

**EMPLOYEE
CONCERNS
SPECIAL PROGRAM**

**VOLUME 9
INDUSTRIAL SAFETY CATEGORY**

**SUBCATEGORY REPORT 90500
LIFE SAFETY**

UPDATED

8902210439

**TVA
NUCLEAR POWER**

8902210439 890204
PDR ADOCK 05000239
P PDC

REPORT TYPE: Watts Bar Nuclear Plant Subcategory

REVISION NUMBER: 3

TITLE: Life Safety Related to Industrial Safety

PAGE 1 OF 31

REASON FOR REVISION:

Include minor editorial changes, and a revision of section 5.0 and 7.0.

PREPARATION

PREPARED BY:

Alfred C. White
SIGNATURE

1-28-87
DATE

REVIEWS

PEER:

E. J. Wiseman
SIGNATURE

1/29/87
DATE

TAS:
R.R. 1/30/87
302

D.W. Stewart
SIGNATURE

2/2/87
DATE

CONCURRENCES

CEG-H: Linnell 1/29/87
SRP: James R. Russell 2-10-87
SIGNATURE DATE

APPROVED BY:

MURPHY 2/23/87
ECSP MANAGER DATE

NA
MANAGER OF NUCLEAR POWER DATE
CONCURRENCE (FINAL REPORT ONLY)

Preface, Glossary, and List of Acronyms
for ECTIG Subcategory Reports

HISTORY OF REVISION

REV NUMBER	PAGES REVISED	REASON FOR CURRENT REVISION
3	i	To clarify that one or more attachments will help the reader find where a particular concern is evaluated

Preface

This subcategory report is one of a series of reports prepared for the Employee Concerns Special Program (ECSP) of the Tennessee Valley Authority (TVA). The ECSP and the organization which carried out the program, the Employee Concerns Task Group (ECTG), were established by TVA's Manager of Nuclear Power to evaluate and report on those Office of Nuclear Power (ONP) employee concerns filed before February 1, 1986. Concerns filed after that date are handled by the ongoing ONP Employee Concerns Program (ECP).

The ECSP addressed over 5800 employee concerns. Each of the concerns was a formal, written description of a circumstance or circumstances that an employee thought was unsafe, unjust, inefficient, or inappropriate. The mission of the Employee Concerns Special Program was to thoroughly investigate all issues presented in the concerns and to report the results of those investigations in a form accessible to ONP employees, the NRC, and the general public. The results of these investigations are communicated by four levels of ECSP reports: element, subcategory, category, and final.

Element reports, the lowest reporting level, will be published only for those concerns directly affecting the restart of Sequoyah Nuclear Plant's reactor unit 2. An element consists of one or more closely related issues. An issue is a potential problem identified by ECTG during the evaluation process as having been raised in one or more concerns. For efficient handling, what appeared to be similar concerns were grouped into elements early in the program, but issue definitions emerged from the evaluation process itself. Consequently, some elements did include only one issue, but often the ECTG evaluation found more than one issue per element.

Subcategory reports summarize the evaluation of a number of elements. However, the subcategory report does more than collect element level evaluations. The subcategory level overview of element findings leads to an integration of information that cannot take place at the element level. This integration of information reveals the extent to which problems overlap more than one element and will therefore require corrective action for underlying causes not fully apparent at the element level.

To make the subcategory reports easier to understand, three items have been placed at the front of each report: a preface, a glossary of the terminology unique to ECSP reports, and a list of acronyms.

Additionally, at the end of each subcategory report will be a Subcategory Summary Table that includes the concern numbers; identifies other subcategories that share a concern; designates nuclear safety-related, safety significant, or non-safety related concerns; designates generic applicability; and briefly states each concern.

Either the Subcategory Summary Table or another attachment or a combination of the two will enable the reader to find the report section or sections in which the issue raised by the concern is evaluated.

The subcategories are themselves summarized in a series of eight category reports. Each category report reviews the major findings and collective significance of the subcategory reports in one of the following areas:

- management and personnel relations
- industrial safety
- construction
- material control
- operations
- quality assurance/quality control
- welding
- engineering

A separate report on employee concerns dealing with specific contentions of intimidation, harassment, and wrongdoing will be released by the TVA Office of the Inspector General.

Just as the subcategory reports integrate the information collected at the element level, the category reports integrate the information assembled in all the subcategory reports within the category, addressing particularly the underlying causes of those problems that run across more than one subcategory.

A final report will integrate and assess the information collected by all of the lower level reports prepared for the ECSP, including the Inspector General's report.

For more detail on the methods by which ECTG employee concerns were evaluated and reported, consult the Tennessee Valley Authority Employee Concerns Task Group Program Manual. The Manual spells out the program's objectives, scope, organization, and responsibilities. It also specifies the procedures that were followed in the investigation, reporting, and closeout of the issues raised by employee concerns.

ECSP GLOSSARY OF REPORT TERMS*

classification of evaluated issues the evaluation of an issue leads to one of the following determinations:

- Class A: Issue cannot be verified as factual
- Class B: Issue is factually accurate, but what is described is not a problem (i.e., not a condition requiring corrective action)
- Class C: Issue is factual and identifies a problem, but corrective action for the problem was initiated before the evaluation of the issue was undertaken
- Class D: Issue is factual and presents a problem for which corrective action has been, or is being, taken as a result of an evaluation
- Class E: A problem, requiring corrective action, which was not identified by an employee concern, but was revealed during the ECTG evaluation of an issue raised by an employee concern.

collective significance an analysis which determines the importance and consequences of the findings in a particular ECSP report by putting those findings in the proper perspective.

concern (see "employee concern")

corrective action steps taken to fix specific deficiencies or discrepancies revealed by a negative finding and, when necessary, to correct causes in order to prevent recurrence.

criterion (plural: criteria) a basis for defining a performance, behavior, or quality which ONP imposes on itself (see also "requirement").

element or element report an optional level of ECSP report, below the subcategory level, that deals with one or more issues.

employee concern a formal, written description of a circumstance or circumstances that an employee thinks unsafe, unjust, inefficient or inappropriate; usually documented on a K-form or a form equivalent to the K-form.

evaluator(s) the individual(s) assigned the responsibility to assess a specific grouping of employee concerns.

findings includes both statements of fact and the judgments made about those facts during the evaluation process; negative findings require corrective action.

issue a potential problem, as interpreted by the ECTG during the evaluation process, raised in one or more concerns.

K-form (see "employee concern")

requirement a standard of performance, behavior, or quality on which an evaluation judgment or decision may be based.

root cause the underlying reason for a problem.

*Terms essential to the program but which require detailed definition have been defined in the ECTG Procedure Manual (e.g., generic, specific, nuclear safety-related, unreviewed safety-significant question).

Acronyms

AI	Administrative Instruction
AISC	American Institute of Steel Construction
ALARA	As Low As Reasonably Achievable
ANS	American Nuclear Society
ANSI	American National Standards Institute
ASME	American Society of Mechanical Engineers
ASTM	American Society for Testing and Materials
AWS	American Welding Society
BFN	Browns Ferry Nuclear Plant
BLN	Bellefonte Nuclear Plant
CAQ	Condition Adverse to Quality
CAR	Corrective Action Report
CATD	Corrective Action Tracking Document
CCTS	Corporate Commitment Tracking System
CEG-H	Category Evaluation Group Head
CFR	Code of Federal Regulations
CI	Concerned Individual
CMTR	Certified Material Test Report
COC	Certificate of Conformance/Compliance
DCR	Design Change Request
DNC	Division of Nuclear Construction (see also NU CON)

**TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM**

REPORT NUMBER: 90500

FRONT MATTER REV: 2

PAGE vi OF viii

DNE Division of Nuclear Engineering
DNQA Division of Nuclear Quality Assurance
DNT Division of Nuclear Training
DOE Department of Energy
DPO Division Personnel Officer
DR Discrepancy Report or Deviation Report
ECN Engineering Change Notice
ECP Employee Concerns Program
ECP-SR Employee Concerns Program-Site Representative
ECSP Employee Concerns Special Program
ECTG Employee Concerns Task Group
EEOC Equal Employment Opportunity Commission
EQ Environmental Qualification
EMRT Emergency Medical Response Team
EN DES Engineering Design
ERT Employee Response Team or Emergency Response Team
FCR Field Change Request
FSAR Final Safety Analysis Report
FY Fiscal Year
GET General Employee Training
HCI Hazard Control Instruction
HVAC Heating, Ventilating, Air Conditioning
II Installation Instruction
INPO Institute of Nuclear Power Operations
IRN Inspection Rejection Notice

**TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM**

REPORT NUMBER: 90500

FRONT MATTER REV: 2

PAGE vii OF viii

L/R	Labor Relations Staff
M&AI	Modifications and Additions Instruction
MI	Maintenance Instruction
MSPB	Merit Systems Protection Board
MT	Magnetic Particle Testing
NCR	Nonconforming Condition Report
NDE	Nondestructive Examination
NPP	Nuclear Performance Plan
NPS	Non-plant Specific or Nuclear Procedures System
NQAH	Nuclear Quality Assurance Manual
NRC	Nuclear Regulatory Commission
NSB	Nuclear Services Branch
NSRS	Nuclear Safety Review Staff
NU CON	Division of Nuclear Construction (obsolete abbreviation, see DNC)
NUMARC	Nuclear Utility Management and Resources Committee
OSHA	Occupational Safety and Health Administration (or Act)
ONP	Office of Nuclear Power
OWCP	Office of Workers Compensation Program
PHR	Personal History Record
PT	Liquid Penetrant Testing
QA	Quality Assurance
QAP	Quality Assurance Procedures
QC	Quality Control
QCI	Quality Control Instruction

**TVA EMPLOYEE CONCERNS
SPECIAL PROGRAM**

REPORT NUMBER: 90500

FRONT MATTER REV: 2

PAGE viii OF viii

QCP	Quality Control Procedure
QTC	Quality Technology Company
RIF	Reduction in Force
RT	Radiographic Testing
SQN	Sequoyah Nuclear Plant
SI	Surveillance Instruction
SOP	Standard Operating Procedure
SRP	Senior Review Panel
SWEC	Stone and Webster Engineering Corporation
TAS	Technical Assistance Staff
T&L	Trades and Labor
TVA	Tennessee Valley Authority
TVTLC	Tennessee Valley Trades and Labor Council
UT	Ultrasonic Testing
VI	Visual Testing
WBECSP	Watts Bar Employee Concern Special Program
WBN	Watts Bar Nuclear Plant
WR	Work Request or Work Rules
WP	Workplans

1.0 CHARACTERIZATION OF ISSUES

The eight issues in this subcategory, deal with 21 employee concerns about inadequate provisions for emergency egress from some areas in units 1 and 2. There are no concerns in this subcategory that are nuclear safety-related. A means of egress is a continuous and unobstructed way of exit travel from any point in a building or structure to a public area. A means of egress is comprised of three distinct parts: the way or path of exit access, the exit itself, and way of exit discharge to the outside.

A review of the issues in this subcategory indicates the issues are primarily concerned with two components of emergency egress. Seven issues are about providing two remote and unobstructed means of egress. The remaining issue is about the marking of exits and of the routes to exits.

1.1 Providing Two Remote and Unobstructed Means of Egress

A characterization of the issues over providing two remote and unobstructed means of egress follows.

1.1.1 Unit 2 Pipe Chase

Nine concerns were recorded regarding employee egress from the Watts Bar Nuclear Plant (WBN) unit 2 pipe chase during emergency situations. The concerns arose when two of the three possible exits from the pipe chase were locked for security purposes and sufficient telephones were not provided to report an emergency.

When the pipe chase was constructed there was an exit at both elevations 676 and 713. When unit 1 became a controlled area these two pipe chase exits opened into the controlled area in unit 1. So the two doors were locked. A temporary opening was cut in the pipe chase wall at elevation 713, but that gave only one means of egress for the employees working in the pipe chase.

1.1.2 Emergency Egress from the Radiochemistry Laboratory

The issue deals with the Radiochemistry Laboratory at WBN and Sequoyah (SQN) which has two exits not remote from each other, but located toward one end of the laboratory. This creates a perceived life safety problem for employees working in the lab. One employee was concerned that there was no fire extinguisher in the WBN titration room which is one of the three rooms that make up the labs. The Radiochemistry Laboratory at WBN is in the Auxiliary Building (AB) at elevation 713 and measures approximately 75 feet by 25 feet. It is comprised of a counting room, titration room, as well as the laboratory area. The lab at SQN measures approximately 78 feet by 26 feet and is comprised of the same three rooms in a similar arrangement.

Two concerns were recorded that specifically related to emergency egress problems in the WBN Radiochemistry Laboratory. Subsequently, one concern was received relating a firetrap in a specific but unidentified department at WBN, and a second relating the same concern about SQN laboratory. Additional information was requested from Quality Technology Company (QTC) to identify the departments that were not specified in these two concerns. No information was provided. The parameters common to both unclassical concerns are (1) exits situated in a manner that could trap employees, (2) storage (and use) of chemicals that could explode, (3) an unspecified amount of electrical equipment, and (4) the existence of a sprinkler system in the area. Interviews with safety personnel at SQN and WBN indicated that the Radiochemistry Laboratory was the only area in both plants that met all the four parameters. Therefore, these two concerns were also included in this issue.

1.1.3 Inadequate Egress Through Airlock Door

The issue addresses a concern that the airlock door located at elevation (el) 713 unit 1 side, AB could malfunction and not open in an emergency situation. The employee's concern was that the A56 and A57 doors at el 713 at opposite ends of the airlock between the Service Building (SB) and the AB could fail to operate in an emergency situation. This would create a life safety hazard by blocking a means of emergency egress from the area. The problems stem from the A57 door needing to be frequently adjusted, sometimes blocking egress and access through the airlock.

1.1.4 Need for Personnel Hatch in Unit 1 Reactor Pressurizer Housing

The issue addresses concern that an additional personnel hatch should be installed in the top of the reactor pressurizer housing for emergency egress of employees working in the area. There is only one means of emergency egress from the housing. That exit is the opening at the bottom of the housing at el 747 in the lower containment area.

1.1.5 Need for Emergency Exit in Men's Restroom

The issue consists of one concern generated through the WBN employee suggestion program. The suggestion was for another fire exit from the men's restroom and locker room at el 729 in the SB. The restroom and locker room measures approximately 85 feet by 100 feet. The area is comprised of a toilet area, washroom, large locker room, shower room and two drying rooms.

1.1.6 Inadequate Egress in the Turbine Building (TB) and Intake Pumping Station (IPS) at Browns Ferry Nuclear Plant (BFN)

The issue is comprised of two concerns about emergency egress at BFN. One employee was concerned about two equipment doors in the TB being chained and locked, blocking the means of egress from the area. The second is a concern about emergency egress around a 3,000 gallon caustic tank in the IPS, should the tank fail.

1.1.7 Emergency Egress Past Safety Relief Valve Discharge

The issue consists of a concern about egress from the valve room platforms because there is only one egress path past the safety relief valve vent stacks while the plant is operating. The egress from the platform grating requires that an employee walk past one or more vent valve stacks along the grating that is guarded with guardrails down one of two fixed ladders to the valve room floor. During normal plant operations the average temperature in the upper valve room area would exceed 100°F. The stacks vent steam to the outside atmosphere under abnormal situations such as a reactor trip or inadvertent buildup.

1.2 Marking Emergency Exits and Routes to Exits

Two concerns deal with marking exits and routes to exits. One concern suggested that exit routes should be clearly marked on the floor, not only with wall and door signs. The other concern was about pedestrian walkways in WBN, but the walkway location was not clearly defined. Further investigation revealed that the employee's concern was primarily about emergency egress, particularly that the exits and routes to exits from the plant are not adequately marked so that new employees could find their way out in emergency situations.

2.0 SUMMARY

2.1 Issues Raised

The issues raised are over always providing two remote means of unlocked egress from work areas.

Those areas include the unit 2 pipe chase; WBN and SQN Radiochemistry Laboratory; airlock near the unit 1 side of the AB; unit 1 reactor pressurizer housing; the men's room and locker room at el 729 in the SB; the safety relief valves north and south valve rooms; and a locked equipment airlock door in the TB and inadequate egress around the caustic storage tank in the IPS. A separate issue is related to marking exits and the directions to exits.

2.2 Evaluation Process

The process used to evaluate each of the issues included initial inspections of the work area reviewing previous reports and investigations conducted on these employee concerns; reviewing design and construction drawings; obtaining and analyzing all applicable requirements, codes, and standards; inspecting the areas to assess compliance with requirements; interviewing appropriate managers, employees and safety professionals to assess management actions related to the issues; interviewing employees to determine the level of employee knowledge and awareness; and reinspecting to determine if corrective actions were taken.

2.3 Findings Cited Against Requirements

The specific requirements that apply to each issue will be more thoroughly discussed in 3.2 of this report.

2.3.1 Providing Two Remote and Unobstructed Means of Egress

2.3.1.1 Unit 2 Pipe Chase

The issue was valid when the concerns were recorded. For a period of time employees were working in the congested pipe chase with only one means of egress. There are no Occupational Safety and Health Administration (OSHA) standards that apply to emergency egress in construction and repair activities. The pipe chase did not, however, meet the requirements of the Life Safety Code (LSC) that do require two remote means of egress. Management has taken action in response to the concerns to provide two means of egress from the pipe chase.

2.3.1.2 Emergency Egress from the Radiochemistry Laboratory

The issue is not valid. The laboratories at SQN and WBN do not have two exits that are remote from each other as required by OSHA and LSC standards. Management has, however, implemented both engineering and administrative controls that result in equivalent protection to that provided by two remote exits. A fire extinguisher is located in the titration room.

2.3.1.3 Inadequate Egress Through Airlock Door

The issue is not valid. The airlock door has to be frequently adjusted. There is another means of egress through the Radiochemistry Laboratory around the airlock. Employees are aware of this other means of egress because they have exited that way on numerous occasions when work was being performed on the airlock door. This is consistent with OSHA and LSC requirements that specify that where one exit can be blocked, two means of egress must be provided.

2.3.1.4 Need for Personnel Hatch in Unit 1 Reactor Pressurizer Housing

The issue is not valid. There is only one means of emergency egress from the pressurizer housing through the opening in the housing at el 747 in the lower containment area. Management has, however, taken actions so that when work is being performed in the housing, protection equivalent to two remote means of egress is provided. This is consistent with OSHA requirements and the LSC equivalency provision.

2.3.1.5 Need for Emergency Exit in Men's Restroom

The issue is valid. Management has agreed with an employee safety suggestion that another emergency exit is needed in the men's room and locker room in the SB at el 729. It has issued a Design Change

Request (DCR) and a workplan to install another exit door from the locker room to the outside.

2.3.1.6 Inadequate Egress in the Turbine Building and Intake Pumping Station at Browns Ferry Nuclear Plant

The issue is not valid. The equipment doors are locked. They are not, however, part of the emergency egress path. There is a personnel door marked as an emergency exit adjacent to each of the two equipment doors. The IPS issue is also not valid. There are two means of egress around the caustic tank to the stairs leading to the upper level as required by OSHA standards and the LSC. Additionally, there are two emergency escape ladders and hatches at opposite ends of the facility to the upper level. This complies with OSHA and the LSC requirements.

2.3.1.7 Emergency Egress Past Safety Relief Valve Discharge

The issue is not valid. There is only one path of travel around the discharge of the safety relief valves: a platform grating with two fixed ladders descending to the valve room floor. This one path would technically not comply with OSHA and the LSC standards that require two remote means of egress. There are additional safeguards provided when work is performed in the area and the plant is operating in the form of access restrictions, prejob work planning, and procedures for work in "concealed spaces" such as the valve room. When radiation is detected in the area, a Radiation Work Permit will be required before work can start. Interviews with a craft foreman who performed work in the valve room twice during "hot functional" indicates the prejob work planning and "concealed space" procedures have been implemented when work has been performed in the valve room. These additional safeguards provide equivalent protection to what would be provided by two remote means of egress around and down from the grating.

2.3.2 Marking Emergency Exits and Routes to Exits

There were two concerns about exits and routes to exits not being adequately marked in both units. The issue is valid. There are areas in the plant where exits and the routes to exits are not adequately marked. Such areas include the pipe chase, the inside of reactor pressurizer housing, and the annulus. Management has recognized these inadequacies and issued a DCR to provide exit markings that meet the LSC requirements. One concern suggested that exit routes should be clearly marked on the floor. There is no requirement that exit routes must be specifically marked on the floor.

2.4 Collective Significance of the Findings

2.4.1 Management Effectiveness

When WBN and SQN were designed, management did not establish and apply a requirement that emergency egress and other safety and health requirements be fully incorporated into plant designs. The OSHA standards did not come into existence until 1970 with the Occupational Safety and Health Act. The requirements in the LSC were recognized as the basis for adequate emergency egress in most industries. Engineering design organizations have taken actions since these plants were designed that significantly improves the consideration given to safety and health requirements.

There are numerous areas in the plant that do not technically comply with OSHA or the LSC emergency egress requirements. WBN management, in instances where inadequacies are recognized, has taken action in the form of both engineering and administrative controls to provide equivalent protection for employees working in these areas. This corrective action is not as effective as eliminating the hazard. However, for hazards that can not be eliminated, such action reduces risk for the employees to the lowest possible level.

In the design, construction, and operation of the plant, security has sometimes been given precedence over industrial safety and health. This is demonstrated by all the emergency exit doors that have locking mechanisms and by the key card system that could obstruct emergency egress in violation of OSHA and the LSC requirements prohibiting obstructions of egress.

2.4.2 Employee Effectiveness

Employees are adequately aware of the exits from the areas in which they work.

2.4.3 Technical Adequacy

The design and construction organizations did not adequately apply the LSC when the plant was being designed and subsequently built.

WBN management, in the design of the unit 2 pipe chase controlled area, did not adequately apply the emergency egress requirements of the LSC for the employees working in the area.

2.5 Causes of Findings

When WBN and SQN were designed, TVA design organizations did not have a policy in place that required applicable safety and health requirements to be fully incorporated in designs. They have established such a policy since WBN and SQN were designed.

The investigations revealed that employees do not understand the emergency egress requirements. They specifically do not understand that the alternative safeguards provided in areas with inadequate egress result in "equivalent" protection as would be provided by full compliance with the requirements. These alternative safeguards do not eliminate the problem, but do serve to reduce the hazard to the employees to the lowest possible level.

There was inadequate communication between the supervisors and employees at WBN when the concerns were recorded. The employees had difficulty expressing their real concerns to their supervisors. Supervisors, on the other hand, had difficulty recognizing the sincerity of their employees' concerns, as well as in providing feedback to the employee on what actions will or not be taken on their concerns. This was the fundamental reason the WBN employee concern program was initiated.

2.6 Corrective Actions Taken and Results Achieved

Management has taken action to provide additional safeguards in the form of engineering and administrative controls when an emergency egress problem is identified. The investigation of the unit 2 pipe chase issue resulted in WBN management's taking specific actions to provide two means of egress for the employees when they are working in the area. These corrective actions are discussed more fully in paragraph 4.1.1 of this report.

3.0 EVALUATION PROCESS

Reports and studies conducted on the employee concerns within this subcategory during the previous concerns evaluation program were compiled and reviewed and are incorporated within this report.

The evaluation process was similar for each issue and included the following steps.

3.1 Review of Design and Construction Drawings

The design and construction drawings were obtained and reviewed to learn the physical layout of the work areas involved in the issue and the physical and functional relationship to the surrounding areas. This activity was often accompanied by a work area observation.

3.2 Analysis of Applicable Codes and Requirements

All life safety requirements were obtained and reviewed to determine the standards and codes that apply to these emergency egress issues. Title 29, Code of Federal Regulations, Parts 1910 and 1926, provides the minimum occupational safety and health requirements with which TVA must comply under Executive Order 12196 and Section 19

of the Occupational Safety and Health Act of 1970. The National Fire Protection Association (NFPA) Code 101, the LSC contains requirements for emergency egress from buildings and structures also apply. The LSC was in existence before OSHA standards were developed and was used as the basis for emergency egress determinations in port industries. The LSC emergency egress requirements are very similar and actually were the basis for OSHA standards when they were issued in 1971.

3.2.1 Providing Two Remote and Unobstructed Means of Egress

Section 1910.36(b)(1) specifies that the design of exits and other safeguards must not result in occupants relying on one single safeguard in an emergency situation, and additional safeguards must be provided in case any single safeguard is ineffective. Section 1910.36(a)(8) specifies that every building or structure, section or area of size, occupancy, and arrangement that occupants may be endangered by blocking any single means of egress by fire or smoke, must have at least two remote means of egress arranged to minimize the possibility that both could be blocked by fire or other emergency situation.

The LSC has requirements for emergency egress similar to those of Part 1910. Article 2-1 specifies that the design of exits and other safeguards shall be such that, in an emergency situation, occupants will not have to depend on any single safeguard, and additional safeguards must be provided in case any single safeguard is ineffective.

Article 2-4 requires that no lock or fastening device shall be installed to prevent free escape from the inside of a building except in mental, penal, or corrective institutions.

Article 2-8 specifies that every building or structure, section or area of size, occupancy, and arrangement that occupants may be endangered by the blocking of any single means of egress by fire or smoke, must have at least two remote means of egress arranged to minimize the possibility that both could be blocked by a fire or other emergency situation.

Article 28-2.4 of the chapter, "Industrial Occupancies," includes power plants, by definition, without differentiating between fossil or nuclear plants. The chapter specifies that no less than two exits shall be provided for every story or section of a building or structure. It provides one exception, however, to the two-exit requirements: where there are rooms with less than 25 person occupancy having a direct exit to the street or open area and a total travel distance to the exit from any point less than 50 feet, a single exit may be permitted.

Article 28-2.5.2 contains an exception from the requirement that the exit be arranged to be reached by different paths, by permitting a common path of travel for the first 50 feet from any point in the room in a low hazard location such as the radiochemistry laboratories.

Article 1-5.1 defines the concept of equivalency. The article specifies that the LSC is not intended to prevent the use of systems, methods, or devices of equivalent or superior quality, strength, fire resistance, effectiveness, durability, or safety to those prescribed by the LSC.

An exception to Article 5-2.9.1 specifies that fixed fire escape ladders can be used as part of a required means of egress to provide a means of egress from towers and elevated platforms around machinery or similar spaces subject to occupancy only by able-bodied adults, not more than 3 in number.

Part 1910's emergency egress requirements apply to general industrial work areas but do not apply to construction and repair operations. The Safety and Health Regulations for Construction in 29 CFR 1926 do not contain emergency egress requirements for construction activities.

Article 31-1.1 contains specific requirements that apply to construction, repair, and improvement operations. It specifies that adequate escape facilities shall be maintained at all times in buildings under construction for use by the construction workers. Escape facilities shall consist of doors, walkways, stairs, ramps, fire escapes, ladders, or other approved means or devices arranged in accordance with the general principles of the LSC insofar as they can reasonably be applied to buildings under construction.

3.2.2 Marking Emergency Exits and Routes to Exits

Section 1910.36(b)(5) specifies that every exit shall be clearly visible or the route to reach it conspicuously indicated so that every occupant of every building or structure will readily know the direction of escape from any point. Each path of escape, in its entirety, shall be so arranged or marked that the way to a place of safety outside is unmistakable. Any doorway or passageway not constituting an exit or way to reach an exit, shall be arranged or marked to minimize its confusion with an exit.

Section 1910.36(b)(6) specifies that adequate and reliable illumination shall be provided for all exit facilities in every building or structure equipped for artificial illumination.

Section 1910.37(q)(1) specifies that exits shall be marked by a readily visible sign. Access to exits shall be marked by readily visible signs in all cases where the exit or way to reach it is not immediately visible to the occupants.

Section 1910.37(q)(2) specifies that any door, passage, or stairway which is neither an exit nor a way of exit access, and which is so located to be mistaken for an exit, shall be identified by a sign reading "Not an Exit" or similar designation.

Section 1910.37(q)(5) specifies that a sign reading "Exit," or similar designation, with an arrow indicating the direction, shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.

Section 1910.37(q)(6) specifies that every exit sign shall be suitably illuminated by reliable light source giving a value of not less than 5-foot candles on the illuminated surface.

Section 1910.37(1)(7) specifies that an internally illuminated exit sign shall be provided in all occupancies where reduction of normal illumination is permitted.

Section 5-10 of the LSC contains requirements for marking exits similar to those in section 1910.37 for general industrial operations. Article 5-10.1 specifies that exits be marked by an approved sign readily visible from any direction of exit access. Access to exits are required in Article 5-10.2 to be marked by readily visible signs where the exit or way to reach it is not immediately visible to occupants. Article 10-4.1.1 specifies that signs reading "Exit" or having a similar designation, with an arrow indicating the direction, shall be placed in every location where the direction of travel to reach the nearest exit is not immediately apparent.

3.3 Workplace Inspections

Inspections were conducted of each work area involved in the issues to assess compliance with applicable regulations and adequacy of corrective actions taken on the problems.

3.4 Interviews

Interviews were conducted with WBN and Division of Nuclear Construction (DNC) safety and fire protection personnel on each issue to identify previous investigation work and obtain their assessment of the issues' validity. Interviews were conducted with managers and supervisors in WBN DNC, Public Safety Service (PSS), and Division of Nuclear Engineering (DNE) to determine how the involved work areas were designed and constructed; and to determine what management actions had been taken or planned on the issues. Interviews were conducted with employees to assess their knowledge of emergency exits and their location. The chairman of NFPA Subcommittee on Emergency Egress was interviewed to obtain an interpretation of the application of the LSC requirements to nuclear plants and their activities.

4.0 FINDINGS

While the majority of the issues addressed within this subcategory report relate to circumstances and conditions at one specific Office of Nuclear Power (ONP) site (WBN), the life safety aspect of some of these issues has universal implications. For example, although the unit 2 Pipe Chase issue is specific to WBN, the circumstances and conditions may apply at

other ONP sites. Therefore life safety considerations are being addressed through the development of ONP Standards (which are generic documents for all ONP) and through the development of site procedures (which deal with one site's specific circumstances).

The findings and conclusions of this subcategory report are not in conflict with any findings and conclusions generated as a result of previous investigations of the employee concerns addressed by this report.

4.1 Providing Two Remote and Unobstructed Means of Egress

Seven issues comprised of nineteen concerns were over providing two remote means of egress.

4.1.1 Unit 2 Pipe Chase

WBN

The issue was valid when the concerns were recorded. There were employees working in the pipe chase with only one means of emergency egress at the time the concerns were recorded. Management has taken actions in response to these concerns that presently provide three means of egress for the employees working in the area. This determination was based on the following findings:

1. The pipe chase is an area located between the unit 2 Reactor Building (RB) and the AB. It spans elevations 676, 692, and 713, roughly resembles a "z" pattern, and runs for approximately 250 feet. It contains the pipe penetrations into containment along with other supportive equipment. The area is very congested with the piping and equipment which creates numerous tripping and bumping hazards, as well as access and egress problems. These problems are made more difficult during the construction operations by scaffolding and welding equipment.
2. The pipe chase was designated and constructed with two remote exits. This is consistent with the "two remote means of egress" requirements in Article 2-8 of the LSC.

3. The pipe chase was originally included in the security plan as part of the controlled area. This left the pipe chase exits at els 676 and 713 open, but inside the controlled area. Because the exits were in the controlled area, access to the pipe chase for material and personnel could only be achieved by first going through the security access portal. This resulted in fewer numbers of personnel being allowed in the pipe chase, therefore, slowing work in the area. Although access to the pipe chase through the security portal used up valuable worktime, the arrangement and number of exits were consistent with the intent of NFPA requirements.
4. DNC requested that the pipe chase be removed from the controlled area so the access could be improved. After several discussions among WBN DNC, DNE, and PSS on access, security, and safety considerations, the pipe chase was removed from the controlled area. The two exits at els 676 and 713 were locked since they exited to controlled areas under the security plan. A temporary opening was cut in the pipe chase wall at el 713 for access to the pipe chase by DNC personnel. This allowed DNC personnel uncontrolled access to the work area in the pipe chase, but resulted in only one means of unlocked emergency egress from the pipe chase. This occurred in January 1985.
5. The concerns stated the number of workers in the pipe chase ranged from 15-60, at any one time. There are numerous areas in the pipe chase where travel distance to the opening at el 713 would exceed 50 feet, and the travel distance would be obstructed by piping and equipment. The LSC exclusion in Article 28-2.4.1 from the two-exit requirements, where there are less than 25 persons and less than 50 feet travel distance to an exit, would not apply to the pipe chase.
6. The two locked exits and the provision of only one unlocked emergency exit at el 713 does not meet NFPA requirements which require two remote exits that provide free and unobstructed egress from all parts of the building or structure at all times when it is occupied.

These conditions existed until DNC agreed to provide some additional safeguards in an October 17, 1985 memorandum in response to an investigation of employee concerns. The memorandum was from Guenter Wadewitz to L. C. Ellis and was titled "Watts Bar Nuclear Plant -

Employee Concerns Pertaining To Unit 2 Pipe Chase" (RIMS C24 851018 007). Those safeguards included providing a fire watch when employees are working in the area, improving ventilation and emergency lighting, sealing all areas penetrating the pipe chase walls, removing transient fire loads and compressed gas cylinders, and providing telephones near the exits to contact the Emergency Response Team (ERT) to open the locked doors in emergency situations. The two exits at els 676 and 713 remained locked which did not meet NFPA two-exit requirement.

7. The concerns were recorded from June to December 1985. Therefore, there were employees working in the pipe chase from January to October 17, 1985, with two of the three exits locked and no additional safeguards provided.
8. After several discussions among ONP, DNC, DNE, and PSS representatives, WBN management specified in a February/26, 1986 memorandum that the two exits at els 676 and 713 would remain locked for security purposes, but a PSS Officer would be posted at each of the exists with a key to provide immediate emergency egress when employees are working in the area. The memorandum was from W. T. Cottle to John Hutton and was titled "Watts Bar Nuclear Plant (WBN) - Life Safety In Unit 2 Pipe Chase" (RIMS L01 860227). The temporary opening at el 692 remained open for DNC personnel and material areas. This provided three means of emergency egress from the pipe chase.
9. Observations of the pipe chase indicate that corrective actions agreed to on February 25, 1986, are being carried out by WBN PSS, and DNC. Telephones have been provided near all three exits.

10. When both units begin operating, the egress problems in the pipe chase will no longer exist since the entire area will be a controlled area and the exits will be opened.

4.1.2 Emergency Egress From Radiochemistry Laboratory

WBN and SQN

The emergency egress issue in SQN and WBN Radiochemistry Laboratory was not valid since equivalent protection in the form of both engineering and administrative controls has been provided to ensure that employees do not have to rely on any single safeguard for emergency egress. The determination was based on the following findings:

1. Review of the design and construction drawings of both laboratories demonstrate they are similar in size and physical composition. The most significant difference between the two laboratories is that both exits from SQN plant discharge through airlocks whereas only one of the exits from the WBN laboratory discharge through an airlock.
2. The Radiochemistry Laboratory at WBN and SQN were not designed and constructed in strict compliance with the Section 1910.36(b)(8) since the two means of egress are not remote from each other. The process for considering safety in the design of WBN and SQN will be discussed in Subcategory Report 90700.
3. An official of NFPA provided an interpretation in a telephone interview that, when it is impossible to provide the two remote means of egress, additional safeguards can be used to provide equivalent protection for workers in the area. Some specific means of providing additional safeguards mentioned by the official included reducing the fireload in the area and installing automatic sprinkler systems. Both safeguards have been provided in the laboratory.

4. Workplace observations, interviews with WBN managers, WBN fire protection and safety professionals, SQM safety professionals and the WBN laboratory shift supervisor, as well as documented investigation reports, indicate that equivalent protection has been provided for the lab employees. Additional safeguards provided to minimize the possibility of fire blocking the egress include installation of fire extinguishers, firewall separations, removal of a flammable material storage cabinet from the laboratory, and addition of having a sprinkler system. These additional safeguards are consistent with the intent of 1910.36(b): occupants of the laboratory do not have to rely on any single safeguard. The safeguards also provide equivalent protection in accordance with the LSC.
5. Workplace observations indicated a fire extinguisher was located in the titration room of the WBN lab.

4.1.3 Inadequate Egress Through Airlock Door

WBN

The issue is not valid since either of the A56 and A57 doors' malfunctioning would not block the only means of egress from the area. There is another means of egress around the airlock area should the doors be blocked. This determination is based on the following findings:

1. Door A56 is an alarmed equipment door on the SB side of the airlock with a personnel door built in it allowing personnel to pass through it without opening the larger equipment door. Door A57 at the opposite end at the airlock is a much heavier door on the AB side of the airlock. The frequent adjustments of this door led to the concern.
2. Interviews with WBN safety personnel and employees indicate the A57 doors were frequently being repaired during the period when the concern was recorded. These doors were installed approximately one year ago. This was primarily due to the doors being opened in excess of 400 times per day, although they were designed to be opened 20-50 times per day.

3. If either the A56 or A57 doors are inoperable for any reason, a secondary means of emergency egress around the air lock can be achieved through the adjacent doors to the Radiochemistry Laboratory.
 4. Interviews with employees working the area, as well as an employee representative on the health and safety committee, indicate the employees know and understand the Radiochemistry Laboratory is another means of emergency egress around the airlock. This knowledge is due to employees having had to go through the laboratory so often in the past when A57 was inoperable or being repaired.
 5. Interviews indicate that when the plant begins operating, the openings of the A57 doors should diminish resulting in fewer adjustments.
 6. While the investigation did not reveal any valid emergency egress problems in the airlock, it did reveal some serious maintenance problems with the A57 doors. WBN and the door's manufacturer have completed a study to determine specific actions that can be taken to resolve these problems. There were several other concerns recorded on the reliability of the airlock doors. The concerns will be investigated and a report issued by the Operations group.
- 4.1.4 Need for Personnel Hatch in Unit 1 Reactor Pressurizer Housing

WBN

The issue is not valid. There is not a second remote means of emergency egress through the top of the pressurizer housing. Additional safeguards, however, are implemented when employees work in the housing. These safeguards provide equivalent protection to that provided by adding a "personnel" hatch in the top of the housing. This determination is based on the following findings.

1. The reactor pressurizer housing contains the pressurizer and its associated equipment. The pressurizer maintains the pressure in the reactor coolant system and limits transient pressure as the plant load decreases or increases.
2. There is an equipment hatch in the top of the pressurizer housing that is opened during some operations to lower equipment such as ladders and air movers into the housing. The opening is not considered a means of emergency egress.
3. The only means of emergency egress from the housing is through the opening at the bottom of the housing at el 747 in the lower containment area. Providing only one exit does not meet the 1910.36(b)(8) requirements for two remote means of egress.
4. Additional safeguards are provided when employees are performing such activities as adjusting valves in the housing. Those safeguards include working in the area under the "buddy system," provision of telephones for emergency communication, ladder climbing devices, and other safeguards that would control potential hazards of the work.
5. Additional safeguards are included in the workplans for more involved activities in the area such as outage work, in accordance with paragraph IV of HCI-GI, Watts Bar Nuclear Plant Hazard Control Plan. These additional safeguards can include opening the hatch on the top of the housing to lower air movement equipment into the housing to reduce heat, stationing a safety observer on top of the housing, manning the polar crane for emergency removal of any injured employee, and posting a fire watch when the fire load is increased in the area. These additional safeguards meet the requirement of 1910.36(b)(1) where emergency egress will not depend solely on any single safeguard and complies with the "equivalency" provision of Article 1-5.1 of the LSC.

4.1.5 Need for Emergency Exit in Men's Restroom

WBN

The issue is valid. The suggestion identified an emergency egress problem that should be corrected. Two remote means of egress from the restroom and locker room are not provided as required by Section 1910.36(b)(6).

The WBN Industrial Safety staff evaluated the suggestion, determined the area did not meet the egress requirements, and recommended the additional exit door be installed. The hazard is not, however, significant enough that alternative safeguards must be provided in the area on an interim basis. Management has agreed with the suggestion for a second egress and has issued a DCR 611 to install a door in the locker room wall discharging to the outside. Workplan E6017-01 has been developed to specify how the work should be performed.

4.1.6 Inadequate Egress in the Turbine Building and Intake Pumping Station at Browns Ferry Nuclear Plant Locations

BFN

The issue is not valid. The equipment airlock doors in the TB were locked with chains and locks, but they are not emergency exit doors. This determination is based on the following findings:

1. There are two sets of equipment doors in the Turbine Building that had chains and locks on the handles.
2. The equipment doors were locked while modifications were being made to them. These doors are not emergency exits, but are used for moving equipment from the RB to the TB.
3. Within fifteen feet of each set of equipment doors is a personnel door that is marked for and used as an emergency exit door.
4. Apparently, the concerned individual thought the equipment doors were blocked emergency exits, but they are not.

The concern about emergency egress around the caustic storage tank in the IPS is not valid. There are two remote means of egress from the area around the tank. This determination is based on the following findings:

1. The 3,000 gallon caustic storage tank is surrounded by a dike that is approximately six-inches high. This would contain any small leaks of caustic, short of a major rupture of the tank, providing time in which the employees can exit the area.
2. There are two routes of emergency egress around the tank to the stairway going up to the upper level. In addition, there are fixed ladders going up to two emergency escape hatches at opposite ends of the facility.
3. Egress around the caustic storage tank is consistent with the 1910 and the LSC requirements for two remote means of emergency egress.

4.1.7 Emergency Egress Past Safety Relief Valve Discharge

WBN

The issue is not valid. There is only one means of egress around the safety relief valve discharge vents. Other procedures, however, are instituted when employees work in the area that provide equivalent protection to that provided by two means of egress. This determination is based on the following findings:

1. There is only one path around one or more of the vent valve stacks on the platform gratings in the valve rooms.
2. Emergency egress from the work platform to the valve room floor is achieved by traveling down one of two fixed ladders to the valve room floor. This use of ladders is consistent with the exception to Article 5-2.9.1 of the LSC which allows fixed fire escape ladders to be used as a means of egress from elevated

platforms around machinery or similar spaces occupied by no more than three able-bodied adults. There are fewer than three employees involved in most operations on the platform. There is a protective railing around the elevated platform.

3. The two ladders on one end of the platform do not meet the 1910.36(b)(8) requirements for two remote means of egress because they are not remote from each other. There are other safeguards applied, however, that approach equivalent protection by reducing exposure to the lowest possible level for employees working in the area. Those safeguards include the use of the Radiation Work Permit system to control and monitor employees working in the area when there is radiation present. In accordance with paragraph IV of HCI-G1, Watts Bar Nuclear Plant Hazard Control Plan, work in the valve room must be preplanned and carried out as specified in the job safety precautions in the workplan. These procedures are reviewed by the WBN Industrial Safety and Fire Protection staff before the workplan is approved.
4. The valve room is an area covered by HCI-G82, "Working in Concealed Areas," which requires that specific actions be taken when workers are in the area. These actions include the use of the "buddy system," supervisory preplanning to identify and control hazards, provisions for periodic communication contacts with employees in the area, and establishment of a specific time when the work should be completed.
5. An interview with a general maintenance foreman who has twice performed work in the valve room during "hot functionals" substantiated that the work was planned and carried out as planned. Some precautions mentioned were a specific procedure specifying the number of employees and length of time in the area; radio contacts with the employees every 20 minutes; replacing work groups at specific time periods with another group; placing an engineer or engineering aide in area with employees; providing ice chest with cool water nearby; and arranging with PSS for prompt emergency response if necessary.

4.2 Marking Emergency Exits and Routes to Exits

This one issue was comprised of two concerns about marking emergency exits and routes to exits. One of the concerns specifically suggested that exit routes be marked on the floor, not with signs.

WBN

The issue is valid. The investigation revealed that in some areas of the plant, exits and exit routes are not adequately marked. Before these concerns were recorded, management had begun taking action that will result in exits being adequately marked in both units of WBN. This determination is based on the following findings:

1. There are no requirements specifying that exit routes be marked on the floor. Marking exits on the floor would be difficult in areas where grating is used.
2. Inspections indicate that the more completed areas of the plant such as the unit 1 controlled areas, waste treatment facility and the IPS have marked exits that comply with OSHA requirements. The inspections reveal that areas in unit 2 still under construction have exits that are not marked as well as in the unit 1 controlled areas.
3. Inspections indicate there are some areas in the plant such as the pipe chase, annulus, or the pressurizer housing where the access to exits, the direction of exits, or the actual exits are not adequately marked according to sections 1910.36(b)(5) and 37(q)(5).
4. Interviews indicate management was aware of the exit marking deficiencies for some time. WBN management issued DCR 330 with a planned start date of October 1, 1985. The purpose of the DCR was to design and procure exit signs and emergency lighting in both units 1 and 2 in accordance with 1910 and the LSC requirements. This process is presently underway.
5. WBN employees are periodically informed of emergency procedures through the General Employee Training (GET) Program, as well as through safety meetings, and an orientation program conducted by each supervisor. As part of this orientation supervisors inform new employees of the location of exits from the areas

the employees will be working. Interviews with randomly selected employees and their representative on the Health and Safety Committee indicate the employees know their way out of their work areas in emergency situations. New WBN employees working in areas where there could be potential hazards are accompanied by more experienced employees under the "buddy system" until they are familiar with their work areas and their emergency egress routes.

6. DNC employees are informed of emergency procedures through special meetings on the topic, safety meetings, and safety bulletins. For the last two years, DNC supervisors have been required to provide an orientation to new employees on plant requirements including emergency procedures. Since unit 2 has been nearing completion over the last two years, there have been few new employees. Interviews with randomly selected DNC employees indicate they know their way out of their work areas in emergency situations.
7. Interviews and observations indicate WBN was designed and constructed without adequate marking of exits or the routes to exits. The process by which safety, including emergency egress requirements was considered in the design and construction of WBN will be discussed more thoroughly in Subcategory Report 90700.

5.0 COLLECTIVE SIGNIFICANCE

5.1 Management Effectiveness

Numerous areas within the plants do not have two remote egress routes or are so congested that emergency egress would be difficult. Management has been effective in identifying these areas and correcting the condition either by installing a second egress route, or by instituting administrative and/or engineering controls.

Management has placed plant security over life safety in certain circumstances such as the unit 2 Pipe Chase issue. This action jeopardized employees working within this locked area.

5.2 Employee Effectiveness

Employees are aware of where emergency exits are, and are adequately instructed in emergency procedures as they related to emergency egress.

5.3 Technical Adequacy

Design and construction organizations did not establish a policy that emergency egress be adequately provided in the original designs for WBN and SQN. The OSHA standards were not in effect at that time, but the LSC was recognized as the basis for emergency egress considerations in most industries.

6.0 CAUSES

Only one issue contained negative findings that were not resolved through the normal existing systems. All other issues have been resolved through normal systems or were not valid because management is providing equivalent protection in the form of engineering and or administrative controls. Several of the issues came about because emergency egress problems were designed into the plant. Design organizations are taking action to improve the consideration given to safety and health requirements in design. The past and present considerations given to safety and health requirements are more fully discussed in Subcategory Report 90700.

6.1 Unit 2 Pipe Chase

WBN

Emergency egress from the pipe chase was not adequately considered when WBN decided to remove the pipe chase from the controlled area providing only one means of egress for the employees. In this instance, compliance with security requirements resulted in noncompliance with the LSC egress requirements. Management has taken action in response to the concerns to provide two means of egress from the pipe chase when employees are working in the area.

6.2 Inadequate Knowledge of Emergency Egress Requirements

WBN

The investigations indicated that several issues, i.e., the radiochemistry laboratories at WBN and SQN, egress through the airlock door, egress from unit 1 reactor pressurizer housing, egress past the safety relief valve discharge, and the marking emergency exits were caused by the concerned employees not adequately understanding the emergency egress requirements. They, specifically, did not know or understand that other additional safeguards in the form of engineering and administrative controls may be provided for equivalent protection as the two remote means of egress.

6.3 Inadequate Communication

WBN

Twenty of the 21 concerns in this subcategory indicated that the employee had notified his supervisor of his concern, yet the concerns were still extracted by QTC in various employee interviews. This indicates the employees were dissatisfied with the actions taken by their supervisors or the feedback provided. There are several possibilities that could have contributed to this.

The employee (1) notified his supervisor of his concern and was unhappy with the response, (2) did not adequately communicate the importance of his concern to the supervisor so it could be investigated, (3) told QTC he notified his supervisor because it was the "right" answer," or (4) may have not trusted management enough to express his concern beyond his supervisor for further resolution.

If the employee did notify his supervisor, the supervisor (1) may have not recognized the importance of the concern to the employee and was hesitant to investigate it, (2) may have not had the knowledge or skills to investigate the concern and provide effective feedback to the employee, (3) may have investigated the concern and initiated action but did not provide feedback to the employee, or (4) may have not taken the time to investigate the concern and provide feedback. Any combination of these possibilities and the fact that so many forms indicated the supervisors had been notified demonstrate there was inadequate communication between supervisors and employees at WBN when the concerns were recorded by QTC. The WBN employee concern program was initially developed because of this communication problem.

7.0 CORRECTIVE ACTIONS

This section of the report discusses corrective actions initiated as a direct result of these evaluations. No immediate corrective actions or stop work orders were initiated as a direct result of the subcategory evaluations. No outstanding corrective actions exists as a result of any prior investigation of the employee concerns addressed by this report.

Issues relating to the SB men's restroom and to the marking of emergency exits were determined to be valid, but were being corrected through existing systems. Management was aware that emergency egress from the Radiochemistry Laboratory, the unit 1 reactor pressurizer housing, and the safety relief valves did not technically comply with OSHA nor the LSC requirements and was applying engineering and administrative controls to provide equivalent protection for the employees working in each area.

7.1 Corrective Actions Initiated As Direct Result of Evaluations

The issue about the unit 2 pipe chase was the only issue determined to have negative findings that was not corrected through existing systems. The corrective actions came as a direct result of investigation of these concerns. The corrective actions are discussed in paragraph 4.1.1 of this report.

The following is a listing of problems identified in Corrective Action Tracking Documents (CATDs) and their corrective action plans.

a. Problem Description:

Employees do not clearly understand the requirements for emergency egress from work locations, nor do they understand that safeguards in the form of engineering and/or administrative controls can be provided which offer equivalent protection as that provided by two remote exits.

Corrective Action Plan

CATD 90500-1 - (i) The "Hazard Line" (a periodic safety bulletin initiated by the WBN Industrial Safety Office and sent to each foreman/supervisor) will be revised to include a section on emergency egress requirements and administrative and/or engineering controls as applied in areas such as the Radiochemistry Lab, pipe chase, pressurizer housings, and other confined or concealed plant areas. Each supervisor will be directed to discuss these bulletins at their next regularly scheduled safety meetings. (ii) the Industrial Safety Staff will discuss egress requirements at a scheduled plant wide meeting before January 1987. In addition, an emergency exit sign has been placed at the interior entrance to the Radiochemistry Lab.

b. Problem Description

There is inadequate communication between supervisors and employees at WBN. This results in employees inadequately communicating concerns to their supervisors and their supervisors providing inadequate feedback to employees on actions taken or not taken.

Proposed Corrective Action Plan:

Inadequate communication between line management and employees concerning industrial safety issues are addressed by Corrective Action Tracking Documents (CATDs) within the Management of Safety Subcategory (Report 90100) of the Industrial Safety Category as follows:

CATD 90100-1, 5, 9 and 13 establish a Central Safety Committee (CSC) comprised of line management. CATD 90100-2, 6, 10 and 14 establish various line management subcommittees to the CSC. CATD 90100-3, 7, 11 and 15 establish a safety audit program. One of the principle purpose of the CSC will be to communicate and to improve the enforcement of the industrial safety program by all line managers to the employees.

8.0 LIST OF EVALUATORS

A. C. White was the evaluator of these issues.

9.0 ATTACHMENTS

Attachment A - Subcategory Summary Table

CATEGORY: SF INDUSTRIAL SAFETY

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL	2 SAF RELATED	3 FIND CLASS	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION CAT - SF SUBCAT - 905
-----	---	---	---	---	---	---	---	-----	-----	-----	-----
N-86-019-00201	SF	905	N	BFN	1 Y N N N	2 NO NA NA NA	3 A NA NA NA		NSRS	DURING THE EXIT INTERVIEW THE CI EXPRESSED HIS CONCERN REGARDING THE LOCATION OF THE CAUSTIC STORAGE TANK AT THE INTAKE PUMPING STATION. THERE IS NOT A REASONABLE ESCAPE ROUTE IN THE EVENT THE CAUSTIC TANK FAILS.	1.1.6, 2.3.1. 3.2.1, 4.1.6
N-86-032-00101	SF	905	N	BFN	1 Y N N N	2 NO NA NA NA	3 A NA NA NA		NSRS	DURING THE EXIT INTERVIEW, THE CI EXPRESSED A PERSONNEL SAFETY CONCERN REGARDING EMERGENCY EXIT FROM THE TURBINE BUILDING. THE EQUIPMENT AIRLOCK EXIT DOORS HAVE CHAINS AND LOCKS ON THE HANDLES.	1.1.6, 2.3.1. 3.2.1, 4.1.2
85-028-00201 T50126	SF	905	N	WBN	1 N N Y Y	2 NA NA NO NO	3 NA NA B B		QTC	CI IS CONCERNED THAT FIRE SAFETY IN THE RADIOCHEM LAB IS JEOPARDIZED BY HAVING THE ENTRANCE AND EXITS ADJACENT AND PERFORMING FLUSH TESTS IN THE TRITRATION ROOM WITH NO FIRE EXTINGUISHER. NUCLEAR POWER CONCERN. CI	1.1.2, 2.3.1. 3.2.1, 4.1.2

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
 EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY
 SUBCATEGORY: 905 LIFE SAFETY

CATEGORY: SF INDUSTRIAL SAFETY

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL 2 SAF RELATED 3 FIND CLASS BF BL SQ WB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION CAT - SF SUBCAT - 905
85-032-00201 T50138	SF	905	N	WBN	1 N N N Y 2 NA NA NA NO 3 NA NA NA C		QTC	UNIT 2 PIPE CHASE HAS INSUFFICIENT PROVISIONS FOR COMMUNICATION SHOULD HELP BE REQUIRED INSIDE THE PIPE CHASE. A PHONE WAS PLACED AT THE EXIT OF THE PIPE CHASE, BUT THIS, BY ITSELF, IS INSUFFICIENT. ADDITIONALLY THIS AREA. CONSTRUCTION DEPT. CONCERN. CI HAS NO FURTHER INFORMATION. NO FOLLOW UP REQUIRED.	1.1.1, 2.3.1. 3.2.1, 4.1.1. 6.1, 7.1
85-096-00101 T50008	SF	905	N	WBN	1 N N N Y 2 NA NA NA NO 3 NA NA NA C		QTC	PERSONNEL SAFETY HAZARD - CONGESTED AREA PIPE CHASE #2, AUX. BLDG, EL 71 3, UNIT 2, WBHP. DOOR BLOCKED OFF AND DIFFICULT TO GET MATERIAL INTO AREA	1.1.1, 2.3.1. 3.2.1, 4.1.1. 6.1, 7.1
85-177-00201 T50216	SF	905	N	WBN	1 N N N Y 2 NA NA NA NO 3 NA NA NA C		QTC	TELEPHONES ARE NOT AVAILABLE IN PIPE CHASE FOR PERSONNEL SAFETY USE. CI FEELS THAT LACK OF TELEPHONES WOULD PREVENT QUICK RESPONSE TO AN EMERGENCY SITUATION. NO ADDITIONAL INFORMATION COULD BE PROVIDED BY CI. CONS	1.1.1, 2.3.1. 3.2.1, 4.1.1. 6.1, 7.1

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

REFERENCE - ECPS131J-ECPS131C
 FREQUENCY - REQUEST
 P - ISSS - RHM

TENNESSEE VALLEY AUTHORITY
 OFFICE OF NUCLEAR POWER
 EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
 EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY
 SUBCATEGORY: 905 LIFE SAFETY

PAGE - 3
 RUN TIME - 16:50:14
 RUN DATE - 01/28/87

CATEGORY: SF INDUSTRIAL SAFETY

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL				HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION CAT - SF SUBCAT - 905
					2 SAF RELATED	3 FIND CLASS	BF	BL				
1 -85-319-00401 T50011	SF	905	N	WBN	1	N	N	N	Y	QTC	PLANT EMERGENCY EXIT/ASSEMBLY ROUTES SHOULD BE CLEARLY MARKED ON FLOOR - NOT ONLY WITH SIGNS	1.2, 2.3.2, 3.2.2, 4.2
1 -85-319-00601 T50254	SF	905	N	WBN	1	N	N	N	Y	QTC	THERE IS NEED FOR A PERSONNEL HATCH IN THE UPPER HATCH OF REACTOR PRESSURIZER HOUSING; ALSO NEEDED IS A PLATFORM AROUND THIS HATCH. THE PRESENT SYSTEM REQUIRES CARPENTERS, ELECTRICIANS, AND BOILERMAKERS. ADDING A PRESSURIZER HOUSING TO EXIT IF NECESSARY. NUCLEAR POWER CONCERN. UNIT 1. NO ADDITIONAL INFORMATION AVAILABLE IN FILE. NO FOLLOW-UP REQUIRED.	1.1.4, 2.3.1 3.2.1, 4.1.4
1 -85-436-00101 T50011	SF	905	N	WBN	1	N	N	N	Y	QTC	PIPE CHASE 713' ELEV. #2 REACTOR HAS A SERIOUS PERSONNEL SAFETY HAZARD DUE TO A CONGESTED CONFINED AREA WHERE 30-40 PEOPLE ARE WORKING AROUND EXPLOSIVE MATERIALS WELDING AND DOING ELECTRICAL INSTALLATION WITH NO WAY R. THIS CONCERN HAS BEEN ADDRESSED NUMEROUS TIMES AT SAFETY MEETINGS AND NO CORRECTIVE ACTION HAS BEEN TAKEN	1.1.1, 2.3.1 3.2.1, 4.1.1 6.1, 7.1

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

CATEGORY: SF INDUSTRIAL SAFETY

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	FIND CLASS				HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION		
					1	2	3	4				CAT	- SF	
-85-462-00101 T50020	SF	905	N	WBN	1	N	N	N	Y	QTC	SERIOUS SAFETY CONDITION EXISTS PIPE CHASE #2 REACTOR. 20-60 PEOPLE WORKING IN A CONGESTED AREA WITH ONE WORKER OUT. REPORTED TO SAFETY NUMEROUS TIMES. NO CORRECTIVE ACTION TAKEN	1.1.1, 2.3.1, 3.2.1, 4.1.1, 6.1, 7.1		
-85-483-00101 T50035	SF	905	N	WBN	1	N	N	N	Y	QTC	PIPE CHASE ELEVATOR #13 AUX BLDG (UNIT 2) HAS A SINGLE PERSON ACCESS/EGRESS. FIRE, SMOKE, TOXIC FUMES, ETC COULD INCAPACITATE WORKERS (AT TIMES AS MANY AS 15-20) IN THIS AREA.	1.1.1, 2.3.1, 3.2.1, 4.1.1, 6.1, 7.1		
-85-528-00101 T50046	SF	905	N	WBN	1	N	N	Y	Y	IN-85-528-001	QTC	THE TWO DOORS IN THE CHEM LAB ARE VERY CLOSE TOGETHER AND COULD ALMOST BE CONSIDERED AS ONE. IF A FIRE SHOULD OCCUR IN THE DOOR AREA, ANYONE INSIDE COULD BE TRAPPED.	1.1.2, 2.3.1, 3.2.1, 4.1.2	

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

REGORY: SF INDUSTRIAL SAFETY

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL				HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION CAT - SF SUBCAT - 905	
					2 SAF RELATED	3 FIND CLASS	BF	BL					SQ
1 -85-696-00101 T50079	SF	905	N	WBN	1	N	N	N	Y	IN-85-696-001	QTC	UNIT #2, PIPE CHASE ON ELEVATION 713', CURRENTLY REQUIRES ENTRANCE/ACCESS THROUGH A SMALL OPENING APPROXIMATELY 12' WIDE. THE RESTRICTION IS DUE TO SCAFFOLDING AND PIPE CONSTRUCTION. THE ONLY OTHER POSSIBLE EXIT IS SIDE.	1.1.1, 2.3.1, 3.2.1, 4.1.1, 6.1, 7.1
1 -85-807-00101 T50071	SF	905	N	WBN	1	N	N	N	Y		QTC	PIPE CHASE #2 HAS ONLY ONE ACCESS - ELEV. 692 - AUX. BUILDING, THROUGH T O ELEV. 757. IN CASE OF FIRE/INJURY TO AN EMPLOYEE IT WOULD BE EXTREMELY DIFFICULT TO EVACUATE. THE ACCESS AT ELEV. 713, IS CONTROLLED BY SECURITY CONTACT SECURITY IN CASE OF AN EMERGENCY. THIS ACCESS SHOULD HAVE A PERMANENT GUARD AT ALL TIMES. NO ADDITIONAL INFORMATION AVAILABLE.	1.1.1, 2.3.1, 3.2.1, 4.1.1, 6.1, 7.1
1 -85-861-00101 T50087	SF	905	N	WBN	1	N	N	N	Y	IN-85-861-001	QTC	PERSONNEL ACCESS TO CERTAIN INSTRUMENTATION IS UNSAFE DURING PLANT OPERATIONS. THE ONLY EXIT FROM GRATING PLATFORM IS PAST DISCHARGE OF SAFETY RELIEF VALVES (BOTH UNITS) NORTH AND SOUTH VALVE ROOMS, 729' AND 737' EL EXISTS TO PREVENT WORKING IN THIS AREA WHILE PLANT IS OPERATING. NO FURTHER DETAILS AVAILABLE.	1.1.7, 2.3.1, 3.2.1, 4.1.7

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

REFERENCE - ECPS131J-ECPS131C
 FREQUENCY - REQUEST
 - ISSS - RHM

TENNESSEE VALLEY AUTHORITY
 OFFICE OF NUCLEAR POWER
 EMPLOYEE CONCERN PROGRAM SYSTEM (ECPS)
 EMPLOYEE CONCERN INFORMATION BY CATEGORY/SUBCATEGORY
 SUBCATEGORY: 905 LIFE SAFETY

PAGE - 6
 RUN TIME - 16:50:14
 RUN DATE - 01/28/87

CATEGORY: SF INDUSTRIAL SAFETY

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL				HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION CAT - SF SUBCAT - 905	
					2 SAF RELATED	3 FIND CLASS	BF	BL					SQ
86-085-00201 T50120	SF	905	N	WBN	1	N	N	N	Y		QTC	THERE ARE NO CLEARLY DEFINED PEDESTRIAN WALKWAYS INSIDE WBNP. CI HAS NO ADDITIONAL INFORMATION. CONSTRUCTION CONCERN, UNITS 1 & 2.	1.2, 2.3.2, 3.2.2, 4.2
86-089-00101 T50118	SF	905	N	WBN	1	N	N	N	Y	IN-86-089-001	QTC	CI IS FEARFUL THE AIR LOCK DOOR LOCATED AT EL. 713' UNIT 1 SIDE, AUX BLDG. COULD MALFUNCTION AND COULD NOT BE OPENED IN CASE OF AN EMERGENCY. CI HAS NO FURTHER INFORMATION. NUCLEAR POWER CONCERN	1.1.3, 2.3.1, 3.2.1, 4.1.3
86-279-00101 T50150	SF	905	N	WBN	1	N	N	N	Y		QTC	CI IS CONCERNED ABOUT A PIPE CHASE IN UNIT 2 ELEVATION 692' THAT HAS ONLY ONE ENTRY/EXIT. THE UPPER ENTRY/EXIT IS BLOCKED BY A FENCE. CI IS CONCERNED THAT THERE IS ONLY ONE TELEPHONE AT THE ONE ENTRY/EXIT AND IF THE PIPE CHASE WORKERS COULD BE TRAPPED. CI HAS NO ADDITIONAL INFO. CONSTRUCTION DEPT. CONCERN. NO FOLLOW-UP REQUIRED.	1.1.1, 2.3.1, 3.2.1, 4.1.1, 6.1, 7.1

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

REGORY: SF INDUSTRIAL SAFETY

CONCERN NUMBER	CAT	SUB CAT	S H R D	PLT LOC	1 REPORT APPL 2 SAF RELATED 3 FIND CLASS BF BL SQ HB	HISTORICAL REPORT	CONCERN ORIGIN	CONCERN DESCRIPTION	REF. SECTION CAT - SF SUBCAT - 905	
86-012-00101 T50268	SF	905	S	SQN	1 N N Y Y 2 NA NA NO NO 3 NA NA B B		QTC	CI CONCERNED THAT A SPECIFIC DEPARTM ENT (KNOWH) IS A FIRE TRAP. THE EXI TS ARE SITUATED SUCH, THAT IF AN EXP LOSION OCCURRED DUE TO THE STORAGE O F CHEMICALS, THE PEOPLE HOULD BE TRA PPED. ALSO, DUE TO THE AMOUNT OF EL ERE IS A HIGH RISK OF ELECTROCUTION IF THE SPRINKLER SYSTEM HAS ACTIVATE D. NUCLEAR POWER CONCERN. ANONYMOU S CONCERN.	1.1.2, 2.3.1. 3.2.1, 4.1.2	
	02	SF	906	S	SQN	1 N N Y Y 2 NA NA NO NO 3 NA NA A A				
86-008-00101 T50268	SF	905	S	HBN	1 N N Y Y 2 NA NA NO NO 3 NA NA B B		QTC	CI IS CONCERNED THAT A SPECIFIC DEPA RTMENT (KNOWN) IS A FIRE TRAP. THE EXITS ARE SITUATED SUCH, THAT IF AN EXPLOSION OCCURRED DUE TO THE STORAG E OF CHEMICALS, THE PEOPLE HOULD BE TRAPPED. ALSO, DUE TO THE AMOUNT OF THERE IS A HIGH RISK OF ELECTROCUTIO N IF THE SPRINKLER SYSTEM HAS ACTIVA TED. NUCLEAR POWER CONCERN. ANONYM OUS CONCERN.	1.1.2, 2.3.1. 3.2.1, 4.1.2	
	02	SF	906	S	HBN	1 N N Y Y 2 NA NA NO NO 3 NA NA A A				
86-0199	01	SF	905	N	HBN	1 N N N Y 2 NA NA NA NO 3 NA NA NA D		OECP	WE NEED ANOTHER FIRE EXIT FROM MENS RESTROOM AND LOCKER ROOM ELEV. 729	1.1.5, 2.3.1. 3.2.1

21 CONCERNS FOR CATEGORY SF SUBCATEGORY 905

CONCERNS ARE GROUPED BY FIRST 3 DIGITS OF SUBCATEGORY NUMBER.

ECSP CORRECTIVE
Action Tracking Document
(CAID)

INITIATION

1. Immediate Corrective Action Required: Yes No
2. Stop Work Recommended: Yes No
3. CAID No. 90500-1 4. INITIATION DATE 08-12-86
5. RESPONSIBLE ORGANIZATION: WNP ONP
6. PROBLEM DESCRIPTION: QR NQR
Employees do not adequately understand that additional safeguards
in the form of engineering and administrative controls can be
provided in areas that do not comply with egress requirements.
These requirements do not eliminate the hazards, but do serve to
minimize the exposure to the employees to the lowest possible
level.
7. PREPARED BY: NAME Arthur C. White ATTACHMENTS
DATE: 8-13-86
8. CONCURRENCE: CEG-H Tom Ellis DATE: 8-13-86
9. APPROVAL: ECTIG PROGRAM MGR. D. Stewart DATE: 2/2/87

CORRECTIVE ACTION

10. PROPOSED CORRECTIVE ACTION
See attached.
- THIS ITEM COMPLETED**
DATE: 1-11-88
11. PROPOSED BY: DIRECTOR/MGR: [Signature] ATTACHMENTS
DATE: _____
12. CONCURRENCE: CEG-H: _____ DATE: _____
SRP: _____ DATE: _____
ECTIG PROGRAM MGR: _____ DATE: _____

VERIFICATION AND CLOSEOUT

13. Approved corrective actions have been verified as satisfactorily implemented.

SIGNATURE TITLE DATE