understanding of the task statements and their elements. The verbs used in this analysis and their corresponding definitions are provided in Table 3.4.

### 3.2.7 Independence, Validity, and Reliability

The purpose of this task analysis is to provide an independent determination of the information and control requirements needed in a power plant control room to conduct operations efficiently and competently in accordance with the Combustion Engineering Emergency Procedure Guidelines (CEN-152, Revision 02). "Independent" refers to the requirement of the analysis that it be unconstrained by existing control room designs. That is, the analysis will develop the information and control requirements without regard to instrumentation or controls that exist in any particular control room. This analysis meets the requirements for independence as follows. First, it is a generic analysis. While a Reference Plant design is defined with respect to plant systems, sub-systems, and components, no description is offered or referenced with respect to information or control requirements, instrumentation, or control room design. Second, the analysis is modeled and conducted as a top-down activity which derives information and control requirements based on a analyzed interaction between the Reference Plant and the operator. The interface analyzed is that which must be utilized in an

## TABLE 3.4

## VERB LIST

| Task/ Task Element | Verb | Definition |
|---|---|---|
| T. | Align | - To arrange or configure components so as to let flow or current pass. |
| T./te. | Block | - Manipulation of instrumentation or controls which either results in blocking of the automatic initiation of system or component operation. |
| te. | Calculate | - To make a computation. Suggests the use of simple mathematics and results in a determinable results in a determinable result; e.g., calculate the RCS boron concentration. |
| T. | Compare<br>Evaluate | - To examine in order to note similarities or difference. |
| te | Close | - To shut. |
| T. | Control | - The act of regulating a plant parameter. Control is usually performed by way of an instrument or apparatus which is available in the control room, which in turn regulates a mechanism. |
| T./te. | Decrease | - To cause to become less or smaller; to reduce; e.g., restrict flow, decrease pressurizer level. |
| te. | Detect | - To note, hear, see, sense or become aware of, e.g., a plant alarm, a change in valve status. |
| T./te. | Determine<br>Decide<br>Diagnose | - To consult control room instrumentation so as to decide or settle conclusively the status of a plant parameter, plant equipment, etc. A decision which is based on a careful examination and analysis of plant parameter(s). |
| T. | Establish<br>Restore | - To set securely in a condition; e.g., create or establish a flow. |
| T./te. | Increase | - To make greater or larger; e.g., increase turbine speed. |
| T. | Ensure | - To determine or verify a state or condition, and in its absence, to cause it to occur. |

TABLE 3.4 (continued)

VERB LIST

| Task/ Task Element | Verb | Definition |
|---|---|---|
| T. | Isolate | - To separate or set apart; e.g., to close valves so as to segregate a system, an area or a component. |
| T. | Monitor | - To continually check for status, by means of a control room instrument; e.g., monitor an edgewise meter for changes in pump discharge pressure. |
| T. | Maintain | - To continue; carry on; keep up a certain condition; e.g., as in to maintain less than 1 psig in containment. |
| te. | Open | - To remove obstructions from; to clear; to form spaces or gaps between; e.g., open the valve. |
| te. | Position | - To place or locate a component or instrument in a predetermined position. |
| te. | Read | - To visually collect control room information using a display. |
| te. | Record | - To indicate permanently, to register the performance of a plant parameter over time. |
| te. | Request | - To initiate a task sequence in which all actions occur outside the control room. Instrumentation or controls are not associated with the task element verb request. |
| T./te. | Reset | - To place a system or component in a position or state in which automatic actuation can again occur. |
| te. | Start | - To set into motion, operation, or activity; e.g., start the pump. |
| te. | Stop | - To cause to halt, cease or terminate; e.g., to cause a motor to stop operating. |
| te. | Throttle | - To regulate, as in regulate flow or speed. Suggests ability for partial movement. |

TABLE 3.4 (continued)

VERB LIST

| Task/ Task Element | Verb | Definition |
|---|---|---|
| T./te. | Trip | - To release a catch, trigger or switch, setting something in operation; e.g., electrical logic to stop a pump. |
| T. | Verify | - To give confidence to the certainty or validity of; e.g., visual inspection of displays or light indication for valve position. |

hypothetical control room to activate the Reference Plant systems and components to restore or fulfill the safety functions. Thus, the requirements derive from the need to fulfill or restore the safety functions rather than any preconceived notion about existing instrumentation or controls.

Validity refers to that feature of a study which provides assurance that the conclusions reached are consistent with the process and context of the study (i.e., internal validity) as well as being representative of reality outside the context of the study (i.e., external validity). The design of this analysis achieves internal validity as follows. First, the analysis is conducted in accordance with a pre-determined and defined design. The assumptions, definitions, limits, methods, and goals of the design are well-defined and structured to ensure that the results are logically obtained as a result of the application of the process. Second, a multidisciplinary team is used to conduct the analysis. This ensures that the logic of the process as well as the intermediate and final results are viewed from a variety of expert points of view. This feature was further enhanced by periodic technical review meetings during which the direction and results of the process at that time were reviewed by the team.

External validity is assured in this analytical design as follows. First, the analysis is conducted by a team of experts who applied experience in power plant design and operations. This ensures that the results obtained are applicable to and implementable in a power plant control room. Second, a representative power plant design is used as the Reference Plant. This ensures that the results (information and control requirements) are derived from the need to operate power plant systems, sub-systems and components which are representative of existing power plants. Third, the analysis makes reference to extensive design documentation and transient analysis for the Reference Plant and similar designs. This ensures that inputs to the analysis are representative of existing designs. Fourth, the analytical design takes as a starting point the C-E EPGs. These EPGs have been validated in a number of trials on full scope simulators as well as having been implemented at a number of C-E designed plants. The validation of the EPGs provides assurance that the primary input to the analysis has already been tested with respect to its implementability in a real power plant design.

Reliability refers to the reproducibility of the results obtained in an analysis. In a study which obtains reliable results, similar results would be obtained by a different team of experts using the same methodology and inputs. Reliability of results is assured in this analytical design as follows. First, objective criteria are used throughout the design to permit clear-cut decisions and measurement. For example, a well-defined set of verbs are used to ensure that task and task element statements possess a clear-cut meaning. Similarly, the functional characteristics which are determined for each information and control requirement are clearly defined in the analysis model. Further, the coding scheme developed for data base entry provides a limited forced choice for most of the characteristics which limits the degrees of freedom in determining the results. Second, the analysis is conducted in phases and, consequently, the intermediate and final results are developed and reviewed a number of times. Most tasks appear in more than one EPG. Thus, each task is analyzed in the context of a number of different scenarios. Most components, sub-systems, and systems are employed in more than one task. Therefore, information and control requirements may be developed for a particular component a number of times depending on the tasks in which that component is utilized. During the consolidation phase, composite results are developed for each component which embrace the information and control requirements developed for that component in as many tasks as it appeared in.

### 3.2.8 INPO Job Task Analysis Cross-Reference

The C-E ICCR provides a cross-reference to the Institute for Nuclear Power Operations (INPO) Job and Task Analysis. INPO's Training and Education Division has conducted a job and task analysis project for operations, maintenance and technical support positions in the nuclear industry. The cross reference to the INPO Job and Task Analysis provides utilities with the information necessary to access job task data for their specific plant or for plants of similar configuration. This makes it possible to easily reference task information in the INPO data base since the C-E ICCR cross reference identifies, by task title code, where the same type of task information has been analyzed by INPO. The task title code is the 10 digit number found in the "task breakdown" report. The cross reference was established at the request of the C-E Owners Group Operations Subcommittee. It can provide a useful means for tying this effort to utilities' job training programs.

## 4.0 DATA BASE MANAGEMENT SYSTEM (DBMS)

A data base management system using Ashton Tate dBase III (TM) was created for storing, organizing, manipulating and printing significant portions of the generic ICCR. Each Owners Group participant received (on floppy disk) the dBase III executive program and all of the data entered for the generic analysis in order to permit conversion to a plant-specific document. The DBMS is built for running on an IBM PC or compatible with 256K RAM and a 10 megabyte hard disc capacity.

The DBMS has been set up to be easy to use and easy to understand. It is an entirely menu driven system which permits data entry, data modification, data reading, and data printing, in a variety of report formats. The DBMS is run by program command files which contain the procedures for actually executing dBase III activities to store, retrieve, and manipulate information. Data base files are used for storage and organization of information.

The main menu for the DBMS is shown on Figure 4.1. There are four main sections to this menu. The first section permits additions of new data to the data base. The second section permits display and modification of data already entered in the data base. The third section permits reporting of data base information via the printer. The fourth section permits reading data in certain report formats on the CRT.

The structure of the DBMS facilitates the work process of task analysis. Details regarding each of the main menu items and use of the data base are provided in Appendix E. Briefly, menu items for task breakdown (items 1, 5, 10, and 16) permit input, retrieval, modification, or printing of the task elements associated with each task statement. Main menu items associated with task breakdown and task elements (menu items 1, 5, 10, 11, and 17) permit input, retrieval, modification, and printing of the information and control characteristics associated with each task element. Main menu items for information and control bases (items 2, 6, 12) permit inputting, modification, and printing of the basis for each element's information or control characteristics. Main menu items for "lookup tables" (items 4, 8, and 9)

permit input, modification, and printing of "lookup table" contents. "Lookup tables" contain information which is numerically coded for ease of entry and which is repeatedly used throughout the DBMS. Main menu items for consolidated output (items 3, 7, 15, and 18) provide for inputting, modification, printing, and viewing of the consolidated information and control requirements. Main menu item 13, Task Listings, is a print report which lists the task statements by their sequential order of occurrence in each EPG Main menu item 14, I&C Component listing, provides a report of all I&C requirements by affected plant system and component.

FIGURE 4.1

DATA BASE MANAGEMENT SYSTEM MAIN MENU

INFORMATION AND CONTROL CHARACTERISTICS REVIEW

MAIN MENU

ADD DATA

1) TASK BREAKDOWN
2) I&C BASES
3) CONSOLIDATED OUTPUT
4) LOOKUP TABLES

MODIFY OR DISPLAY DATA

5) TASK BREAKDOWN
6) I&C BASES
7) CONSOLIDATED OUTPUT
8) LOOKUP TABLES

REPORTS TO PRINTER

9) LOOKUP TABLES
10) TASK BREAKDOWN
11) TASK ELEMENT INFO/CONTROL
12) INFO/CONTROL CHAR. BASES
13) TASK LISTINGS
14) I&C COMPONENT LISTING
15) CONSOLIDATED

REPORTS TO SCREEN

16) TASK BREAKDOWN
17) TASK ELEMENT INFO/CONTROL
18) CONSOLIDATED

B) BACKUP ICCR DATA BASES
Q) QUIT SESSION AND RETURN TO MSDOS 2.1

PLEASE CHOOSE ONE

## 5.0 DESCRIPTION OF THE ANALYSIS

### 5.1 MULTIDISCIPLINARY TEAM

The analysis was conducted as a team effort. With the exception of the senior reactor operators (SROs), all team members participated in each phase of the analysis described below. The SROs functioned strictly as subject matter experts. In addition to the actual conduct of the work, bi-weekly technical review meetings were held. All team members participated in the meetings and reviewed the work which had been completed in the prior two weeks. These meetings provided an additional opportunity for a cross- discipline review of the work as it was developed.

### 5.2 DEVELOPMENT OF TASK STATEMENTS, TASK LISTINGS AND THE TASK INVENTORY

The first level of analysis in this study was the division of CEN-152 into safety function steps within each EPG section. The term "function" as used in this study refers to a set of safety functions defined by W.R. Corcoran, M.T. Cross, J.F. Church, and N.J. Porter (Reference 20). Each EPG step or section was summarized by noting the safety functions being addressed. With this departure from the wording of CEN-152, the same numbering of steps was preserved in the analysis for reference purposes.

The next level of the analysis involved the development of a unique set of tasks which could be related to the steps of the EPGs. Team members analyzed a particular guideline or guideline section to develop the tasks which would be required to maintain or restore the safety functions of a particular EPG step. Tasks were identified as a set of operator actions which constitute a unit of work that is independent of the particular task sequence (i.e., the same regardless of the preceding or subsequent task). Tasks were identified at approximately the same general level of abstraction. Some tasks overlapped with other tasks. That is, "Determine pressurizer level" is an appropriate task and appeared as a stand alone task in a large number of EPG steps. It also appeared as a task element of a number of other tasks of somewhat greater complexity.

Next, a commonality analysis was conducted across all of the event scenarios. The goal of this analysis was to identify the minimum number of unique task statements which would encompass all of the task requirements for all EPG steps. The purpose is minimize the task analysis effort and to assure consistency of analysis and results across all EPGS. The result was a set of approximately 150 task statements.

Appendix A contains a page excerpted from the list of unique task statements. The reader will also find, for each task the corresponding four digit code. The first 2 digits of the code correspond to the system with which the task statement is associated. The two digit code for the system is identified at the top of each system description in the Reference Plant description.

Then, task listings were developed for each EPG. These list the tasks in their order of occurrence in the EPG. A particular EPG step may contain one or more tasks from the complete list of unique task statements. Task listings comprise tasks for all of the EPG steps, supplementary information items, safety function status checks, and the functional recovery guideline resource assessment trees. Appendix B provides as an example, a portion of the task listing generated for the LOFC EPG. Where appropriate, task listings summarize each EPG step by noting the relevant safety functions addressed in that step. The numbers next to each task are sequential starting from task 1 through the number of tasks which appear in that EPG. This number is referred to as the task sequence number.

Simultaneously, a task inventory was developed to identify the location of each unique task statement from the task listings throughout the system. The task inventory identifies, for each task, the relevant plant system, the unique four digit task statement code, EPG title, EPG section, and EPG task sequence number. A sample page from the task inventory is contained in Appendix C.

Each task was broken down into elements of human action, referred to as task elements. Task elements begin with one of the well defined verbs from the verb list (the verb list is contained in Section 3.2). Task elements define the elementary human actions which are required to execute a particular task

(in their order of anticipated occurrence). The header verb for each task element indicates whether the human action is in the sensory-cognitive arena or in the behavioral arena. These two regimes correspond, respectively, to information and control requirements. Thus, each element has an associated information or control function.

Elements were developed using a system of general matrices which identify, at the component level, a list of potential instruments or controls versus a list of potential task element header verbs. Appendix F contains the matrices for components used to develop task elements. These matrices provided a structured approach to developing task elements as well as ensuring consideration of all possible information and control functions for a particular component.

The reference plant description and consultation with SMEs provided information regarding the components which required monitoring or operation under a given task. When determining task elements, the conditions under which the task was performed were considered, as were the purpose of the task, initiating cues, and affected safety functions. This ensured a context in which to judge the task and to discern the operator actions necessary to complete it. Thus, each task is a sequence of human actions (defined in the task elements) needed to accomplish a particular safety function using particular plant systems, subsystems and components. The analysis of each task was conducted in the context of every operating sequence in which that task appears as identified in the task inventory. In addition to SME input regarding the operating sequences, a variety of plant simulation analyses (References 1-4, 6-13, 15 and 21) were consulted to define the task context.

Appendix F contains sample pages from the task breakdown report. In the complete report, there is a task breakdown for each task statement location in the EPG systems. Each task breakdown contains the task statement, the four digit task code, the purpose of that task, the initiating cues for that task (in the context of an EPG), the safety functions which the task is intended to affect, the INPO task number which cross-references the task statement to the

INPO Job Task Analysis, the task elements associated with that task, and the plant system which is affected by each task element. Since a task is defined as a unit of operator activity which is independent of the scenario in which it is implemented, the elements contained under each task are adequate to support the execution of that task in each EPG location in which the task appears.

## 5.4 DEVELOPMENT OF TASK ELEMENT I&C REQUIREMENTS AND CHARACTERISTICS

Once the task elements were identified, the minimum functional characteristics of the implied information and control requirements were determined and a rationale for each of these characteristics documented. Since each task has the potential for appearing in a large number of plant transient scenarios, the characteristics for the information and control requirements were developed to encompass all of the scenarios in which that task appears. A gross determination of these scenarios was obtained by observing in which EPG (e.g., steam generator tube rupture, excess steam demand, loss of coolant accident, etc.) the task appeared. Expansion and refinement of these scenarios is obtained by reviewing plant thermohydraulic analyses (e.g., references 1 through 9 and 11 through 15), as well as discussion with SMEs. Human factors principles (see the coding section in Appendix E) as well as additional engineering documentation (references 10, 14, 15, and 18) provided further rationale for the development of I&C characteristics. The rationale are summarized and documented in the I&C characteristic bases. Examples of the bases are contained in Appendix H. The I&C characteristics themselves are documented in total in the Information and Control Characteristics report. Appendix G contains excerpts from that report.

## 5.5 CONSOLIDATION OF I&C REQUIREMENTS AND CHARACTERISTICS

The analysis data to this point was coded for input on coding sheets. "Add data" screens from the main menu for task breakdown and I&C bases (main menu items 1 and 2 on Figure 4.1) are used for this input.

Once all of the tasks were analyzed and input to the DBMS, all of the information and control requirements and their minimum functional characteristics were sorted out of the data base according to affected plant system and component within that system. This sorting of data was accomplished automatically by main menu Item 14 (Figure 4.1), I&C component listing. This consolidation sort provides a listing of information and control minimum functional characteristics by component and permits inspection of those characteristics. The purpose of conducting such a sort is that a particular information or control function may have had characteristics developed under a number of task statement headings. These characteristics were developed for each task given the plant transient scenarios in which that task was embedded. Thus, a variety of characteristics may have been developed for each information or control requirement depending on the number of tasks and, therefore, scenarios, in which that requirement appears. The consolidation provides the basis for inspecting the characteristics developed for each requirement. A single list of characteristics can then be identified for each requirement which will encompass all of the characteristics developed for all tasks throughout all EPG scenarios. For example, the pressurizer level information functional range (percent of level) may have been developed in a number of tasks. If the level range developed for one task was 20 to 80% and the range developed for another task was 30 to 90%, then the consolidated list would provide an encompassing range of 20 to 90% to ensure coverage of all tasks in which the pressurizer level was required. The consolidated list was then re-input to the DBMS. These entries develop a new data base file of information and control requirements organized by affected components within affected characteristics for each requirement are identified in this data base

file. Each requirement is uniquely identified in the consolidated data base file. The output from the consolidated data base file is obtained by using main menu item No. 15 (Figure 4.1), consolidated report to printer. This is the listing of information and control requirements and their characteristics required to support emergency operations in accordance with the Combustion Engineering Emergency Procedure Guidelines. The list is contained in Appendix L of this report.

## 6.0 RECOMMENDED PROCEDURE FOR CONVERSION OF GENERIC ICCR TO PLANT-SPECIFIC ICCR

This section of the report provides a recommended procedure for converting the generic ICCR to a plant-specific ICCR for use in control room design review efforts (references 16 and 18) and for emergency operating procedure upgrade efforts (reference 17). The procedure developed in this section assumes that the utility will follow approximately the same work process and observe the same task analytical model as was used in the generic ICCR. Sufficient detail regarding this recommended procedure is provided below to permit use of the generic ICCR data and data base management system for conducting the conversion.

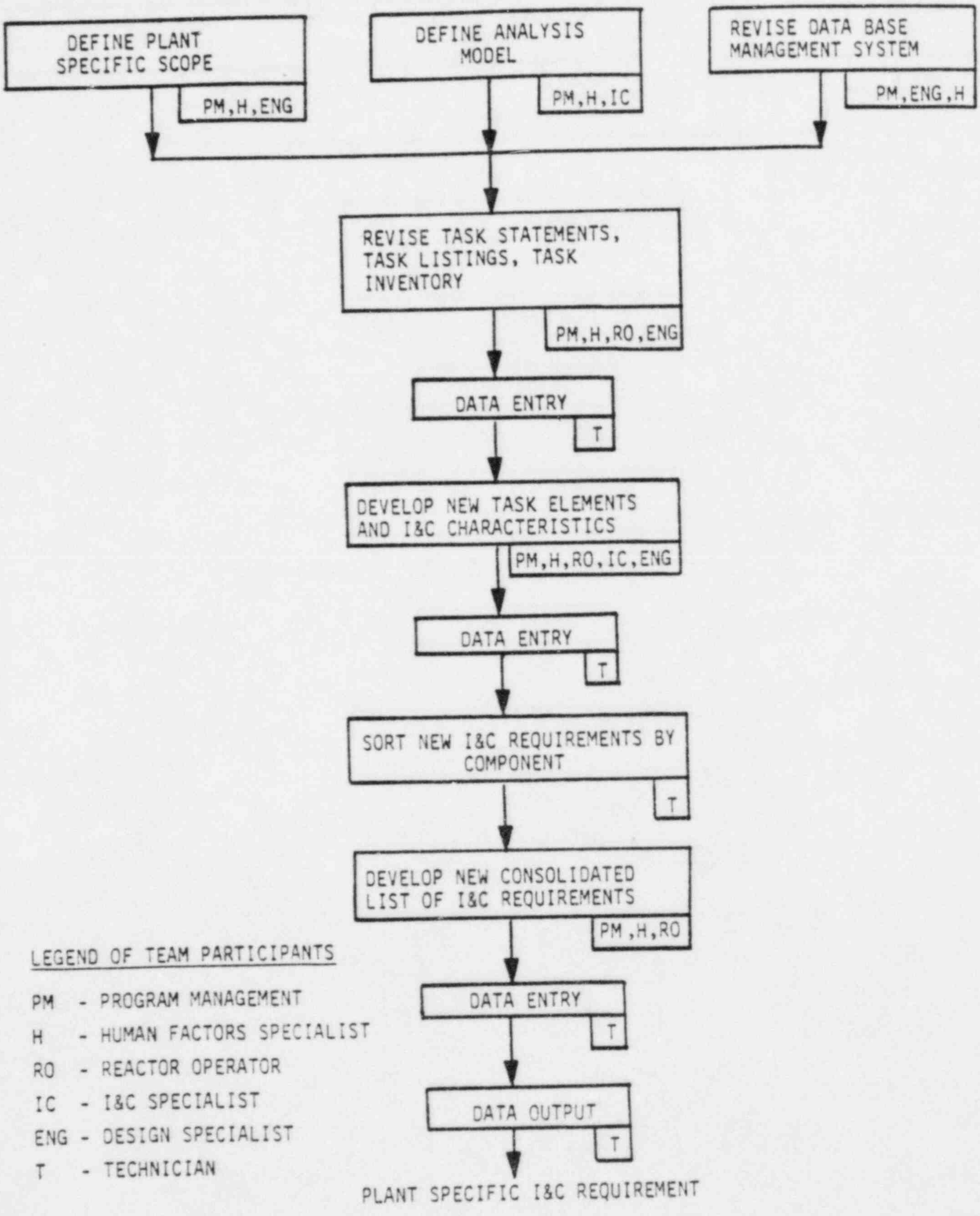
### 6.1 OVERALL CONVERSION PROCESS

This section provides a summary of the process for conducting a conversion to plant-specific document. Figure 6.1 indicates the major activities for conducting a conversion and the critical personnel for each activity. The first three activities, development of the analysis model, definition of plant specific scope, and modification of the data base management system, may occur in parallel. Definition of the model is important to insuring consistency and technical adequacy of the product.

Definition of scope is important to define the boundaries of the work and to delineate the applicability of the products. The data base management system (DBMS) should be modified as necessary to conform to the analytical model and scope. The next activity is the revision of the EOP task listings, the task statement list, and the task inventory. Taken together, these three activities develop the framework for the balance of the analysis. Review of elements developed under the generic ICCR is the next major activity. This activity also includes development of revised I&C characteristics to correspond to the plant specific design. The final activity in the conversion is the development of a new consolidated information and controls list. The DBMS is currently structured to facilitate data manipulation and input required to generate this list.

FIGURE 6.1

GENERIC TO PLANT SPECIFIC ICCR:
RECOMMENDED CONVERSION PROCESS



## 6.2 PLANT-SPECIFIC ICCR SCOPE

Defining the scope of the plant specific effort is a vital part of the ICCR. The scope of the effort is primarily determined by the plant systems and procedures on which the analysis will be conducted. It is further delineated by an a priori decision regarding which, if any, activities outside the control room will be analyzed. That is, the utility must decide whether to conduct a task analyses for the remote shutdown panel and/or any other activities outside the control room which are conducted by the operator during emergency operations.

The central purpose of the ICCR is to conduct an analysis to determine, independently of the existing design (to the extent practical), what kinds of controls and information displays are needed by the operator in the control room to conduct emergency operations. Emergency operations are defined in NUREG-0899 (reference 17) as any plant transient which is initiated by or results in a reactor trip or an engineered safeguard feature actuation. The Combustion Engineering Emergency Procedure Guidelines (CEN-152, Rev. 02) provide the technical basis for developing plant specific emergency operating procedures for dealing with the kinds of events referred to in NUREG-0899. Nevertheless, the utility may decide to include other procedures in the task analysis effort. Such procedures may be normal, or abnormal, or other emergency operating procedures. Encompassing actions needed to address the scenarios for which the procedures were developed, it is important to decide which of these procedures will be incorporated in the task analysis before the analysis is begun.

The plant systems which may be used during an emergency and which must be monitored and controlled from the control room (or remote shutdown panel, if that is in the scope of the analysis) should be defined at the beginning of the analytical effort. The complete reference plant description (a portion is contained in Appendix D to this document) describes the extent and limit of plant systems analyzed in the generic ICCR. As part of the conversion effort, the utility must decide where plant specific design differences from the

reference plant exist and determine which additional, if any, plant systems will be incorporated in the analysis. Design differences between the utility plant and the reference plant may consist of different component sizing, different numbers of components, different types of components, different arrangements of components, or equivalent or alternative systems to those defined in the reference plant. Plant specific FSARs, systems descriptions, engineering documentation, component specifications, thermo-hydraulic and nuclear analyses, and training material may all be useful in determining differences in the utility and reference plant designs. Plant systems not covered in the generic reference plant description may be referred to or operated in plant specific emergency operating procedures (or other procedures within the scope of the task analysis). These systems should also be included in the scope of the plant specific conversion effort. Care should be taken not to be over-inclusive with respect to additional systems. Only those systems which are specifically called on for operation or monitoring in plant specific procedures should be added. In some instances, only parts of systems, subsystems, or components from subsystems need be added to complete the picture. Plant specific subject matter experts (reactor operators and senior reactor operators) can be very valuable in making these determinations.

The result of this activity should be a brief description of the systems to be included within the analyses, specific loci of design differences between the generic reference plant and the utility plant, a list of the emergency operating procedures and any other procedures to be addressed, and a discussion of any activities outside the control room which are to be within the scope of the analysis.

## 6.3 PLANT-SPECIFIC TASK ANALYSIS MODEL

Each utility should review, in consultation with their human factors consultant, the generic task analysis model described in Section 3.2 above. The generic ICCR analysis model uses certain definitions, assumptions, and structure. The utility should review these for applicability to the plant-specific conversion. For example, certain characteristics are defined and were analyzed for the information and controls identified in the generic

analysis. These characteristics are defined in Section 3.2 of this document. The utility may wish to define additional characteristics for the information and controls. In another example, the verbs used to head either task or task elements are also defined in Section 3.2. The utility may wish to alter the definitions and/or add verbs to this list for plant-specific purposes.

## 6.4 DATA BASE MANAGEMENT SYSTEM MODIFICATION

The data base management system (DBMS) provided with the generic ICCR may require modification for the plant-specific conversion. Modification should derive directly from and provide support for changes to either the scope of the analysis or changes in the task analysis model as discussed in Sections 6.2 and 6.3 above. For the most part, changes to the DBMS may take four forms: 1) changes to the contents of existing data base files; 2) additional data base files; 3) additional input capabilities to be stored either in existing data base files or new data base files; 4) new data base sorting and report features. Note that changes to the contents of the lookup tables may already be made using the existing DBMS structure. A review of the DBMS menu contained in Figures 4.1 will reveal the ability to change the "lookup table" contents at will. DBMS changes described in 2, 3 and 4 above require changes to DBMS command files (i.e., the program which executes dBase III and provides the basic structure for the generic ICCR DBMS).

The dBase III manual provides a number of commands which can be used to read, list, print, or modify the existing command files. Sections 6.5, 6.6, and 6.7 below assume that the command files provided with the generic ICCR software are unchanged.

## 6.5 DEVELOPING PLANT-SPECIFIC TASK LISTINGS AND INVENTORY

Appendix A of this document provides examples from the approximately 150 unique tasks identified for the generic ICCR. Appendix B provides an example of the sequential listing of the unique tasks as they are invoked in a portion of the LOFC EPG. Appendix C provides part of the inventory which identifies where certain tasks appear throughout the guideline system. Conversion of the

generic ICCR to the plant-specific ICCR may require revision of the task statements, task listings, and, therefore, the task inventory. This activity is an important part of the conversion effort since the task listings provide the basic structure for conducting the task analysis.

Using the plant-specific procedures, plant-specific systems, and SME input, the plant-specific task statement list should be developed. The generic list which was generated for the generic ICCR should be marked up to (1) delete inapplicable tasks and (2) to add tasks which are needed to address plant-specific design differences and scope differences. The most convenient process for accomplishing this is to mark up the task listings for each emergency operating procedure to reflect the differences between the generic and plant-specific scope. In addition to requiring the addition and deletion of tasks, this may also require changing the order of the tasks as they appear in the task listings. A number of tasks are grouped under the system referred to as "miscellaneous" and are simply bracketed statements which say [plant-specific]. The task inventory provides the location of these tasks throughout the guideline system. Tasks which describe the operator activities for these plant-specific actions should be developed and added to the task statement list and task listings. Utilities may find it useful to use the guidelines which were used in the generic the effort for writing tasks. These are contained in Table 3.2 above.

As the task listings are marked up to reflect plant-specific operating sequences and equipment, the task inventory should also be revised. The task inventory provides a location for each task throughout the emergency operating procedure system by procedure, procedure step, and task sequence number inside that procedure.

The revised task statement list, EOP task listing, and task inventory, can now be entered in the data base using main menu Item 4 (Figure 4.1) and lookup table menus Items 3 and 8 (Figure 4.2). The revised task listings may be printed using main menu Item 13.

## 6.6 TASK ANALYSIS FOR PLANT-SPECIFIC ICCR

Task statements which were developed in the generic ICCR but which were deleted for the plant-specific ICCR as described in Section 6.5 above should now be deleted from the data base. The DBMS main menu Item 5 (Figure 4.1) may be used for deleting such entries.

Task statements which were added to the list provided with the generic ICCR must be entered into the data base. This may be accomplished using main menu Item 1 (Figure 4.1) of the DBMS. These new tasks will require the development of task elements to describe the units of human activity which describe that task. Subject matter experts (SMEs) should be consulted for the development of task elements. The structured component verb matrices described in section 5.0 above and contained in Appendix F may also be useful for developing task elements. Plant-specific procedures may also be useful in developing task elements.

The operations SMEs should also review all of the elements contained under all the tasks which were not modified from the generic ICCR. Their review may result in the addition, deletion or modification of certain elements contained under the unchanged tasks. Revision of task elements under existing tasks may be accomplished using main menu Item 5 (Figure 4.1) of the DBMS.

Next, new characteristics for all of the information and controls associated with all revised elements and elements affected by differences in the design between the reference plant and the utility plant must be generated. Note that the documentation of the bases for selecting these characteristics is optional for the utility. Bases were developed in the generic ICCR only for the purpose of permitting the utility to determine the rationale for the generic ICCR I&C characteristics. Development of revised I&C characteristics requires considerable input from operations SMEs, human factors specialists, and engineering specialists. The revised characteristics may be entered using main menu Items 1 and 5 (Figure 4.1) of the DBM.

## 6.7 PLANT SPECIFIC CONSOLIDATION OF INFORMATION AND CONTROL REQUIREMENTS AND CHARACTERISTICS

Once all of the tasks, task elements, and I&C characteristics have been revised as appropriate for the plant-specific effort, a consolidation of these requirements must be accomplished. Main menu Item 14 (Figure 4.1) of the DBM may be used to sort out of the data base all of the I&C requirements associated with each component contained in each of the affected systems addressed in the plant-specific ICCR. Main menu Item 14 permits printing of I&C requirements and characteristics for those components affected by the plant-specific conversion of the ICCR. These characteristics can then be combined under information and control names in a way which insures that the range of each characteristic encompasses all the requirements developed in the task analysis. This data can then be re-entered to the DBMS. Once the consolidation has been accomplished and the data re-entered to the DBMS, a revised consolidated plant-specific list of I&C requirements and characteristics can be provided using main menu Item 15 (Figure 4.1) of the DBMS.

## 7.0 REFERENCES

1. CEN-128, "Response of C-E Nuclear Steam Supply Systems to Accidents and Transients", Volumes 1 & 2.
2. CEN-114, "Review of Small Break Transients in C-E NSSS's"
3. CEN-117, "ICC, A Response to NRC IE Bulletin 79-06C, Item 5, for C-E NSSS's"
4. CEN-268, "Justification of Trip Two/Leave Two RCP Trip Strategy during Transients"
5. CEN-152, "Combustion Engineering Emergency Procedure Guidelines", Vol. 1 & 2, Rev. 02
6. CEN-158-P, "Evaluation of Instrumentation for Detection of ICC in C-E NSSS's"
7. CEN-185, "Heated Junction Thermocouple Test Reports"
8. Baltimore Gas & Electric Final Safety Analysis Report (FSAR) for Calvert Cliffs Units 1 and 2
9. CEN-199, Effects of Vessel Head Voiding during Transients and Accidents in C-E NSSS's"
10. CEN-115-NP, "Response to NRC IE Bulletin 79-06C, Items 2 and 3, for C-E NSSS's"
11. San Onofre Main Feedwater and Condensate System Description Rev. 01 (7/26/81)
12. Florida Power and Light Final Safety Analysis Report (FSAR) for St. Lucie Unit 2
13. NUREG-0801, Evaluation Criteria for Detailed Control Power Design Review
14. NUREG-0899, Guidelines for the Preparation of Emergency Operating Procedures
15. NUREG-0700, Guidelines for Control Room Design Reviews
16. Meeting Summary - Task Analysis Requirements of Supplement 1 to NUREG-0737; August 29, 1984 meeting with the Combustion Engineering Owner's Group (CEOG) Operations Subcommittee, NRC memorandum from H. Brent Clayton to D. L. Ziemann, September 7, 1984 (contained in Appendix K to this document).

17. The Plant Designer's View of the Operators" Role in Nuclear Plant Safety, W. R. Coreman, M. T. Cross, J. F. Church, and N. J. Porter. Presented at Fourth Symposium on Training of Nuclear Facility Personnel, April 27-29, 1981; Gatlinburg, Tennessee (C-E TIS-6766)

18. NUREG-0737, Supplement 1, Requirements for Emergency Response Capabilities (Generic Letter No. 82-33)

APPENDIX A

# TASK STATEMENT LIST

## TASK STATEMENT LIST

This Appendix contains examples from a listing of the approximately 150 unique tasks developed for the task analysis of the C-E Emergency Procedure Guidelines (EPGs), CEN-152, Revision 02. Each task is assigned a four digit code number. The first two digits of the code number correspond to the plant system with which the task is most closely associated. Appendix D provides a listing of the plant systems addressed in this generic task analysis. The second two digits in the four digit task code are simply sequential numbers within each plant system category.

The task statements were developed as one of the initial steps in the task analysis process. Each step was developed according to ground rules and criteria laid out in Section 3 and according to the process described in section 5 of this report.

TASK STATEMENT TABLE

| CODE | TASK STATEMENT |
| --- | --- |
| 0001 | [PLANT SPECIFIC] |
| 0002 | [DETERMINE IF P.SPEC RCP RESTART CRITERIA ARE MET] |
| 0003 | RECORD TIME |
| 0004 | DETERMINE IF PLANT CONDITIONS PERMIT BLOCK OF PPS |
| 0101 | DETERMINE REACTOR VESSEL LEVEL |
| 0102 | DETERMINE RCS SUBCOOLING |
| 0103 | DETERMINE RCS COOLDOWN RATE |
| 0104 | DETERMINE CORE EXIT TEMP |
| 0105 | DETERMINE RCS LOOP DELTA TEMP |
| 0106 | DETERMINE RCS LOOP AVERAGE TEMP |
| 0107 | COMPARE HOT LEG TEMP TO CORE EXIT TEMP |
| 0108 | DETERMINE RCS COLD LEG TEMP |
| 0109 | DETERMINE RCS HOT LEG TEMP |
| 0110 | DETERMINE RCS FLUID RADIOACTIVITY LEVELS |
| 0111 | INITIATE LOW TEMP OVERPRESSURIZATION PROTECTION |
| 0112 | DETERMINE IF IN ONCE-THROUGH COOLING |
| 0113 | STOP ONCE-THROUGH COOLING |
| 0114 | DETERMINE IF RCS LEAK IS ISOLATED |
| 0201 | DETERMINE IF RCPs ARE OPERATING |
| 0202 | ENSURE PROPER RCP OPERATION |
| 0203 | VERIFY PROPER RCP AUXILIARIES |
| 0204 | START ONE RCP IN EACH LOOP |
| 0205 | STOP ALL OPERATING RCPs |
| 0206 | STOP OPERATION OF TWO RCPs IN OPPOSITE LOOPS |
| 0301 | ISOLATE S/G BLOWDOWN |
| 0302 | DETERMINE SG LEVEL |
| 0303 | DETERMINE S/G DELTA PRESSURE |
| 0304 | DETERMINE SG PRESSURE |
| 0305 | VERIFY S/G SAFETY VALVES OPEN |
| 0306 | ENSURE PROPER SG BLOWDOWN |
| 0307 | DETERMINE IF A S/G IS ISOLATED |
| 0308 | ISOLATE A S/G |
| 0309 | UNISOLATE THE ISOLATED S/G |
| 0401 | DETERMINE MAIN CONDENSER AVAILABILTY |
| 0402 | ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM |
| 0403 | ENSURE PROPER OPERATION OF ATMOS DUMP VALVES |
| 0405 | ENSURE MAIN TURBINE TRIPPED |
| 0406 | ENSURE MSIS |
| 0407 | BLOCK MSIS |
| 0409 | DETERMINE IF PLANT CONDITIONS PERMIT BLOCK OF MSIS |
| 0410 | VERIFY ADVs OPEN |
| 0411 | VERIFY TBV OPEN |
| 0501 | ENSURE PROPER HPSI OPERATION |
| 0502 | ENSURE ALL AVAILABLE HPSI PUMPS ARE OPERATING |
| 0503 | THROTTLE HPSI |
| 0504 | RESTART HPSI |
| 0505 | DETERMINE IF SIS TERMINATION CRITERIA ARE MET |
| 0506 | MONITOR SIS TERMINATION CRITERIA |

TASK STATEMENT TABLE

| CODE | TASK STATEMENT |
| --- | --- |
| 0507 | DETERMINE HPSI PUMP FLOW TO RCS |
| 0508 | ENSURE PROPER SIS VALVE ALIGNMENT |
| 0509 | ALIGN SIS FOR SIMULTANEOUS HOT & COLD LEG INJECT |
| 0510 | ALIGN SIS FOR COLD LEG INJECTION |
| 0511 | ENSURE SIAS |
| 0512 | BLOCK SIAS |
| 0513 | DETERMINE CONTAINMENT SUMP LEVEL |
| 0514 | STOP HPSI PUMPS |
| 0515 | ENSURE RAS |
| 0516 | ISOLATE SITs |
| 0517 | VENT SITs |
| 0518 | DRAIN SITs |
| 0519 | DETERMINE IF SIAS IS PRESENT |
| 0520 | ENSURE PROPER LPSI OPERATION |
| 0521 | DETERMINE LPSI PUMP FLOW TO RCS |
| 0522 | ALIGN CHARGING PUMPS TO INJECT THROUGH SIS |
| 0601 | ENSURE PROPER OPERATION OF CNTMT AIR COOLERS |
| 0602 | ENSURE PROPER CNTMT SPRAY OPERATION |
| 0603 | DETERMINE CNTMT SPRAY FLOW |
| 0604 | START CNTMT SPRAY SYSTEM OPERATION |
| 0605 | STOP CNTMT SPRAY SYTEM OPERATION |
| 0606 | DETERMINE CNTMT TEMPERATURE |
| 0607 | DETERMINE CNTMT PRESSURE |
| 0608 | DETERMINE CNTMT HYDROGEN CONCENTRATION |
| 0609 | ENSURE PROPER HYDROGEN RECOMBINER OPERATION |
| 0610 | DETERMINE CNTMT AREA RADIATION STATUS |
| 0611 | DETERMINE CNTMT AIRBORNE RADIATION LEVEL |
| 0612 | ENSURE CSAS |
| 0613 | BLOCK CSAS |
| 0614 | ALIGN CONTAINMENT SPRAY PUMPS FOR COLD LEG INJECT |
| 0701 | ENSURE CIAS |
| 0702 | BLOCK CIAS |
| 0801 | ENSURE ADEQUATE CONDENSATE INVENTORY |
| 0802 | STOP REDUNDANT AFW PUMPS |
| 0803 | DETERMINE CONDENSATE INVENTORY |
| 0804 | ENSURE MFW TO EITHER/BOTH SGs |
| 0805 | MODULATE AFW FLOWRATE |
| 0806 | MODULATE MFW FLOWRATE |
| 0807 | ISOLATE FW LINE BREAK |
| 0808 | ENSURE AUX FEEDWATER TO EITHER/BOTH SGs |
| 0809 | ENSURE PROPER CONDENSATE PUMP OPERATION |
| 0810 | ENSURE PROPER MFW PUMP OPERATION |
| 0811 | ENSURE PROPER AFW PUMP OPERATION |
| 0901 | ENSURE ALL AVAILABLE CHARGING PUMPS ARE OPERATING |
| 0902 | ENSURE PROPER CHARGING OPERATION |
| 0903 | STOP CHARGING PUMPS |
| 0904 | COMPARE CHARGING FLOW & LETDOWN FLOW |
| 0905 | ENSURE PROPER LETDOWN OPERATION |

TASK STATEMENT TABLE

| CODE | TASK STATEMENT |
|---|---|
| 0906 | STOP LETDOWN |
| 0907 | DETERMINE RWT LEVEL |
| 0908 | CLOSE RWT OUTLET VALVES |
| 0909 | ENSURE REALIGNMENT FROM BAMT TO SUITABLE SOURCE |
| 0910 | ENSURE RCS IS BORATED TO TECH SPEC LIMITS |
| 0911 | DETERMINE SUITABLE BORATED WATER SOURCE |
| 0912 | DETERMINE IF LETDOWN IS OPERABLE |
| 0913 | DETERMINE COLD SHUTDOWN RCS BORON CONCENTRATION |
| 0914 | DETERMINE SHUTDOWN MARGIN REQ'D BY TECH SPECS |
| 0915 | DETERMINE RCS BORON CONCENTRATION |
| 0916 | DETERMINE BAMT LEVEL |
| 0917 | DETERMINE SPENT FUEL POOL LEVEL |
| 0918 | ALIGN VIA GRAVITY FEED FROM BAMTS TO CHARGING PUMP |
| 0919 | ALIGN BORIC ACID MAKEUP PUMPS TO CHARGING PUMPS |
| 0920 | ALIGN VIA GRAVITY FEED FROM RWT TO CHARGING PUMPS |
| 0921 | ALIGN VIA GRAVITY FEED FROM SPENT FUEL POOL TO CP |
| 0922 | DETERMINE VCT LEVEL |
| 0923 | DETERMINE BORON ADDITION RATE |
| 0924 | DETERMINE CHARGING FLOW |
| 1001 | ENSURE PROPER OPERATION OF PPCS |
| 1002 | ENSURE PROPER OPERATION OF PLCS |
| 1003 | DETERMINE PZR PRESSURE |
| 1004 | DETERMINE IF PZR PRESS WITHIN LIMITS OF P/T CURVE |
| 1005 | DETERMINE PZR LEVEL |
| 1006 | MONITOR PZR LEVEL |
| 1007 | ENSURE PROPER OPER OF PZR PROPORTIONAL HEATERS |
| 1008 | ENSURE PROPER OPERATION OF PZR BACKUP HEATERS |
| 1009 | ENSURE PROPER OPERATION OF PZR MAIN SPRAY |
| 1010 | ENSURE PROPER OPERATION OF PZR AUXILIARY SPRAY |
| 1011 | VERIFY PZR MAIN SPRAY VALVES OPEN |
| 1012 | VERIFY PZR AUX SPRAY VALVES OPEN |
| 1101 | OPERATE THE REACTOR VESSEL VENT |
| 1102 | OPEN PORVS |
| 1103 | ENSURE PROPER PORV OPERATION |
| 1104 | ENSURE PROPER PORV BLOCK VALVE OPERATION |
| 1105 | OPERATE PZR VENT |
| 1106 | MONITOR QUENCH TANK PARAMETERS |
| 1201 | DETERMINE REACTOR POWER |
| 1202 | DETERMINE REACTOR START-UP RATE |
| 1203 | TRIP REACTOR |
| 1204 | OPEN REACTOR TRIP BREAKERS |
| 1205 | DETERMINE CEA INSERTION STATUS |
| 1206 | DEENERGIZE CEA MOTOR GENERATOR(S) |
| 1207 | ENERGIZE CEA MOTOR GENERATOR(S) |
| 1208 | ENSURE PROPER CEDM OPERATION |
| 1301 | ENSURE MAIN GENERATOR OUTPUT BREAKERS OPEN |
| 1302 | ENSURE STATION LOADS ARE TRANSFERRED OFFSITE |
| 1303 | ENSURE DIESELS ARE STARTED & LOADED ELECTRICALLY |

TASK STATEMENT TABLE

| CODE | TASK STATEMENT |
|---|---|
| 1304 | RESTORE IE ELECTRICAL POWER |
| 1401 | ENSURE COMPONENT COOLING WATER SUPPLY TO CONT FANS |
| 1901 | ENSURE RCS SAMPLE LINES ARE ISOLATED |
| 1902 | ISOLATE SECONDARY SAMPLING |
| 1903 | SAMPLE S/G FOR RADIOACTIVITY |
| 1904 | DETERMINE STEAM PLANT RADIOACTIVITY |

APPENDIX B

EPG TASK LISTINGS

EPG TASK LISTINGS

Appendix B contains a portion of the sequential listing of task statements for the LOFC EPG. The LOFC EPG will be the guideline from which the remaining task analysis examples will be extracted. This forms a sense of continuity in explaining how the tasks are analyzed from this point to the task elements, to the information and control characteristics and finally to the I&C bases. Step 8 of the LOFC EPG will be the specific step developed through to the I&C bases (Appendix H).

There is one task listing for each EPG in the complete EPG Task Listing Report. The task listings encompass all the steps of each EPG, the supplementary information for each EPG, including safety function status checks and applicable EPG figures. The major subheadings of each task listing correspond to the EPG steps and supplementary information item numbers. Where appropriate, each EPG step is summarized in terms of the safety functions which that step is intended to address. Each EPG step and supplementary information item is subdivided into the appropriate tasks from the unique task statement list. The tasks are listed in their anticipated order of occurrence. The number appearing next to each task statement in the listing is referred to as the task sequence number. It identifies the order of occurrence of that task within the EPG. Note that a particular task statement from the unique task statement list may appear more than once in each EPG, EPG step, and guideline in the EPG system.

## LOFC Task Listing

1. Verify standard post trip actions (analyzed in SPTA Task listing)

2. Ensure proper diagnosis of event and safety function status

    1. Determine reactor power
    2. Determine reactor startup rate
    3. Determine CEA insertion status
    4. Ensure RCS is borated per Tech. Spec. Limits
    5. [Plant specific]
    6. Determine pressurizer level
    7. Ensure proper charging operation
    8. Ensure proper letdown operation
    9. Determine RCS subcooling
    10. Determine reactor vessel level
    11. Determine pressurizer pressure
    12. Ensure proper operation of PZR auxiliary spray
    13. Ensure proper operation of PZR proportional heater
    14. Ensure proper operation of PZR backup heater
    15. Determine if pressurizer pressure is within limits of P/T curve
    16. Determine RCS loop average temperature
    17. Determine RCS subcooling
    18. Determine S/G level
    19. Ensure MFW to either/both S/G(s)
    20. Ensure AFW to either/both S/G(s)
    21. Determine RCS average loop temperature
    22. Determine containment pressure
    23. Determine containment area radiation status
    24. Sample steam generator for radioactivity
    25. Determine steam plant radioactivity
    26. Determine containment temperature
    27. Determine containment pressure
    28. Determine containment hydrogen concentration

3. Branching Step: If LOFC diagnosis not confirmed, implement FRG. If LOFC confirmed, continue.

4. Verify all safety function criteria are met

   Same as Tasks 1 through 28 above.

5. Branching Step: If safety functions are met, continue with this guideline; otherwise, implement FRG

6. Control core heat removal

   29. Determine if RCPs operating
   30. Ensure MFW to either/both S/G
   31. Ensure AFW to either/both S/G
   32. Determine main condenser availability
   33. Ensure proper operation of TBS
   34. Ensure proper operation of ADVs
   35. Determine PZR level
   36. Determine RCS subcooling
   37. [Determine if plant specific RCP restart criteria are met]

7. Control core heat removal

   38. Start on RCP in each loop
   39. Ensure proper RCP operation
   40. Ensure proper HPSI operation
   41. Ensure proper charging operation
   42. Determine pressurizer level
   43. Determine if SIS termination criteria are met

8. Control RCS heat removal

   44. Determine RCS subcooling
   45. Determine PZR level
   46. Determine main condenser availability

47. Ensure MFW to either/both S/G(s)
48. Ensure AFW to either/both S/G(s)
49. Ensure proper operation of TB system
50. Ensure proper operation of ADVs
51. Determine RV level

9. Control RCS inventory

52. etc.....

APPENDIX C

TASK INVENTORY

TASK INVENTORY

Appendix C contains portions of the task inventory. The complete task inventory is a five column table which identifies the location of each task statement throughout the EPG system. The first column of the task inventory is a two digit number corresponding to the plant system identified with the task statement. The second column is the four digit task statement number which uniquely identifies each task statement. The third column is the abbreviation of the title in which the task of the EPG in which the task statement appears. The next column is a four character identifier for the EPG section in which the task statement appears. Identifiers comprised of four digits represent an EPG step number. Identifiers beginning with the letters "SI" indicate a supplementary information item number. The last column in the table is the task sequence number. This is a three digit number identifying the order of occurrence of a task statement in an EPG. More specifics on the coding scheme are found in Appendix E.

TASK CODE TABLE

| SYSTEM NUMBER | TASK CODE | EPG TITLE NUMBER | EPG SEQUENCE NUMBER | EPG SECTION NUMBER |
|---|---|---|---|---|
| ------ | ---- | ------ | ------ | ------ |
| 00 | 0001 | 01 | 007 | 0002 |
| 00 | 0001 | 01 | 012 | 0003 |
| 00 | 0001 | 01 | 019 | 0004 |
| 00 | 0001 | 01 | 029 | 0005 |
| 00 | 0001 | 01 | 034 | 0006 |
| 00 | 0001 | 01 | 044 | 0007 |
| 00 | 0001 | 01 | 049 | 0008 |
| 00 | 0001 | 01 | 054 | 0009 |
| 00 | 0001 | 02 | 005 | 0002 |
| 00 | 0001 | 03 | 010 | 0002 |
| 00 | 0001 | 03 | 070 | 0011 |
| 00 | 0001 | 03 | 176 | 0038 |
| 00 | 0001 | 03 | 228 | 0045 |
| 00 | 0001 | 04 | 010 | 0002 |
| 00 | 0001 | 04 | 062 | 0011 |
| 00 | 0001 | 04 | 201 | 0045 |
| 00 | 0001 | 05 | 010 | 0002 |
| 00 | 0001 | 06 | 005 | 0002 |
| 00 | 0001 | 06 | 075 | 0018 |
| 00 | 0001 | 06 | 079 | 0018 |
| 00 | 0001 | 06 | 094 | 0022 |
| 00 | 0001 | 07 | 005 | 0002 |
| 00 | 0001 | 09 | 012 | 0002 |
| 00 | 0001 | 13 | 001 | 0001 |
| 00 | 0001 | 13 | 002 | 0002 |
| 00 | 0001 | 13 | 003 | 0002 |
| 00 | 0001 | 19 | 017 | 0005 |
| 00 | 0001 | 19 | 020 | 0005 |
| 00 | 0001 | 20 | 060 | 0011 |
| 00 | 0001 | 22 | 018 | 0004 |
| 00 | 0001 | 23 | 049 | 0010 |
| 00 | 0001 | 23 | 053 | 0010 |
| 00 | 0001 | 24 | 070 | 0012 |
| 00 | 0001 | 24 | 074 | 0012 |
| 00 | 0001 | 26 | 006 | 0001 |
| 00 | 0001 | 26 | 011 | 0002 |
| 00 | 0001 | 27 | 008 | 0003 |
| 00 | 0001 | 29 | 006 | 0002 |
| 00 | 0001 | 32 | 006 | 0001 |
| 00 | 0001 | 32 | 038 | 0002 |
| 00 | 0001 | 32 | 129 | 0004 |
| 00 | 0001 | 32 | 143 | 0004 |
| 00 | 0001 | 32 | 158 | 0005 |
| 00 | 0001 | 32 | 172 | 0005 |
| 00 | 0001 | 32 | 203 | 0005 |
| 00 | 0001 | 32 | 220 | 0008 |
| 00 | 0002 | 03 | 077 | 0012 |

TASK CODE TABLE

| SYSTEM NUMBER | TASK CODE | EPG TITLE NUMBER | EPG SEQUENCE NUMBER | EPG SECTION NUMBER |
|---|---|---|---|---|
| ...... | .... | ...... | ...... | ...... |
| 00 | 0002 | 04 | 079 | 0016 |
| 00 | 0002 | 05 | 123 | 0024 |
| 00 | 0002 | 06 | 110 | 0024 |
| 00 | 0002 | 07 | 037 | 0006 |
| 00 | 0002 | 20 | 009 | 0003 |
| 00 | 0002 | 23 | 009 | 0002 |
| 00 | 0002 | 24 | 024 | 0005 |
| 00 | 0003 | 03 | 011 | SI10 |
| 00 | 0003 | 03 | 057 | 0009 |
| 00 | 0003 | 03 | 150 | 0031 |
| 00 | 0003 | 03 | 169 | 0037 |
| 00 | 0003 | 07 | 002 | SI02 |
| 00 | 0003 | 10 | 020 | SI08 |
| 00 | 0003 | 14 | 010 | SI06 |
| 00 | 0003 | 20 | 010 | SI06 |
| 00 | 0003 | 23 | 002 | SI02 |
| 00 | 0004 | 03 | 126 | 0025 |
| 00 | 0004 | 04 | 138 | 0033 |
| 00 | 0004 | 04 | 180 | 0043 |
| 00 | 0004 | 05 | 158 | 0031 |
| 00 | 0004 | 07 | 109 | 0022 |
| 01 | 0101 | 02 | 010 | 0002 |
| 01 | 0101 | 03 | 015 | 0002 |
| 01 | 0101 | 03 | 023 | SI13 |
| 01 | 0101 | 03 | 028 | SI14 |
| 01 | 0101 | 03 | 033 | SI15 |
| 01 | 0101 | 03 | 105 | 0017 |
| 01 | 0101 | 03 | 193 | 0040 |
| 01 | 0101 | 03 | 201 | 0041 |
| 01 | 0101 | 04 | 015 | 0002 |
| 01 | 0101 | 04 | 017 | SI14 |
| 01 | 0101 | 04 | 020 | 0002 |
| 01 | 0101 | 04 | 022 | SI15 |
| 01 | 0101 | 04 | 106 | 0021 |
| 01 | 0101 | 04 | 147 | 0034 |
| 01 | 0101 | 04 | 155 | 0035 |
| 01 | 0101 | 05 | 013 | SI09 |
| 01 | 0101 | 05 | 015 | 0002 |
| 01 | 0101 | 05 | 017 | 0002 |
| 01 | 0101 | 05 | 018 | SI10 |
| 01 | 0101 | 05 | 080 | 0014 |
| 01 | 0101 | 05 | 172 | 0033 |
| 01 | 0101 | 05 | 176 | 0034 |
| 01 | 0101 | 06 | 010 | 0002 |
| 01 | 0101 | 06 | 091 | 0020 |
| 01 | 0101 | 07 | 010 | 0002 |
| 01 | 0101 | 07 | 012 | SI08 |

TASK CODE TABLE

| SYSTEM NUMBER | TASK CODE | EPG TITLE NUMBER | EPG SEQUENCE NUMBER | EPG SECTION NUMBER |
|---|---|---|---|---|
| ------ | ---- | ------ | ------ | ------ |
| 01 | 0101 | 07 | 017 | SI09 |
| 01 | 0101 | 07 | 051 | 0008 |
| 01 | 0101 | 07 | 131 | 0026 |
| 01 | 0101 | 07 | 139 | 0027 |
| 01 | 0101 | 11 | 025 | 0003 |
| 01 | 0101 | 14 | 013 | 0003 |
| 01 | 0101 | 14 | 015 | SI07 |
| 01 | 0101 | 14 | 018 | AC01 |
| 01 | 0101 | 14 | 018 | SI08 |
| 01 | 0101 | 14 | 023 | SI09 |
| 01 | 0101 | 15 | 019 | 0004 |
| 01 | 0101 | 15 | 032 | AC01 |
| 01 | 0101 | 18 | 014 | 0003 |
| 01 | 0101 | 20 | 020 | SI09 |
| 01 | 0101 | 20 | 025 | SI10 |
| 01 | 0101 | 20 | 071 | 0014 |
| 01 | 0101 | 20 | 080 | 0015 |
| 01 | 0101 | 22 | 028 | AC01 |
| 01 | 0101 | 23 | 017 | SI07 |
| 01 | 0101 | 23 | 022 | SI08 |
| 01 | 0101 | 23 | 060 | 0013 |
| 01 | 0101 | 23 | 068 | 0014 |
| 01 | 0101 | 24 | 009 | SI05 |
| 01 | 0101 | 24 | 013 | 0003 |
| 01 | 0101 | 24 | 014 | SI06 |
| 01 | 0101 | 25 | 018 | 0004 |
| 01 | 0101 | 26 | 009 | SI05 |
| 01 | 0101 | 26 | 010 | 0002 |
| 01 | 0101 | 26 | 014 | SI06 |
| 01 | 0101 | 26 | 019 | 0003 |
| 01 | 0101 | 32 | 053 | 0003 |
| 01 | 0101 | 32 | 063 | 0003 |
| 01 | 0101 | 32 | 070 | 0003 |
| 01 | 0101 | 32 | 074 | 0003 |
| 01 | 0101 | 32 | 162 | 0005 |
| 01 | 0102 | 01 | 015 | 0004 |
| 01 | 0102 | 01 | 032 | 0006 |
| 01 | 0102 | 02 | 009 | 0002 |
| 01 | 0102 | 02 | 017 | 0002 |
| 01 | 0102 | 03 | 014 | 0002 |
| 01 | 0102 | 03 | 016 | SI11 |
| 01 | 0102 | 03 | 076 | 0012 |
| 01 | 0102 | 03 | 099 | 0017 |
| 01 | 0102 | 03 | 173 | 0038 |
| 01 | 0102 | 03 | 196 | 0041 |
| 01 | 0102 | 04 | 010 | SI09 |
| 01 | 0102 | 04 | 014 | 0002 |

TASK CODE TABLE

| SYSTEM NUMBER | TASK CODE | EPG TITLE NUMBER | EPG SEQUENCE NUMBER | EPG SECTION NUMBER |
|---|---|---|---|---|
| ------ | ---- | ------ | ------ | ------ |
| 01 | 0102 | 04 | 078 | 0016 |
| 01 | 0102 | 04 | 099 | 0021 |
| 01 | 0102 | 04 | 151 | 0035 |
| 01 | 0102 | 05 | 006 | SI06 |
| 01 | 0102 | 05 | 014 | 0002 |
| 01 | 0102 | 05 | 037 | 0002 |
| 01 | 0102 | 05 | 073 | 0014 |
| 01 | 0102 | 05 | 122 | 0024 |
| 01 | 0102 | 05 | 174 | 0034 |
| 01 | 0102 | 06 | 009 | 0002 |
| 01 | 0102 | 06 | 009 | SI06 |
| 01 | 0102 | 06 | 026 | 0002 |
| 01 | 0102 | 06 | 084 | 0020 |
| 01 | 0102 | 06 | 109 | 0024 |
| 01 | 0102 | 07 | 009 | 0002 |
| 01 | 0102 | 07 | 017 | 0002 |
| 01 | 0102 | 07 | 036 | 0006 |
| 01 | 0102 | 07 | 044 | 0008 |
| 01 | 0102 | 07 | 134 | 0027 |
| 01 | 0102 | 09 | 012 | SI06 |
| 01 | 0102 | 10 | 012 | SI06 |
| 01 | 0102 | 11 | 004 | SI05 |
| 01 | 0102 | 11 | 019 | 0003 |
| 01 | 0102 | 14 | 002 | SI01 |
| 01 | 0102 | 14 | 017 | AC01 |
| 01 | 0102 | 15 | 002 | SI01 |
| 01 | 0102 | 15 | 013 | 0004 |
| 01 | 0102 | 16 | 004 | SI03 |
| 01 | 0102 | 17 | 004 | SI04 |
| 01 | 0102 | 17 | 005 | 0002 |
| 01 | 0102 | 18 | 004 | SI04 |
| 01 | 0102 | 18 | 007 | 0003 |
| 01 | 0102 | 18 | 019 | 0005 |
| 01 | 0102 | 19 | 004 | SI04 |
| 01 | 0102 | 20 | 004 | SI04 |
| 01 | 0102 | 20 | 008 | 0003 |
| 01 | 0102 | 20 | 075 | 0015 |
| 01 | 0102 | 21 | 002 | SI03 |
| 01 | 0102 | 22 | 004 | SI04 |
| 01 | 0102 | 22 | 027 | AC01 |
| 01 | 0102 | 23 | 008 | 0002 |
| 01 | 0102 | 23 | 012 | SI06 |
| 01 | 0102 | 23 | 063 | 0014 |
| 01 | 0102 | 23 | 086 | AC01 |
| 01 | 0102 | 24 | 002 | SI03 |
| 01 | 0102 | 24 | 007 | 0003 |
| 01 | 0102 | 24 | 023 | 0005 |

TASK CODE TABLE

| SYSTEM NUMBER | TASK CODE | EPG TITLE NUMBER | EPG SEQUENCE NUMBER | EPG SECTION NUMBER |
|---|---|---|---|---|
| ...... | .... | ...... | ...... | ...... |
| 01 | 0102 | 25 | 002 | S103 |
| 01 | 0102 | 25 | 012 | 0004 |
| 01 | 0102 | 26 | 002 | S103 |
| 01 | 0102 | 26 | 004 | 0001 |
| 01 | 0102 | 26 | 014 | 0003 |
| 01 | 0102 | 32 | 051 | 0003 |
| 01 | 0102 | 32 | 073 | 0003 |
| 01 | 0102 | 32 | 161 | 0005 |
| 01 | 0102 | 32 | 173 | 0005 |
| 01 | 0103 | 02 | 005 | S104 |
| 01 | 0103 | 03 | 003 | S101 |
| 01 | 0103 | 03 | 007 | S107 |
| 01 | 0103 | 03 | 142 | 0028 |
| 01 | 0103 | 04 | 003 | S103 |
| 01 | 0103 | 04 | 123 | 0027 |
| 01 | 0103 | 05 | 003 | S102 |
| 01 | 0103 | 05 | 136 | 0028 |
| 01 | 0103 | 05 | 144 | 0029 |
| 01 | 0103 | 06 | 006 | S102 |
| 01 | 0103 | 09 | 017 | S107 |
| 01 | 0103 | 10 | 017 | S107 |
| 01 | 0103 | 11 | 001 | S104 |
| 01 | 0103 | 16 | 001 | S101 |
| 01 | 0103 | 17 | 001 | S103 |
| 01 | 0103 | 18 | 001 | S103 |
| 01 | 0103 | 19 | 001 | S103 |
| 01 | 0103 | 20 | 001 | S103 |
| 01 | 0103 | 20 | 039 | 0007 |
| 01 | 0103 | 21 | 007 | S104 |
| 01 | 0103 | 22 | 001 | S103 |
| 01 | 0103 | 23 | 006 | S103 |
| 01 | 0103 | 24 | 048 | 0008 |
| 01 | 0103 | 24 | 054 | 0009 |
| 01 | 0104 | 03 | 014 | S110 |
| 01 | 0104 | 03 | 034 | 0002 |
| 01 | 0104 | 03 | 095 | 0016 |
| 01 | 0104 | 04 | 037 | 0002 |
| 01 | 0104 | 05 | 036 | 0002 |
| 01 | 0104 | 07 | 005 | S102 |
| 01 | 0104 | 14 | 016 | AC01 |
| 01 | 0104 | 20 | 013 | S106 |
| 01 | 0104 | 23 | 005 | S102 |
| 01 | 0104 | 24 | 085 | AC01 |
| 01 | 0104 | 25 | 011 | 0004 |
| 01 | 0104 | 25 | 028 | 0001 |
| 01 | 0104 | 32 | 183 | 0005 |
| 01 | 0104 | 32 | 196 | 0005 |

APPENDIX D

REFERENCE PLANT DESCRIPTION

## REFERENCE PLANT DESCRIPTION

This appendix contains an example system from the reference plant description. This appendix also contains a list of all systems defined in the reference plant. Each system description for each system defined in the reference plant contains some narrative which provides information about the system and important components in the system, a component listing which contains the corresponding code number for components in that system, and a simplified diagram of the systems showing the important components, system interfaces, and identifying by number the components which are listed on the component listing for each system. The reference plant description provides the physical basis on which to conduct the analysis of the interface between the operator and the machine in the context of the C-E Emergency Procedure Guidelines. In this sense, the reference plant also provides a scope of the analysis. The systems outside the reference plant description are not addressed in this task analysis.

19 systems were identified in the reference plant description. These are the systems which are used in the C-E Emergency Procedure Guidelines. The systems were identified by conducting a review of the C-E Emergency Procedure Guidelines. The systems are listed on the next page.

## SYSTEMS OF GENERIC ICCR

| SYSTEM | ABBREVIATION |
|---|---|
| MISCELLANEOUS | MISC |
| REACTOR COOLANT SYSTEM | RCS |
| REACTOR COOLANT PUMPS | RCP |
| STEAM GENERATOR | S/G |
| MAIN STEAM SYSTEM | MSS |
| SAFETY INJECTION SYSTEM | SIS |
| CONTAINMENT ATMOSPHERE CONTROL SYSTEM | CACS |
| CONTAINMENT ISOLATION SYSTEM | CIS |
| FEEDWATER SYSTEMS | FWS |
| CHEMICAL AND VOLUME CONTROL SYSTEM | CVCS |
| PRESSURIZER SYSTEM | PZR |
| PRESSURIZER AND REACTOR VESSEL GAS VENT SYSTEM | RGVS |
| REACTIVITY CONTROL (CEA'S, CEDN'S, RPS) | RXCS |
| ELECTRICAL DISTRIBUTION SYSTEM | EDS |
| COMPONENT COOLING WATER SYSTEM | CCWS |
| COMPRESSED AIR SYSTEM | CAS |
| INTAKE COOLING WATER SYSTEM | ICWS |
| STEAM GENERATOR BLOWDOWN SYSTEM | DGBS |
| SHUTDOWN COOLING SYSTEM | SCS |
| RCS AND STEAM GENERATOR SAMPLING SYSTEM | SS |
| NONE | NONE |

## REFERENCE PLANT

The reference plant is a pressurized water reactor with two coolant loops. The Reactor Coolant System (RCS) circulates water in a closed cycle, to remove heat from the reactor core and transfers it to a secondary (steam generating) system. The steam generators provide the interface between the Reactor Coolant (primary) System and the Main Steam (secondary) System. The steam generators are vertical U-tube heat exchangers in which heat is transferred from the reactor coolant to the Main Steam System. Reactor Coolant is prevented from mixing with the main steam by the steam generator tubes and the steam generator tube sheet.

Reactor Coolant System (RCS) (01)

The reactor coolant system performs five functions: it provides adequate coolant flow, maintains a proper degree of subcooling, provides overpressure protection, provides heat generation and provides heat removal. The system comprises two closed heat transfer loops in parallel with the reactor vessel. Each loop contains one steam generator and two pumps which circulate coolant. The RCS is a closed system thus forming a barrier to the release of radioactive materials.

The arrangement of the RCS is shown in Figure RC-1. The major components of the system are the reactor vessel, two parallel heat transfer loops, each containing one steam generator and two reactor coolant pumps, (described under a separate system) a pressurizer connection to one of the reactor vessel outlet pipes (the pressurizer is also described under a separate section), and associated piping. All components are located inside containment.

During normal operation, the reactor coolant is circulated through the reactor vessel and S/G's by the reactor coolant pumps. The coolant is heated by the fissioning fuel in the core as it passes through the reactor vessel, and is cooled in the steam generator as it gives up heat to the secondary system to form steam. The coolant also serves as a neutron moderator in the core and contains a soluable neutron absorber (boric acid) for reactivity control. The coolant is maintained in a subcooled condition by maintaining a high system pressure.

RCS pressure is controlled by the pressurizer, where steam and water are maintained in thermal equilibrium. Steam is formed by energizing immersion heaters in the pressurizer, or is condensed by the pressurizer spray to limit pressure variations caused by contraction or expansion of the reactor coolant. The average temperature of the reactor coolant varies with power level. A temperature control program, in which pressurizer level varies as a function of power, is used to minimize the transfer of reactor coolant into and out of the RCS.

The charging pumps and letdown control valves in the Chemical and Volume Control System (CVCS) are used to maintain the programmed pressurizer water level. A continuous but variable letdown purification flow is maintained to keep the RCS chemistry within prescribed limits. A charging nozzle and letdown nozzle are provided on the reactor coolant piping for this operation. The charging flow is also used to alter the boron concentration or correct the chemical content of the reactor coolant.

Other reactor coolant loop penetrations are the pressurizer surge line in one reactor vessel outlet pipe; the four safety injection inlet nozzles, one in each reactor vessel inlet pipe, two outlet nozzles to the Shutdown Cooling System, one in each reactor vessel outlet pipe, two pressurizer spray nozzles, vent and drain connections, and sample and instrument connections.

REACTOR VESSEL DESIGN PARAMETERS

Design Pressure, psia 2500
Design Temperature, °F 650

Nozzles

Inlet (4) 30 in. ID (nominal)
Outlet(2) 42 in. ID (nominal)
CEDM (97)
Instrumentation (10)
Vent (1)

Dimensions

Inside Diameter 172 in. (nominal)
Vessel height 408 9/16 in.

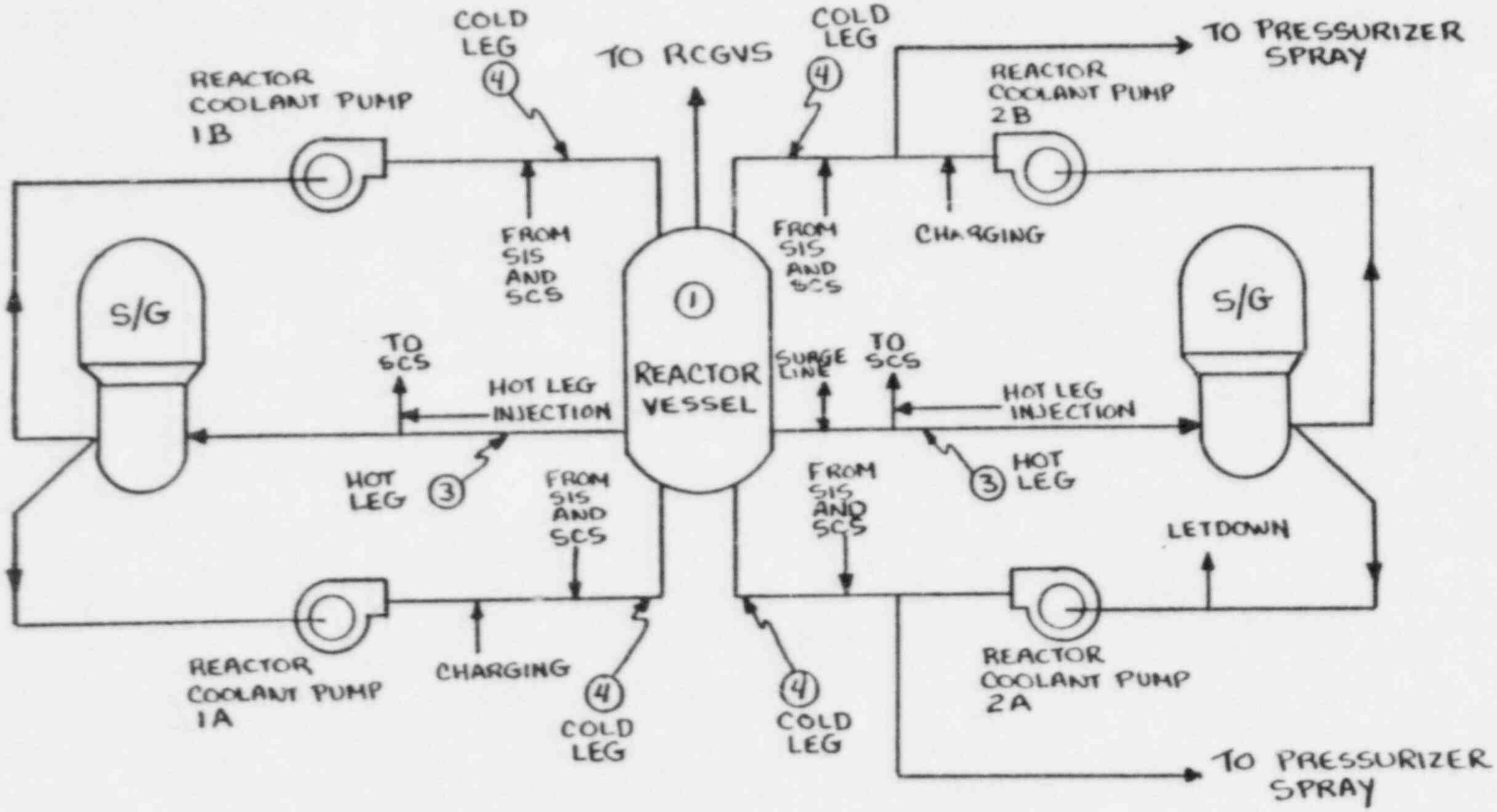



FIGURE RCS-1

REACTOR COOLANT SYSTEM

Component Listing for
Reactor Coolant System (RCS-01)

1. Reactor Vessel

2. Blank

3. RCS Hot Leg (2)

4. RCS Cold Leg (4)

APPENDIX E

DATA BASE MANAGEMENT SYSTEM DESCRIPTION

## DATA BASE MANAGEMENT SYSTEM DESCRIPTION

A data base management system (DBMS) was developed to assist in this analysis. A DBMS is essential in such an analysis due to the large amount of data to be collected, manipulated, and documented. This Appendix describes the structure of the DBMS, its installation in the appropriate hardware, and the use of the DBMS in conducting the analysis.

### E.1 HARDWARE REQUIREMENTS AND INSTALLATION OF THE DBMS

The DBMS uses the Ashton-Tate dBase III (trademark) as the primary software for executing the data base management. For the generic ICCR DBMS, dBase III has been configured to run according to a process and format suitable to this task analysis. The dBase III command language which configures dbase III for this DBMS is contained in a series of command files which constitute the executive program. The executive program and all of the data for the generic ICCR have been provided to each CEOG participant on two sets of floppy discs. There are nine discs in the first set. The installation program and executive program are contained in the first two floppy discs. The data files are contained in the next six floppy discs. The ninth disc is a system disc. This set of nine discs is used to perform the initial installation of the generic ICCR DBMS and data on the hard disc.

The second set of discs consists of an initial set of six data discs for backup of hard disc data. This set of discs is used for occasional back up of ICCR data files as the plant specific conversion progresses. Additional data discs may be added to this set as the data base grows during the plant specific conversion.

### E.2 STRUCTURE OF THE DBMS

The floppy discs provided with the generic ICCR are comprised of two sections. The second floppy disc in the installation set contains the executive program which configures and provides the basis for operating

dBase III in a structure and format suitable to this analysis. The second section are data files which are contained on data discs. The data discs contain the data for the generic ICCR.

Two types of dBase III files are used to create the DBMS and store data from the generic ICCR. Data base files are used to store program instructions for structuring dBase III operations in a process and format suitable for this analysis. Data base files are also used to store the data from the generic ICCR. A series of "lookup tables", identified in the DBMS sub-menu (Figure E-1) are used to store coded data for inputting during the analysis. This is data which is frequently used during the ICCR analysis. For example, the "Task Statement" table contains the list of the approximately 150 unique task statements identified in the generic ICCR along with their corresponding 4-digit code numbers. The 4-digit code numbers are used for inputting during the analysis. Similarly, the information "Range Table" contains a list of information display ranges which are used as input during the analysis of informational displays along with their 2-digit code numbers.

Data base files are also used to store the primary input data for the task analysis in the DBMS. For example, a data base file is used to store the task elements and associated information and control requirements and characteristics for each task.

Index files are used in the DBMS to order information for manipulation or printing with respect to specific DBMS functions.

TABLE E-1

Lookup Tables

GENERAL TABLES

1) epg title
2) affected safety functions
3) task statement
4) cue
5) affected system
6) r.t.
7) availability
8) task code

CONTROL TABLES

9) type of control
10) mode

INSTRUMENTATION TABLES

11) type of display
12) range
13) units
14) accuracy

R) Return to Main Menu

PLEASE CHOOSE ONE

## E.3 CODING SCHEME FOR THE DBMS

A coding scheme was developed for the DBMS which provided two functions. The first function was to provide a limited set of forced choices for each of the characteristics and constraints to be defined in the task analysis. Providing such a forced choice assisted in the delineating the model for the task analysis as discussed in Section 3.2 of the report. Second, using a numerical or alpha-numeric coding scheme provided for a sufficient data entry process. This portion of Appendix E provides the coding schemes as well as some criteria for selection of coding during the data entry. For the Generic ICCR, standardized coding sheets were used to prepare data entry. The forms ensure a consistent manner of data entry as well as ensuring that the data does not exceed the allowable fields allowed in the DBMS.

### EPG Title

Each EPG was coded using a 2-digit code. This information is contained in the EPG "Lookup Table", shown in Table E-2. The 2-digit codes 01 through 07 correspond to the standard abbreviations for the Optimal Recovery Guidelines of the EPG's. The 2-digit codes 08 through 32 correspond to sections of the Functional Recovery Guideline beginning with the functional recovery entry procedure proceeding through the functional recovery reactivity control one, functional reactivity control two, ... functional long term actions, and functional resource assessment trees.

### Affected Safety Functions

The safety functions are coded using a single digit code. Table E-3 provides the "Lookup Table" contents with the text which corresponds to each single digit code number.

TABLE E-2

EPG Title Table

| CODE | EPG TITLE |
|---|---|
| 01 | SPTA |
| 02 | RT |
| 03 | LOCA |
| 04 | SGTR |
| 05 | ESDE |
| 06 | LOF |
| 07 | LOFC |
| 08 | FREP |
| 09 | FRC1 |
| 10 | FRC2 |
| 11 | FRC3 |
| 12 | FRC4 |
| 13 | FMVA |
| 14 | FIC1 |
| 15 | FIC2 |
| 16 | FPC1 |
| 17 | FPC2 |
| 18 | FPC3 |
| 19 | FPC4 |
| 20 | FPC5 |
| 21 | FPC6 |
| 22 | FHR1 |
| 23 | FHR2 |
| 24 | FHR3 |
| 25 | FHR4 |
| 26 | FHR5 |
| 27 | FCI1 |
| 28 | FTP1 |
| 29 | FTP2 |
| 30 | FCG1 |
| 31 | FLTA |
| 32 | FRAT |

TABLE E-3

Affected Safety Functions Table

| CODE | AFFECTED SAFETY FUNCTIONS |
|---|---|
| 1 | Reactivity Control |
| 2 | Pressure Control |
| 3 | Inventory Control |
| 4 | Core Heat Removal |
| 5 | RCS Heat Removal |
| 6 | Containment Isolation |
| 7 | Containment Temperature/Pressure |
| 8 | Containment Combustible Gas |
| 9 | Maintenance of Vital Auxiliaries |

Affected System

Each system defined in the reference plant description was coded using a 2-digit code number. Table E-4 provides the "Lookup Table" contents as well as the expansion of the abbreviations contained in the "Lookup Table". Note that code "99" corresponds to "none" in the "Lookup Table". This notation was used for coding the affected system column in the "Task Breakdown" input (main menu items 1 and 5) for task elements which have no associated information or control requirements or for tasks which have been analyzed elsewhere in the ICCR.

Task Statement

The "Task Statement" table contains a 4-digit code number and the associated text which defines each of the task statements. Sample task statements for the Generic ICCR and the associated 4-digit code numbers are contained in Appendix A of this report. The 4-digit code number for each task can be broken into two parts. The first 2 digits corresponds to the affected system code noted above. The system which is coded for each task is the system with which that task is most closely associated. For example, if a task required the operation of the reactor coolant pumps, the 4-digit code number for that task statement would be begin the digit "02" (see Table E-4). The second 2 digits of the 4-digit task code are simply sequential numbers for the task statements which correspond to a particular reference plant system.

Task Code

The "Task Code Lookup Table" provides the task inventory for the entire task analysis. The data in this table is represented in five columns which are system number, task code, EPG title number, EPG sequence number, and EPG section number. The System Number column provides the number of the Reference Plant System (from the affected system coding table) which corresponds to the task code contained in that line item on the table. The "task code" column contains the 4-digit task code which corresponds to the

TABLE E-4

Affected System Coding

The system code refers to the reference plant system with which the task or task element is concerned.

| SYSTEM | ABBREVIATION | CODE |
|---|---|---|
| Miscellaneous | MISC | 00 |
| Reactor Coolant System | RCS | 01 |
| Reactor Coolant Pumps | RCP | 02 |
| Steam Generator | S/G | 03 |
| Main Steam System | MSS | 04 |
| Safety Injection System | SIS | 05 |
| Containment Atmosphere Control System | CACS | 06 |
| Containment Isolation System | CIS | 07 |
| Feedwater Systems | FWS | 08 |
| Chemical and Volume Control System | CVCS | 09 |
| Pressurizer System | PZR | 10 |
| Pressurizer and Reactor Vessel Gas Vent System | RGVS | 11 |
| Reactivity Control (CEA's, CEDM's, RPS) | RXCS | 12 |
| Electrical Distribution System | EDS | 13 |
| Component Cooling Water System | CCWS | 14 |
| Compressed Air System | CAS | 15 |
| Intake Cooling Water System | ICWS | 16 |
| Steam Generator Blowdown System | SGBS | 17 |
| Shutdown Cooling System | SCS | 18 |
| RCS and Steam Generator Sampling System | SS | 19 |
| None | NONE | 99 |

text contained in the "Task Statement" table. The EPG title number column contains the 2-digit code that for the EPG title in which the task appears (coding for EPG title is provided above). The EPG sequence number provides the 3-digit code which indicates the sequential placement of that task in a particular EPG or EOP task listing. The EPG section number column is a 4-digit alpha-numeric code which identifies the portion of the EPG in which the task appears. A 4-digit numerical coding indicates the EPG step in which the task appears. An alpha-numeric coding beginning with the letters "AC" followed by 2-digits indicates the Functional Recovery Guideline acceptance criteria number in which the task appears. A 4-character alpha-numeric coding beginning with the letters "SI" followed by 2-digits indicates the EPG supplementary information item number in which the task appears. The "Task Code" table (task inventory) for the Generic ICCR is contained in part in Appendix C of this report.

## Cue for Initiating a Task

The cue is the stimulus or process which lead the operator to initiate a particular task under consideration. Cue is coded on each "Task Breakdown" sheet. The "Task Breakdown" for the Generic ICCR is contained in Appendix F of this report. Inputting of cue coding is provided on DBMS main menu items one and five. The coding for the Generic ICCR is provided in Table E-5, "Cue Table".

## Type of Display (TOD) for Information

Displays provide plant or equipment information to the operating crew in the control room. In the Generic ICCR, selection of the type of display observed the following guidelines:

Value: Analog meters, digital indicators, CRT's, counters, pen-recorders, etc. used to gain information on the instantaneous value (parameter value) of a plant system or piece of equipment. Printers and recorders can also be used to obtain the instantaneous values of a parameter.

TABLE E-5

Cue Table

| CODE | CUE |
|---|---|
| 1 | Task Initiated by Plant Alarm |
| 2 | Task Sequence in Procedure |
| 3 | Operator Observes a Parameter or Condition |
| 4 | Task Conducted Continuously or Periodically |

Trend: Printers, recorders, CRT's, etc. used to obtain the trend of a parameter versus time. Trend displays are most appropriate when the task requires the tracking of a parameter or a condition over time.

Status: A status display provides qualitative information on the state of a parameters or equipment (for the most part this will be binary information). Indicator lights, alarm windows, annunciators, etc. are adequate for providing this kind of information to the operator.

In the context of the requirements specified in the Generic ICCR, there is an implied heirarchy in the variables status, value, and trend. That is, a trend recorder may be used to obtain either value or status information. Similarly, a value indicator may be used to obtain status indication. Thus, if the Generic ICCR requires a status indication, either a value or trend display which provides equivalent information may be used in its place. The coding for "Type of Display" is provided in Table E-6, "Type of Display Table".

Range for Information Displays

The range for an information display should cover the entire span of the expected variance of any parameter or condition during all the transients under consideration. Range should include the starting and ending points of the span. For status indications, the range will consist of the discrete values which the status indication can assume. Range is coded using a 2-digit code which corresponds to some text statement. The coding used in the Generic ICCR is provided in Table E-7 "Range Table".

Units for Information Displays and Control Functions

The units for information displays and control functions are the units of

TABLE E-6

Type of Display Table

| CODE | TYPE OF DISPLAY |
|---|---|
| 1 | Value |
| 2 | Trend |
| 3 | Status |

TABLE E-7

Range Table

| CODE | RANGE | CODE | RANGE |
|---|---|---|---|
| 01 | 0-100 | 40 | 50-300 |
| 02 | 0-1000 | 41 | 500-4000 |
| 03 | 0-120 | 42 | 300-575 |
| 04 | 0-1200 | 43 | 300-665 |
| 05 | 0-15000 | 44 | 100-300 |
| 06 | 0-130 | 45 | 30-100 |
| 07 | 0-65 | 46 | 300-590 |
| 08 | 0-1500 | 47 | 300-610 |
| 09 | 0-7 | 48 | 300-1200 |
| 10 | 0-900 | 49 | 200-2600 |
| 11 | 0-20 | 50 | 0-1150 |
| 12 | 0-200 | 51 | 0-180 |
| 13 | 0-2000 | 52 | 0-1600 |
| 14 | 0-550 | 53 | 0-6 |
| 15 | 0-2400 | 54 | 1000-1500 |
| 16 | 0-250 | 55 | 40-200 |
| 17 | 0-70 | 56 | 40-300 |
| 18 | 0-30 | 57 | 0-10 |
| 19 | 0-300 | 58 | 0-320 |
| 20 | 0-3000 | 59 | 0-95000 |
| 21 | 0-400 | 60 | 50-350 |
| 22 | 0-4000 | 61 | 120-550 |
| 23 | 0-500 | 62 | 0-94500 |
| 24 | 0-600 | 63 | 0-2500 |
| 25 | 0-6000 | 64 | 65-92 |
| 26 | 0-40 | 65 | 40-54 |
| 27 | 0-80 | 66 | 0-5000 |
| 28 | 0-90 | 67 | 0-50 |
| 29 | 0-82000 | 68 | 10E-6-10E-2 |
| 30 | 1-10 | 69 | 0-5 |
| 31 | (-)1-2 | 90 | 0-150 |
| 32 | 0-150 | 91 | 200-700 |
| 33 | 0-1.5 | 92 | ADEQ/LOW |
| 34 | 100-600 | 93 | NORMAL/BYPASS |
| 35 | 1000-4000 | 95 | 1xE(-)8/2x82 |
| 36 | 1000-6000 | 96 | ZERO/NO ZERO |
| 37 | 0-650 | 97 | SPEED |
| 38 | 50-150 | 98 | OPEN/SHUT |
| 39 | 50-250 | 99 | ON/OFF |

measurement for status, value, and trend informational displays and for the specified control ranges. These are specified on the basis of the units which are most appropriate for accomplishment of the task. For example, unless the specific height of fluid in a tank is important or necessary for task accomplishment, tank level can usually be specified as a percent of some span of interest. Specification of percentage as the units provides a logical and intuitive indication of the volume of tank contents. The units for a status information display are simply the discrete values which the status indication can assume. The units used in the Generic ICCR and their corresponding 2-digit codes are provided in Table E-8, "Units Table".

Accuracy of Informational Displays

For certain tasks, the accuracy of the information display may be essential to proper completion of the task. Determination of the accuracy requirements are based on considerations such as the accuracy needed to insure timely completion of a task, the accuracy needed to insure equipment protection, or the accuracy needed to prevent confusion on the part of the operator. Accuracy is coded using a single digit. The ranges of accuracy used in the Generic ICCR and their respective single digit codes are provided in Table E-9, "Accuracy Table".

Type of Control

This coding identifies the type of control function required to exercise a particular component in order to perform a particular task. Two types of control functions were coded in the Generic ICCR. A "discrete" control function is one which has predetermined, distinct, and finite settings. The actions performed using a discrete control are few and obviously limited. An example of a discrete control function is an on-off control for a pump motor.

A "continuous" control function is one which permits the control of a component or parameter over a designated range such that the value

TABLE E-8

Units Table

| CODE | UNITS | CODE | UNITS |
|---|---|---|---|
| 01 | AMPS | 39 | % |
| 02 | CPM | 40 | %V |
| 03 | CPS | 41 | %W |
| 04 | CF | 42 | %P(T) |
| 05 | DFM | 43 | PPH |
| 06 | DPM | 44 | PSI |
| 07 | DEG | 45 | PSIA |
| 08 | DESC | 46 | PSID |
| 09 | DEGF | 47 | PSIG |
| 10 | FT | 48 | RPM |
| 11 | FTW | 49 | R/HR |
| 12 | GAL | 50 | SEC |
| 13 | GPH | 51 | SCFM |
| 14 | GPM | 52 | STEPS |
| 15 | HZ | 53 | UNITS |
| 16 | HR | 54 | V |
| 17 | IN | 55 | W |
| 18 | INHG | 56 | W/SQCM |
| 19 | INW | 57 | SCFH |
| 20 | KA | 58 | MPPH |
| 21 | KVAR | 59 | %DEF |
| 22 | KV | 60 | RODID |
| 23 | KW | 61 | RODSP |
| 24 | MVAR | 62 | LB/HR |
| 25 | MW | 63 | uC/CM E3 |
| 26 | UA | 64 | OFF/AUTO |
| 27 | UCI | 88 | ADEQ/LOW |
| 28 | UCI/G | 89 | 1000 GAL |
| 29 | UMHO | 90 | 1000 LBM/HR |
| 30 | MPH | 91 | NORMAL/BYPASS |
| 31 | MA | 92 | % H2 BY VOL |
| 32 | MR/HR | 93 | OFF/BLOW |
| 33 | MV | 94 | FAST/BLOW |
| 34 | MILS | 95 | % HEIGHT |
| 35 | MIN | 96 | % FULL PWR |
| 36 | NOTCH | 97 | ZERO/NO ZERO |
| 37 | PPB | 98 | OPEN/SHUT |
| 38 | PPM | 99 | ON/OFF |

TABLE E-9

Accuracy Table

| CODE | ACCURACY |
| --- | --- |
| 1 | 0 - 2.5% |
| 2 | 0 - 15% |
| 3 | N/A |
| 4 | 0 - 10% |

TABLE E-10

Type of Control Table

| CODE | TYPE OF CONTROL |
| --- | --- |
| 1 | Discrete |
| 2 | Continuous |
| 3 | N/A |

or condition which may be assumed are in a continuum over the range of interest. An example of a "continuous" control is a valve control function which permits modulation of the valve opening over a range of interest. The coding for control type is provided in Table E-10, "Type of Control Table".

Mode of Control Function Operation

This coding identifies whether the control function specified under type of control utilizes a direct remote-manual control of the parameter or component, or whether some automatic feature is interpolated in the control loop. A "manual" mode of control is one in which the positioning of the controller assumes the value assigned directly by the operator using the control scheme. An example of the "manual" mode of control is the direct opening and closing of a remotely operable valve. Another example would be the direct remote positioning of a remotely operable valve over some continuous range of interest. An "automatic" mode of control is a control scheme for which a set point is adjusted by the operator and the control scheme acts to achieve and maintain that setpoint by controlling a component accordingly. An example of an "automatic" mode of control would be a control scheme which the operator adjusted the setpoint for the flow in a system and in which the control scheme adjusted the position of a valve to maintain and achieve that flow setpoint. Mode of control is specified for a control scheme taking into consideration the control action required of the operator and the demands which the tasks places on the operator. For example, if the task requires the maintenance of a flow which can assume different values depending on the task context, then an automatic mode of control would be specified in order to minimize the task demands on the operator. The coding used in the Generic ICCR for mode of control is contained in Table E-11, "Mode Table".

Reaction Time for Information Displays and Control Functions

Informational displays and control functions require a certain

TABLE E-11

Mode Table

| CODE | MODE |
| --- | --- |
| 1 | Manual |
| 2 | Automatic |
| 3 | Man/Auto |

response time in order to insure timely completion of a task and to prevent operator confusion. The response time for informational displays is defined as the amount of time between a step change in a parameter indicated by the informational display and a reflection of 90% of that change in the informational display. This definition applies for value and trend informational displays. For status displays, the response time is defined as the time from the change in state or condition of that being monitored to its reflection in status indication. For conditions or parameters which change instantaneously or nearly instantaneously, (e.g., electrical current, breaker status, valve position for small valves) a more rapid response time (e.g., 0 to 1 second) may be specified to insure that the operator receives timely and consistent information as expected. In other cases, a condition (e.g. valve position for large valves) may change slowly. In such cases, response time should reflect the rate of change of the parameter or condition and the feedback needed by the operator in order to properly execute the task.

Response time for a control function should be specified recognizing the possible rate of change in the component state or condition or the rate of change of a parameter and the requirements of the task for timely execution of the task. For example, the response time for a breaker control should be relatively short (e.g. 0 - 1 second) since it is desired to be able to control these components in a relatively short period of time. On the other hand, a control scheme which operates a large valve which has a finite travel time need have a response time which corresponds to the travel time of that valve. Response to control functions is measured from the time that the control is manipulated until the component being controlled assumes the desired position or state. Response time does include time for the parameter being controlled to achieve its desired condition. The coding used for response time for informational displays and control functions in the Generic ICCR is provided in Table E-12, "RT Table".

TABLE E-12

RT Table

| CODE | RT |
| --- | --- |
| 1 | 1 - 5 sec |
| 2 | 6 - 10 sec |
| 3 | 11 - 30 sec |
| 4 | 31 - 60 sec |
| 5 | >60 sec |
| 6 | 0 - 1 sec |

Availability of Information Displays and Control Functions

Availability with respect to information displays and control functions refers to the functionability of a display or control following certain plant conditions. For the Generic analysis, two broad categories of availability requirements were used. If an information display or control function is required to function following a loss of offsite power, then this places certain engineering requirements on these devices (e.g., the device must be powered from onsite electrical power). The second major category of availability requirement is the functionability of an information display or control in a harsh containment environment. If a portion of an information display loop (i.e., the transmitter) or a portion of the control loop is located in the containment building, and its function is required following an event which creates a harsh containment environment (i.e., loss of coolant accident, steam line break), then the availability requirement is referred to as post DBA. The availability coding used in the Generic ICCR is provided in Table E-13, "Availability Coding Table".

Component Coding for Affected Systems

A 2-digit coding systems was used to identify the components within a specific system as described in the Reference Plant Description. No "Lookup Table" data file was created in the DBMS for cross referencing the coding and text. A cross referencing between coding and text is provided on component listings located in each Reference Plant system description. An example of a component listing for the RCS is included in Appendix D.

Intervals for Information Displays

Intervals are graduated by units of 1, 2, or 5 or decimal multiples thereof. In this analysis, intervals are designated in the largest interval which will support execution of the task. An approximate thumb rule for designating interval graduations is that during a transient

TABLE E-13

Availability Coding Table

| CODE | AVAILABLE |
|---|---|
| 1 | LOOP |
| 2 | DBA |
| 3 | LOOP + DBA |
| 4 | N/A |

which requires following a parameter on a information display, parameter values should not change at a rate greater than 1 interval per second. This particular data is only used in the consolidation phase and since it is only during this phase that the entire range of the informational display can be judged. Thus, interval markings provide the major scale marking for an informational display which are annotated by alpha-numeric indications.

Divisions for Informational Displays

Divisions are the number of intermediate markings between the major scale interval markings. Division markings are not alpha-numerically annotated. Divisions are specified in order to provide adequate reading resolution for the operator as required by the task for which the informational display is being specified. Human factors thumb rules require that no more than nine division graduations should separate indicated values. No coding scheme is used for divisions therefore no "Lookup Table" is provided in the DBMS for this. A number of divisions to be used between scale intervals is indicated as unit value between 1 and 9. Note that this data is only used during the consolidation phase since it is only during this phase that the interval markings are designated for an informational display.

APPENDIX F

TASK BREAKDOWN REPORTS

## TASK BREAKDOWN REPORTS

Appendix F contains the "task breakdown reports" for the tasks of Step 8 of the LOFC EPG. These reports list the human actions (task elements) which must be accomplished in order to execute the task. The context within which the task appears is provided by the task statement, statement of the purpose of the task, an indication of the cues which may initiate execution of the task, the EPG title within which the task appears, and the sequence number (order of occurrence) for the task in the particular EPG. The task elements provide a listing, in their anticipated sequence of occurrence, of the elemental human actions requiring the use of either control room information or controls which must be accomplished to execute the task. Elements are identified only as they relate to systems specified in the reference plant, (Appendix D) and as they relate to information or control functions contained in the control room. Note that some elements have no associated information or control requirements and are only identified to clarify the sequence of actions needed to accomplish the task. In some instances another task may be used as element of a task. For example, "Determine pressurizer level" is a task in its own right. However, due to its elementary nature and frequency of use, "Determine pressurizer level" may be used as an element of other tasks. In such instances, the task statement is recorded as an element with its unique four digit task number in parenthesis. Since the information or controls associated with that task have already been developed elsewhere, the affected system is listed as "noned" to simplify the data base coding and to eliminate redundant work.

As noted above, there is a separate task breakdown report for each instance of an appearance of a task in an EPG. The page number at the bottom of each task breakdown report identifies the EPG title, four digit task code, EPG section number, and task sequence number for that appearance of the task in an EPG. The "task breakdown reports" in this Appendix are excerpted from the LOFC EPG and are ordered in their order of appearance of task within Step 8. Thus, this Appendix provides an expansion and further detailing of the task listings for Step 8 contained in Appendix B.

GENERIC COMPONENT I&C MATRICES

CONTROLLER/LOGIC

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Information** | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Reset Status (auto/manual) | | | | | | | | | | | | | | | | | | | |
| On/Off Status | | | | | | | | | | | | | | | | | | | |
| Continuous Output | | | | | | | | | | | | | | | | | | | |
| Trip Status | | | | | | | | | | | | | | | | | | | |
| Interlock Status | | | | | | | | | | | | | | | | | | | |
| **Controls** | | | | | | | | | | | | | | | | | | | |
| On/Off Manual | | | | | | | | | | | | | | | | | | | |
| Automatic On/Off | | | | | | | | | | | | | | | | | | | |
| Automatic Continuous | | | | | | | | | | | | | | | | | | | |
| Trip | | | | | | | | | | | | | | | | | | | |
| Reset | | | | | | | | | | | | | | | | | | | |
| Interlock | | | | | | | | | | | | | | | | | | | |
| Interlock Override | | | | | | | | | | | | | | | | | | | |

## MOTOR OPERATED VALVES

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Information** | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Valve Position Indication (continuous) | | | | | | | | | | | | | | | | | | | |
| Valve Position Indication (limit switch) | | | | | | | | | | | | | | | | | | | |
| Power Available | | | | | | | | | | | | | | | | | | | |
| **Controls** | | | | | | | | | | | | | | | | | | | |
| Manual open/shut | | | | | | | | | | | | | | | | | | | |
| Automatic open/shut | | | | | | | | | | | | | | | | | | | |
| Manual Continuous Control | | | | | | | | | | | | | | | | | | | |
| Auto Continuous Control | | | | | | | | | | | | | | | | | | | |
| Reset | | | | | | | | | | | | | | | | | | | |
| Interlock | | | | | | | | | | | | | | | | | | | |

PNEUMATICALLY OPERATED VALVE

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Information** | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Valve Position Indication (continuous) | | | | | | | | | | | | | | | | | | | |
| Power Available | | | | | | | | | | | | | | | | | | | |
| Air Pressure | | | | | | | | | | | | | | | | | | | |
| Valve Position Indication (limit switches) | | | | | | | | | | | | | | | | | | | |
| **Controls** | | | | | | | | | | | | | | | | | | | |
| Manual open/shut | | | | | | | | | | | | | | | | | | | |
| Automatic open/shut | | | | | | | | | | | | | | | | | | | |
| Reset | | | | | | | | | | | | | | | | | | | |
| Interlock | | | | | | | | | | | | | | | | | | | |
| Manual Continuous Control | | | | | | | | | | | | | | | | | | | |
| Auto Continuous Control | | | | | | | | | | | | | | | | | | | |

## FANS - ELECTRIC

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Information** | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Speed (discrete) | | | | | | | | | | | | | | | | | | | |
| Power (watts) | | | | | | | | | | | | | | | | | | | |
| Current (amps) | | | | | | | | | | | | | | | | | | | |
| Voltage | | | | | | | | | | | | | | | | | | | |
| Breaker Status | | | | | | | | | | | | | | | | | | | |
| Cooling Water Flow | | | | | | | | | | | | | | | | | | | |
| Cooling Water Inlet Temperature | | | | | | | | | | | | | | | | | | | |
| Cooling Water Outlet Temperature | | | | | | | | | | | | | | | | | | | |
| Cooling Water Pressure | | | | | | | | | | | | | | | | | | | |
| **Controls** | | | | | | | | | | | | | | | | | | | |
| Manual on/off | | | | | | | | | | | | | | | | | | | |
| Auto on/off (trip) | | | | | | | | | | | | | | | | | | | |
| Variable speed (discrete) | | | | | | | | | | | | | | | | | | | |
| Interlock | | | | | | | | | | | | | | | | | | | |
| Reset | | | | | | | | | | | | | | | | | | | |

PIPING/HEADERS

| Information | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Flow | | | | | | | | | | | | | | | | | | | |
| Pressure | | | | | | | | | | | | | | | | | | | |
| Temperature | | | | | | | | | | | | | | | | | | | |
| Radioactivity | | | | | | | | | | | | | | | | | | | |

TANKS

| Information | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Tank Level | | | | | | | | | | | | | | | | | | | |
| Tank Pressure | | | | | | | | | | | | | | | | | | | |
| Tank Temperature | | | | | | | | | | | | | | | | | | | |
| **Controls** | | | | | | | | | | | | | | | | | | | |
| None | | | | | | | | | | | | | | | | | | | |

HEAT EXCHANGERS

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Information | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Inlet Temperature (process) | | | | | | | | | | | | | | | | | | | |
| Outlet Temperature (process) | | | | | | | | | | | | | | | | | | | |
| Inlet Cooling Temperature | | | | | | | | | | | | | | | | | | | |
| Outlet Cooling Temperature | | | | | | | | | | | | | | | | | | | |
| Inlet Process Pressure | | | | | | | | | | | | | | | | | | | |
| Outlet Process Pressure | | | | | | | | | | | | | | | | | | | |
| Inlet Cooling Pressure | | | | | | | | | | | | | | | | | | | |
| Outlet Cooling Pressure | | | | | | | | | | | | | | | | | | | |
| Process Fluid Level | | | | | | | | | | | | | | | | | | | |
| Cooling Fluid Level | | | | | | | | | | | | | | | | | | | |
| Process Flow | | | | | | | | | | | | | | | | | | | |
| Cooling Flow | | | | | | | | | | | | | | | | | | | |

## SOLENOID VALVES

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Information** | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Open/Shut Status (solenoid power) | | | | | | | | | | | | | | | | | | | |
| Open/Shut Status (valve position) | | | | | | | | | | | | | | | | | | | |
| Power Available | | | | | | | | | | | | | | | | | | | |
| **Controls** | | | | | | | | | | | | | | | | | | | |
| Open/Shut Manual | | | | | | | | | | | | | | | | | | | |
| Open/Shut Automatic | | | | | | | | | | | | | | | | | | | |
| Interlock | | | | | | | | | | | | | | | | | | | |
| Reset | | | | | | | | | | | | | | | | | | | |

## PRESSURIZER

| | Sensory | | | Cognitive | | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Instrumentation | Read | Detect | | Determine | Compare | Decide | Diagnose | Calculate | | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Pressurizer Level | | | | | | | | | | | | | | | | | | | | | |
| Pressurizer Pressure | | | | | | | | | | | | | | | | | | | | | |
| Pressurizer Temperature | | | | | | | | | | | | | | | | | | | | | |
| Steam Space | | | | | | | | | | | | | | | | | | | | | |
| Water Space | | | | | | | | | | | | | | | | | | | | | |
| Heaters | | | | | | | | | | | | | | | | | | | | | |
| Power (e.g., KW) | | | | | | | | | | | | | | | | | | | | | |
| On/Off Status | | | | | | | | | | | | | | | | | | | | | |
| Current (e.g., amps) | | | | | | | | | | | | | | | | | | | | | |
| Voltage | | | | | | | | | | | | | | | | | | | | | |
| Trip Status | | | | | | | | | | | | | | | | | | | | | |
| Power Available | | | | | | | | | | | | | | | | | | | | | |
| Controls (Heaters) | | | | | | | | | | | | | | | | | | | | | |
| On/Off Manual | | | | | | | | | | | | | | | | | | | | | |
| Automatic On/Off | | | | | | | | | | | | | | | | | | | | | |
| Automatic Continuous | | | | | | | | | | | | | | | | | | | | | |
| Trip Reset | | | | | | | | | | | | | | | | | | | | | |

CENTRIFUGAL PUMP - TURBINE DRIVEN

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Information | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Throttle Valve Position | | | | | | | | | | | | | | | | | | | |
| Steam Chest Pressure | | | | | | | | | | | | | | | | | | | |
| Steam Header Pressure | | | | | | | | | | | | | | | | | | | |
| First Stage Pressure | | | | | | | | | | | | | | | | | | | |
| Turbine Speed | | | | | | | | | | | | | | | | | | | |
| Trip Valve Position | | | | | | | | | | | | | | | | | | | |
| Pump Discharge Pressure | | | | | | | | | | | | | | | | | | | |
| Pump Discharge Flow | | | | | | | | | | | | | | | | | | | |
| Pump Suction Pressure | | | | | | | | | | | | | | | | | | | |
| Lubrication Oil | | | | | | | | | | | | | | | | | | | |
| (turbine or pump) | | | | | | | | | | | | | | | | | | | |
| Oil Pressure | | | | | | | | | | | | | | | | | | | |
| Controls | | | | | | | | | | | | | | | | | | | |
| Manual Throttle Valve Control | | | | | | | | | | | | | | | | | | | |
| (speed control) | | | | | | | | | | | | | | | | | | | |
| Trip (trip valve) | | | | | | | | | | | | | | | | | | | |
| Automatic Speed Control | | | | | | | | | | | | | | | | | | | |

## POSITIVE DISPLACEMENT PUMP

## MOTOR DRIVEN

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Information | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Speed | | | | | | | | | | | | | | | | | | | |
| Amperes (current) | | | | | | | | | | | | | | | | | | | |
| Voltage | | | | | | | | | | | | | | | | | | | |
| Watts (power) | | | | | | | | | | | | | | | | | | | |
| On/Off Status Light | | | | | | | | | | | | | | | | | | | |
| Suction Pressure | | | | | | | | | | | | | | | | | | | |
| Discharge Pressure | | | | | | | | | | | | | | | | | | | |
| Discharge Flow | | | | | | | | | | | | | | | | | | | |
| Lubricating Oil | | | | | | | | | | | | | | | | | | | |
| Oil Pressure | | | | | | | | | | | | | | | | | | | |
| Oil Sump Level | | | | | | | | | | | | | | | | | | | |
| Oil Temperature | | | | | | | | | | | | | | | | | | | |
| Oil Flow | | | | | | | | | | | | | | | | | | | |
| Seal Cooling Water | | | | | | | | | | | | | | | | | | | |
| Water Pressure | | | | | | | | | | | | | | | | | | | |
| Water Temperature | | | | | | | | | | | | | | | | | | | |
| Water Flow | | | | | | | | | | | | | | | | | | | |
| Controls | | | | | | | | | | | | | | | | | | | |
| On/Off Manual | | | | | | | | | | | | | | | | | | | |
| Automatic On/Off | | | | | | | | | | | | | | | | | | | |
| Speed Control Discrete | | | | | | | | | | | | | | | | | | | |
| Speed Control Continuous | | | | | | | | | | | | | | | | | | | |

BREAKERS - MAIN DISTRIBUTION

| | Sensory | | Cognitive | | | | | Behavioral | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Information** | Read | Detect | Determine | Compare | Decide | Diagnose | Calculate | Close | Open | Decrease | Increase | Trip | Reset | Request | Position | Throttle | Start | Stop | Record |
| Open/shut status | | | | | | | | | | | | | | | | | | | |
| Current (amps) | | | | | | | | | | | | | | | | | | | |
| Voltage | | | | | | | | | | | | | | | | | | | |
| Trip ID - overcurrent | | | | | | | | | | | | | | | | | | | |
| undervoltage | | | | | | | | | | | | | | | | | | | |
| reverse phase | | | | | | | | | | | | | | | | | | | |
| interlock | | | | | | | | | | | | | | | | | | | |
| Phase Sychronization | | | | | | | | | | | | | | | | | | | |
| (breaker open) | | | | | | | | | | | | | | | | | | | |
| Control PWR available | | | | | | | | | | | | | | | | | | | |
| **Controls** | | | | | | | | | | | | | | | | | | | |
| Manual open/shut | | | | | | | | | | | | | | | | | | | |
| Auto trip - overcurrent | | | | | | | | | | | | | | | | | | | |
| undervoltage | | | | | | | | | | | | | | | | | | | |
| reverse phase | | | | | | | | | | | | | | | | | | | |
| interlock | | | | | | | | | | | | | | | | | | | |

TASK BREAKDOWN REPORTS

TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
|---|---|---|
| LOFC | 0008 | INVENTORY CONTROL<br>CORE HEAT REMOVAL |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
|---|---|---|---|---|---|
| DETERMINE RCS SUBCOOLING | 0102 | 044 | 2<br>3<br>4 | 0000740501 | TO PERMIT THE OPERAT<br>OR TO MONITOR RCS IN<br>VENTORY AND THE ADEQ<br>UACY OF CORE COOLING |

| TASK ELEMENTS | AFFECTED SYSTEM |
|---|---|
| READ RCS SUBCOOLING AT CORE OUTLET | RCS |
| READ RCS HOT LEG TEMPERATURE | RCS |
| READ RCS COLD LEG TEMPERATURE | RCS |
| READ PRESSURIZER PRESSURE | PZR |
| READ RCS SUBCOOLING IN HOT LEG | RCS |
| READ CORE EXIT TEMPERATURE | RCS |
| CALCULATE RCS SUBCOOLING USING ELEMENTS #02,03,04&06 | NONE |

TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
|---|---|---|
| LOFC | 0008 | INVENTOPY CONTROL<br>CORE HEAT REMOVAL |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
|---|---|---|---|---|---|
| DETERMINE PZR LEVEL | 1005 | 045 | 1<br>2<br>3<br>4 | 0000110501 | 1)SAFETY FUNCTION STATUS CHECKS<br>2)CHECK EVENT DIAGNOSIS<br>3)CONTROL RCS INVENTORY |

| TASK ELEMENTS | AFFECTED SYSTEM |
|---|---|
| READ PRESSURIZER LEVEL | PZR |
| READ PRESSURIZER LEVEL TREND | PZR |

## TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
|---|---|---|
| LOFC | 000C | RCS HEAT REMOVAL<br>CORE HEAT REMOVAL<br>MAINTENANCE OF VITAL AUXILIARIES |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
|---|---|---|---|---|---|
| DETERMINE MAIN CONDENSER AVAILABILTY | 0401 | 046 | 2 | 0000510501 | TO ASSIST IN DECIDING IF RCS HEAT CAN BE DUMPED TO THE CONDENSER |

| TASK ELEMENTS | AFFECTED SYSTEM |
|---|---|
| READ CONDENSER VACUUM | FWS |
| DETECT TBS TO CONDENSER VACUUM INTERLOCK RESET | FWS |
| DETECT MAIN CIRCULATING PUMP BREAKER SHUT | ICWS |
| DETECT MAIN CONDENSER STARTUP HOGGER BREAKER SHUT | FWS |
| DETECT MAIN CONDENSER MAIN CIRC FLOW ADEQUATE | ICWS |
| DETECT MAIN CONDENSER VACUUM ADEQUATE | FWS |

# TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
|---|---|---|
| LOFC | 0008 | CORE HEAT REMOVAL<br>RCS HEAT REMOVAL |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
|---|---|---|---|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 | 047 | 2<br>3 | 0000740501 | TO ENSURE THE CAPABILITY TO REMOVE HEAT FROM THE RCS USING THE S/G |

| TASK ELEMENTS | AFFECTED SYSTEM |
|---|---|
| DETECT PROPER CONDENSATE PUMP OPERATION (TASK 0809) | NONE |
| DETECT PROPER FEEDWATER PUMP OPERATION (TASK 0810) | NONE |
| DETECT AUTOMATIC CLOSURE OF MFW REGULATING VALVE | FWS |
| DETECT AUTOMATIC POSITIONING OF BFW REG VALVE TO MIN | FWS |
| DETECT MFW ISOLATION VALVE(S) OPEN | FWS |
| OPEN MFW ISOLATION VALVE(S) | FWS |
| READ FEEDWATER FLOW TO S/G | FWS |
| THROTTLE BFW REG. VALVE POSITION | FWS |
| READ BFW REG. VALVE POSITION | FWS |
| THROTTLE MANUALLY MFW REG. VALVE POSITION | FWS |
| READ MFW REG. VALVE POSITION | FWS |
| READ S/G LEVEL | S/G |
| READ S/G LEVEL TREND | S/G |

# TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
|---|---|---|
| LOFC | 0008 | CORE HEAT REMOVAL<br>RCS HEAT REMOVAL |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
|---|---|---|---|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 | 048 | 2<br>3<br>4 | 0000540501 | 1)VERIFY/CONTROL S/G AVAILABILITY FOR RCS & CORE HEAT REMOVAL<br>2)EVALUATE NEED FOR PLANT COOLDOWN<br>3)MAINTAIN S/G LEVEL |

| TASK ELEMENTS | AFFECTED SYSTEM |
|---|---|
| READ ELECTRIC DRIVEN AFW PUMP BREAKER POSITION | FWS |
| READ ELECTRIC DRIVEN AFW PUMP DISCHARGE PRESSURE | FWS |
| READ STEAM DRIVEN AFW PUMP DISCHARGE PRESSURE | FWS |
| OPEN STEAM DRIVEN AFW PUMP STEAM SUPPLY VALVE | MSS |
| DETECT STEAM DRIVEN AFW PUMP STM SUPPLY VLV POSITION | MSS |
| THROTTLE THE AFW THROTTLE VALVE | FWS |
| READ AFW THROTTLE VALVE POSITION | FWS |
| READ ELECTRIC DRIVEN AFW PUMP FLOW | FWS |
| READ STEAM DRIVEN AFW PUMP FLOW | FWS |
| READ S/G LEVEL | S/G |
| READ S/G LEVEL - TREND | S/G |

TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
| --- | --- | --- |
| LOFC | 0008 | RCS HEAT REMOVAL<br>CORE HEAT REMOVAL<br>MAINTENANCE OF VITAL AUXILIARIES |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
| --- | --- | --- | --- | --- | --- |
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 | 049 | 2 | 0000740501 | TO REMOVE RCS HEAT FROM THE S/Gs VIA THE MAIN CONDENSER |

| TASK ELEMENTS | AFFECTED SYSTEM |
| --- | --- |
| DETERMINE MAIN CONDENSER AVAILABILITY (TASK 0401) | NONE |
| DETERMINE RCS HOT LEG TEMPERATURE (TASK 0109) | NONE |
| DETERMINE RCS COLD LEG TEMPERATURE (TASK 0108) | NONE |
| DETERMINE S/G PRESSURE (TASK 0304) | NONE |
| DETERMINE SG LEVEL (TASK 0302) | NONE |
| ENSURE MFW TO EITHER/BOTH SGs (TASK 0103) | NONE |
| ENSURE AFW TO EITHER/BOTH SGs (TASK 0808) | NONE |
| DETERMINE RCS COOLDOWN RATE (TASK 0103) | NONE |
| POSITION TBS OPEN PRESSURE SETPOINT | MSS |
| READ TBS VALVE POSITION MOVEMENT | MSS |

TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
|---|---|---|
| LOFC | 0008 | CORE HEAT REMOVAL<br>RCS HEAT REMOVAL |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
|---|---|---|---|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 | 050 | 2<br>3<br>4 | 0000740501 | TO PERMIT HEAT RE-MOVAL THROUGH THE S/Gs |

| TASK ELEMENTS | AFFECTED SYSTEM |
|---|---|
| DETERMINE S/G PRESSURE (TASK 0304) | NONE |
| DETERMINE S/G LEVEL (TASK 0302) | NONE |
| DETERMINE RCS HOT LEG TEMPERAURE (TASK 0109) | NONE |
| DETERMINE RCS COLD LEG TEMPERATURE (TASK 0108) | NONE |
| DETERMINE RCS COOLDOWN RATE (TASK 0103) | NONE |
| ENSURE MFW TO EITHER/BOTH SGs (TASK 0804) | NONE |
| ENSURE AFW TO EITHER/BOTH SGs (TASK 0808) | NONE |
| POSITION ADV OPEN PRESSURE SETPOINT | MSS |
| READ ADV POSITION | MSS |

TASK BREAKDOWN REPORT

| EPG TITLE | EPG STEP | AFFECTED SAFETY FUNCTIONS |
|---|---|---|
| LOFC | 0008 | INVENTORY CONTROL<br>CORE HEAT REMOVAL |

| TASK STATEMENT | TASK CODE | TASK LISTING | CUE | INPO CODE | PURPOSE |
|---|---|---|---|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 | 051 | 4<br>3 | 0000110501 | TO PERMIT OPERATOR TO MONITOR RCS INVENTORY CHANGES AND ESPECIALLY CORE COVERAGE |

| TASK ELEMENTS | AFFECTED SYSTEM |
|---|---|
| DETERMINE RCS SUBCOOLING (TASK 0102) | NONE |
| DETERMINE PZR LEVEL (TASK 1005) | NONE |
| DETERMINE IF RCPs ARE OPERATING (TASK 0201) | NONE |
| DETERMINE CORE EXIT TEMPERATURE (TASK 0104) | NONE |
| READ REACTOR VESSEL UPPER HEAD FLUID TEMPERATURE | RCS |
| READ REACTOR VESSEL FLUID LEVEL | RCS |
| DETERMINE PRESSURIZER PRESSURE (TASK 1003) | NONE |
| DETERMINE IF CORE EXIT TEMPERATURE INDICATES SUPERHT | NONE |
| DETERMINE IF RV UPPER HEAD TEMP INDICATES SATURATION | NONE |

APPENDIX G

INFORMATION AND CONTROL CHARACTERISTICS

INFORMATION AND CONTROL CHARACTERISTICS

Appendix G contains reports which detail the characteristics of information and controls derived from each task element listed in the task breakdown reports in Appendix F. Note that some elements on task breakdown reports do not lead to the derivation of information or control characteristics. This is identified for the element by indicating its affected system is "none". At this level of the task analysis, the characteristics derived for each information requirement are: types of display, range of display, accuracy, units, availability, and reaction time. The characteristics derived for each control function are: type of control, mode, range of control (minimum and maximum), units, availability, and reaction time. The definitions for each of tnese characteristics and the possible values which may be assigned to each are defined and identified in Appendix E under Coding.

This Appendix is organized by task code numbers. The page number at the bottom of the page is the four digit task code followed by a one or two digit number indicating the task element number from which the characteristics of that page are developed. Pages are ordered by the order of the task code numbers.

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ CORE EXIT TEMPERATURE | RCS | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 200-700 | |
| | | | UNITS | DEGF | |
| | | | ACCURACY | 0 - 2.5% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ RCS SUBCOOLING AT CORE OUTLET | RCS | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-200 | |
| | | | UNITS | DEGF | |
| | | | ACCURACY | 0 - 10% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ RCS SUBCOOLING IN HOT LEG | RCS | 03 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-200 | |
| | | | UNITS | DEGF | |
| | | | ACCURACY | 0 - 10% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ RCS HOT LEG TEMPERATURE | RCS | 03 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 300-665 | |
| | | | UNITS | DEGF | |
| | | | ACCURACY | 0 - 2.5% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ RCS COLD LEG TEMPERATURE | RCS | 04 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 300-590 | |
| | | | UNITS | DEGF | |
| | | | ACCURACY | 0 - 2.5% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ PRESSURIZER PRESSURE | PZR | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 200-2600 | |
| | | | UNITS | PSIA | |
| | | | ACCURACY | 0 - 10% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| CALCULATE RCS SUBCOOLING USING ELEMENTS #02,03,04&06 | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE PZR LEVEL | 1005 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ PRESSURIZER LEVEL | PZR | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % BETWEEN UPPER AND LOWER LVL TAP |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE PZR LEVEL | 1005 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ PRESSURIZER LEVEL TREND | PZR | 01 | INST. | | |
| | | | T.O.D. | TREND | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % BETWEEN UPPER AND LOWER LVL TAP |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 11-30sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE MAIN CONDENSER AVAILABILTY | 0401 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ CONDENSER VACUUM | FWS | 03 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-30 | |
| | | | UNITS | INHG | |
| | | | ACCURACY | 0 - 10% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE MAIN CONDENSER AVAILABILTY | 0401 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT MAIN CONDENSER VACUUM ADEQUATE | FWS | 03 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | ADEQ/LOW | |
| | | | UNITS | ON/OFF | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE MAIN CONDENSER AVAILABILTY | 0401 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT TBS TO CONDENSER VACUUM INTERLOCK RESET | FWS | 03 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | ON/OFF | SETPOINT = [16 IN HG] |
| | | | UNITS | ON/OFF | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 0-1SEC | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE MAIN CONDENSER AVAILABILTY | 0401 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT MAIN CONDENSER STARTUP HOGGER BREAKER SHUT | FWS | 03 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | OPEN/SHUT | |
| | | | UNITS | OPEN/SHUT | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 0-1SEC | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE MAIN CONDENSER AVAILABILTY | 0401 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT MAIN CIRCULATING PUMP BREAKER SHUT | ICWS | 01 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | OPEN/SHUT | |
| | | | UNITS | OPEN/SHUT | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 0-1SEC | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE MAIN CONDENSER AVAILABILTY | 0401 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT MAIN CONDENSER MAIN CIRC FLOW ADEQUATE | ICWS | 07 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | ADEQ/LOW | SETPOINT = [120,00 GPM] |
| | | | UNITS | ON/OFF | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ S/G LEVEL | S/G | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % WIDE RANGE LEVEL |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ S/G LEVEL TREND | S/G | 01 | INST. | | |
| | | | T.O.D. | TREND | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % WIDE RANGE LEVEL |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ BFW REG. VALVE POSITION | FWS | 07 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| THROTTLE BFW REG. VALVE POSITION | FWS | 07 | CONTROL | | |
| | | | T.O.C. | CONTINUOUS | |
| | | | MODE | MANUAL | |
| | | | RANGE | | |
| | | | MIN: | 0 | |
| | | | MAX: | 100 | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT AUTOMATIC POSITIONING OF BFW REG VALVE TO MIN | FWS | 07 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT AUTOMATIC CLOSURE OF MFW REGULATING VALVE | FWS | 08 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ FEEDWATER FLOW TO S/G | FWS | 16 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-6000 | FLOW TO ONE S/G ONLY |
| | | | UNITS | 1000 LBM/HR | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| THROTTLE MANUALLY MFW REG. VALVE POSITION | FWS | 08 | CONTROL | | |
| | | | T.O.C. | CONTINUOUS | |
| | | | MODE | MANUAL | |
| | | | RANGE | | |
| | | | MIN: | 0 | |
| | | | MAX: | 100 | |
| | | | R.T. | 11-30sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ MFW REG. VALVE POSITION | FWS | 08 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| OPEN MFW ISOLATION VALVE(S) | FWS | 15 | CONTROL | | |
| | | | T.O.C. | DISCRETE | |
| | | | MODE | MANUAL | |
| | | | RANGE | | |
| | | | MIN: | SHUT | |
| | | | MAX: | OPEN | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | N/A | |

# TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT MFW ISOLATION VALVE(S OPEN | FWS | 15 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | OPEN/SHUT | |
| | | | UNITS | OPEN/SHUT | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT PROPER CONDENSATE PUMP OPERATION (TASK 0809) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE MFW TO EITHER/BOTH SGs | 0804 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT PROPER FEEDWATER PUMP OPERATION (TASK 0810) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ S/G LEVEL | S/G | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ S/G LEVEL - TREND | S/G | 01 | INST. | | |
| | | | T.O.D. | TREND | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ ELECTRIC DRIVEN AFW PUMP BREAKER POSITION | FWS | 09 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | OPEN/SHUT | |
| | | | UNITS | OPEN/SHUT | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 0-1SEC | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ ELECTRIC DRIVEN AFW PUMP DISCHARGE PRESSURE | FWS | 09 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-1200 | |
| | | | UNITS | PSIG | |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ ELECTRIC DRIVEN AFW PUMP FLOW | FWS | 11 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-320 | |
| | | | UNITS | GPM | |
| | | | ACCURACY | 0 - 10% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ STEAM DRIVEN AFW PUMP DISCHARGE PRESSURE | FWS | 10 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-1200 | |
| | | | UNITS | PSIG | |
| | | | ACCURACY | 0 - 15% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ STEAM DRIVEN AFW PUMP FLOW | FWS | 12 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-600 | |
| | | | UNITS | GPM | |
| | | | ACCURACY | 0 - 10% | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ AFW THROTTLE VALVE POSITION | FWS | 11 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | 0 - 10% | |
| | | | R.T. | 0-1SEC | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| THROTTLE THE AFW THROTTLE VALVE | FWS | 11 | CONTROL | | |
| | | | T.O.C. | CONTINUOUS | |
| | | | MODE | MANUAL | |
| | | | RANGE | | |
| | | | MIN: | 0 | |
| | | | MAX: | 100 | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| OPEN STEAM DRIVEN AFW PUMP STEAM SUPPLY VALVE | MSS | 06 | CONTROL | | |
| | | | T.O.C. | DISCRETE | |
| | | | MODE | MANUAL | |
| | | | RANGE | | |
| | | | MIN: | SHUT | |
| | | | MAX: | OPEN | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE AUX FEEDWATER TO EITHER/BOTH SGs | 0808 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETECT STEAM DRIVEN AFW PUMP STM SUPPLY VLV POSITION | MSS | 06 | INST. | | |
| | | | T.O.D. | STATUS | |
| | | | RANGE | OPEN/SHUT | |
| | | | UNITS | OPEN/SHUT | |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| POSITION TBS OPEN PRESSURE SETPOINT | MSS | 07 | CONTROL | | |
| | | | T.O.C. | CONTINUOUS | |
| | | | MODE | MAN/AUTO | |
| | | | RANGE | | |
| | | | MIN: | 200 | |
| | | | MAX: | 1000 | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ TBS VALVE POSITION MOVEMENT | MSS | 07 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | N/A | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | N/A | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURRINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE MAIN CONDENSER AVAILABILITY (TASK 0401) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE RCS COLD LEG TEMPERATURE (TASK 0108) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE S/G PRESSURE (TASK 0304) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
| --- | --- |
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
| --- | --- | --- | --- | --- | --- |
| DETERMINE RCS HOT LEG TEMPERATURE (TASK 0109) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

## TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE SG LEVEL (TASK 0302) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE RCS COOLDOWN RATE (TASK 0103) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| ENSURE MFW TO EITHER/BOTH SGs (TASK 0103) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF TURBINE BYPASS SYSTEM | 0402 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| ENSURE AFW TO EITHER/BOTH SGs (TASK 0808) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ ADV POSITION | MSS | 02 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % OF FULL VALVE STROKE |
| | | | ACCURACY | 0 - 2.5% | |
| | | | R.T. | 0-1SEC | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE S/G PRESSURE (TASK 0304) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE S/G LEVEL (TASK 0302) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE RCS COLD LEG TEMPERATURE (TASK 0108) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE RCS HOT LEG TEMPERAURE (TASK 0109) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
| --- | --- |
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
| --- | --- | --- | --- | --- | --- |
| DETERMINE RCS COOLDOWN RATE (TASK 0103) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| POSITION ADV OPEN PRESSURE SETPOINT | MSS | 02 | CONTROL | | |
| | | | T.O.C. | CONTINUOUS | |
| | | | MODE | MAN/AUTO | |
| | | | RANGE | | |
| | | | MIN: | 200 | |
| | | | MAX: | 1000 | |
| | | | R.T. | 1-5sec | |
| | | | AVAIL. | LOOP | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| ENSURE MFW TO EITHER/BOTH SGs (TASK 0804) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| ENSURE PROPER OPERATION OF ATMOS DUMP VALVES | 0403 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| ENSURE AFW TO EITHER/BOTH SGs (TASK 0808) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ REACTOR VESSEL UPPER HEAD FLUID TEMPERATURE | RCS | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 200-700 | |
| | | | UNITS | DEGF | |
| | | | ACCURACY | 0 - 2.5% | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| READ REACTOR VESSEL FLUID LEVEL | RCS | 01 | INST. | | |
| | | | T.O.D. | VALUE | |
| | | | RANGE | 0-100 | |
| | | | UNITS | % | % LEVEL BETWEEN FAP AND TOP OF RV |
| | | | ACCURACY | N/A | |
| | | | R.T. | 6-10sec | |
| | | | AVAIL. | LOOP+DBA | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
| --- | --- |
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
| --- | --- | --- | --- | --- | --- |
| DETERMINE PRESSURIZER PRESSURE (TASK 1003) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE CORE EXIT TEMPERATURE (TASK 0104) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE IF RV UPPER HEAD TEMP INDICATES SATURATION | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE IF CORE EXIT TEMPERATURE INDICATES SUPERHT | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED COMP SYSTEM | NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE IF RCPs ARE OPERATING (TASK 0201) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE PZR LEVEL (TASK 1005) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

TASK ELEMENT INFO/CONTROL CHARACTERISTICS

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE REACTOR VESSEL LEVEL | 0101 |

| TASK ELEMENT | AFFECTED SYSTEM | COMP NUMB | INFO/CONTROL CHARACT. ITEM | VALUE | REMARKS |
|---|---|---|---|---|---|
| DETERMINE RCS SUBCOOLING (TASK 0102) | NONE | | INST. | | |
| | | | T.O.D. | | |
| | | | RANGE | | |
| | | | UNITS | | |
| | | | ACCURACY | | |
| | | | R.T. | | |
| | | | AVAIL. | | |

APPENDIX H

# I&C CHARACTERISTIC BASES

I&C CHARACTERISTICS BASES

Appendix H contains samples of rationale associated with the information and control characteristics identified in Appendix G. There is a page of I&C Characteristics Bases for each page of I&C Characteristics in the completed ICCR.

INFO/CONTROL CHARACTERISTICS BASES

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | ELEMENT NUMBER | AFFECTED SYSTEM | COMPONENT NUMBER |
|---|---|---|---|
| READ RCS SUBCOOLING AT CORE OUTLET | 01 | RCS | 01 |

| INFO/CONTROL CHARACT. ITEM | VALUE | BASIS FOR EACH REQUIREMENT |
|---|---|---|
| INST. T.O.D. | VALUE | SUBCOOLING VALUES NEED TO BE PROVIDED CONTINUOUSLY TO ASSESS THE P LANT, THEREFORE A VALUE TYPE DISPLAY IS NEEDED. |
| RANGE | 0-200 | MIN VALUE BASED ON SATURATED CONDITIONS. MAX VALUE BASED ON ALLOWI NG 200 DEG F SUBCOOLING TO BE USED AS A GUIDE FOR AVOIDING PTS (TECH SPECS 3/4.4.9 SL-2). MAX EXPECTED VALUE 140 DEG F - SMALL FEED LINE BREAK, RX TRIP, CASE 85B OF CEN-128 APP. C. |
| UNITS | DEGF | DEG F IS THE APPROPRIATE UNIT FOR DETERMINING SUBCOOLING WITH THE RESPECT TO TEMPERATURE. |
| ACCURACY | 0 - 10% | AN ACCURATE DISPLAY IS NECESSARY SO THAT IT IS USEFUL AT SMALL AMOUNTS OF SUBCOOLING, HOWEVER A 10% ACCURACY IS ADEQUATE FOE THE PURPOSE OF DETERMINING IF RCS SUBCOOLING IS PRESENT. |
| R.T. | 6-10sec | SUBCOOLING INFORMATION NEEDS TO BE AVAIABLE AT A RATE CONSISTANT WITH THE FORCED CIRCULATION TRANSIT TIME OF 6-10 SECONDS. |
| AVAIL. | LOOP+DBA | REQUIRED FOLLOWING LOCA AND ESD EVENTS, TRANSMITTER IS LOCATED IN CONTAINMENT. |

INFO/CONTROL CHARACTERISTICS BASES

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | ELEMENT NUMBER | AFFECTED SYSTEM | COMPONENT NUMBER |
|---|---|---|---|
| READ RCS HOT LEG TEMPERATURE | 02 | RCS | 03 |

| INFO/CONTROL CHARACT. ITEM | VALUE | BASIS FOR EACH REQUIREMENT |
|---|---|---|
| INST. | | |
| T.O.D. | VALUE | TEMPERATURE VALUES NEED TO BE PROVIDED CONTINUOUSLY TO ASSESS THE PLANT, THEREFORE A VALUE TYPE DISPLAY IS NEEDED. |
| RANGE | 300-665 | A MAX VALUE 665 DEG F FROM TOTAL LOSS OF FEED FIG 14-21 OF CEN-114 AMENDMENT 1-P.AND A MAX VALUE 300 DEG F RECOMMENDED MAX TEMP TO EN TER SHUTDOWN COOLING FSAR 5.4.7.1.2.d. |
| UNITS | DEGF | DEG F IS THE APPROPRIATE UNITS FOR TEMPERATURE. |
| ACCURACY | 0 - 2.5% | EMERGENCY PROCEDURES REQUIRE SUBCOOLING INDICATION IN THE RANGE OF 20 DEG F OR LESS. A 2.5% ACCURACY IS NECESSARY TO ACHIEVE THIS IF THIS INSTRUMENT IS USED TO CALCULATE SUBCOOLING. |
| R.T. | 6-10sec | LOOP TRANSIT TIME OF 6-10 SEC. THEREFORE A RESPONSE TIME OF 6-10 S ECONDS IS SUFFICIENT TO KEEP THE OPERATOR UPDATED. |
| AVAIL. | LOOP+DBA | REQUIRED FOLLOWING LOCA, ESD AND IS LOCATED IN CONTAINMENT. |

INFO/CONTROL CHARACTERISTICS BASES

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | ELEMENT NUMBER | AFFECTED SYSTEM | COMPONENT NUMBER |
|---|---|---|---|
| READ RCS COLD LEG TEMPERATURE | 03 | RCS | 04 |

| INFO/CONTROL CHARACT. ITEM | VALUE | BASIS FOR EACH REQUIREMENT |
|---|---|---|
| INST. | | |
| T.O.D. | VALUE | TEMPERATURE VALUES NEED TO BE PROVIDED CONTINUOUSLY TO ASSESS THE PLANT, THEREFORE A VALUE TYPE DISPLAY IS NEEDED. |
| RANGE | 300-590 | MAX VALUE 590 DEG F FROM ST. LUCIE 2 FSAR FIG. 15.2.5.2-5 LOSS OF FEED. MIN VALUE 300 DEG F RECOMMENDED MAX TEMP TO ENTER SHUTDOWN COOLING FSAR 5.4.7.1.2.d. |
| UNITS | DEGF | DEG F IS THE APPROPRIATE UNITS FOR TEMPERATURE. |
| ACCURACY | 0 - 2.5% | SUBCOOLING INDICATION IS NEEDED IN THE RANGE OF 20 DEG F OR LESS. A 2.5% ACCURACY IS NECESSARY TO ACHIEVE THIS IF THIS INSTRUMENT IS USED TO CALCULATE SUBCOOLING. |
| R.T. | 6-10sec | LOOP TRANSIT TIME OF 6-10 SEC. |
| AVAIL. | LOOP+DBA | REQUIRED FOLLOWING A LOCA AND ESD EVENTS AND THE TRANSMITTER IS LOCATED IN CONTAINMENT. |

INFO/CONTROL CHARACTERISTICS BASES

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | ELEMENT NUMBER | AFFECTED SYSTEM | COMPONENT NUMBER |
|---|---|---|---|
| READ PRESSURIZER PRESSURE | 04 | PZR | 01 |

| INFO/CONTROL CHARACT. ITEM | VALUE | BASIS FOR EACH REQUIREMENT |
|---|---|---|
| INST. | | |
| T.O.D. | VALUE | PRESSURE VALUES NEED TO BE PROVIDED TO ALLOW FOR THE CALCULATION OF RCS SUBCOOLING, THEREFORE A VALUE TYPE DISPLAY IS NEEDED. |
| RANGE | 200-2600 | MAXIMUM PRESSURE IS BASED ON SETPOINT OF 2500 +/- 1% + 3% ACCUMULATION WHICH IS 2600 PSIA. (FSAR TABLE 5.4-3) MINIMUM PRESSURE IS BASED ON BEING ABLE TO MONITOR THE PLANT PRESSURE TO WHERE THE SAFETY INJECTION TANKS DISCHARGE. |
| UNITS | PSIA | PSIA IS THE APPROPRIATE UNITS FOR A PRESSURE WHICH CAN BE USED TO CALCULATE THE AMOUNT OF SUBCOOLED MARGIN FROM SATURATED CONDITIONS . |
| ACCURACY | 0 - 10% | AT 2200 PSIA A 100 PSI CHANGE IN PRESSURE CHANGES THE SATURATION TEMPERATURE 7 DEG F. TO PERFORM THE EMERGENCY PROCEDURES SUBCOOLING SHOULD BE ACCURATE TO 20 DEG F, AN ACCURACY OF 10% IS ADEQUATE FOR PZR PRESSURE TO ACHIEVE THIS. |
| R.T. | 6-10sec | BASED ON LARGE BREAK LOCA DEPRESSURIZATION TIME OF 20 SEC. CENPD-132P FIG IV.D.1-18. |
| AVAIL. | LOOP+DBA | REQUIRED FOLLOWING LOCA AND ESD EVENTS. TRANSMITTER IS LOCATED IN CONTAINMENT. |

INFO/CONTROL CHARACTERISTICS BASES

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | ELEMENT NUMBER | AFFECTED SYSTEM | COMPONENT NUMBER |
|---|---|---|---|
| READ RCS SUBCOOLING IN HOT LEG | 05 | RCS | 03 |

| INFO/CONTROL CHARACT. ITEM | VALUE | BASIS FOR EACH REQUIREMENT |
|---|---|---|
| INST. | | |
| T.O.D. | VALUE | SUBCOOLING VALUES NEED TO BE PROVIDED CONTINUOUSLY TO ASSESS THE P LANT, THEREFORE A VALUE TYPE DISPLAY IS NEEDED. |
| RANGE | 0-200 | MIN VALUE BASED ON SATURATED CONDITIONS. MAX VAUE BASED ON ALLOW-ING 200 DEG F SUBCOOLING TO BE USED AS A GUIDE FOR AVOIDING PTS (TECH SPECS 3/4.4.9 ST. LUCIE 2). MAX EXPECTED VALUE 140 DEG F - SMALL FEED LINE BREAK, RX TRIP, CASE 85B OF CEN-128 APP. C. |
| UNITS | DEGF | DEG F IS THE APPROPRIATE UNIT FOR DETERMINING SUBCOOLING WITH RESP ECT TO TEMPERATURE. |
| ACCURACY | 0 - 10% | AN ACCURATE DISPLAY IS NECESSARY SO THAT IT IS USEFUL AT SMALL AMOUNTS OF SUBCOOLING, HOWEVER A 10% ACCURACY IS ADEQUATE FOR THE PURPOSE OF DETERMINING IF RCS SUBCOOLING IS PRESENT. |
| R.T. | 6-10sec | FORCED CIRCULATION TRANSIT TIME 6-10 SEC. |
| AVAIL. | LOOP+DBA | REQUIRED FOLLOWING LOCA AND ESD EVENTS., TRANSMITTER IS LOCATED IN CONTAINMENT. |

INFO/CONTROL CHARACTERISTICS BASES

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | ELEMENT NUMBER | AFFECTED SYSTEM | COMPONENT NUMBER |
|---|---|---|---|
| READ CORE EXIT TEMPERATURE | 06 | RCS | 01 |

| INFO/CONTROL CHARACT. ITEM | VALUE | BASIS FOR EACH REQUIREMENT |
|---|---|---|
| INST. | | |
| T.O.D. | VALUE | TEMPERATURE VAULUES NEED TO BE PROVIDED CONTINUOUSLY TO ASSESS THE PLANT, THEREFORE A VALUE TYPE DISPLAY IS NEEDED. |
| RANGE | 200-700 | A MAX VALUE OF 665 DEG F FROM TOTAL LOSS OF FEED FIG. 14-21 OF CEN-114-P AMENDMENT 1-P AND A MIN VALUE 300 DEG F THE RECOMMENDED MAX TEMPERATURE TO ENTER SHUTDOWN COOLING FSAR 5.4.7.1.2.d IS NEEDED. THEREFORE A RANGE OF 200 TO 700 ENCOMPASSES THIS NEED. |
| UNITS | DEGF | DEG F IS THE APPROPRIATE UNITS FOR TEMPERATURE. |
| ACCURACY | 0 - 2.5% | EMERGENCY PROCEDURES REQUIRE SUBCOOLING INDICATION IN THE RANGE OF 20 DEG F OR LESS. A 2.5% ACCURACY IS NECESSARY TO ACHIEVE THIS IF THIS INSTRUMENT IS USED TO CALCULATE SUBCOOLING. |
| R.T. | 6-10sec | LOOP TRANSIT TIME OF 6-10 SEC. |
| AVAIL. | LOCP+DBA | REQUIRED SOLLOWING LOCA, ESD AND IS LOCATED IN CONTAINMENT. |

INFO/CONTROL CHARACTERISTICS BASES

| TASK STATEMENT | TASK CODE |
|---|---|
| DETERMINE RCS SUBCOOLING | 0102 |

| TASK ELEMENT | ELEMENT NUMBER | AFFECTED SYSTEM | COMPONENT NUMBER |
|---|---|---|---|
| CALCULATE RCS SUBCOOLING USING ELEMENTS #02,03,04&06 | 07 | NONE | |

| INFO/CONTROL CHARACT. ITEM | VALUE | BASIS FOR EACH REQUIREMENT |
|---|---|---|
| INST. | | |
| T.O.D. | | |
| RANGE | | |
| UNITS | | |
| ACCURACY | | |
| R.T. | | |
| AVAIL. | | |

APPENDIX I

ABBREVIATIONS

## Standard Abbreviations Listing

| | |
|---|---|
| AFAS | Auxiliary Feedwater Actuation Signal |
| AFWS | Auxiliary Feedwater System |
| AVAIl | Availability |
| BAMP | Boric Acid Condensate Pump |
| BAMT | Boric Acid Makeup Tank |
| BFWV | Bypass Feedwater Valve |
| CACS | Containment Atmosphere Control System |
| CAS | Compressed Air System |
| CCAS | Containment Cooling Actuation Signal |
| CCWS | Component Cooling Water System |
| CEA | Control Element Assembly |
| CEDM | Control Element Drive Mechanism |
| CEDMCS | Control Element Drive Mechanism Control System |
| CET | Core Exit Thermocouples |
| CHRS | Containment Hydrogen Recombiner System |
| CIAS | Containment Isolation Actuation Signal |
| CIS | Containment Isolation System |
| CNTMT | Containment |
| CSAS | Containment Spray Actuation Signal |
| CSS | Containment Spray System |
| CVCS | Chemical and Volume Control System |
| CVH | Containment Vent Header |
| DBA | Design Basis Event |
| Delta-P | Differential Pressure |
| DNBR | Departure From Nucleate Boiling Ratio |
| D/P | Differential Pressure |
| DPM | Decades Per Minute |
| EDS | Electrical DIstribution System |
| EDT | Equipment Drain Tank |
| EFAS | Emergency Feed Actuation Signal |
| E/P | Electro Pneumatic |
| ESDE | Excess Steam Demand Event |
| ESFAS | Engineered Safety Features Actuation System |

| | |
|---|---|
| FCI1 | Functional Containment Isolation Guideline 1 |
| FCG1 | Functional Containment Combustible Gas Control Guideline 1 |
| FHR1 | Functional RCS and Core Heat Removal Guideline 1 |
| FHR2 | Functional RCS and Core Heat Removal Guideline 2 |
| FHR3 | Functional RCS and Core Heat Removal Guideline 3 |
| FHR4 | Functional RCS and Core Heat Removal Guideline 4 |
| FHR5 | Functional RCS and Core Heat Removal Guideline |
| FIC | Flow Indication Controller |
| FIC1 | Functional Inventory Control Guideline 1 |
| FIC2 | Functional Inventory Control Guideline 2 |
| FLTA | Functional Long Term Action Guideline |
| FMVA | Functional Maintenance of Vital Auxiliaries Guideline |
| FPC1 | Functional Pressure Control Guideline 1 |
| FPC2 | Functional Pressure Control Guideline 2 |
| FPC3 | Functional Pressure Control Guideline 3 |
| FPC4 | Functional Pressure Control Guideline 4 |
| FPC5 | Functional Pressure Control Guideline 5 |
| FPC6 | Functional Pressure Control Guideline 6 |
| FRC1 | Functional Reactivity Control Guideline 1 |
| FRC2 | Functional Reactivity Control Guideline 2 |
| FRC3 | Functional Reactivity Control Guideline 3 |
| FRC4 | Functional Reactivity Control Guideline 4 |
| FREP | Functional Recovery Entry Procedure |
| FTP1 | Functional Containment Temperature and Pressure Control Guideline 1 |
| FTP2 | Functional Containment Temperature and Pressure Control Guideline 2 |
| FWCS | Feedwater Control System |
| FWS | Feedwater System |
| $H_2$ | Hydrogen |
| HJTC | Heated Junction Thermocouples |
| HPSI | High Pressure Safety Injection |
| ICC | Inadequate Core Cooling |
| ICWS | Intake Cooling Water System |
| I/O | Input/Output |
| ISOL | Isolation |
| LCP | Local Control Panel |

| | |
|---|---|
| LOCA | Loss of Coolant Accident |
| LOF | Loss of Feed |
| LOFC | Loss of Forced Circulation |
| LOOP | Loss of Offsite Power |
| LP | Low Pressure |
| LPSI | Low Pressure Safety Injection |
| M/A | Manual/Automatic |
| MISC | Miscellaneous |
| MFW | Main Feedwater |
| MG | Motor-Generator |
| MOV | Motor Operated Valve |
| MSIV | Main Steam Isolation Valve |
| MSIS | Main Steam Isolation Signal |
| MSS | Main Steam System |
| MSSV | Main Steam Safety Valve |
| NI | Nuclear Instrumentation |
| NSSS | Nuclear Steam Supply System |
| PLCS | Pressurizer Level Control System |
| PPCS | Pressurizer Pressure Control System |
| PPS | Plant Protection System |
| PTS | Pressurized Thermal Shock |
| PZR | Pressurizer |
| QT | Quench Tank |
| RAS | Recirculation Actuation Signal |
| RCP | Reactor Coolant Pump |
| RCS | Reactor Coolant System |
| RDT | Reactor Drain Tank |
| RGVS | Reactor Vessel and Pressurizer Gas Vent System |
| RPS | Reactor Protection System |
| RT | Reaction Time or Reactor Trip |
| RV | Reactor Vessel |
| RVUH | Reactor Vessel Upper Head |
| RWT | Refueling Water Tank |
| RXCS | Reactivity Control System |
| SCS | Shutdown Cooling System |

| | |
|---|---|
| S/G | Steam Generator |
| SGBS | Steam Generator Blowdown System |
| SGTR | Steam Generator Tube Rupture |
| S/I | Switch/Indicator |
| SIAS | Safety Injection Actuation System |
| SIS | Safety Injection System |
| SME | Subject Matter Expert |
| SMM | Subcooled Margin Monitor |
| SPTA | Standard Post Trip Actions |
| SS | Sampling System |
| T | Tank |
| TBCS | Turbine Bypass Control System |
| $T_C$ | RCS Cold Leg Temperature |
| $T_H$ | RCS Hot Leg Temperature |
| TOC | Type of Control |
| TOD | Type of Display |
| V | Valve |

APPENDIX J

SUPPORTING DOCUMENTATION

SUPPORTING DOCUMENTATION

This Appendix provides two memoranda as supporting documentation for the Generic ICCR. The first memo is the meeting minutes of the August, 29, 1984, meeting between the NRC and the C-E Owner's Group. This memorandum provides the basis for using the C-E Emergency Procedure Guidelines as a starting point in the task analysis. The second memorandum is from Advanced Resource Development, the consultant used by C-E to conduct this Generic task analysis, which endorses the Generic task analysis model and process.

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

September 7, 1984

MEMORANDUM FOR: Dennis L. Ziemann, Chief
Procedures and Systems Review Branch
Division of Human Factors Safety

FROM: H. Brent Clayton, Section Leader
Section A - Procedures
Procedures and Systems Review Branch
Division of Human Factors Safety

SUBJECT: MEETING SUMMARY - TASK ANALYSIS REQUIREMENTS OF SUPPLEMENT 1 TO NUREG-0737
AUGUST 29, 1984 MEETING WITH COMBUSTION ENGINEERING GROUP (CEOG) OPERATIONS SUBCOMMITTEE

Staff representatives met with representatives of the CEOG Operations Subcommittee on August 29, 1984, to discuss the task analysis requirements of Supplement 1 to NUREG-0737 (Generic Letter 82-33). The purposes of the meeting were (1) for the Subcommittee to discuss how operator information and control needs have been addressed by the Emergency Procedure Guideline (EPG) development effort, and (2) for the staff to identify any additional analysis or documentation needed for review. Enclosure 1 is a list of attendees.

Mr. Bob Pierce of CE presented an overview of the EPGs and their development and documentation. He stated that EPG-based procedures have been developed at three plants and are in use at one of them. Enclosure 2 is a copy of the transparencies used by Mr. Pierce in his presentation.

A detailed discussion followed on processes used to determine operator information and control needs and instrumentation (display) and control requirements. The staff reiterated its position that the instrumentation and control needs should not be predetermined by existing equipment. The staff also stated that it was not expected that all human engineering instrument and control discrepancies would require design modifications.

Following a staff caucus, the staff made the following comments to the meeting attendees:

(1) Based on Mr. Pierce's presentation and the ensuing discussion, it appears that the basic parameters and control functions needed to satisfy the safety functions are identified in the EPGs.

(2) However, in many cases, the EPGs do not explicitly identify the information and control needs beyond the safety function level which are necessary for preparing emergency operating procedures (EOPs) and determining the adequacy of existing instrumentation and controls.

(3) Because these information and control needs are not included in the EPGs, further analysis and documentation is required. This analysis and documentation can be done by each licensee or applicant, or part of it can be done generically, if desired.

(4) Each licensee and applicant must describe the process used to identify parameters and other information and control needs that are not provided in, or are different from those specified in, the EPGs. They must also describe how the characteristics of needed instruments and controls are determined. The processes for doing this may be described in either the procedures generation package or the detailed control room design review documentation with appropriate cross-referencing. It should be noted that EOP steps frequently do not specify tasks to the specific operator action level. The task analysis should go to the level of actual operator actions that are required to perform the EOP steps, such that the information and control needs for each operator action or subtask are identified. For example, the EOP step, "start a reactor coolant pump," actually consists of several operator actions or subtasks.

(5) For each instrument and control used to perform the EOPs, there should be an auditable record that defines the necessary characteristics of the instrument or control and the bases for that determination. The necessary characteristics should be derived from analysis of the information and control needs where provided in the EPGs (or other generic information, if applicable) and from analysis of plant-specific information if not provided in, or different from, the EPGs or other generic information.

Owners Group representatives asked the staff if the definition of "task analysis" provided in NUREG-0899 was accepted by both Human Factors Engineering Branch and Procedures and Systems Review Branch. We confirmed that it was accepted by both branches.

The Owners Group also asked for an example of an acceptable task analysis program. Although not identified in the meeting, it appears that the task analysis program for Dresden Units 2 and 3 is probably the best example to date. Our comments on the Dresden program are provided in a letter to

Dennis L. Farrar of Commonwealth Edison Company from Dennis M. Crutchfield of the staff, dated March 14, 1984, "Results of In Progress Audit of Detailed Control Room Design Review." Commonwealth Edison Company should be contacted directly for specific details on their task analysis program.

H. Brent Clayton, Section Leader
Section A - Procedures
Procedures and Systems Review Branch
Division of Human Factors Safety

Enclosures:
1. List of Attendees
2. Transparencies

cc w/enclosures:
J. Barrow, CEOG
[redacted]

ENCLOSURE 1

CE OWNERS GROUP OPERATIONS SUBCOMMITTEE
NRC DIVISION OF HUMAN FACTORS SAFETY
MEETING TO DISCUSS TASK ANALYSIS REQUIREMENTS OF
SUPPLEMENT 1 TO NUREG-0737
AUGUST 29, 1984

COMBUSTION ENGINEERING

G. Bischoff
P. Nelson
C. Molnar
M. Green
R. Pierce

COMBUSTION ENGINEERING OWNERS GROUP

D. Cox
F. Nandy
L. Myers
J. Becker
R. Myers
W. Klein
T. Quan
M. Jones
G. Sanchez
J. Barrow
B. Steen-Larsen
C. Williams
R. Arsenault
E. Boulette
K. Holthaus
W. McGhee
W. Bromley
J. Prichert
P. Secker

OTHER

R. Liner, SAIC
C. Kain, SAIC
P. Le, SAIC
T. Houghton, KMC
D. Shea, Human Eng. Assoc's., Inc.
T. O'Donoghue, SAIC
M. Greenberg, LUND/ATI Consulting
D. Taylor, ARD Corp.
E. Levine, SAIC
R. Shannon, ARD Corp.

NRC

B. Clayton
H. Thompson
D. Tondi
R. Eckenrode
M. Goodman
M. Licitra
S. Weiss
J. Hoyt
V. Moore
G. Mazetis
J. Kramer
R. Ramirez
D. Ziemann

ARD ADVANCED RESOURCE DEVELOPMENT
CORPORATION

5457 Twin Knolls Road • Suite 400 • Columbia, Maryland 21045 • (301) 596-5845

May 13, 1985

Mr. Robert T. Pearce
C-E Power Systems
Combustion Engineering, Inc.
1000 Prospect Hill Road
P.O. Box 500
Windsor, Connecticut 06095-0500

Dear Mr. Pearce:

Advanced Resource Development (ARD) Corporation has participated with Combustion Engineering in the development of a generic task analytical guide for the C-E Owner's Group. This program has proceeded through the following stages: systems analysis of a generic plant, function/task listing across emergency operating procedures, scenarios of task elements for each task, and finally information/control requirements and their bases for each task element.

Professionals from ARD have participated and helped to shape the final product by participating in all stages of this analysis. ARD believes that the procedural steps used in the development of the generic task analysis have been appropriate and therefore, should result in a valid final product.

Sincerely,

Robert Kershner

Robert Kershner
Vice President
Human Factors Technology Division

cc: E. Silverman
R. Shannon

4872B

APPENDIX K

RESUMES OF MULTIDISCIPLINARY TEAM MEMBERS

RESUMES OF MULTI-DISCIPLINARY TEAM MEMBERS

This Appendix provides the resumes of the personnel who participated in the multidisciplinary team for the Generic task analysis effort. Specific responsibilities for each of the members whose resume appears in Appendix K are identified in Section 3 of this report.

RESUME OF STEVEN C. RYDER: Nuclear Engineer, Plant Operating Procedures Group

## SUMMARY OF QUALIFICATIONS:

Expertise includes an understanding of integrated plant operations. Experienced in the design, operation, procurement and qualification of NSSS Process Instrumentation Systems. Familiar with associated IEEE standards and Nuclear Regulatory Guides for instrumentation, involved in numerous instrument error evaluations, was an electronics technician in the Naval nuclear program.

## PROFESSIONAL EXPERIENCE:

COMBUSTION ENGINEERING, INC. — November 1980 - Present
Power Systems, Nuclear Power Systems

Nuclear Engineer, Plant Operating Procedures, 1984 - Present
Plant Engineering Department

Involved in the development of operator information and control characteristics requirements based on the Combustion Engineering Emergency Procedure Guidelines. Involved in the development of generic electrical emergency (including blackout) procedure guidance and other Revision 3 items for the Combustion Engineering Owners Group.

Nuclear Engineer, NSSS Process Instrumentation, 1980 - 1984
I&C Engineering Department

Responsible for the instrument system design conformity to IEEE Standards and U.S. Nuclear Regulatory Guides as appropriate for a C-E NSSS Process Instrumentation package. Work involved development of instrument drawings and specifications, instrument procurement, instrument and system interfacing, supportive analysis and qualification reviews. Other work involved quality assurance reviews of other C-E instrument system designs; test program evaluations; involvement in C-E's NUPLEX 80 instrument package design and procurement; instrument error analyses for normal and accident environments; involvement in engineering programs to provide conformance to Nuclear Regulatory Guides 0588, 1.97, and 1.75; and proposal support for upgrading instrument system packages/engineering programs.

U.S. NAVY: Naval Nuclear Power Program

Electronic Technician, USS Bainbridge (CGN-25)

Responsible for the maintenance on electronic equipment for reactor plant control and operations as technician and supervisor of a twelve-man workcenter. Also worked in the administrative, operations, and training areas of reactor plant control and operation. Qualified Reactor Operator responsible for operation and control of the reactor plant at power; extended to include the engine room support systems while shut down.

RESUME OF STEVEN C. RYDER: (continued)

EDUCATION:

Electronics Technician A School: Great Lakes, Illinois, 1975

Naval Nuclear Power School: Orlando, Florida, 1976

Naval Nuclear Prototype Training: West Milton, New York, 1976

Bachelor of Science in Electrical Engineering, University of Hartford (in progress)

C-E Compact Simulator Course, 1984

C-E Nuclear Power Plant Thermal-Hydraulics Course, 1985

PROFESSIONAL AFFILIATIONS:

Instrument Society of America (ISA): Member of Connecticut Valley Section

Rev. Date 4/12/84

RESUME OF MICHAEL F. GRAMES: Senior Nuclear Engineer, Primary System, Plant Engineering

SUMMARY OF QUALIFICATIONS:

Mr. Grames has seven years of operational reactor experience with the U.S. Submarine force. He is currently responsible for generation and evaluation of fluid system design functions and components.

PROFESSIONAL EXPERIENCE:

COMBUSTION ENGINEERING, INC., Senior Engineer, August 1983 to Present

Mr. Grames is involved in the generation and evaluation of technical calculations in areas of fluid mechanics and heat transfer, review and evaluation of technical documents (test procedures, instrumentation and controls documents, plant specific technical specification, etc.), and the collection and analysis of vibration data on primary system components including reactor coolant pumps and reactor vessel internals.

U.S. NAVY, June 1976 to July 1983

Leading Engineering Officer at the S1G Reactor Plant, Windsor, CT.
April 1981 to July 1983

As leading engineering officer, Mr. Grames managed a crew of 30 Navy Staff and 60 students. He served as instructor for students and staff on various aspects of nuclear reactor operations and maintenance. He also supervised reactor plant operations and training.

U.S. Submarine Gurnard, December 1977 to April 1981

Mr. Grames held several positions including Assistant Engineer, Radiological Controls Officer (Health Physics), Mechanical Division Officer, and Electrical Division Officer. Responsibilities included supervision of reactor plant operations and maintenance (including two extended shipyard periods and a refueling).

PERSONAL BACKGROUND:

Bachelor of Science in Electrical Engineering,
Oregon State University, 1976

Navy Nuclear Power School, 1977

Navy Engineers School, 1980

RESUME OF GREGG MAX: Senior Engineer, Primary Systems, Plant Engineering

SUMMARY OF QUALIFICATIONS:

Mr. Max has been involved in the development of the C-E Emergency Procedure Guidelines. He has experience in evaluating a wide variety of NSSS transient events, in support of both best estimate and licensing efforts.

PROFESSIONAL EXPERIENCE:

COMBUSTION ENGINEERING, INC. February 1980 to Present
Power Systems, Nuclear Power Systems

Senior Engineer, Primary Systems, Plant Engineering, 1984 to Present

Mr. Max has worked on the development of the C-E Emergency Procedure Guidelines. This work has involved extensive revisions and additions to the existing Guidelines, covering containment atmosphere control, recovery from electrical distribution system emergencies, and a wide variety of revisions required by the NRC Safety Evaluation Report. Other work has included instrumentation and control characteristics review (in support of control room design reviews), and resolution of Engineering Evaluation Requests from the APS operations department.

Senior Engineer, Plant Systems Analysis and Evaluation, 1981 to 1984

Mr. Max evaluated a wide variety of NSSS transient events using both best estimate methods (in support of power ascension testing and simulation code verification) and licensing methods (in support of FSAR Chapter 15 Safety Analysis). Other tasks included reviews of technical specifications and QA of Safety Analysis calculations.

Engineer II, Thermal Hydraulics Group, Advanced Development Department, 1980 to 1981.

Mr. Max performed thermal hydraulics analyses as part of LMFAR conceptual design studies.

PERSONAL BACKGROUND:

B. A. in Physics, Williams College, 1978

M. E. in Nuclear Engineering, University of Virginia, 1979

RESUME OF PAMELA J. HANSEN

SUMMARY OF QUALIFICATIONS:

For the past six years, Ms. Hansen has been involved in the application of Human Factors to nuclear power plant design and operation. This involvement has included the application of her experience in human factors psychology principles, which were acquired through coursework in psychology and biological engineering and enriched by extensive experience in the Human Factors field. Ms. Hansen's expertise includes a complete understanding of integrated plant operations.

Recent projects Ms. Hansen has conducted have included control room design reviews, function and task analyses, the generation of operator training materials, and the generation, verification, simulator validation and implementation of operator emergency guidance materials.

PROFESSIONAL EXPERIENCE:

COMBUSTION ENGINEERING, INC. September 1978 to Present
Power Systems, Nuclear Power Systems

Principal Nuclear Steam Supply System Engineer, Plant Operating Procedures Group 1984 to Present.

Ms. Hansen is currently providing a wide variety of human factors engineering services, including coordinating and conducting a task analysis of the Combustion Engineering Emergency Procedure Guidelines. This effort involves identifying generic operator information and control requirements, interviewing nuclear power plant operations staff and establishing control room instrumentation and control criteria for the tasks operators are expected to accomplish. Additional responsibilities encompass providing task leadership in control room design reviews, and the development of advanced control room operator aids.

Ms. Hansen is pursuing a Ph.D. in human factors psychology. This area of concentration will provide Ms. Hansen with additional training in theories of design and analysis of human-machine systems in a nuclear power plant operations context.

Senior Nuclear Steam Supply System Engineer, Plant Operating Procedures Group, 1981 - 1984

Ms. Hansen's responsibilities included providing task leadership in the C-E Emergency Guidance Program from the conceptual phase to plant specific implementation. She was responsible for verification and validation of the C-E emergency guidance on a full-scope simulator. Ms. Hansen integrated human factors engineering principles throughout the program. Special emphasis was on the operator, as an information processing system operating with an operating crew in a control room during complex situations.

She was also responsible for the development of system lesson materials for the training of plant operations personnel in the use of emergency guidance materials. Ms. Hansen was also involved in the development of the technical analyses which form the basis of the C-E emergency guidance.

Nuclear Steam Supply System Engineer II, September 1978 to March 1981

Ms. Hansen is experienced in the overall design and development of Nuclear Power Plant systems, with concentration on thermodynamic and hydraulic system design.

She was responsible for the design, develpment, specification, support and testing of auxiliary systems used for emergency core cooling, decay heat removal, containment heat removal and fission product removal following design base events.

PERSONAL BACKGROUND:

Masters of Science in Mechanical Engineering, Syracuse University, 1978
Bachelor of Science in Bioengineering, Syracuse University, 1977

Emphasis of her educational program was on mechanical engineering, biomechanics, bioinstrumentational engineering, psychology and human performance.

PROFESSIONAL AFFILIATIONS:

American Society of Mechanical Engineers (ASME)

Society of Women Engineers (SWE)

RESUME OF ROBERT PEARCE: Human Factors Section Leader

## SUMMARY OF QUALIFICATIONS:

Mr. Pearce has extensive training and experience in engineering and psychology. For the past five years he has had wide involvement in and supervisory responsibility for human factors engineering efforts including the design review of nuclear power plant control rooms, assessment of power plant operators information needs, function and task analysis, and operator aid development. As part of his psychological training and research, he has accumulated broad experience in interviewing people and in cognitive and psychological processes.

Mr. Pearce has 15 years experience in nuclear power including system design, design supervision, plant operation and maintenance supervision. He has participated in special projects and was the assistant program manager for a steam generator chemical cleaning project and program manager for an electromagnetic feedwater filter test program.

## PROFESSIONAL EXPERIENCE:

COMBUSTION ENGINEERING, INC., September 1975 to Present
Power Systems Group, Nuclear Power Systems

Collateral, 1979 - Present

Mr. Pearce is pursuing a Ph.D. in psychology. As part of this training he has taken extensive course and practical work in cognitive structures and processes, memory, perception, decision and problem solving theory, interviewing techniques, linguistics and representation and organization of knowledge. The practical work has included extensive interviewing (over 100 people) for clinical purposes.

Consulting Engineer, 1984 - Present

Mr. Pearce is the Task Manager for development of Combustion Engineering Emergency Procedure Guidelines. This development effort includes technical analyses, probabilistic risk assessment, function and task analysis, generic operator information and control requirements, and procedure verification and validation. Mr. Pearce has human factors education and experience. Mr. Pearce is also involved in the development of a maintainability assessment program and the development of advance control room operator aids.

Mr. Pearce is the principal architect of the maintainability program. Key elements of this program are extensive interviewing of plant personnel to identify and codify their maintenance practices followed by introduction of this data to a data base manager on a PC for further analysis.

Principal Nuclear Steam Supply System Engineer, 1981 - 1984

Mr. Pearce has responsible for the development of emergency procedure guidelines with special interest in the validation of procedures and implementation of human factors. He has been involved in Control Room Design Review for the Palo Verde nuclear units.

Senior Nuclear Steam Supply System Engineer, 1979 - 1981

Mr. Pearce was responsible for the development of pre-operational testing, operating and emergency procedures for various C-E customer utilities.

Senior Nuclear Steam Supply System Engineer, 1975 - 1979

Mr. Pearce was responsible for the design, development, specification, procurement, testing, installation and licensing of plant auxiliary systems, including chemical and volume control, fuel pool cooling and purification, and primary and steam generator chemistry control. During this time, he also supervised other engineers in these activities and served as program manager for an electromagnetic feedwater filtration test project and a steam generator chemical cleaning test project.

U.S. NAVY - 1969 to 1975
Nuclear Power Training Unit, Windsor, Connecticut 1973 - 1975

Senior instructor on the training staff at a Navy nuclear power training facility. Mr. Pearce was the Navy Officer responsible to civilian management for the timely qualification of officer and enlisted students.

USS Sam Rayburn (SSBN-635), FPO, N.Y., 1971 - 1973

Officer on board this submarine in charge of various divisions during the 2 1/2 year tour.

Naval Nuclear Power School, Bainbridge, MD and Naval Nuclear Power Training Unit, Windsor, CT 1969 - 1971.

EDUCATION:

Graduate of U.S. Naval Academy, Class of 1969, with a B.S. in engineering and minor in business.

Naval Nuclear Power School, Brainbridge, MD and Naval Nuclear Power Training Unit, Windsor, CT. 1969 - 1971

Undergraduate study in psychology (28 credit hours) as a prelude to graduate study (1975 - 1978)

M.A. in psychology from the University of Hartford (1981)

Ph.D. candidate in psychology from the University of Hartford (1986 projected completion).

## ARD Corporation

RICHARD H. SHANNON
Manager, Automation Services Group
Senior Engineer

- Human Factors Engineering
- Anthropometrics/Biomechanics
- Job/Task Analysis
- Human Performance Assessment
- Work Measurement
- Systems Analysis
- Experimental Design
- Human Error Analysis

Dr. Shannon is a Senior Engineer providing industrial engineering and research support in human performance measurement. His experience spans a wide range of human factors activities and areas of application, both military and industrial. Dr. Shannon has participated in many studies on the effects of stressful environments upon human performance (cold, heat, chemical warfare, acceleration, vibration, flight). He has recently developed a battery of 31 cognitive and psychomotor tests with fifteen alternative forms in order to observe the effects of the environment using a repeated measures design. He has conducted studies on manual materials handling and the proper biomechanical techniques for handling loads. Dr. Shannon has also worked with numerous existing and emerging naval aircraft and ship systems as a human factors and systems safety engineer.

Presently Dr. Shannon is Project Director for the CRDR at the Louisiana Power and Light Company's Waterford-3 station. This position requires that he coordinate and participate in the various phases of inventory review, task analysis, operator experience review, checklist survey, verification and validation. He has also assisted Combustion Engineering in the development of a generic task analysis and instrument/control requirements for the C-E Owner's Group.

PREVIOUS EXPERIENCE

- 1982 to 1984 Naval Medical Research Institute, Bethesda, Maryland
  Head, Performance Physiology Branch

Coordinated a multi-disciplinary program on the effects of cold, heat and chemical warfare on human performance under field and laboratory conditions. Relative to these duties, Dr. Shannon developed a cognitive/psychomotor battery of 31 tests with normative baselines (each test measuring a specific construct and containing 15 alternative forms); and the construction of a human performance laboratory containing various psychomotor apparatus tests, work physiology equipment, evoked-potential computer, a programmable environmental chamber, and a network system of computers for behavioral testing.

- 1979 to 1982 Naval Biodynamics Laboratory, New Orleans, Louisiana
  Head, Human Performance Sciences Department; Chief, Task and Workload Division

Coordinated the activities of personnel in the design, scheduling and conduct of experiments involving human performance under normal and stressful conditions (acceleration, vibration). Performed task analyses of U.S. Navy jobs and work stations for the purpose of establishing synthetic validity for a selected battery of performance tests. Designed a human performance laboratory which included an automated test battery and six APPLE computers in a network system.

- 1979 and 1983 to 1984 University of Southern California, Los Angeles, California, and Golden Gate University, San Francisco, California Lecturer, Human Factors and Safety Science Departments of USC and Public Administration Department of GGU.

Taught ten graduate courses in research methodology, statistics, experimental design, human factors engineering and system safety engineering as a part of the educational extension programs of these two universities in Virginia.

- 1977 to 1979 Naval Safety Center, Norfolk, Virginia
  Human Factors Engineer, Systems Safety Engineer

Major areas of effort were to monitor human engineering and system safety efforts on the F18, LAMPS, AV8, OA4M aircraft through plant visits, conferences, program and mock-up/lighting reviews, statistical analyses of mishap reports, functional studies of maintenance and pilot duties, and evaluations of aircraft design deficiencies.

- 1975 to 1977 Texas Tech University, Lubbock, Texas
  Doctoral Candidate, Psychology and Industrial Engineering Departments

Emphasis of educational program was upon human factors engineering, biomechanics, human performance, safety, statistics, work measurement and analysis, motion analysis and modeling.

- 1971 to 1975 Naval Aerospace Medical Research Laboratory, Pensacola, Florida
  Research Psychologist

Developed pilot and flight officer task analyses in all major aircraft in the Navy inventory. Additional areas of concern were flight student attritions, statistical models for pilot prediction and performance assessment, aircrew human error, instructor reliability and bias, student selection and training, and aircrew safety.

- 1969 to 1971 Fleet Air Wings, U.S. Atlantic Fleet, Norfolk, Virginia
  Research Psychologist

Research of Patrol aircrewmen included personnel fatigue, crew coordination/utilization, human engineering of work stations, performance assessment, maintenance and pilot human errors, and flight safety. In addition, studies into maintenance procedures, organizational climate, aircrew human error, and pilot training within fighter squadrons were conducted.

EDUCATION

Ph.D., Industrial Engineering, Experimental Psychology, Texas Tech University, Lubbock, Texas, 1978.

M.Ed., Industrial Psychology, Springfield College, Springfield, Massachusetts, 1969.

B.S., General Engineering, Naval Science, U.S. Naval Academy, Annapolis, Maryland, 1961.

PROFESSIONAL AFFILIATIONS

Human Factors Society
American Institute of Industrial Engineers (Senior Member)

MILITARY SERVICE

1957 to 1961 Midshipman, U.S. Naval Academy, Annapolis, Maryland

1961 to 1963 Flight Training, Pensacola, Florida

1963 to 1966 Naval Aviator, Plane Commander in S2E Aircraft (received Air Medal), VS-29, San Diego, California

1966 to 1968 Flight Instructor, VT-1, Pensacola, Florida

1969 to 1984 Research Psychologist, U.S. Navy

# ARD Corporation

JOSEPH B. WINTER, JR.
Project Engineer
Human Factors Psychologist

- Task Analysis
- Computerized Statistical Analysis
- Human Factors Engineering
- Project Design
- Multipurpose Job Analysis
- Job Evaluation/Compensation

Mr. Winter has over eight years experience providing human factors services, four of which have been in the nuclear power generation area. As a practicing human factors analyst, he has conducted job analysis projects pertaining to selection, classification, performance appraisal, training, and design analysis using a wide variety of analytical techniques. Mr. Winter supported Virginia Electric and Power Company's task analysis/training curriculum program for Nuclear Operations, and has worked extensively at the North Anna and Surry power stations. Mr. Winter is presently providing a wide variety of human factors engineering services for the DCRDR for Louisiana Power & Light Company's Waterford station and Commonwealth Edison Company's Dresden, Quad Cities, and LaSalle Stations, including task analysis for Emergency Operating Procedures, questionnaire development and implementation, checklist survey and verification and validation. In addition, he has been instrumental in a generic task analysis of Combustion Engineering's CEN-152 Emergency Operating Procedures.

PREVIOUS EXPERIENCE

- 1982 to 1983 Whittaker General Medical Corporation, Richmond, Virginia
  Manager, Corporate Compensation

Directed both Operations and Research and Development staff. Provided technical direction to staff personnel to create a classification system incorporating a task analysis approach, as well as a computerized system to factor geographic differences in pay. Duties included interface with sales and operations managers and executives in over 60 entities in 36 states for pay administration purposes. Maintained control and final approval over sales and gross profit figures flowing from A/R and rebate systems into an automated sales compensation system under CICS. Full responsibility for all calculations and payment of commissions for a salesforce exceeding 500 individuals with 35,000 active customers. DEC, APPLE, and IBM hardware were utilized. Designed and programmed statistical analysis projects utilizing the SAS software package under TSO and MSA database software for sensitive executive reports. Settled labor disputes with individual employees as well as State and Federal Departments of Labor. Provided guidance and support to three manufacturing subsidiaries for pay purposes.

- 1980 to 1982 Virginia Electric and Power Company, Richmond, Virginia
  Senior Analyst, Project Leader, In-house Consultant

Responsible for initial start-up and methodology design of Virginia Electric and Power Company's task analysis/training curriculum program for Nuclear Operations. Served as INPO contact and Virginia Electric and Power Company contributor to generic task studies. Devised task inventory booklets, and

performed computerized statistical analysis of data compiled from Control Room Operators, Electricians, and Mechanics. Provided technical direction on Health Physics and Instrument Technician task analysis projects. Performed a task analysis/job evaluation study on 1500 clerical employees. Lectured security investigative personnel on abberant behavior.

- 1978 to 1980 <u>City of Richmond - Department of Personnel</u>, Richmond, Virginia
  Personnel Analyst

Performed multipurpose job analyses using a variety of methods (including task analysis) for selection, classification, pay and performance appraisal purposes. Validated, devised and administered tests (paper and pencil, oral, performance, etc.) to conform with federal regulatory (EEOC, Department of Labor, Department of Justice and OPM) and professional standards. Served in all phases of assessment center activities for entry level police department applicants (administrator, rater, and role player).

- 1974 to 1978 <u>State of Virginia - Department of Corrections</u>, Richmond, Virginia
  Psychologist's Assistant
  Staff Psychologist

Conducted diagnostic and prognostic interviews in prison reception centers and jails throughout the State of Virginia for security, vocational, and classification purposes. Initiated court committment proceedings and represented the State of Virginia in actions involving involuntary committment to state medical hospitals from penal facilities. Conducted psychotherapy and interpreted psychological test batteries.

## EDUCATION

M.S., Psychology, Virginia Commonwealth University, Richmond, Virginia, 1979

B.S., Psychology, Virginia Commonwealth University, Richmond, Virginia, 1974

## PROFESSIONAL AFFILIATIONS

Psi Chi (Psychology Honorary)
American Psychological Association (affiliate)
Human Factors Society (member)

## MILITARY SERVICE

U.S. Army, 1969 to 1972

PROFESSIONAL AFFILIATIONS

Human Factors Society
American Nuclear Society
Order of the Engineer

Resume of Paul B. Kramarchyk

I. Professional Experience

A. 1982 - Present - Combustion Engineering, Inc.

1. Simulator Instructor. Provide training for the operation of pressurized water reactors. Write lesson plans for training material. Teach hot license candidates and requalification classes. Develop, coordinate and present course for non-nuclear executives regarding the operation of a nuclear generating station.

B. 1981-82 - WNP units 3 and 5,

1. Unit Supervisor. Represented WNP to the owner's group. Developed operation and emergency procedures. Developed as built system P&ID's. Reviewed WNP simulator specifications.

C. 1980-81 - Florida Power and Light, St. Lucie unit 1.

1. Reactor operator, supervised and coordinated routine operation activities.

D. 1975-80 - Combustion Engineering, Inc.

1. Designed update of drawings and sizing calculations for chemical and volume control system and the reactor coolant pumps. Authored startup test procedures. Supervised the test shift in the conduct of RCP LOCA test. Responsible engineer for on-site fuel maintenance activities.

II. Military

A. 1970-74 - U.S.S. Patrick Henry (SSBN). Supervised engine room. Engineering laboratory technician.

B. 1968-70 - U.S.S. Northampton (CC1). Auxiliary man for operation and maintenance of air conditioning and hydraulic systems.

Resume of Paul B. Kramarchyk

III. Education

A. Presently - studying independently for a professional engineer's license.

B. 1981-82 - Gray's Harbor Community College, Aberdeen, Washington. Nuclear Technology Technician courses.

C. 1966-67 - Hudson Valley Community College, Troy, New York. Chemical Technology Program.

IV. Licenses

A. 9/83 - NRC Instructor Certification (C-E PWR).

B. 1980 - RO, St. Lucie, Unit I.

Resume of Peter J. Dellarco

I. Professional Experience

A. 6/83 - Present - Combustion Engineering, Inc.

1. Lecture Training Instructor, member of Product Improvement Group. Present the C-E/Studsvik concept trainer simulator to overseas markets. Administering the in-house requalification and SRO certification. Upgrade exisitng training materials.

B. 6/77 - 6/83 - Millstone Nuclear Power Station, Unit 2.

1. Training coordinator/senior instructor-operator. Developed, organized, scheduled and coordinated reactor operator, senior reactor operator and non-licensed operator training.

C. 2/70 - 9/70 - Union Carbide Corporation.

1. Boiler tender. Operated fossil steam generating power plant.

II. Military

A. 6/75 - 4/77 - U.S.S. Casimir Pulaski, Leading first class. Leading Engineering Laboratory Technician. Qualified Engine Room Supervisor. Stood operating watches on mechanical watchstations. Supervisor of radiological controls, chemistry and including training.

B. 5/73 - 6/75 - U.S.S. Whale, Leading Engineering Laboratory technician. Qualified in all mechanical watch stations up to engine room supervisor.

C. 9/72 - 5/73 - NPTU S3G Prototype, ELT School.

D. 2/72 - 9/72 - Nuclear Power School, Bainbridge, Maryland.

III. Education

A. 1980 - Present - Thames Valley State Technical College. Courses leading to computer programming.

B. 1976 - 78 - DeVry Institute of Technology. Completed program in Electronics Technology.

C. 9/67 - 1/70 - Buffalo State College. Courses in Industrial Arts Education.

IV. Licenses/Certifications

A. 1/81 - NRC SRO, Millstone, Unit II (C-E PWR)

B. 11/80 - NRC RO, Millstone, Unit II (C-E PWR)

APPENDIX L

RESULTS - CONSOLIDATED INFORMATION AND CONTROLS LIST

## RESULTS - CONSOLIDATED INFORMATION AND CONTROLS LIST

This Appendix provides the results for the Generic task analysis. The information and control requirements and characteristics are grouped by affected reference plant system and affected component within that system. For each informational display identified as a requirement, the category of characteristic and its associated value is identified. Similarly, for each control function identified, the categories of characteristics and their associated values are provided. The values which are provided for both informational and control functions are those which encompass all the requirements developed in the task analysis effort. Thus, all of the requirements and characteristics identified in information and for all tasks in the ICCR are encompassed by the characteristics of the consolidated list.

The consolidated list provides the requirements and functional characteristics for information and controls required to support emergency operations of the reference plant from the power plant control room in accordance with the C-E Emergency Procedure Guidelines (CEN-152, Rev. 02). Note, however, that not all of the information requirements identified in the consolidated list may be required. That is, some of the information displayed by certain information requirements may overlap or be redundant to information provided by other displays. For example, there are numerous ways to determine RCS subcooling. Subcooling may be provided by a subcooling instrument, by manual interpretation of pressurizer pressure and RCS temperature indication, by interpretation of the core exit thermocouples, or by interpretation of the RVLMS HJTC temperature indication. Therefore, the utility may exercise discretion in applying the requirements of some informational displays which are backup or alternative displays to other informational displays.

The functional characteristics specified are the minimum required to support emergency operations. Control room devices which meet or exceed these requirements are acceptable. Furthermore, it is anticipated that the utility will generate additional requirements and alter as much as 50% of the existing generic characteristics during the plant specific conversion process. The changes derive from design and operating differences between the plant specific and the generic.

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCS | RCS COLD LEG (4) |

## I&C REQUIREMENTS

### INFORMATION

COLD LEG TEMPERATURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 275 |
| MAX: | 590 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 50 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

### INFORMATION

RCS FLOW INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 120 |
| UNITS: | % |
| ACCURACY: | N/A |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | DBA |
| REACTION TIME: | 1-5sec |

### INFORMATION

RCP DELTA-P INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 90 |
| UNITS: | PSID |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 10 |
| DIVISIONS: | 1 |
| AVAILABILITY: | DBA |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| RCS | RCS COLD LEG (4) |

I&C REQUIREMENTS

INFORMATION

COLD LEG TEMPERATURE RECORDER

| | |
| --- | --- |
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 275 |
| MAX: | 590 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 50 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCS | RCS HOT LEG (2) |

I&C REQUIREMENTS

INFORMATION

HOT LEG TEMPERATURE

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 300 |
| MAX: | 700 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

INFORMATION

HOT LEG SUBCOOLING

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 250 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 50 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCS | REACTOR VESSEL |

I&C REQUIREMENTS

INFORMATION

CORE EXIT TEMPERATURE

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 200 |
| MAX: | 1200 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 100 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

INFORMATION

UPPER HEAD TEMPERATURE

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 200 |
| MAX: | 700 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 100 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

INFORMATION

REACTOR VESSEL UPPER HEAD LEVEL

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 20 |
| DIVISIONS: | 1 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCS | REACTOR VESSEL |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

RCS AVERAGE TEMPERATURE

TYPE OF DISPLAY: VALUE
RANGE
MIN: 300
MAX: 610
UNITS: DEGF
ACCURACY: 0 - 2.5%
INTERVALS: 50
DIVISIONS: 4
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

INFORMATION
-----------

RCS DELTA-T

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: DEGF
ACCURACY: 0 - 2.5%
INTERVALS: 20
DIVISIONS: 9
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

INFORMATION
-----------

SUBCOOLING BY REPRESENTATIVE CET'S

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 250
UNITS: DEGF
ACCURACY: 0 - 2.5%
INTERVALS: 50
DIVISIONS: 9
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| RCP | CONTROLLED BLEEDOFF (4) |

I&C REQUIREMENTS

INFORMATION

CONTROLLED BLEEDOFF FLOW IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 10
UNITS: GPM
ACCURACY: 0 - 15%
INTERVALS: 2
DIVISIONS: 3
AVAILABILITY: N/A
REACTION TIME: 11-30sec

INFORMATION

CONTROLLED BLEEDOFF TEMP IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 40
MAX: 200
UNITS: DEGF
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 1
AVAILABILITY: N/A
REACTION TIME: 11-30sec

INFORMATION

BLEEDOFF CAVITY PRESS IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 200
UNITS: PSIA
ACCURACY: 0 - 15%
INTERVALS: 50
DIVISIONS: 4
AVAILABILITY: N/A
REACTION TIME: 11-30sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCP | RCP MOTOR (4) |

I&C REQUIREMENTS

INFORMATION

OPERATING STATUS IND

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: N/A
REACTION TIME: 1-5sec

INFORMATION

RCP CURRENT

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 600
UNITS: AMPS
ACCURACY: 0 - 15%
INTERVALS: 100
DIVISIONS: 9
AVAILABILITY: N/A
REACTION TIME: 1-5sec

CONTROL

RCP MOTOR CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: N/A
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCP | RCP MOTOR (4) |

I&C REQUIREMENTS

INFORMATION

RCP SPEED

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 1000 |
| UNITS: | RPM |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 200 |
| DIVISIONS: | 3 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

INFORMATION

RCP MOTOR VOLTAGE

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 7 |
| UNITS: | KV |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 1 |
| DIVISIONS: | 9 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCP | RCP MOTOR COOLER (8) |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

RCP STATOR TEMP INDICATION

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 40 |
| MAX: | 300 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 11-30sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCP | RCP SEAL (4) |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

RCP MIDDLE SEAL CAVITY PRESSURE IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 2400
UNITS: PSIA
ACCURACY: 0 - 15%
INTERVALS: 500
DIVISIONS: 4
AVAILABILITY: N/A
REACTION TIME: 11-30sec

INFORMATION
-----------

RCP UPPER SEAL CAVITY PRESS IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 2400
UNITS: PSIA
ACCURACY: 0 - 15%
INTERVALS: 500
DIVISIONS: 4
AVAILABILITY: N/A
REACTION TIME: 11-30sec

INFORMATION
-----------

RCP LOWER SEAL CAVITY TEMP IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 40
MAX: 200
UNITS: DEGF
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 1
AVAILABILITY: N/A
REACTION TIME: 11-30sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCP | RCP SEAL COOLER (8) |

## I&C REQUIREMENTS

### INFORMATION

CCW FLOW INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 250 |
| UNITS: | GPM |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 11-30sec |

### INFORMATION

CCW TEMPERATURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 40 |
| MAX: | 200 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 11-30sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCP | RCP THRUST BEARING (4) |

## I&C REQUIREMENTS

### INFORMATION

UPPER THRUST BEARING TEMP IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 40
MAX: 200
UNITS: DEGF
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 1
AVAILABILITY: N/A
REACTION TIME: 11-30sec

### INFORMATION

LOWER THRUST BEARING TEMP IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 40
MAX: 200
UNITS: DEGF
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 1
AVAILABILITY: N/A
REACTION TIME: 11-30sec

### INFORMATION

UPPER GUIDE THRUST BEARING TEMP IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 40
MAX: 200
UNITS: DEGF
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 1
AVAILABILITY: N/A
REACTION TIME: 11-30sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RCP | RCP THRUST BEARING (4) |

I&C REQUIREMENTS
-----------------

INFORMATION
-----------

LOWER GUIDE THRUST BEARING TEMP IND

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 40 |
| MAX: | 200 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 1 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 11-30sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| S/G | STEAM GENERATOR (2) |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

S/G LEVEL IND (W. R.)

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

INFORMATION
-----------

S/G LEVEL RECORDER (W. R.)

| | |
|---|---|
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

INFORMATION
-----------

S/G PRESSURE IND

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 1150 |
| UNITS: | PSIA |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 200 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 11-30sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| S/G | STEAM GENERATOR (2) |

I&C REQUIREMENTS

INFORMATION

S/G PRESSURE RECORDER

| | |
| --- | --- |
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 0 |
| MAX: | 1150 |
| UNITS: | PSIA |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 200 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 11-30sec |

INFORMATION

S/G DELTA-P BETWEEN S/G's

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | -200 |
| MAX: | +200 |
| UNITS: | PSID |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| MSS | AFW PUMP STEAM SUPPLY ISOLATION VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

### INFORMATION

VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| MSS | ATMOSPHERIC DUMP VALVE (4) |

## I&C REQUIREMENTS

### CONTROL

S/G PRESSURE/ADV CONTROLLER

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

ADV POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 20 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| MSS | MAIN STEAM ISOLATION VALVE (MSIV) (2) |

I&C REQUIREMENTS

INFORMATION

MSIV POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONTROL

MSIV CONTROLLER

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| MSS | MAIN TURBINE |

I&C REQUIREMENTS

INFORMATION

MAIN TURBINE SPEED INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 0 |
| MAX: | 2400 |
| UNITS: | RPM |
| ACCURACY: | N/A |
| INTERVALS: | 500 |
| DIVISIONS: | 9 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 6-10sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| MSS | MAIN TURBINE STOP VALVE (4) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| MSS | MSIS CONTROLLER |

## I&C REQUIREMENTS

### INFORMATION

MSIS ACTUATED STATUS INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

### INFORMATION

MSIS BLOCKED STATUS INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

### CONTROL

MSIS ACTUATOR SWITCH

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| MSS | MSIS CONTROLLER |

I&C REQUIREMENTS

CONTROL

MSIS BLOCK SWITCH

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION

MSIS BLOCK PERMISSIVE STATUS IND

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| MSS | MSIV BYPASS VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 6-10sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| MSS | TURBINE BYPASS VALVES (4) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | N/A |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SCS HEAT EXCHANGER FLOW CONTROL VALVE (2) |

I&C REQUIREMENTS

CONTROL

LPSI/SCSHX BYPASS FLOW VLV CONTROL

TYPE OF CONTROL: CONTINUOUS
MODES: MANUAL
RANGE
MIN: 0
MAX: 100
UNITS: %
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| SIS | HOT LEG INJECTION HEADER (2) |

I&C REQUIREMENTS

INFORMATION

FLOW TO RCS HOT LEG INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 400 |
| UNITS: | GPM |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 100 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| SIS | HPSI FLOW CONTROL VALVE (12) |

## I&C REQUIREMENTS

### CONTROL

HPSI FLOW CONTROL VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MANUAL |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 6-10sec |

### INFORMATION

HPSI FLOW CONTROL VALVE INDICATION

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | HPSI HOT LEG INJECTION CONTROL VALVE (4) |

## I&C REQUIREMENTS

### CONTROL

HPSI HOT LEG INJ FLOW VALVE CONTROL

TYPE OF CONTROL: CONTINUOUS
MODES: MANUAL
RANGE
MIN: 0
MAX: 100
UNITS: %
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### INFORMATION

HPSI HOT LEG INJ FLOW VALVE POS IND

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | HPSI PUMP (2) |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

HPSI PUMP OPERATING STATUS IND

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONTROL
-------

HPSI PUMP CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION
-----------

HPSI PUMP MOTOR AMPS

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 70 |
| UNITS: | AMPS |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 10 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | LPSI FLOW CONTROL VALVE (4) |

## I&C REQUIREMENTS

### INFORMATION

VALVE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### CONTROL

VALVE CONTROLLER

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MANUAL |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 6-10sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| SIS | LPSI HEADER (2) |

I&C REQUIREMENTS

INFORMATION

FLOW TO RCS INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 2500 |
| UNITS: | GPM |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 500 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION

PRESSURE INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 300 |
| UNITS: | PSIG |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | LPSI PUMP (2) |

I&C REQUIREMENTS

INFORMATION

LPSI PUMP MOTOR AMPS

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 70
UNITS: AMPS
ACCURACY: 0 - 15%
INTERVALS: 10
DIVISIONS: 9
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONTROL

LPSI PUMP CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

INFORMATION

LPSI PUMP OPERATING STATUS IND

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| SIS | RAS CONTROLLER |

## I&C REQUIREMENTS

### INFORMATION

RAS STATUS INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | REFUELING WATER TANK LEVEL |

I&C REQUIREMENTS

INFORMATION

RWT LEVEL INDICATION

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 11-30sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | RWT ISOLATION VALVE (4) |

## I&C REQUIREMENTS

### INFORMATION

RWT ISOLATION POSITION IND

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### CONTROL

RWT ISOLATION VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 11-30sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SAFETY INJECTION TANK (4) |

I&C REQUIREMENTS

CONTROL

SIT VENT VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP+DBA
REACTION TIME: 1-5sec

INFORMATION

SIT LEVEL INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: N/A
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

INFORMATION

SIT PRESSURE INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 650
UNITS: PSIG
ACCURACY: 0 - 15%
INTERVALS: 100
DIVISIONS: 4
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SAFETY INJECTION TANK (4) |

## I&C REQUIREMENTS

### INFORMATION

SIT DRAIN VALVE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

### CONTROL

SIT DRAIN VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

### INFORMATION

SIT VENT VALVE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SAFETY INJECTION TANK (4) |

## I&C REQUIREMENTS

### INFORMATION

SIT DRAIN BYPASS VALVE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

### CONTROL

SIT DRAIN BYPASS VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SCS HEAT EXCHANGER FLOW CONTROL VALVE (2) |

I&C REQUIREMENTS

INFORMATION

LPSI/SCSHX BYPASS FLOW VALVE IND

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SCS HEAT EXCHANGER OUTLET VALVE (2) |

I&C REQUIREMENTS

CONTROL

SCSHX OUTLET VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 31-60sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SIAS CONTROLLER |

I&C REQUIREMENTS

INFORMATION

SIAS ACTUATED STATUS INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: >60sec

INFORMATION

SIAS BLOCKED STATUS INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

INFORMATION

SIAS BLOCK PERMISSIVE STATUS IND

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| SIS | SIAS CONTROLLER |

## I&C REQUIREMENTS

### CONTROL

SIAS BLOCK SWITCH

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

### CONTROL

SIAS ACTUATE SWITCH

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SIS | SIS HEADER (4) |

I&C REQUIREMENTS

INFORMATION

FLOW INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 400
UNITS: GPM
ACCURACY: 0 - 15%
INTERVALS: 100
DIVISIONS: 9
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

INFORMATION

PRESSURE INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 2400
UNITS: PSIG
ACCURACY: 0 - 15%
INTERVALS: 500
DIVISIONS: 4
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

INFORMATION

FLOW TO RCS COLD LEG INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 400
UNITS: GPM
ACCURACY: 0 - 2.5%
INTERVALS: 100
DIVISIONS: 9
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| SIS | SIT ISOLATION VALVE (4) |

## I&C REQUIREMENTS

### INFORMATION

SIT ISOLATION VALVE INDICATION

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

### CONTROL

SIT ISOLATION VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 11-30sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CACS | CNTMT SPRAY HEADER ISOLATION VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE XONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 6-10sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT |

## I&C REQUIREMENTS

### INFORMATION

AIRBORNE ACTIVITY INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 1E-1 |
| MAX: | 1E-5 |
| UNITS: | uC/CM E3 |
| ACCURACY: | N/A |
| INTERVALS: | E-X |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | >60sec |

### INFORMATION

RADIATION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | ADEQ |
| MAX: | HIGH |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 11-30sec |

### INFORMATION

PRESSURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 30 |
| UNITS: | PSIG |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 5 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT |

## I&C REQUIREMENTS

### INFORMATION

TEMPERATURE RECORDER

| | |
|---|---|
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 100 |
| MAX: | 300 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

### INFORMATION

TEMPERATURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 100 |
| MAX: | 300 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

### INFORMATION

PRESSURE RECORDER

| | |
|---|---|
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 0 |
| MAX: | 30 |
| UNITS: | PSIG |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 5 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT COOLING FAN (4) |

## I&C REQUIREMENTS

### INFORMATION

INTAKE COOLING WATER LOW FLOW IND

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

CNTMT COOLING UNIT ICW OUTLET IND

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 100 |
| MAX: | 300 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 11-30sec |

### INFORMATION

CNTMT COOLING UNIT AIR INLET TEMP

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 100 |
| MAX: | 300 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT COOLING FAN (4) |

## I&C REQUIREMENTS

### CONTROL

FAN MOTOR CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: SLOW
UNITS: OFF/SLOW
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

### INFORMATION

FAN COOLER DELTA-T

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 20
UNITS: DEGF
ACCURACY: 0 - 15%
INTERVALS: 5
DIVISIONS: 4
AVAILABILITY: LOOP+DBA
REACTION TIME: 11-30sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT SPRAY PUMP (2) |

## I&C REQUIREMENTS

### CONTROL

PUMP MOTOR CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

PUMP MOTOR SUPPLY BREAKER INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

### INFORMATION

DISCHARGE PRESSURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 400 |
| UNITS: | PSIG |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 100 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 11-30sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT SPRAY PUMP SUCTION ISO VALVE TO RWT |

## I&C REQUIREMENTS

### INFORMATION

VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

### CONTROL

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT SUMP |

I&C REQUIREMENTS

INFORMATION

SUMP LEVEL

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CONTAINMENT SUMP SIS/CSP SUCTION ISOLATION VALV |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 11-30sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | CSAS CONTROLLER |

I&C REQUIREMENTS

CONTROL

CSAS BLOCK SWITCH

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | NORM |
| MAX: | BLOK |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

INFORMATION

CSAS BLOCKED STATUS INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | NORM |
| MAX: | BLOK |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION

CSAS BLOCK PERMISSIVE STATUS IND

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | NORM |
| MAX: | BLOK |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CACS | HYDROGEN ANALYZER (2) |

## I&C REQUIREMENTS

### INFORMATION

HYDROGEN CONCENTRATION INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 10
UNITS: % H2 BY VOL
ACCURACY: 0 - 10%
INTERVALS: 1
DIVISIONS: 9
AVAILABILITY: LOOP
REACTION TIME: >60sec

### CONTROL

SAMPLE SELECTOR SWITCH

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### CONTROL

H2 SAMPLE PUMP CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | HYDROGEN ANALYZER (2) |

## I&C REQUIREMENTS

### CONTROL

#### ANALYZER MODE SELECTOR SWITCH

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: STBY
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

### INFORMATION

#### ANALYZER OPERATING STATUS INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### INFORMATION

#### HYDROGEN CONCENTRATION RECORDER

TYPE OF DISPLAY: TREND
RANGE
MIN: 0
MAX: 10
UNITS: % $H_2$ BY VOL
ACCURACY: 0 - 10%
INTERVALS: 1
DIVISIONS: 9
AVAILABILITY: LOOP
REACTION TIME: >60sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | HYDROGEN RECOMBINER |

I&C REQUIREMENTS

CONTROL

POWER CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MANUAL |
| RANGE | |
| MIN: | 0 |
| MAX: | 80 |
| UNITS: | KW |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 6-10sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CACS | HYDROGEN RECOMBINER (2) |

I&C REQUIREMENTS

INFORMATION

HYDROGEN RECOMBINER TEMPERATURE IND

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 1000 |
| MAX: | 1500 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 100 |
| DIVISIONS: | 5 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | >60sec |

INFORMATION

POWER INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 80 |
| UNITS: | KW |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 10 |
| DIVISIONS: | 1 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 6-10sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CIS | CIAS CONTROLLER |

I&C REQUIREMENTS

CONTROL

CIAS ACTUATOR SWITCH

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

INFORMATION

CIAS ACTUATED INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

INFORMATION

CIAS BLOCKED INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CIS | CIAS CONTROLLER |

## I&C REQUIREMENTS

### CONTPOL

CIAS BLOCK SWITCH

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | NORM |
| MAX: | BLOK |
| UNITS: | ON/OFF |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

### INFORMATION

CIAS BLOCK PERMISSIVE STATUS IND

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | >60sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CIS | CNTMT ISOLATION VLVS (APPLICABLE TO MANY SYSTEM |

I&C REQUIREMENTS

INFORMATION

VALVE STATUS INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONTROL

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | CONDENSATE PUMP (3) |

I&C REQUIREMENTS
----------------

CONTROL
-------

MOTOR CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | AUXILIARY FEEDWATER HEADER (MOTOR DRIVEN PUMPS) |

## I&C REQUIREMENTS

### CONTROL

THROTTLE VALVE CONTROL

TYPE OF CONTROL: CONTINUOUS
MODES: MAN/AUTO
RANGE
MIN: 0
MAX: 100
UNITS: %
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### INFORMATION

THROTTLE VALVE POSITION INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: N/A
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

### CONTROL

ISOLATION VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | AUXILIARY FEEDWATER HEADER (MOTOR DRIVEN PUMPS) |

## I&C REQUIREMENTS

### INFORMATION

ISOLATION VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### INFORMATION

HEADER FLOW INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 320
UNITS: GPM
ACCURACY: 0 - 10%
INTERVALS: 50
DIVISIONS: 4
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| FWS | AUXILIARY FEEDWATER HEADER (TURBINE DRIVEN PUMP |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

THRIOTTLE VALVE POSITION INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: N/A
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

CONTROL
-------

ISOLATION VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

INFORMATION
-----------

ISOLATION VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| FWS | AUXILIARY FEEDWATER HEADER (TURBINE DRIVEN PUMP |

I&C REQUIREMENTS

INFORMATION

HEADER FLOW INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 600
UNITS: GPM
ACCURACY: 0 - 10%
INTERVALS: 50
DIVISIONS: 4
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONTROL

THROTTLE VALVE CONTROL

TYPE OF CONTROL: CONTINUOUS
MODES: MAN/AUTO
RANGE
MIN: 0
MAX: 100
UNITS: %
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | BYPASS FEEDWATER REGULATING VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

TYPE OF CONTROL: CONTINUOUS
MODES: MAN/AUTO
RANGE
MIN: 0
MAX: 100
UNITS: %
AVAILABILITY: N/A
REACTION TIME: 6-10sec

### INFORMATION

VALVE POSITION INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: N/A
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: N/A
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | CONDENSATE PUMP (3) |

## I&C REQUIREMENTS

### INFORMATION

PUMP MOTOR SUPPLY BREAKER IND

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: N/A
REACTION TIME: 1-5sec

### INFORMATION

DISCHARGE PRESSURE INDICATION

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 550
UNITS: PSIG
ACCURACY: N/A
INTERVALS: 50
DIVISIONS: 4
AVAILABILITY: N/A
REACTION TIME: 1-5sec

### INFORMATION

DISCHARGE FLOW INDICATION

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: N/A
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: N/A
REACTION TIME: 6-10sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| FWS | CONDENSATE STORAGE TANK |

I&C REQUIREMENTS
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INFORMATION
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TANK LEVEL INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 400 |
| UNITS: | 1000 GAL |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | >60sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | ELECTRIC DRIVEN AFW PUMP (2) |

I&C REQUIREMENTS

CONTROL

MOTOR CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

INFORMATION

MOTOR OPERATING INDICATION

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ONF
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

INFORMATION

DISCHARGE PRESSURE

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 1200
UNITS: PSIG
ACCURACY: 0 - 15%
INTERVALS: 200
DIVISIONS: 3
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | ELECTRIC DRIVEN AFW PUMP (2) |

I&C REQUIREMENTS

INFORMATION

MOTOR SUPPLY BREAKER INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| FWS | MAIN CONDENSER SHELL (2) |

I&C REQUIREMENTS

INFORMATION

LOW VACUUM INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONTROL

TBS INTERLOCK RESET SWITCH

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

INFORMATION

STARTUP HOGGER BREAKER INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | MAIN FEEDWATER BYPASS THROTTLE VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

### INFORMATION

VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | MAIN FEEDWATER HEADER |

I&C REQUIREMENTS

INFORMATION

FLOW INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 6000 |
| UNITS: | 1000 LBM/HR |
| ACCURACY: | N/A |
| INTERVALS: | 500 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

AFFECTED SYSTEM ---------------- FWS

AFFECTED COMPONENT ------------------ MAIN FEEDWATER HEADER ISOLATION VALVES (2 PER S

I&C REQUIREMENTS
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CONTROL
-------

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP+DBA
REACTION TIME: 1-5sec

INFORMATION
-----------

VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP+DBA
REACTION TIME: 0-1SEC

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| FWS | MAIN FEEDWATER PUMP DISCHARGE VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | MAIN FEEDWATER REGULATING VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | N/A |
| REACTION TIME: | 11-30sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | N/A |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | STEAM DRIVEN AFW PUMP |

## I&C REQUIREMENTS

### CONTROL

PUMP GOVERNOR CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MAN/AUTO
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

### INFORMATION

DISCHARGE PRESSURE INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 1200
UNITS: PSIG
ACCURACY: 0 - 15%
INTERVALS: 200
DIVISIONS: 3
AVAILABILITY: LOOP
REACTION TIME: 6-10sec

### INFORMATION

PUMP OPERATING INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | STEAM GENERATOR MAIN FEEDWATER PUMP (2) |

I&C REQUIREMENTS

CONTROL

MOTOR CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | N/A |
| REACTION TIME: | 6-10sec |

INFORMATION

MOTOR SUPPLY BREAKER INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

INFORMATION

MOTOR CURRENT INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 600 |
| UNITS: | AMPS |
| ACCURACY: | N/A |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| FWS | STEAM GENERATOR MAIN FEEDWATER PUMP (2) |

I&C REQUIREMENTS

INFORMATION

SUCTION PRESSURE

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 550 |
| UNITS: | PSIG |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| FWS | STEAM GENERATOR MAIN FEEDWATER PUMP RECIRC VALV |

I&C REQUIREMENTS
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CONTROL
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VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | N/A |
| REACTION TIME: | 6-10sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | BAMP DISCHARGE SUCTION ISOLATION VALVE |

## I&C REQUIREMENTS

### CONTROL

BORIC ACID MAKEUP COUNTER CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | 0 |
| MAX: | 10E4 |
| UNITS: | GAL |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | BAMP DISCHARGE TO CHARGING SUCTION ISOLATION VA |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

### INFORMATION

VALVE POSITION INIDCATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CVCS | BAMP DISCHARGE TO VOLUME CONTROL TANK HEADER |

## I&C REQUIREMENTS

### INFORMATION

ISO VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

### CONTROL

ISO VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CVCS | BAMP RECIRC TO BAMT ISOLATION VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

### INFORMATION

VALVE POSITION INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | BAMT OUTLET GRAVITY FEED ISOLATION VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | BORIC ACID MAKEUP COUNTER |

I&C REQUIREMENTS
----------------

CONTROL
-------

COUNTER CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | 0 |
| MAX: | 10E4 |
| UNITS: | GAL |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | BORIC ACID MAKEUP PUMP (2) |

I&C REQUIREMENTS

CONTROL

PUMP MOTOR CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION

MOTOR OPERATING INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CVCS | BORIC ACID MAKEUP TANK (2) |

I&C REQUIREMENTS

INFORMATION

LOW LEVEL INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | BORONOMETER |

I&C REQUIREMENTS

INFORMATION

INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 3000 |
| UNITS: | PPM |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 500 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | >60sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | CHARGING HEADER |

## I&C REQUIREMENTS

### INFORMATION

REGEN HX CHG ISO VLV POSITION IND

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

### CONTROL

REGEN HX CHG ISO VLV CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | CHARGING PUMP (3) |

## I&C REQUIREMENTS

### INFORMATION

FLOW INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 150 |
| UNITS: | GPM |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 20 |
| DIVISIONS: | 1 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

PUMP DISCHARGE PRESSURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 200 |
| MAX: | 2600 |
| UNITS: | PSIA |
| ACCURACY: | N/A |
| INTERVALS: | 500 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### CONTROL

PUMP MOTOR CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | CHARGING PUMP (3) |

I&C REQUIREMENTS

INFORMATION

PUMP MOTOR SUPPLY BREAKER INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

INFORMATION

LOW SUCTION PRESSURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | CHARGING RCS LOOP STOP VALVE (2) |

## I&C REQUIREMENTS

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | LETDOWN BACKPRESSURE REGULATING VALVE (2) |

I&C REQUIREMENTS

CONTROL

VALVE CONTROLLER

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | AUTOMATIC |
| RANGE | |
| MIN: | 300 |
| MAX: | 590 |
| UNITS: | PSIG |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | LETDOWN HEADER (2) |

I&C REQUIREMENTS

CONTROL

CONTROL VALVE CONTROL

TYPE OF CONTROL: CONTINUOUS
MODES: MAN/AUTO
RANGE
MIN: 0
MAX: 100
UNITS: %
AVAILABILITY: N/A
REACTION TIME: >60sec

INFORMATION

FLOW INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 130
UNITS: GPM
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 1
AVAILABILITY: N/A
REACTION TIME: >60sec

INFORMATION

CONTROL VLV POSITION INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: 0 - 10%
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: N/A
REACTION TIME: 0-1SEC

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CVCS | LETDOWN HEAT EXCHANGER |

## I&C REQUIREMENTS

### INFORMATION

LETDOWN OUTLET TEMP INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 50 |
| MAX: | 250 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 50 |
| DIVISIONS: | 9 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

### INFORMATION

LETDOWN OUTLET PRESSURE INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 300 |
| MAX: | 590 |
| UNITS: | PSIG |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 50 |
| DIVISIONS: | 9 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | PRESSURIZER AUXILIARY SPRAY VALVE (2) |

I&C REQUIREMENTS

INFORMATION

VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP+DBA
REACTION TIME: 0-1SEC

CONTROL

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP+DBA
REACTION TIME: 1-5sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CVCS | RCS/LETDOWN ISOLATION VALVES (2) |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

VALVE POSITION INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

CONTROL
-------

VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| CVCS | REGENERATIVE HEAT EXCHANGER |

I&C REQUIREMENTS

INFORMATION

LETDOWN OUTLET TEMP INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 50
MAX: 300
UNITS: DEGF
ACCURACY: 0 - 2.5%
INTERVALS: 50
DIVISIONS: 9
AVAILABILITY: N/A
REACTION TIME: 1-5sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | RWT TO CHARGING PUMP SUCTION VALVE |

I&C REQUIREMENTS

INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | SPENT FUEL POOL |

## I&C REQUIREMENTS

### INFORMATION

LOW LEVEL INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | SPENT FUEL POOL TO CHARGING PUMP SUCTION TAP |

## I&C REQUIREMENTS

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX. | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | VOLUME CONTROL TANK |

I&C REQUIREMENTS
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INFORMATION
-----------

LEVEL INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 20 |
| DIVISIONS: | 9 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CVCS | VOLUME CONTROL TANK OUTLET ISOLATION VALVE |

I&C REQUIREMENTS

INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| PZR | LTOP |

I&C REQUIREMENTS

CONTROL

SYSTEM MODE SELECTOR SWITCH

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

INFORMATION

MODE SELECTED INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| PZR | PORV (2) |

I&C REQUIREMENTS

INFORMATION

VALVE INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP+DBA
REACTION TIME: 0-1SEC

CONTROL

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP+DBA
REACTION TIME: 1-5sec

# CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| PZR | PORV BLOCK VALVES (2) |

## I&C REQUIREMENTS

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | AUTOMATIC |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| PZR | PRESSURIZER |

I&C REQUIREMENTS

INFORMATION

PRESSURE INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 200
MAX: 2600
UNITS: PSIA
ACCURACY: 0 - 10%
INTERVALS: 500
DIVISIONS: 4
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

INFORMATION

LEVEL INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

INFORMATION

LEVEL RECORDER

TYPE OF DISPLAY: TREND
RANGE
MIN: 0
MAX: 100
UNITS: %
ACCURACY: 0 - 15%
INTERVALS: 20
DIVISIONS: 3
AVAILABILITY: LOOP+DBA
REACTION TIME: 6-10sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| PZR | PRESSURIZER |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

PRESSURE RECORDER

| | |
|---|---|
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 200 |
| MAX: | 2600 |
| UNITS: | PSIA |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 500 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

INFORMATION
-----------

PLCS REF SETPOINT LEVEL INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 80 |
| UNITS: | % |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 20 |
| DIVISIONS: | 9 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| PZR | PRESSURIZER HEATERS |

## I&C REQUIREMENTS

### INFORMATION

BACKUP HEATERS ON INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

### CONTROL

BACKUP HEATER CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

### INFORMATION

PROPORTIONAL HEATERS ON INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| PZR | PRESSURIZER HEATERS |

I&C REQUIREMENTS

CONTROL

PROPORTIONAL HEATER MODE SELECTOR

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | AUTO |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| PZR | PRESSURIZER MAIN SPRAY VALVES (2) |

## I&C REQUIREMENTS

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | DBA |
| REACTION TIME: | 0-1SEC |

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MANUAL |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | DBA |
| REACTION TIME: | 1-5sec |

### CONTROL

PRESSURIZER PRESSURE CONTROLLER

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | AUTOMATIC |
| RANGE | |
| MIN: | 2150 |
| MAX: | 2350 |
| UNITS: | PSIA |
| AVAILABILITY: | DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RGVS | CONTAINMENT VENT ISOLATION VALVE |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RGVS | PRESSURIZER VENT ISOLATION VALVES (2) |

I&C REQUIREMENTS

CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RGVS | QUENCH TANK |

I&C REQUIREMENTS

INFORMATION

LOW LEVEL INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

INFORMATION

PRESSURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 7 |
| UNITS: | PSIG |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 1 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

INFORMATION

TEMPERATURE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 40 |
| MAX: | 250 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RGVS | REACTOR VESSEL HEAD VENT ISOLATION VALVES (2) |

I&C REQUIREMENTS

CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| RGVS | RGVS VENT TO QUENCH TANK HEADER ISOLATION VALVE |

I&C REQUIREMENTS

CONTROL

VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

INFORMATION

VALVE POSITION INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RXCS | BREAKER CONTROL (2) |

I&C REQUIREMENTS

CONTROL

MG SET BREAKER

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RXCS | CEAs AND CEDMs (84) |

I&C REQUIREMENTS

INFORMATION

ZERO POSITION INDICATOR

```
TYPE OF DISPLAY: STATUS
RANGE
   MIN:          OFF
   MAX:          ON
UNITS:           ON/OFF
ACCURACY:        N/A
INTERVALS:
DIVISIONS:
AVAILABILITY:    LOOP+DBA
REACTION TIME:   1-5sec
```

INFORMATION

CEA POSITION INDICATOR

```
TYPE OF DISPLAY: VALUE
RANGE
   MIN:          0
   MAX:          100
UNITS:           %
ACCURACY:        N/A
INTERVALS:       20
DIVISIONS:       3
AVAILABILITY:    LOOP+DBA
REACTION TIME:   1-5sec
```

CONTROL

CEA CONTROL

```
TYPE OF CONTROL: CONTINUOUS
MODES:           MANUAL
RANGE
   MIN:          0
   MAX:          100
UNITS:           %
AVAILABILITY:    LOOP+DBA
REACTION TIME:   1-5sec
```

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RXCS | CEDM MOTOR GENERATORS (2) |

I&C REQUIREMENTS

INFORMATION

VOLTAGE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 300 |
| UNITS: | V |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | DBA |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| RXCS | REACTOR |

## I&C REQUIREMENTS

### INFORMATION

POWER RATE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | -1 |
| MAX: | +2 |
| UNITS: | DPM |
| ACCURACY: | 0 - 10% |
| INTERVALS: | E-X |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

### INFORMATION

POWER INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 1E-8 |
| MAX: | 2E+2 |
| UNITS: | % FULL PWR |
| ACCURACY: | N/A |
| INTERVALS: | 1 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

### INFORMATION

POWER RECORDER

| | |
|---|---|
| TYPE OF DISPLAY: | TREND |
| RANGE | |
| MIN: | 1E-8 |
| MAX: | 2E+2 |
| UNITS: | % FULL PWR |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 1 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| RXCS | REACTOR TRIP BREAKERS (8) |

## I&C REQUIREMENTS

### CONTROL

BREAKER CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### INFORMATION

BREAKER INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| EDS | AUXILIARY TRANFORMER TO BUS B2 FEEDER BREAKER |

## I&C REQUIREMENTS

### CONTROL

BREAKER CONTROL (BUS B2)

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### CONTROL

BREAKER CONTROL (BUS A2)

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| EDS | BUS A1 |

## I&C REQUIREMENTS

### INFORMATION

BUS POWER AVAILABLE INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: N/A
REACTION TIME: 1-5sec

### INFORMATION

BREAKER INDICATOR(S)

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

### INFORMATION

LOAD INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 6000
UNITS: KW
ACCURACY: N/A
INTERVALS: 500
DIVISIONS: 4
AVAILABILITY: N/A
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| EDS | BUS B1 |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

BUS POWER AVAILABLE INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: N/A
REACTION TIME: 1-5sec

INFORMATION
-----------

BREAKER INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

INFORMATION
-----------

LOAD INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 6000
UNITS: KW
ACCURACY: N/A
INTERVALS: 500
DIVISIONS: 4
AVAILABILITY: N/A
REACTION TIME: 1-5sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| EDS | BUS B3 |

I&C REQUIREMENTS

INFORMATION

BREAKER INDICATOR(S) (BUS B3)

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION

BRAKER INDICATOR(S) (BUS A3)

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION

BUS VOLTAGE INDICATOR (BUS B3)

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 6 |
| UNITS: | KV |
| ACCURACY: | N/A |
| INTERVALS: | 1 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| EDS | BUS B3 |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

BUS VOLTAGE INDICATOR (BUS A3)

| | |
| --- | --- |
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 6 |
| UNITS: | KV |
| ACCURACY: | N/A |
| INTERVALS: | 1 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| EDS | BUS B3 TO BUS B2 BUS TIE BREAKER |

## I&C REQUIREMENTS

### CONTROL

BREAKER CONTROL (BUS B3)

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### CONTROL

BREAKER CONTROL (BUS A3)

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| EDS | EMERGENCY DIESEL GENERATOR |

I&C REQUIREMENTS
----------------

INFORMATION
-----------

FREQUENCY INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 80
UNITS: HZ
ACCURACY: 0 - 2.5%
INTERVALS: 10
DIVISIONS: 9
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

INFORMATION
-----------

VOLTAGE INDICATOR

TYPE OF DISPLAY: VALUE
RANGE
MIN: 0
MAX: 6
UNITS: KV
ACCURACY: N/A
INTERVALS: 1
DIVISIONS: 9
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

CONTROL
-------

DIESEL START CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MAN/AUTO
RANGE
MIN: OFF
MAX: ON
UNITS: ON/OFF
AVAILABILITY: LOOP
REACTION TIME: 11-30sec

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| EDS | EMERGENCY DIESEL GENERATOR |

I&C REQUIREMENTS

INFORMATION

LOAD INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 1000 |
| MAX: | 4000 |
| UNITS: | KW |
| ACCURACY: | 0 - 2.5% |
| INTERVALS: | 500 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| EDS | EMERGENCY DIESEL GENERATOR OUTPUT BREAKER |

## I&C REQUIREMENTS

### CONTROL

BREAKER CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| EDS | MAIN GENERATOR |

I&C REQUIREMENTS

CONTROL

OUTPUT BREAKER CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

INFORMATION

OUTPUT BREAKER INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| EDS | STARTUP TRANSFORMER TO BUS B2 FEEDER BREAKER |

## I&C REQUIREMENTS

### INFORMATION

BUS B2 VOLTAGE

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 6 |
| UNITS: | KV |
| ACCURACY: | N/A |
| INTERVALS: | 1 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

BUS A2 VOLTAGE

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 6 |
| UNITS: | KV |
| ACCURACY: | N/A |
| INTERVALS: | 1 |
| DIVISIONS: | 9 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### CONTROL

BREAKER CONTROL (BUS B2 FEEDER)

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| EDS | STARTUP TRANSFORMER TO BUS B2 FEEDER BREAKER |

I&C REQUIREMENTS

CONTROL

BREAKER CONTROL (BUS A2 FEEDER)

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| EDS | SYNCHRONOUS SWITCH (ALL BREAKERS) |

## I&C REQUIREMENTS

### CONTROL

SYNCHRONOUS PERMISSIVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CCWS | CNTMT COOLING UNITS (4) |

## I&C REQUIREMENTS

### INFORMATION

CCW LOW FLOW

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

CNTMT COOLING UNIT OUTLET TEMP

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 100 |
| MAX: | 300 |
| UNITS: | DEGF |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 11-30sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| CCWS | COMPONENT COOLING WATER PUMP (3) |

## I&C REQUIREMENTS

### INFORMATION

PUMP OPERATING INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| ICWS | COMPONENT COOLING WATER HEAT EXCHANGER |

I&C REQUIREMENTS

INFORMATION

ICW LOW FLOW INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| ICWS | INTAKE COOLING WATER PUMP (3) |

I&C REQUIREMENTS

INFORMATION

DISCHARGE PRESSURE INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

INFORMATION

PUMP OPERATING INDICATION

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| ICWS | MAIN CIRCULATING PUMP (4) |

I&C REQUIREMENTS

INFORMATION

PUMP SUPPLY BREAKER INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| ICWS | MAIN CONDENSER MAIN CIRC WATER HEADER |

I&C REQUIREMENTS

INFORMATION

HEADER LOW FLOW INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY· | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SGBS | BLOWDOWN SYSTEM FLOW CONTROL VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | CONTINUOUS |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| AVAILABILITY: | N/A |
| REACTION TIME: | 31-60sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 100 |
| UNITS: | % |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 20 |
| DIVISIONS: | 3 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 6-10sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SGBS | BLOWDOWN SYSTEM HEADER |

I&C REQUIREMENTS

INFORMATION

FLOWRATE INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 0 |
| MAX: | 10 |
| UNITS: | 1000 LBM/HR |
| ACCURACY: | 0 - 10% |
| INTERVALS: | 1 |
| DIVISIONS: | 3 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SGBS | BLOWDOWN SYSTEM RADIATION MONITOR |

I&C REQUIREMENTS

INFORMATION

HIGH RADIATION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | OFF |
| MAX: | ON |
| UNITS: | ON/OFF |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SGBS | BLOWDOWN TANK |

I&C REQUIREMENTS

INFORMATION

TANK LEVEL

| | |
|---|---|
| TYPE OF DISPLAY: | VALUE |
| RANGE | |
| MIN: | 50 |
| MAX: | 350 |
| UNITS: | GAL |
| ACCURACY: | 0 - 15% |
| INTERVALS: | 50 |
| DIVISIONS: | 4 |
| AVAILABILITY: | N/A |
| REACTION TIME: | 11-30sec |

CONTROL

TANK VENT VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 1-5sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SGBS | BLOWDOWN TANK DISCHARGE VALVE |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | N/A |
| REACTION TIME: | 11-30sec |

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SGBS | CONTAINMENT ISOLATION VALVES IN BLOWDOWN LINE ( |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MAN/AUTO |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 6-10sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP+DBA |
| REACTION TIME: | 1-5sec |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SS | PRESSURIZER SAMPLE LINE ISOLATION VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
|---|---|
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
|---|---|
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |

CONSOLIDATED REPORT

| AFFECTED SYSTEM | AFFECTED COMPONENT |
|---|---|
| SS | RCS SAMPLE LINE ISOLATION VALVE (12) |

I&C REQUIREMENTS

CONTROL

VALVE CONTROL

TYPE OF CONTROL: DISCRETE
MODES: MANUAL
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
AVAILABILITY: LOOP
REACTION TIME: 1-5sec

INFORMATION

VALVE POSITION INDICATOR

TYPE OF DISPLAY: STATUS
RANGE
MIN: SHUT
MAX: OPEN
UNITS: OPEN/SHUT
ACCURACY: N/A
INTERVALS:
DIVISIONS:
AVAILABILITY: LOOP
REACTION TIME: 0-1SEC

| AFFECTED SYSTEM | AFFECTED COMPONENT |
| --- | --- |
| SS | RCS SURGE LINE SAMPLE ISOLATION VALVE (2) |

## I&C REQUIREMENTS

### CONTROL

VALVE CONTROL

| | |
| --- | --- |
| TYPE OF CONTROL: | DISCRETE |
| MODES: | MANUAL |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 1-5sec |

### INFORMATION

VALVE POSITION INDICATOR

| | |
| --- | --- |
| TYPE OF DISPLAY: | STATUS |
| RANGE | |
| MIN: | SHUT |
| MAX: | OPEN |
| UNITS: | OPEN/SHUT |
| ACCURACY: | N/A |
| INTERVALS: | |
| DIVISIONS: | |
| AVAILABILITY: | LOOP |
| REACTION TIME: | 0-1SEC |