August 9, 1984

UNITED STATES OF AMERICA
NUCLEAR REGULATORY COMMISSION

BEFORE THE ATOMIC SAFETY AND LICENSING BOARD

In the Matter of	)	
	)	
CAROLINA POWER & LIGHT COMPANY and NORTH CAROLINA EASTERN MUNICIPAL POWER AGENCY	)	Docket No. 50-400 OL
	)	
(Shearon Harris Nuclear Power Plant)	)	

APPLICANTS' TESTIMONY OF DAVID B. WATERS
IN RESPONSE TO EDDLEMAN CONTENTION 116
(FIRE PROTECTION)

Q.1 Please state your name, address, present occupation and employer.

A.1 My name is David B. Waters. My business address is Carolina Power & Light Company, P. O. Box 165, New Hill, North Carolina 27562. My present occupation is Principal Engineer - Operations for the Carolina Power & Light Company (CP&L).

Q.2 State your educational background and professional work experience.

A.2 I have a B.S. in Engineering Physics from Ohio State University, an M.S. in Nuclear Science and Engineering from Carnegie Institute of Technology and professional experience in the areas of nuclear plant reactor core analysis, licensing and regulatory compliance, nuclear plant operating requirements, and fire protection requirements. A copy of my professional experience and qualifications is affixed hereto as Attachment A.

Q.3 What is your present position with CP&L?

A.3 My present position with CP&L is Principal Engineer - Operations in the Harris Nuclear Project Department.

Q.4 In this position have you any responsibilities relating to the Harris Plant fire protection program?

A.4 Yes. In this position I am delegated the responsibility by the Plant General Manager for administration of the plant fire protection program during the operational phase. This involves the supervision of the plant fire protection staff -- who carry out the development and implementation of procedures, performance of periodic tests of installed fire protection equipment, training of fire brigade members, frequent walkdowns of plant areas to detect fire protection concerns, and interface with insurance carriers, NRC inspectors, and company auditors during periodic inspections. I have developed a working knowledge of nuclear plant fire protection programs, requirements and regulations through my direct involvement with responses to Branch Technical Position 9.5-1 for CP&L's H. B. Robinson and Brunswick Nuclear Plants during the period between May 1976 to March 1979, and during my assignment at the H. B. Robinson Plant as Principal Engineer - Operations from June 1981 to June 1982, with similar responsibilities for fire protection at an operating plant to the ones I presently hold at Harris.

Q.5 What is the purpose of your testimony?

A.5 The purpose of my testimony is to address those aspects of Eddleman Contention 116 that question fire brigade response to a fire at the Harris Plant and allege that the Harris Plant "fire fighting capability for simultaneous fires is inadequate, or at least unanalyzed."

Q.6 What provisions are made for Harris Plant response to a fire?

A.6 The Harris Plant response to a fire event is based on the concept of "defense-in-depth." For purposes of fire protection, the Harris Plant can be viewed as consisting of self-contained spaces, or fire areas. Each fire area containing safety-related equipment will be bounded on all sides by three hour rated fire barriers. All penetrations through a fire barrier will be sealed by tested assemblies having a commensurate rating as that required of the barrier. As discussed in the Fire Hazards Analysis, fire areas will be equipped with detectors to provide early warning of fires, including smouldering fires, and will be protected by suppression systems actuated by thermal detectors. Fire detection and suppression systems are discussed in Applicants' Testimony of Margareta A. Serbanescu.

The trained fire brigade utilizes installed manual equipment such as fire hose stations and fire extinguishers as the primary response to a fire in each fire area. This equipment is backed up by the design features in these areas, to ensure complete extinguishment of even deep-seated fires such as those that could arise from concentrated cable tray fires. Administrative controls are utilized to control activities such as welding and burning or transport and storage of combustible materials, and thus minimize the opportunity for a fire to be initiated. Prior to commercial operation, a pre-fire plan will be prepared for each area of the plant which contains safety-related equipment. The pre-fire plan will provide the Shift Foreman in the control room and the fire brigade leader with information about a possible fire in the area including guidance for preventing a fire from spreading to adjacent areas and for notifying off-site fire companies.

The implementation of the Harris Plant fire protection program provides assurance that fire events that could adversely affect safety-related equipment have a low probability of occurring, and that in the unlikely event they did occur and were not promptly detected and extinguished, the safe shutdown of the plant would not be jeopardized.

Q.7 What assumptions are made regarding fire brigade response time?

A.7 A fire brigade response time of approximately 5-15 minutes is expected for most fire events within the power block. This response time is dependent on many factors, including fire location, weather conditions, and location of fire brigade members within the plant and may vary somewhat from the above numbers. Fire brigade training stresses the importance of prompt reaction to a fire condition, proper use of fire-fighting and protective equipment, and actions required promptly to extinguish different types of fires in a variety of plant areas. This training, supplemented by fire drills, will serve to keep the brigade response time to a minimum.

Q.8 What is the basis for these assumptions?

A.8 They are based upon the experience of the Harris Plant's fire protection staff, which includes power plant, municipal, volunteer, and industrial fire suppression experience totaling over 30 years.

Q.9 Please describe the training program for fire brigade members.

A.9 The training program for fire brigade members is described in FSAR Section 13.2.3, a copy of which is attached hereto as Attachment B.

Q.10 How often do members of the fire brigade participate in fire drills?

A.10 In accordance with Section I.3 of 10 C.F.R. Part 50, Appendix R, fire drills will be conducted at least quarterly for each shift brigade. At least one drill per year will be unannounced for each shift brigade and at least one drill per year will be conducted on a "back shift" for each shift brigade.

Once every three years an unannounced drill will be critiqued by qualified individuals independent of Applicants' staff. A copy of the critique report will be available for NRC review.

Q.11 What are the requirements for refresher training for the fire brigade members?

A.11 In accordance with Section I.1 of 10 C.F.R. Part 50, Appendix R, refresher training sessions for fire brigade members will be conducted quarterly. These sessions will be used to review changes to the fire protection program, to supplement the initial training program and to cover any other subjects as necessary. The refresher training program is designed to ensure that each topic for fire brigade instruction is repeated at a frequency of not more than two years.

Each brigade member, additionally, will participate annually in a practice session covering fire fighting on typical nuclear plant fires. These sessions will involve actual interior structural fire fighting requiring the use of breathing apparatus and full protective clothing.

Q.12 Is there any regulatory requirement or guidance requiring consideration of postulated simultaneous fires in establishing nuclear plant fire fighting capability?

A.12 I am aware of no NRC regulations or regulatory guide and no industry code or standard which requires a commercial nuclear generating facility operator to postulate, or defend against, multiple fires. Section I of 10 C.F.R. Part 50, Appendix R, contains a table establishing three levels of fire damage limits for which fire protection must be provided. For each, only a single fire must be considered.

Because there is no requirement to consider simultaneous fires, Applicants have not specifically addressed this subject in the FSAR or Safe Shutdown Analysis.

Q.13 Have Applicants nevertheless considered how the Harris Plant would respond to two fires occurring simultaneously?

A.13 The design of fire suppression and detection systems as well as fire suppression procedures which will be in place upon commercial operation of the Harris Plant provide adequate capability to react effectively to two fires occurring simultaneously. Activation of the fire detection system in an area is independent of other fire areas, so two fires occurring simultaneously in different areas would be detected and alarm locally and at the main fire detection information center. Also, each suppression system operates independently of the others, thus multiple simultaneous fires would activate multiple suppression systems. Fire brigade training in fire suppression techniques will allow the capability of applying personnel resources to control simultaneous fires.

Q.14 Is there an adequate supply of water to handle the activation of more than one suppression system?

A.14 There is an adequate water supply at the Harris Plant to control multiple fires. The Harris Plant water supply consists of two pumps, each with a rated capacity of 2500 gallons per minute (gpm) and each capable of supplying 100% of the suppression system needs. The largest suppression system to be installed in the Harris Plant will require only 2000 gpm if all of its approximately 130 sprinkler heads operate. Statistics show, however, that for fires occurring in areas protected by sprinkler systems, 95% of them are controlled by less than 15 of the system's sprinkler heads and over 90% are controlled with only one sprinkler head. National Fire Protection Association, Fire Protection Handbook, (14th Edition, 1976), Figure 14-1(0).

Q.15 What inspection requirements will be established to ensure the operation of fire protection and suppression systems?

A.15 Applicants will test detection and suppression systems on a periodic basis as dictated by the Harris Plant Technical Specifications. Supply valves which are normally required to be open are designed to alarm if they are placed in a closed position. Applicants will also perform routine inspections monthly to verify proper valve lineups.

Q.16 Have Applicants established administrative controls for flammable liquids and combustible materials at the Harris Plant?

A.16 The Harris Plant fire protection program includes administrative controls of flammable liquids and combustible materials to ensure that there is a low probability that a fire which could affect plant safety will occur. Administrative controls include the prohibiting the storage of flammable liquids in safety related areas, minimizing the quantities of flammable liquids in safety cans and storing fluids in fire resistant cabinets. In addition, Applicants will implement an aggressive housekeeping program to minimize the accumulation of combustible paper and trash. Smoking will be prohibited in all safety-related areas except those which will be continually manned.

Q.17 Will the fire brigade include sufficient personnel to respond to two simultaneous fires?

A.17 Yes. The fire brigade will consist of a minimum of five persons on each shift, as required by 10 C.F.R. Part 50, Appendix R, who will have been trained pursuant to the requirements described in FSAR Section 13.2, plus at least one fire protection technical aide who will provide expert advice and assistance. In my opinion, sufficient personnel would be available to control effectively two simultaneous fires.

Q.18 Is there sufficient fire equipment on site to respond to two simultaneous fires?

A.18 Yes. Stand pipe and hose systems are installed throughout the Plant to supply hose stations. Each area of the Plant can be reached by effective hose streams from at least two hose stations. Fire extinguishers, self-contained breathing equipment, protective clothing and emergency lanterns are provided as described in FSAR Section 9.5.1.2.3. In addition, there will be a fire engine housed on site which will be available to respond to fires in outlying areas. The engine carries 1000 gallons of water, which will allow an immediate response to a fire situation for 5-10 minutes while adjacent hydrants are supplied with hoses and charged by fire brigade members.

Q.19 What assumptions are made respecting off-site assistance to fight a fire?

A.19 Off-site fire companies could be called to assist in responding to fires. Applicants have estimated an average response time of 30 minutes for the Apex Volunteer Fire Department and the Holly Springs Volunteer Fire Department. These fire company personnel will be given an orientation of the Harris Plant and will be familiar with the Plant's configuration and capabilities. They will be invited to participate in drills at the Harris Plant. The 30-minute response time will vary depending upon the time of day a request for assistance is made. Response times are anticipated to be somewhat better during evening hours. The response time can be expected to be somewhat longer than 30 minutes during normal business hours. Off-site agency assistance will not be as important during those hours, however, because additional assistance will be available on site from day shift operating personnel and fire protection staff.

Q.20 In summary, are you confident that Applicants can fight any postulated fire at the Harris Plant including two simultaneous fires?

A.20 CP&L's management has fully supported and encouraged the development of an aggressive fire protection program and a properly trained fire protection staff at the Harris Plant. The design features, administrative controls and fire protection procedures which I have described are, in my judgment, entirely adequate to provide prompt and effective response to a single fire as required by NRC regulations, and adequate also to respond effectively to two fires occurring simultaneously.

TABLE 13.1.3-16

David Waters
Principal Engineer - Operations

Education

A. B.S. Degree in Engineering Physics - Ohio State University - 1963.

B. M.S. Degree in Nuclear Engineering - Carnegie Institute of Technology - 1967.

Professional Societies

A. American Nuclear Society

B. Professional Engineer - North Carolina - 1975

C. Society of Fire Protection Engineers

Experience

April, 1963, to April, 1972, Senior Engineer, Westinghouse Electric Corporation, Pittsburgh, PA

May, 1972, employed as a Senior Engineer in the Nuclear Generation Section of the Bulk Power Supply Department. Located in the General Office.

June, 1973, employed as a Project Engineer in the Nuclear Generation Section of the Bulk Power Supply Department. Located in the General Office.

July, 1974, employed as a Principal Engineer in the Nuclear Generation Section of the Bulk Power Supply Department. Located in the General Office.

January, 1977, employed as a Director - Start-up and Technical in the Generation Services Section of the Generation Department. Located in the General Office.

September, 1978, employed as a Principal Engineer - Nuclear Generation in the Nuclear Generation Section of the Generation Department. Located in the General Office.

May, 1979, employed as a Principal Specialist - Regulatory Compliance in the Generation Services Section of the Generation Department. Located in the General Office.

November, 1979, employed as a Principal Specialist - Special Projects in Nuclear Operations Administration Section of the Nuclear Operations Department. Located in the General Office.

TABLE 13.1.3-16 (Cont'd)

David Waters
Principal Engineer - Operations

Experience (Cont'd)

February, 1981, employed as a Principal Specialist - Special Projects in the Nuclear Operations Administration Section of the Technical Services Department. Located in the General Office.

June 1981 to June 1982 acting as Principal Engineer - Operations at H. B. Robinson Unit No. 2.

February, 1982, employed as Principal Engineer - Operations, at the Shearon Harris Nuclear Power Plant, located in New Hill, North Carolina.

13.2.3 FIRE BRIGADE TRAINING

13.2.3.1 Fire Brigade Members

13.2.3.1.1 Instruction

Instructions in the topics listed below will be administered to each individual prior to assignment as a fire brigade member. The instructions will include:

a) Identification of the location and types of fire hazards that could produce fires within the plant, including identification of the areas where breathing air will be required.

b) Identification of the location of installed and portable fire fighting equipment in each area, and familiarization with the layout of the plant, including access and regress routes to each area.

c) Proper use of available equipment, and the correct methods of fighting the following types of fire: electrical, cable and cable trays, hydrogen, flammable liquids, waste/debris, and record file.

d) Indoctrination to the plant fire fighting plan, with coverage of each individual's responsibilities and their changes.

e) Proper use of breathing, communication, lighting, and portable ventilation equipment.

f) A detailed review of procedures, with particular emphasis on what equipment must be used in particular areas.

g) A review of the latest modifications to the facility, procedures, fire fighting equipment, and fire fighting plan.

h) The proper method of fighting fires inside buildings and tunnels.

Refresher instructions will be provided to all fire brigade members on a regularly scheduled basis of not less than four sessions a year with sessions to be repeated at a frequency of not more than 2 years. Instructions will be provided by qualified individuals knowledgeable and experienced in fighting the fires that could occur in the plant with the equipment available at the plant. Special instructions will be provided for fire brigade leaders in directing and coordinating fire fighting activities.

13.2.3.1.2 Practice Sessions

Practice sessions will be held for fire brigade members to teach them the proper method of fighting various types of fires and to provide them with practice in extinguishing actual fires. These sessions will be conducted at facilities sufficiently remote from the nuclear plant so as not to endanger safety-related equipment, with the sessions provided at regular intervals not exceeding 1 year. These practice sessions will be conducted requiring fire

2 brigade members to don protective quipment, including emergency breathing apparatus.

13.2.3.1.3 Drills

Drills will be performed in the plant so that the fire brigade will remain proficient in fire fighting techniques. These drills will include:

a) The simulated use of equipment for the various situations and types of fires which could reasonably occur in each safety-related area.

b) Conformance, where possible, to the established plant fire fighting plans.

c) Operation of fire fighting equipment, where practical, including self-contained breathing apparatus, communication equipment, and portable and installed ventilation equipment.

Drills will be performed at regular intervals, not to exceed three months, for each fire brigade to allow members of the brigade to train as a team. At least one drill per year for each fire brigade will be unannounced to determine the fire readiness of the plant fire brigade and plant fire protection systems and equipment. Drills will be planned to establish training objectives and will be critiqued to determine how well the training objectives were met. This critique will, as a minimum, assess: fire alarm effectiveness; response time; selection, placement and use of equipment; the fire brigade chief's direction of the fire fighting effort; and each fire brigade member's response to the emergency.

A drill will be held annually at which offsite fire department participation will be requested.

13.2.3.2 Other Station Employees

13.2.3.2.1 Instruction for All Non-Fire Brigade Members

Once a year all employees will be instructed on the fire protection plan, evacuation routes, and procedures for reporting a fire. Security personnel will be instructed in entry procedures for offsite fire departments, crowd control for people exiting the stations, and procedures for reporting potential fire hazards observed when touring the facility. Instruction will also be given to all shift personnel who will assist the fire brigade in the event of a fire. Temporary employees will be given instructions to familiarize them with the plant's evacuation signals, evacuation routes, and procedures for reporting fires.

13.2.3.2.2 Drills

A plant evacuation drill will be performed annually.

13.2.3.3 Fire Protection Staff

Fire protection staff members will be introduced to a program of specialized training. Instructions for the staff will include:

a) Analysis of building layout and system design with respect to fire protection requirements, including consideration of potential hazards associated with postulated design basis fires.

b) Design and maintenance of fire detection suppression and extinguishing systems.

c) Fire protection techniques and procedures.

d) Training in manual firefighting techniques and procedures for plant personnel and the fire brigade.

13.2.3.4 Offsite Fire Departments

In accordance with commitments for the use of offsite fire departments, the training offered these offsite fire fighting personnel will include courses in basic radiation principles and practices. Additional training will be offered to familiarize them with typical radiation hazards that may be encountered when fighting fires at a nuclear power plant.

13.2.3.5 Construction Personnel

Training for construction personnel will include instructions in reporting fires, responding to alarms, and locating evacuation routes.

13.2.3.6 Initial Training

The initial fire protection training program will be completed prior to receipt of fuel at the site. The Emergency Plan implementing procedures for fire protection will be completed at least three months prior to receipt of fuel. Sufficient fire protection drills will be performed immediately prior to fuel receipt to provide assurance that the plant staff is adequately trained to cope with fire-related emergencies.

Applicants' Exhibit ____
Eddleman Contention 116
Docket No. 50-400 OL

Final Safety Analysis Report
Section 9.5 and Appendix 9.5A
Fire Protection System

5

9.5 OTHER AUXILIARY SYSTEMS

9.5.1 FIRE PROTECTION SYSTEM

The Shearon Harris Nuclear Power Plant (SHNPP) fire protection program is based on the Nuclear Regulatory Commission (NRC) guidelines, Nuclear Mutual Limited (NML) Property Loss Prevention Standards for Nuclear Generating Stations and related industry standards. With regard to NRC criteria, the SHNPP fire protection program meets the intent of the guidelines outlined in Appendix A to Branch Technical Position APCSB 9.5-1, dated August 23, 1976. Information on various aspects of the fire protection program, detailed as required to show conformance with the guidelines or to demonstrate the equivalency of alternative approaches was previously described in the SHNPP PSAR Section 9.10, "Fire Protection System" submitted to the NRC as Amendment 54, dated May 1, 1977.

The purpose of the fire protection program is to ensure the capability to safely shutdown the reactor, maintain it in a safe shutdown condition, and to limit the radioactive release to the environment in the event of a fire.

The SHNPP fire protection program consists of design features, personnel, equipment, and procedures to provide defense-in-depth protection of public health and safety. The program is implemented through plant system and facility design, fire prevention, fire detection, annunciation, confinement, extinguishment, administrative controls, fire brigade organization, inspection and maintenance, training, quality assurance, and testing.

Tables 9.5.1-6 through 9.5.1-8 are the resumes of EBASCO's Fire Protection Engineers responsible for the formulation and implementation of the Fire Protection Program. SHNPP has a Senior Specialist - Fire Protection on its staff who is responsible for the formulation and implementation of the plant Fire Protection Program. 5

9.5.1.1 Design Basis

9.5.1.1.1 Fire Areas

The fire protection program covers areas containing safety related systems and equipment and other plant areas containing fire hazards that could adversely affect safety-related systems.

Considering the fact that separate fire areas for each division of safety related systems reduce the possibility of fire-related damage to redundant safety related equipment, the fire areas were established to separate redundant safety divisions and to isolate safety related systems from fire hazards in non-safety related areas to the extent possible in the previously established plant design. Where feasible, fire barrier separation was used to limit the spread of fires between components that presented major fire hazards within the same safety division. Where redundant systems could not be separated by fire barriers, as in Containment and the Control Room, other measures were employed in order to prevent a fire-caused loss of function of safety related systems. These measures included limitation of the amount of combustible materials, utilization of fire-resistive construction, provision of fire breaks and/or fire-retardant coatings in cable trays, and installation of fire detection systems and automatic fire extinguishing systems. The fire hazard analysis (Section 9.5.1.3 and Appendix 9.5A) was used to demonstrate the adequacy of the fire prevention measures utilized. The spread of the products of combustion to other fire areas was limited by provision of adequate means to ventilate, exhaust, or isolate the fire areas. Provisions were made for personnel access to and escape routes from each fire area.

Areas in which fire could affect, directly or indirectly, safety related structures, systems or components are listed in Table 9.5.1-1.

9.5.1.1.2 Defense-in-Depth

The defense-in-depth concept was used in SHNPP to achieve the desired degree of fire safety. This concept was applied to the fire protection program to achieve an adequate balance in:

a) Prevention of fire initiation through the control, separation and guarding of sources of ignition;

b) Prompt detection of fires or incipient fire conditions in areas containing safety related equipment or in areas of high combustible loading which may expose safety related equipment;

c) Effective suppression of fires to limit consequent damage and to reduce exposure to safety related equipment;

d) Confinement of fires to their areas of initiation by provision of fire barriers, spatial separation and segregation of combustibles; and

e) Separation of redundant safety related equipment to maintain operational capability under postulated fire conditions.

9.5.1.1.3 Program Objectives

The primary objective of the SHNPP fire protection program is to minimize both the probability and the consequences of postulated fires. However, some fires can be expected to occur. Therefore, regardless of fire prevention measures incorporated in plant design and operation, adequate means for prompt detection and for effective control and suppression of fire have been provided.

For those plant systems necessary to achieve and maintain safe plant shutdown, with or without offsite power available, particular emphasis was given to the provision of both passive fire prevention and damage limitation design features and active fire protection equipment and systems having appropriate capability and adequate capacity.

Design concepts used in the fire protection program provide assurance that a fire will not cause the complete loss of function of safety-related systems, even though limited loss of redundancy within one system may occur.

Plant areas are protected as required based on the hazards present in the areas. For hazardous areas, primary fire protection capability is provided by automatic fire detection and extinguishing systems in conjunction with separational fire barriers. As total reliance is not placed on a single fire extinguishing system, appropriate backup fire extinguishing capability is provided throughout the plant to limit the extent of fire damage.

Hose stations, portable fire extinguishers, complete personnel protective equipment and air breathing equipment are provided for use by properly trained personnel. Personnel access to areas is provided to permit effective manual use of fire extinguishing equipment on area fires.

Area fire hazards analyses and evaluations of postulated fire effects were used to determine adequacy of fire protection in maintaining the capability of the plant to safely shut down the reactor and to minimize radioactive releases to the environment.

All instrumentation necessary for safe shutdown, which for the Shearon Harris Plant is considered to be the Hot Standby (shutdown) Mode, is provided for Operator information at both the main control room and an alternate shutdown or equipment location. The systems that are necessary for the Hot Standby Mode, and the associated instrumentation items can be found in Section 7.4 and Table 7.4.1-1.

9.5.1.1.4 Quality Assurance

Fire protection for SHNPP has been incorporated in initial plant design and carried through all phases of construction leading to actual operation. As an essential part of the fire protection program, a quality assurance (QA) program was developed and is being used to identify and rectify any possible deficiencies in design, construction, and operation of the fire protection systems.

9.5.1.1.5 Fire Suppression System Damage

The evaluation of the consequences of inadvertent operation of the fire extinguishing systems is addressed in the description of each respective system and in the detailed fire hazards analysis for each fire area.

The evaluation of the consequences of a crack in a moderate-energy line in the fire extinguishing system has been performed to demonstrate compliance with the guidelines of NRC Branch Technical Position APCSB 3-1 and MEB 3-1 (refer to Section 3.6).

9.5.1.1.6 Unusually Hazardous Materials

The unusually hazardous materials which could complicate fire control activities or present unexpected fire hazards at the SHNPP are listed in Table 9.5.1-2. 15

9.5.1.2 <u>Systems Description</u>

The systems description of the total fire protection for the plant, given in this section, encompasses:

a) <u>active</u> system components generally recognized as fire protection systems, which include fire detection, suppression and control systems and equipment, and

b) passive system components, usually identified as fire prevention, which provide fire prevention, confinement, and damage limitation features in the design of plant structures and systems.

Recognized standards and guidelines call for the inclusion of both active and passive fire protection into the overall plant design.

This section describes the passive and active fire protection systems of the plant and their utilization as detailed below:

a) Applicable fire protection codes, standards, and guidelines

b) Fire prevention (passive systems)

c) Fire protection (active systems)

d) Fire protection of safety related and special plant areas

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9.5.1.2.1 Applicable Fire Protection Codes, Standards and Guidelines

The codes, standards and guidelines used for the design and installation of plant fire protection systems are as follows:

a) American National Standards Institute (ANSI)

B 31.1 1973 - Power Piping
N45.2.9 1974 - Quality Assurance Records, protection from fire hazards

b) American Society for Testing Materials (ASTM)

D-92 - 1978 Test for Flash and Fire Points by Cleveland open cup.
E-84 - 1980 Test For Surface Burning Characteristics of Building Materials.
E-119 - 1980 Standard Test Method for Fire Test of Building Construction and Materials.
E-136 - 1979 Standard Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 C.

c) Factory Mutual Research (FM) Fire Protection Equipment Approval Guide

d) Institute of Electrical and Electronic Engineers (IEEE) Std. 383-1974 Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations, Std. 634-1978 Standard Cable Penetration Fire Stop Qualification Test.

e) National Fire Protection Association (NFPA)

1) Std. No. 10-1978 - Installation of Portable Fire Extinguishers

2) Std. No. 11-1978 - Foam Extinguishing Systems

5) Std. No. 15 - 1977 - Water Spray Fixed Systems

6) Std. No. 20 - 1972 - Centrifugal Fire Pumps

9.5.1.2.1 e) (continued)

3) Std. No. 13-1978 - Installation of Sprinkler System

4) Std. No. 14-1976 - Standpipe and Hose Systems

5) Std. No. 15-1977 - Water Spray Fixed Systems

6) Std. No. 20-1972 - Centrifugal Fire Pumps

7) Std. No. 24-1977 - Outside Protection

8) Std. No. 26-1976 - Supervision of Valves

9) Std. No. 27-1975 - Private Fire Brigades

10) Std. No. 30-1977 - Flammable and Combustible Liquids Code

11) Std. No. 51B-1974 - Cutting and Welding Process

12) Std. No. 72A-1975 - Local Protective Signaling Systems

13) Std. No. 72D-1975 - Proprietary Protective Signaling Systems

14) Std. No. 72E-1978 - Automatic Fire Detectors

15) Std. No. 80-1979 - Fire Doors and Windows

16) Std. No. 90-1978 - Air Conditioning and Ventilation Systems

17) Std. No. 101-1976 - Life Safety Code

18) Std. No. 251-1979 - Fire Tests, Building Construction and Materials

19) Std. No. 291-1977 - Fire Hydrants, Uniform Markings

20) Std. No. 803-1978 - Fire Protection, Nuclear Power Plants

21) Std. No. 1201-1977 - Organization of Fire Services

22) Std. No. 1202-1976 - Organization of Fire Department

23) Std. No. 1963-1979 - Screw Threads and Gaskets for Fire Hose Couplings

24) Std. No. 1961-1979 - Fire Hose

25) Std. No. 1962-1979 - Fire Hose, Care of

f) Nuclear Mutual Limited (NML) - Property Loss Prevention Standards for Nuclear Generating Stations

g) Underwriters' Laboratory, Inc. (UL) Fire Protection Equipment List

h) United States Nuclear Regulatory Commission

1) SRP (Standard Review Plan) Section 9.5.1 Rev. 2 "Fire Protection Program"

2) 10CFR50 Appendix A, General Design Criterion 3, "Fire Protection"

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4) Branch Technical Position APCSB 9.5-1, Rev. 0, "Guidelines for Fire Protection for Nuclear Power Plants"

5) Branch Technical Position APCSB 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment." Attached to Standard Review-Plan 3.6-1, 11/24/75.

6) Branch Technical Position MEB 3-1, "Postulated Break and Leakage Locations in Fluid System Piping Outside Containment." Attached to Standard Review Plan 3.6-2, 11/24/75.

7) Appendix A to Branch Technical Position APCSB 9.5-1, Rev. 0, "Guidelines for Fire Protection for Nuclear Power Plants Docketed Prior to July 1, 1976"

8) Branch Technical Position ASB 9.5-1, Rev. 1, "Guidelines for Fire Protection for Nuclear Power Plants"

3 9) Regulatory Guide 1.39, Rev. 2, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants."

10) Regulatory Guide 1.88, Rev. 2, "Collection, Storage, and Maintenance of Nuclear Power Plant Quality Assurance Records."

11) Regulatory Guide 1.101, Rev. 1, "Emergency Planning for Nuclear Power Plants."

9.5.1.2.2 Fire Prevention (Passive Systems)

Fire prevention is achieved in the design of the plant through the provision of:

a) features which reduce the incidents of fires and limit the extent and damage from fires, such as plant arrangement, building and structural design (including fire barriers, construction material, drainage, and penetration seals), ventilation systems, lighting, and communication systems.

b) control features of other plant systems to minimize the effects of fire, and

c) precaution and design features considered for the adequate protection of identified special hazards such as charcoal.

PLANT LAYOUT AND ARCHITECTURAL FEATURES

Separation and Isolation - The involvement of safety-related equipment in fires which may occur in the plant is minimized by separation of components of safety-related systems from exposing fire hazards. This separation and protection provide the degree of isolation required to minimize the effects of the fires postulated in the fire hazard analysis. Examples of separation isolation and protection of equipment containing significant quantities of combustible materials are:

a) Safety related systems are isolated from fire hazards through the use of physical barriers, spatial separation, noncombustible fire retardant or fire resistive coverings applied to fire exposed or exposing surfaces, provision of automatic fire suppression systems for damage limitation considered in the design of plant structures, or combinations of the above.

b) Systems required for safe plant shutdown are physically separated from each other in most plant areas to the extent that redundant trains are not exposed to a common fire hazard. In areas where adequate spatial separation could not be provided, protection against damage from a common fire hazard is achieved by the provision in the plant design of fire retardant coatings, barriers, fire detection and extinguishing systems, or combination of these means.

c) To verify the effectiveness of separation and isolation of critical equipment components, the fire hazards analysis identifies and locates, throughout the plant, safety-related systems and associated fire hazards and evaluates the effects of the postulated fires on the continued operability of this equipment. Should future plant design changes occur, the fire hazards analysis will be reviewed and updated as necessary to reflect actual conditions.

d) Fire hazards presented by flammable or combustible liquids and gases are reduced by separation, confinement, and system design features.

The storage and use of flammable and combustible liquids meet the intent and basic criteria of NFPA 30, "Flammable and Combustible Liquids Code." Specific standard requirements are satisfied where compatible with other design requirements, except as stated in the fire hazards analysis.

Bulk storage of compressed or cryogenic gases is not permitted within structures housing safety-related equipment (refer to Table 9.5.1-2). Bulk flammable gases are stored outdoors or in separate detached buildings and do not expose safety-related equipment, systems or structures. Small amounts of combustible gases in cylinders are provided in non-safety related areas such as waste processing building laboratories.

The containers are secured at all times to structures or vehicle racks. Safe permitted use of compressed gases is controlled by operational procedures. | 2

The diesel fuel oil day tanks are separated from other plant fire areas by enclosure within concrete vaults having minimum three-hour fire rating, located in the Diesel Generator Buildings. As a precautionary feature considered in the plant design for the significant quantity of oil present in these fire areas, further depth in the defense against a possible fire and its consequences is insured through provision of suppression systems.

The turbine-generator lubricating oil system is located in the Turbine Building. The wall of the Reactor Auxiliary Building adjacent to the Turbine Building is a three-hour fire rated wall from the outside to prevent exposure of any safety-related equipment within the Reactor Auxiliary Building. Furthermore, to prevent a possible fire in the Turbine Building from spreading, for rapid fire control and to reduce damage to the equipment involved, suppression systems were considered and provided, as part of the plant design. A fire in this area will not impact operability of any safety-related equipment.

The reactor coolant pump lube oil system is located within the Containment Building near the reactor coolant pumps. In this case, fire prevention in the plant design is achieved by providing an automatic fire suppression system as a precaution to provide adequate protection of this hazard in case of fire occurrence (for detailed fire hazard analysis refer to Appendix 9.5A).

The use of dry type transformers as required by BTP CMEB 9.5-1 Section C.5.a within safety related structures reduces the separation needed for isolation of this equipment.

Oil filled transformers are located in the transformer yard. They are separated from safety-related structures by more than 50 ft. distance and from
15 the Turbine Building by two-hour fire barrier walls (see Figure 1.2.2-2).

The 230 kV oil-filled cable runs underground from the switchyard to the startup transformers. Twenty-four aboveground oil tanks, 50 gal. each, are spaced 16 ft. apart. The oil used is a special low viscosity oil having a minimum flash point of 295 F tested in accordance with ASTM Method D-92. The tanks are installed on gravel which will absorb any oil spill.

e) In the cable spreading rooms, cabling for redundant safety divisions A and B are separated by three hour fire barriers. Further depth in the defense against fires is achieved by providing automatic suppression systems for the special hazard presented by heavy cable concentrations.

In areas outside of the cable spreading rooms where redundant safety related trays could be exposed to a common fire hazard, protection is provided by spatial separation, presence of fire suppression systems to control and minimize the effects of fire, and/or fire retardant coatings or fire resistive barriers, used singly or in combination.

f) For safety related charcoal filter assemblies, a low-flow air bleed cooling system is provided. This consists of air circulated through the charcoal adsorbers removing the decay heat, thus maintaining the charcoal below combustion temperature. The control room operator will be alerted to any charcoal heating by the high-adsorber temperature instrumentation alarm. In the event of fire in the adsorbers, the fire will be controlled by closing the isolation dampers to the pressure-tight filter cabinet, thus restricting the fire's oxygen supply.

Further means of protection of safety related equipment located adjacent to the charcoal filters is provided by automatic fire suppression systems over the charcoal filter housings for limitation of the extent or damage from possible fires.

BARRIERS AND ACCESS

Fire areas, as designated in Section 9.5.1.1.1 and listed in Table 9.5.1-1 are isolated from other plant areas by floors, walls and ceilings having three hour fire resistance ratings. The fire area boundaries and barrier ratings are shown on Figures 9.5A-1 through 9.5A-40. These fire ratings are established in accordance with Branch Technical Position APCSB 9.5-1 and are based on standard fire tests made in accordance with "Standard Methods of Fire Tests of Building Construction and Material" ASTM E-119 and NFPA 251 (the applicable fire protection codes, standards and guidelines are listed in FSAR Section 9.5.1.2.1).

Doors through fire barriers have fire ratings commensurate with that required of the fire barrier and are of certified fire resistive construction, guaranteed by their manufacturer. These doors are either self-closing or automatic closing types or are normally secured closed. Key doors, status of which is required for security purposes, are supervised, and door position is indicated on the security panel, unauthorized opening being alarmed. Other doors which are not supervised are maintained normally secured closed. Self-closing operability of the doors is monitored through administrative procedures. Specific information concerning the rating of the barriers and doors is given in the "Fire Protection Hazards Analysis" in Appendix 9.5A.

Fire doors will be supervised by one or more of the following methods.

a) Fire doors should be kept closed and electrically supervised at a continuously manned location;

b) Fire doors should be locked closed and inspected weekly to verify that the doors are in the closed position;

c) Fire doors should be provided with automatic hold-open and release mechanisms and inspected daily to verify that doorways are free of obstructions; or 14

d) Fire doors should be kept closed and inspected daily to verify that they are in the closed position.

SHNPP will meet the intent of NUREG-0800 CMEB 9.5-1 C.5.a.5 concerning supervision of fire doors.

The specification for the design and installation of penetration seals through fire barriers requires that the seals be constructed, tested and installed per the applicable fire protection codes, standards and guidelines listed in FSAR Section 9.5.1.2.1. Penetration sealing systems used for piping penetrations through fire barriers provide both necessary piping flexibility and containment of smoke and flames. These may utilize non-combustible piping boots, sleeves, and sealants in accepted combinations. Cable and cable-tray penetrations at fire barriers are sealed to give minimum equivalent protection to those of the fire barrier. Conduits penetrating fire barriers are sealed at both ends with non-combustible material to prevent the passage of smoke and hot gases. 5

All ductwork which penetrate fire barriers will be sealed by fire dampers having a resistance rating at least equal to that of the barrier. The fire dampers are UL listed and/or FM approved.

5

When a high-combustible fire load is present, automatic fusible link closing and manual reopening fire dampers are provided in ventilation openings through fire barrier walls which are not provided with ductwork on either side. (For example, in make-up air transfer grill openings in the walls of the diesel fuel oil pump rooms).

In non-safety related ductwork, automatic fusible link closing and manual reopening fire dampers are provided only where required for highfire exposures at fire barriers, or where fire stair tower walls are penetrated.

In most cases, as detailed in the fire hazards analysis, more than one means of access and egress are provided for each fire area, suitably marked and emergency lighted, to permit escape of occupants and entry of fire response personnel.

Plant elevators and life-safety stairwells are encased in towers having two hour fire rating as required by the NFPA Life Safety Code, and provided with Class B self-closing fire doors rated at 1 1/2 hour. Fire exit routes are clearly marked. Administrative operating procedures will govern operation of elevators during fire emergencies.

Walls and structural materials are non-combustible. Other interior finish materials, including thermal insulation, radiation shielding, and sound-proofing are non-combustible or have a flame spread, smoke and fuel contribution of 50 or less as defined in ASTM E-84, "Surface Burning Characteristics of Building Materials."

Plastics are used only where required as essential equipment and to the minimum extent possible, as detailed in the fire hazards analysis. A small quantity of vinyl is used for trimming of non-seismic instrumentation cable tray cover cutouts for cable exits from those trays which are solid bottom with cover construction. Standard Products Quickedge Minitrim Part No. 75000341, which is a vinyl was the only material available to meet the installation requirements, and therefore was selected for this application. It's use is limited to a minimum 6 in. radius to a maximum of 12 in. by 13 in. rectangular cutout. The "Quickedge" vinyl is self-extinguishing passing Federal Specification FSS-302.

Metal deck roofs are not used on safety-related structures. (Unremoved metal forms used for the casting of reinforced concrete floors or walls do not constitute a metal deck roof or partition.)

Suspended ceilings and their supports are of non-combustible construction. Concealed spaces will be devoid of combustibles to the extent practicable. Electrical wiring to lighting fixtures and to HVAC systems in these spaces are enclosed in conduit to minimize the combustible loading.

a) Limitation of Fire Effects - Plant design includes features to control the products of combustion from a fire and the discharge of water fire suppression systems.

Smoke and heat concentrations in fire areas are reduced by the use of building ventilating systems:

1) Non-recirculating ventilation systems are provided for fire areas which may contain airborne radioactive materials.

2) Partially recirculating ventilation systems are provided in other fire areas which do not contain airborne radioactivity. Where

practicable, these are designed to be manually realigned to once-through purge ventilation for the fire area.

3) Smoke and heat from fires which might occur in areas containing radioactive materials are monitored for radioactivity using the existing area monitors. (For detailed description of the area radiation monitoring system refer to Sections 11.5 and 12.3.4.)

All ventilation systems designed to exhaust smoke or corrosive gases through the use of normal ventilation, have been evaluated to ensure that inadvertent operation or single failures do not violate the controlled areas of the plant (refer to Section 9.4).

To the extent practicable, power supply and controls for ventilation systems are installed outside the area served by the system.

The fresh air supply intakes serving safety-related equipment or systems are physically separated from exhaust air outlets to minimize the possiblility of exhausted air being drawn into the supply intakes and contaminating the intake air with the products of combustion (refer to Section 9.4).

Stairwells are designed to minimize smoke infiltration during a fire by maintaining a positive pressure, by providing 1 1/2 hr. rating fire dampers and doors.

Floor drains are installed in areas containing sprinkler of standpipe and hose station systems. For the description of these drainage systems refer to Section 9.3.3.

Safety related equipment in sprinklered areas are mounted on pads, protected with covers, shields, watertight enclosures, or as detailed in the fire hazards analysis. Concrete floors surrounding the pads are sloped to floor drains at low points.

Areas with equipment containing significant amounts of combustible liquids have containment curbing to preclude inadvertent flows to surrounding areas and drainage systems.

Fire protection water discharged in areas having the potential for radioactive contamination is drained through dedicated systems, collected, sampled and analyzed. If radioactivity levels preclude discharge directly to the environment, the liquids are routed to the Waste Processing Building for suitable treatment prior to disposal (see Sections 9.3.3 and 11.2).

b) <u>Fire Protection</u> of Cables and Circuitry - Safety related cable trays and circuits are isolated or protected from the effects of fire through the use of physical isolation, spatial separation, non-combustible covering, fire prevention through provision of automatic sprinkler systems or any combination of these methods, to ensure the integrity of essential electric circuitry needed during the fire for safe shutdown of the plant and for fire control. Generally all wiring runs outside of cable trays are enclosed in metallic conduit to reduce the exposure of the cable to ignition and combustible loading of the area. However, occasionally, when a cable tray

passes over a piece of equipment cable feeding this equipment drops out of the tray into the top of the equipment without conduit. Such runs are limited to
11 | a maximum of approximately 4 ft. in length.

Several approaches are used to limit the hazard presented by combustible cable insulation. All electrical raceway cable construction, as a minimum, meet the IEEE-383-74 flame test, except in a limited number of places, as outlined in the fire hazards analysis. Communication cable does not meet IEEE-383 qualification but runs only in metallic conduit or underground. Additional fire protection for concentration of cables is provided, as required. Cable insulating materials which do not create hazardous concentrations of corrosive or toxic gas when overheated or when exposed to flames are used to the extent practicable, as detailed in the fire hazards analysis, Section 9.5.1.3 and Appendix 9.5A.

Cable tray construction materials are non-combustible and satisfy the requirements of ASTM E-136. For cable tray fill and derating allowance provided, refer to Sections 8.3.1 and 8.3.2. Cable trays and conduit are used for cables only: miscellaneous storage is not permitted in cable trays, raceways, trenches or culverts; piping for flammable or combustible liquids or gases is not permitted in these areas. Interior high voltage - ampere transformers located in safety related structures are of the dry type.

Cable, cable tray and conduit penetrations of fire barriers (vertical and horizontal) are sealed (fire stops) to give protection at least equivalent to that required for the fire barriers. Fire stops at penetrations of cable trays through fire barriers and all floors are designed to meet the requirements of NFPA 803-1978, Section 6-3, "Protection of Openings in Fire Walls and Subdivisions."

Fire breaks and crossover protection for cable trays criteria is based on guidance from NRC and NML.

Fire breaks are provided along horizontal, vertical and horizontal/vertical cable tray runs, at intervals dictated by the safety function performed, type of trays, and runs. In determining the fire break spacing, the fire stops provided at penetrations are considered as fire breaks.

Fire breaks are designed to prevent the propagation of a fire for a minimum period of thirty minutes, when tested for the largest number of cable routings and maximum cable density.

<u>Covered Trays</u>

Fire breaks, consisting of fire resistive material assemblies which fill the entire void of the covered cable tray enclosed space for at least 1 ft. of enclosed cable tray length, are provided as follows:

1) Cable tray stacks containing either all safety related or safety and non-safety related cable trays:

(a) Horizontal - approximately 20 ft.

(b) Vertical - at midheight if the vertical run is 20 ft. or more, but less than 30 ft. - at approximately 15 ft. intervals in runs of 30 ft. or more.

(c) Horizontal/Vertical - approximately 20 ft., except that the vertical spacing requirement governs in any continuous vertical run of 20 ft. or more.

2) Non-safety related cable trays:

(a) Horizontal - approximately 50 ft.

(b) Vertical - approximately 30 ft.

(c) Horizontal/Vertical - approximately 50 ft. except that vertical spacing requirement governs in any continuous vertical run of 30 ft. or more.

Open Trays

Horizontal cable tray systems protected by automatic sprinkler, do not require fire breaks. Vertical runs of cable tray do not require fire breaks only when the automatic water system is directed on the cable trays. In SHNPP, the sprinkler systems which protect cable trays, are installed at the ceiling level, not especially directed on vertical cable trays and as a consequence fire breaks are provided in all vertical runs, regardless of sprinkler protection.

Occasionally, open cable trays have to be covered for physical protection. In these cases fire break criteria for covered trays governs.

Fire breaks, consisting of fire retardant coatings applied to exposed cable surfaces for 2 ft. along the run of cable trays are provided as follows:

1) Cable tray stacks containing either all safety related or safety and non-safety related cable trays:

(a) Horizontal, not protected by sprinklers, approximately 20 ft. intervals.

(b) Vertical, at midheight if the vertical is 20 ft. or more but less than 30 ft.; or at approximately 15 ft. intervals in runs of 30 ft. or more.

(c) Horizontal/Vertical - approximately 20 ft., only for runs not protected by sprinklers, except that the vertical spacing requirement governs in any continuous vertical run of 20 ft. or more, for either sprinklered or non-sprinklered runs.

2) Non-safety related cable trays:

(a) Horizontal, not protected by sprinklers, approximately 30 ft. intervals.

(b) Vertical, protected or non-protected by sprinklers, approximately 30 ft. intervals.

(c) Horizontal/Vertical - approximately 50 ft. only for horizontal runs not protected by sprinklers, except that the vertical spacing requirement governs in any continuous vertical run of 30 ft. or more for either sprinklered or non-sprinklered runs.

Protection for open cable trays intersections (Tees) or changes of directions (EL L's) consist of fire retardant coatings applied to exposed cable surfaces along each cable tray for a length of 2 ft. prior to the point of entry to the intersection or turn section. To permit verification of cable routing, cables within the intersection or turn are not coated.

Cable tray crossovers are protected with fire retardant coatings applied to exposed cable surfaces in the lower open cable tray(s) and the underside of the tray above it, extending from the centerline of the crossing tray(s) in each direction to a point 1 ft. beyond the outermost edges of the tray(s).

Conduit-Cable Tray Crossings (Less than 5 ft. Vertical Spacing)

Conduit crossovers of open cable trays are protected by fire retardant coatings applied to exposed cable surfaces in the tray, extending from the centerline of the crossing conduit(s) in each direction to a point 1 ft. beyond the outermost edges of the conduit(s).

Conduit crossovers of covered cable trays or of other conduit do not require protection.

Conduit crossunders of open or covered cable trays do not require protection.

Fire protection for areas containing cables and circuitry is achieved in the design of the plant through a combination of the following (detailed in the fire hazards analysis):

1) For early warning of fire conditions in the cables, ionization type smoke detectors are provided along major cable tray runs throughout the plant.

2) For control and minimization of fire effects, either in case of significant cable fire loading within the same safety train, or for congested runs of cable trays (outside the cable spreading room) where redundant trains may expose each other, or may be exposed to a common fire, automatic suppression systems located above the trays at the ceiling level and manual backup capabilities were considered and provided, as required.

3) For essential electric circuits integrity assurance needed during safe shutdown of the plant and for fire control the electrical cables are designed to allow wetting without electrical faulting.

Safety related equipment that does not itself require water protection, but which could be adversely affected by the operation of sprinklers for such cable trays, are physically protected from sprinkler operation or malfunction, as detailed in the Fire Hazards Analysis.

In the cable spreading rooms, cabling for redundant safety Divisions A and B are separated by three hour fire barriers. For detailed descriptions of fire protection features provided for various areas containing Class IE equipment and cables refer to:

1) Control Room, See Section 9.5.1.2.6.a

2) Cable Spreading Rooms, See Section 9.5.1.2.6.c

3) Computer Room - See Section 9.5.1.2.6.d

4) Switchgear Rooms - See Section 9.5.1.2.6.e

5) Remote Safety Related Panels - See Section 9.5.1.2.6.f

6) Battery Rooms - See Section 9.5.1.2.6.g

9.5.1.2.3 Fire Protection (Active Systems)

The Fire Protection System encompasses the following:

a) Water supply and distribution system, including the fire pumps, yard and interior distribution piping.

b) Automatic suppression systems.

c) Fire detection system, covering detection of fire, automatic suppression systems actuation, fire protection equipment supervision and signaling.

d) Manual fire response equipment such as portable fire extinguishers, hose stations, breathing equipment, protective clothing, emergency use of plant communication equipment, access emergency lighting.

For each of the active protection systems used in the plant the following are described, as applicable:

a) General design requirements.

b) System components, operating modes, special features applicable to plant needs, interfaces with other systems, power supplies and reliability, and seismic design considerations.

c) Use of system for protection of safety related facilities.

d) Reference to drawings or lists to indicate specific usage of the systems in the plant.

15 Overall design of the plant fire protection system has been guided by several precepts:

a) Fire protection system water will not be used for any non-fire-related purposes, except limited use on intermittent bases to provide makeup water for isolated HVAC chillers in RAB and WPB.

b) The system design features minimize or preclude inadvertent operation that could cause hazardous or unsafe plant conditions.

c) In all plant areas more than one means of fire control is provided to avoid total reliance on any single system, automatic or manual.

The fire protection systems provided in the plant have been selected based on the nature of the hazards expected, the anticipated rapidity of spread, and the eventual magnitude of the fire. Plant operating, inspection, testing, and maintenance requirements have also been considered.

Water Supply

Fire protection water for the plant is taken from the fresh water supply impounded in the Auxiliary Reservoir with storage capacity greatly exceeding the quantity required for fire protection. Minimum fire protection quantity is based on:

Maximum System Demand	=	2,000 gpm
Maximum Hose Stream Demand	=	1,000 gpm
Two Hour Supply	=	360,000 gal.
Reserve Supply	=	360,000 gal.
Total Supply	=	720,000 gal.
Makeup Re-supply	=	720,000 gal.
Total Reservoir Requirement	=	1,440,000 gal.

Only the above quantity of storage in the reservoir pertains to the Fire Protection System. The reservoir is also used for storage of water used in plant operations that are both safety related and non-safety related. The reservoir has been designed with seismic considerations to assure availability of safety related water supplies. The quality of water in the reservoir is suitable for use in fire protection systems. Although the water does not require clarification or other treatment for removal of suspended solids, traveling screens are provided at the intake structure for the removal of larger impurities which may be present in the water. (For more details, see description of plant water systems, Section 9.2.1.) Although the water supply serves as the plant ultimate heat sink and also as the fire protection water supply, with sufficient capacity for both functions, fire protection system failure will not degrade the ultimate heat sink function (see Section 9.2.5).

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Fire Pumps

Fire pumps and controllers are installed in accordance with NFPA 20. Water is supplied from the Auxiliary Reservoir by two 100 percent capacity outdoor type, vertical, 2,500 gpm, 125 psi fire pumps. Each fire pump is capable of delivering 3,000 gpm at approximately 110 psig. One electric motor driven fire pump and one diesel engine driven fire pump, suitable for outdoor operation, are installed outdoors at opposite ends of the Emergency Service Water Screening Structure. The electric motor driven pump is UL listed. The diesel engine driven pump is FM approved. Both pump controllers are UL listed and FM approved. There are no specific requirements in NFPA 20 that electric motors for fire pumps be listed or approved by an independent laboratory and, therefore, they are not listed. Each pump has a separate intake and discharges through independent underground connections into the main fire loop (see Figure 9.5.1-1). Adequate isolation is provided between pump installations to prevent loss of service of more than one pump in event of a single fire occurrence. 5

The largest firewater flow and pressure requirement is 2750 gpm, 72 psi at the system interface valve for the area below the turbine building operating floor (2000 gpm for the pre-action sprinkier system and 750 gpm for manual hose streams). This demand can be met by either of the two fire pumps. For safety related areas, a maximum system demand of 900 gpm (0.3 gpm/sq. ft. over the most remote 3000 sq. ft.) and 1000 gpm for hose streams comprise the largest flow requirement. The minimum fire-water supply requirements are detailed above.

Each fire pump provides the total fire protection water supply requirement to the fire main loop, thus required fire pump discharge capacity and pressure are available with either pump out of service.

The pump discharge connections are separated by approximately 40 ft. to prevent damage to both connections simultaneously. The fire main loop valves and fire pump discharge valves are arranged to permit discharge from either connection to the main fire loop.

Alarms and indications of fire pump operating conditions, such as pump running, driver availability, and failure to start, are transmitted to the Control Room.

The fire pumps are designed for sequential automatic starting on progressive drops in fire main water pressure. The motor driven fire pump starts automatically when the pressure in the fire loop drops to 90 psig. If the pressure continues to drop, at 80 psig, the diesel driven fire pump starts automatically. Both pumps are stopped manually. The water pressure in the distribution system is maintained at approximately 100 psig by the 50 gpm electric motor driven jockey pump, started automatically on drop in pressure and stopped on restoration of pressure after a suitable time delay provided to prevent unnecessary operation of the fire pumps.

Power for the electric motor driven fire pump is supplied from a 480V power center, which has two feeds, the normal supply coming from a 6.9 kV switchgear and the alternate through a bus tie with another 480 V power center. Both power centers are fed from the same 6.9 kV bus. Fuel supply for the diesel engine driven fire pump, the 550 gal. No. 2 oil tank, is located outdoors, adjacent to the pump area, suitably protected against fire and does not expose the fire pumps to fire damage. A 12 in. dike is provided to contain the oil in case of an oil spill or tank rupture.

A pump test discharge header is provided of such capacity that the fire pumps may be given initial acceptance flow test and periodic performance tests. The discharge of flow test water is sent back to the reservoir. Water discharged from the pressure relief valves on the fire pumps and jockey pump are returned to the reservoir.

Distribution System

The fire protection water distribution system (Figures 9.5.1-1 through 9.5.1-5) consists of an underground 12 in. mechanical joint, ductile iron, cement or bituminous lined pipe loop around the main plant building complex to supply the water requirements for fire protection systems and equipment. The underground loop is cross-connected at three places in a north-south direction through:

a) Waste Processing and Fuel Handling Buildings,

15 b) Reactor Auxiliary Building,

c) Turbine Building

These cross connections are six and eight inch piping, ductile iron, cement or bituminous lined pipe for underground runs and carbon steel pipe, suitably supported, for above-ground piping within buildings. Sectional control valves are provided to assure two-directional supply to all areas.

All sectional and isolation valves in the fire suppression water supply system (except hydrant valves and inside hose connections) are either post indicator valves (PIVs) for underground piping or outside screw and yoke (OS&Y) valves for interior building piping.

15 The guidelines of NFPA 24 were used in the design and installation of the underground yard main fire loop. Fire protection main piping is not interconnected with any plant water systems.

Ductile iron, cement or bituminous lined pipe is used for the yard main fire loop to minimize the effects of tuberculation. Flushing of the system, as required is through the yard hydrants, hose connections and suppression system drains.

Post indicator valves are provided in the distribution system as required for adequate sectionalization of loops and isolation of branch lines to facilitate system maintenance. Isolation valves are located in branch lines connecting to fire suppression systems in the buildings to avoid closing sectional valves in the main loop. Sectional isolation valves are provided in the yard loop piping to minimize the impairment of fire protection water supply if maintenance on the loop or on yard hydrants becomes necessary. Sectional control valves provided in the pump discharge connections to the loop and in the yard main loop piping are positioned to assure supply of fire water
15 systems for any area from either or both fire pumps.

indicators on yard valves or rising stems on internal cross header valves. A water flow alarm is provided on each standpipe riser. Lack of water flow is alarmed for each sprinkler and water spray system.

Non-freeze type fire hydrants, equipped with a minimum of two 2-1/2 in. gated outlets, are installed approximately every 250 ft. along the fire main loop in the yard area around the main plant building complex and are protected from mechanical damage from vehicular traffic. Branch connections from the main loop supply hydrants hose station and systems at outlying structures. Hose houses are installed adjacent to each hydrant and are equipped with the standard complement of 2-1/2 in. fire hose, nozzles, and hose-line equipment in accordance with NFPA 24 requirements. A curb box valve is installed on all hydrant branches.

Screw threads and gaskets for fire hose and hose line equipment are NPT, in accordance with NFPA No. 1963. Each hose house is provided with two each adapters tagged "Raleigh Fire Department Adapter" and "Sanford Fire Department Adapter" which fit local fire department hose threads.

Manual Fire Response

Equipment used for manual fire response is described below.

a) Fire extinguishers - Fire extinguishers provided throughout the plant are UL listed and/or FM approved and labelled accordingly. Extinguishers are mounted in readily accessible locations in conformance with NFPA Standard 10.

Types of extinguishers selected are based on the nature of the fire postulated for the area, in accordance with NFPA 10, and on the unique characteristics of the fire suppresssion agent affecting its proper application to the fire. Considerations include quanity required in relation to the size of the anticipated fire, cleanup after use, and thermal shock or corrosive effects of the agent or its fire decomposition products.

The following basic types of extinguishers are used:

Dry chemical - hand and wheeled - in operational areas or outdoor areas of severe fire potential,

Carbon dioxide or Halon - hand - in area of low fire hazards or containing small electrical equipment where cleanup after the fire is a major consideration, such as Control Room, laboratories and switchgear areas, 15

Water - hand - in areas containing ordinary combustibles such as warehouses and offices.

b) Standpipe and Hose System - Standpipe and hose systems are installed throughout the plant inside buildings to supply hose stations, suitable for safe effective use on identified hazards and involved equipment (refer to Figures 9.5.1-2 through 9.5.1-5). Sufficient hose stations are provided in each area so that all portions of the plant can be reached by effective hose streams from at least two hose stations.

The guidelines of NFPA 14, Class 2, were followed in the design of standpipe and hose systems. Individual standpipes are minimum 4 in. diameter for multiple hose connections and 2-1/2 in. diameter for single hose connections. Hose stations are equipped with 100 ft. of 1-1/2 in. woven jacket, lined fire hose and adjustable spray nozzles, approved for use on energized electrical equipment and cabling, stored on racks or in cabinets. Standpipe hose connections are provided in all buildings (except the Diesel Fuel Oil Storage Tank Building) on all floors at approximately 100 ft. spacing.

The standpipe system is designed and sized to provide, to the most remote hose station, the flow rate and pressure required for effective hose streams.

Operation of a hose station associated with a particular riser is alarmed
15 locally and alarmed and annunciated in the Plant Communications Room and the Control Room following sensing of water flow in the standpipe riser by system flow switches.

Sectional shutoff valves provided for standpipes serving hose stations in safety related areas are located outside the safety related areas to permit access during a fire.

Portions of the standpipe and hose systems installed in the Containment,
15 Reactor Auxiliary and Fuel Handling Building, as shown on (Figures 9.5.1-2 and 9.5.1-4), are designed to be operable, if needed, for manual fire control in areas required for safe plant shutdown following a safe shutdown earthquake (SSE). These portions of the standpipe system were analyzed for SSE loading and seismically supported to assure system pressure integrity. The piping and valves for these standpipes are designed to satisfy ANSI B31.1, "Power Piping."

Normally, the post-SSE standpipe hose station header is supplied from the fire protection water distribution system through seismically qualified check valves. Following an SSE event, water supply for the post-SSE portion of the standpipe system can be obtained by operator manual actuation of valves to connect the Seismic Category I Emergency Service Water System, located in the Reactor Auxiliary Building, to the post-SSE hose standpipe header. This Seismic Cateogry I water source is adequate for supply of two 75 gpm interior hose streams for a period of at least one hour. A booster pump, designed for post SSE operation, and rated 200 gpm at 50 ft. (115.5 psi), is provided in
15 the RAB, at Elevation 216 ft. (Figure 9.5A-6). These pumps are located downstream from the connection to the Emergency Service Water System. The seismic check valves prevent outflow to other portions of the fire protection water distribution system, which may have failed during the seismic event, and thus avoid loss of hose line protection after the earthquake.

c) <u>Self-Contained Breathing Equipment</u> - Breathing equipment is provided as required for protection against smoke inhalation of personnel required to be in plant areas to control fires or to continue vital plant operations.

Self-contained breathing apparatus, using full face postive pressure masks, approved by National Institute for Occupational Safety and Health (NIOSH), with a minimum capacity of one half hour, are provided for fire brigade and control room personnel.

Two extra air bottles are located onsite for each self-contained breathing unit, used by fire brigade and control room personnel, with an onsite six hour supply of reserve air and refilling manifolds for recharging air bottles. The six hour reserve supply is provided from storage cylinders, with resupply from an approved breathing air compressor. The air compressor is equipped with a carbon monoxide monitor and with an air intake located away from dust, organic vapor and other contaminant sources.

d) Protective clothing - Protective clothing will be provided to members of the plant fire brigade or other designated personnel and is located in accessible locations for use of fire response personnel as developed in the Fire Protection Plan.

Instruction in the use of protective clothing and assignment to personnel is a part of the overall fire response procedures developed by plant operating groups.

e) Emergency Lighting - Redundant AC normal/emergency lighting (powered from safety related motor control centers) is provided in areas where safety related functions are performed, in access routes to these areas, and for emergency evacuation. In addition, fixed emergency, DC powered, sealed beam units with individual eight hour battery supplies are provided to light access areas. Each unit consists of two, 12 watt sealed beam floodlamps. These DC units are energized in the event of loss of AC normal/emergency lighting. Emergency DC lighting, fed from the 125 V station battery, provides lighting in the Control Room and the remote shutdown and computer room in the event that either train of the AC normal/emergency lighting is lost. 14

Portable emergency lanterns are provided for personnel use during an emergency. Spare batteries and a battery recharging station are provided (see Section 9.5.3).

f) Emergency Communications - The fixed emergency communication system utilized voice powered head sets at pre-selected stations (see Section 9.5.2).

Fire Suppression Systems

The selection of type of fire suppression system, mode of operation, and performance criteria is based on the fire hazards found in an area, the realistic fire postulated and the overall fire control approach utilized for containment of the fire, limitation of damage and adverse effects on plant operating systems, and eventual extinguishment.

Primary fire suppression systems for the plant discharge water through sprinkler heads, water spray nozzles, or, with the addition of foam solution, through foam making devices. Each system is designed, procured, installed and tested in accordance with applicable NFPA standards.

Suppression systems discharging water through open heads are water spray systems for one-step water release, suppression systems discharging water through closed heads are either multicycle or pre-action systems for two-step release.

Two-step water release requires not only actuation of the sprinkler flow control valve by automatic detectors or manual fire alarm stations but also fusing of the sprinkler head linkage by heat from the fire before water can discharge from the sprinkler head. This operational concept is employed to avoid unnecessary water damage resulting from premature discharge or inadvertent operation caused by system misoperation or mechanical damage. The multi-cycle system is a pre-action system modified so that the water flow control valve is shut off automatically when the fire is extinguished and reopened by the automatic fire detection system if the fire redevelops. Water damage is thus minimized and the hazard of a shut manual system valve is avoided. All system piping is normally dry beyond the sprinkler control valve. Supervisory air pressure in closed piping systems is maintained by small system air compressors at the system riser.

Sprinkler systems (Figures 9.5.1-4 and 9.5.1-5) are provided to protect high hazard or vital process, storage and other operational areas are designed in conformance with distribution system hydraulic calculations which determine water flow density and system pressures available to the protected areas. Sprinkler system discharge densities are hydraulically designed to deliver 0.3 gpm/sq. ft. for the most remote areas of 3,000 sq. ft. or less.

a) <u>Pre-Action Sprinkler Systems</u> are automatic sprinkler systems supplied through hydraulically designed piping systems, containing air under a supervisory pressure of 10-15 psi downstream from the pre-action valve. Each system is automatically actuated by a thermal fire detection system installed in the same area as the sprinklers, which responds before fusing of the sprinkler fusible link. Actuation of the Fire Detection System opens the
15 pre-action valve within five seconds and is alarmed locally, in the Unit 1 Communications Room and in the respective Unit Control Room. The guidelines of NFPA 13 are followed in the design, installation, and testing of the pre-action sprinkler systems.

Pre-action sprinkler systems, with separate pre-action valves, each provided with automatic and manual actuation, manual reset, local alarm and valve supervision, and with annunciation in the Communications Room and the Control
15 Room, are provided for the plant areas listed in Table 9.5.1-3 (see Figure 9.5.1-5).

For pre-action sprinkler systems covering more than one hazard, independent detection-actuation systems, each with specific local alarm and annunciation
15 in both the Unit 1 Communications Room and the Control Room, are provided for each hazard, as detailed in the fire hazards analysis.

b) <u>Multi-Cycle Sprinkler Systems</u> are pre-action sprinkler systems modified to provide the capability for continued on-and-off cycling, during control of the fire, by shutting off the water supply automatically at the multi-cycle valve after the detection system indicates that the fire has been extinguished. Each multi-cycle sprinkler piping system is hydraulically designed and is filled with air under a supervisory pressure of 10-15 psi, downstream from the multi-cycle valve. In the event of damage to the detection circuit, the sprinkler system is capable of being switched to low pressure air system operation mode, maintaining the protection, alarms, and supervision of this sprinkler system.

When controlled by the Fire Detection System, the multi-cycle system is capable of automatically cycling "on" whenever any detector senses heat or "off" after all the detectors in the detection system sense that the temperature has decreased below their actuation point. Water will continue to flow from opened sprinkler heads for a predetermined period of time, adjustable from 30 sec. to 5 min. in the fire detection actuation circuit, after which the valve closes and the flow of water stops. If the temperature again rises to the rating of any thermal detector in the system that controls the multi-cycle system, the multi-cycle valve will reopen and immediately restart the flow of water to extinguish the reignited fire. Lack of water flow through any multi-cycle valve within five seconds from the actuation by the automatic detection system is alarmed locally and in the Control Room via the Communications Room. 15

The guidelines of NFPA 13 and 15 are followed in the design, installation, and testing of the multi-cycle sprinkler systems.

Multi-cycle sprinkler systems with separate multi-cycle valves, each provided with automatic and manual actuation, manual reset, local alarm and valve supervision and with annunciation in the Communications Room and the Control Room are provided for the plant areas listed in Table 9.5.1-4 (see Figure 9.5.1-5). 15

For multi-cycle sprinkler systems covering more than one hazard, independent detection-actuation systems, each with specific local alarm and annunciation in both the Communications Room and the Control Room, are provided for each hazard. 15

c) Water Spray Systems consist of open water spray heads supplied through hydraulically designed piping systems, with water flow controlled by a deluge valve. The deluge valve is actuated automatically by the operation of a Fire Detection System installed in the same area of coverage as the spray heads. When the detector senses fire, the deluge valve opens and the water flows into the piping system. The guidelines of NFPA 15 were followed in the design, installation, and testing of the water spray systems. Lack of water flow through a deluge valve, within five seconds from the actuation by the automatic detection system is alarmed locally and in the Control Room via the Communications Room. 15

Separate water spray systems with automatic and manual actuation, manual reset, and local alarm and valve with annunciator in both the Communications Room and the Control Room are provided for each of the plant areas listed in Table 9.5.1-5 (see Figure 9.5.1-5). 15

d) Foam Systems manual, semi-fixed type, using fluoro-protein mechanical foam, are provided for the auxiliary boiler fuel oil storage tanks, located in the yard. Each tank is equipped with one fixed, type II discharge outlet and foam maker connected to a fixed piping installation, which terminates at a safe distance from the tank outside the dike, with a capped connection. The necessary foam-producing materials and equipment (foam concentrate line proportioner and hose) are stored in a nearby hose house. The water supply for the foam system is from the yard distribution system, taken from the nearby hydrant.

For extinguishment of spill and diked area fires, auxiliary foam hose stream protection is provided. This consists of a line proportioner, hose, and foam nozzle adapter, which is also stored in the hose house with other foam equipment.

The semi-fixed foam systems for the tanks and the foam hose stream equipment are designed in accordance with NFPA No. 11. After the foam solution is depleted, water will continue to flow through the foam system to provide cooling to protected equipment.

Fire Detection System

The Fire Detection System is designed to detect fires, actuate fire protection equipment, monitor the operating status of fire protection system components, annunciate fire, operation, trouble and actuation signals, actuate local and general fire alarms and identify the location of the fire.

The Fire Detection System provides devices, equipment and wiring required to perform the following functions:

a) Detect the presence of products of combustion through use of ionization type detectors provided on an area basis.

b) Detect the presence of heat from a fire through use of thermal rate compensation type detectors provided on an area basis.

c) Detect the presence of flame through use of ultra-violet type detectors provided on an area basis.

d) Detect the drop in supervising air pressure following loss of integrity of fire protection system piping.

e) Detect the flow of water in fire protection piping.

f) Detect pressure drops in the fire protection water distribution system.

g) Indicate the operation of supervised fire protection control equipment.

h) Actuate sprinkler and water spray system control valves and other accessory equipment required for fire control.

i) Indicate actuation, detection, alarm or trouble signals at local panels and at remote main fire detection control panel.

j) Indicate location of signal origination or identification of monitored equipment.

k) Provide internal supervision of all portions of the detection system, indicate trouble conditions and provide fault diagnostic indications.

l) Actuate localized alarm systems, employing bells, horns, or lights, to alert plant personnel of a fire alarm or a system trouble signal generation.

The Fire Detection System satisfies the following general design requirements:

a) All detection and transmission circuits are Class A as defined in NFPA Std. 72D and 72E. The system is designed to assure minimal signal transmission interruption in event of single circuit or device failure.

b) All fire detection devices and associated equipment are either UL listed and/or FM approved and so labeled. They are installed in accordance with manufacturer's specification and applicable NFPA standards.

c) The system consists of a main signaling loop used to carry all fire and trouble alarms from the local fire detection control panels (LFDCP) to the main fire detection control panel (MFDCP). The alarm signals are transmitted by a solid state digital multiplexing technique. The signal transmission system is completely supervised by automatic built-in-test-equipment and alarmed on the MFDCP when a trouble condition exists. The system power is nominal 24V DC.

Power for operation of fire detection systems and for actuation of fire suppression system is supplied from the balance of plant static uninterruptible power supply. The MFDCP located in the Communications Room supervises the Fire Detection System of the plant including support buildings.
Each fire zone is displayed on the MFDCP as a mimic of each of the LFDCP's. 15
Included on the MFDCP are indicating lights for the operational status of the fire pumps, various suppression systems, and the fire detection signal transmission system. The MFDCP initiates a visual and audible alarm in the
Control Room. 15

The control room operator, after receiving a fire or trouble condition signal at the annunciator, from the MFDCP will be able to sound the alarm and to give instruction to all plant personnel needed for control of the emergency through plant communication systems.

The fire detection alarm panels are supplied from Uninterruptible Power Supply (UPS) Bus #1, which is supplied from the 60 kVa static UPS system. The UPS system in turn is supplied from non-Class 1E motor control centers (MCC). In the event of loss of offsite power, the station 250 volt DC battery which is capable of supplying the 60 kVa inverter for 4 hours, is connected via the 250 volt Bus DP-1-250 to the 60 kVa static UPS system. Bus DP-1-250 is also connected via battery chargers to the Class 1E emergency diesel generator manual load block. Figure 8.1.3-3 shows this configuration.

d) Each local panel displays local alarm, trouble, normal and actuation signals. When a fire condition is sensed by a detector, a white zone light is energized on the detector's respective LFDCP. Whenever there is a fire condition indicated at a LFDCP, an audible alarm, which produces a sound

distinctive from other alarm systems, is activated locally at the fire zone. If there is any required automatic action to be initiated for fire suppression the LFDCP performs this function. In addition, the fire condition is
15 indicated on the MFDCP located in the Communications Room. Any audible alarm can be silenced by means of a pushbutton. Further, any local audible alarm may be silenced without affecting the remote alarm on the MFDCP. All fire detection panels are also equipped with "lamp test" pushbuttons. A graphic
15 display unit is provided for the cable spreading rooms to operate in conjunction with the LFDCP. This unit gives the layout of the fire zone and the exact arrangement and location of fire detection therein. The unit operates on a "first-out" annunciation basis by lighting an indicating lamp representing the initially activated detector.

e) A supervisory system is provided for each detection, actuation and alarm circuit, in accordance with NFPA No. 26. The supervisory system is designed to actuate an audible alarm distinct from the fire alarm and an amber light at the LFDCP as well as an amber light on the MFDCP on the occurrence of any of the following:

1) Loss of electrical integrity in any detection circuit.

2) Loss of electrical integrity in any actuation circuit.

3) Loss of electrical integrity in any alarm circuit.

4) Failure of water to flow within five seconds after any deluge valve release is activated.

5) Operation of any isolation or sectionalizing valves in the Fire Protection System, upstream from deluge, pre-action, multi-cycle alarm valves and strainers away from their normal active position.

6) Availability of operational power to fire pumps.

7) Loss of air pressure in supervised suppression system (pre-action and multi-cycle sprinkler systems).

8) Operation of water flow detection devices.

9) Changes in distribution system water pressure.

f) In general, main loop cables connecting local panels with annunciator panel are carried in separate non-safety cable trays with connections to devices, panels or loop cross overs carried in conduit. Interconnecting cable to system devices generally are carried in conduit.

g) All detectors are readily removable to facilitate periodic testing and maintenance. Detectors are designed in a way that in-place testing can be accomplished by means of a portable testing kit or apparatus.

Fire detection systems (heat, smoke, or flame) are provided in all safety-related areas, or in areas that present potential fire exposure to safety related systems or equipment. Annunciators and alarms are transmitted to the MFDCP, located in the Communications Room, which in turn, alerts the Control Room. 15

Selection of detectors was done on the basis of suitability for the postulated fire. Where cables are present and smoldering insulation was postulated, ionization type smoke detectors, sensitive to products of combustion, are provided. Where charcoal or combustible liquids are present and high heat release was postulated, rate compensated type heat detectors are provided. In areas where flames could be present, ultraviolet fire detectors are provided, as marked on Figures 9.5A-2 through 9.5A-40.

Ionization Detection Systems are provided in areas where it is advisable to detect smoke and products of combustion at an early stage of a fire. Ionization detectors are provided on an area basis which is less than the maximums given in NFPA Standard 72E. Class A circuitry is provided with legs of loop separated except at panel connection points. Not less than two detectors are provided in any single area. Detectors are equipped with an integral signal lamp to indicate alarm condition. Sensitivity of each detector is readily adjustable in the field without disassembly of the detection device. Detectors are sufficiently adjustable to compensate for sensitivity loss due to normal background radiation. Except for loss of sensitivity, detectors are not adversely affected by short-term high radioactivity exposures. Detectors in the Containment Building are capable of operation in a high level radiation environment.

Detector devices are readily replaceable for periodic testing and maintenance. Wiring and connections for each detection device have the capability for circuit continuity testing prior to detector device installation.

Detection devices are so located within an area to minimize delayed detection, or loss of sensitivity due to air current, or to obstructions, such as ductwork, piping, cable trays, conduit runs, ceiling or roof beams, equipment, and floor openings.

Circuitry between detection devices and local panels are capable of supplying required operational power and device circuitry operational status supervision following any single break in the circuit or failure of any one component.

Thermal Detection Systems are provided in the same areas where automatic sprinkler systems are installed and are used for actuation of sprinklers. Thermal detectors are provided on an area spacing basis which is less than the maximum specified in NFPA Standard 72E, and are of a rate compensated or rate anticipated/fixed temperature type. Each thermal detector has a minimum temperature setting of 30 F above environmental conditions for the location in which they are used. Sensitivity of detectors is not field adjustable.

Thermal detectors interfaced with a fire extinguishing system (pre-action or multi-cycle) automatically reset themselves after an alarm-condition dissipates. This action resets the multi-cycle system automatically after a preset time delay. The pre-action sprinkler system is manually reset at the valve. Any electrical circuit associated with the pre-action sprinkler system is reset manually from the LFDCP. Loss of supervisory current actuates sprinkler control valves allowing water flow into the sprinkler distribution piping.

Detectors require no replacements after a fire alarm to restore them to normal operation. The number of detectors is determined by the physical layout of sprinklered areas with no less than two detectors provided in any area.

Thermal detectors have the same plug-in, wiring, operating voltage, and interchangeability feature as ionization detectors. They are continually supervised and deenergized to alarm. Detectors are not adversely affected by short term high radioactivity exposures.

Thermal detectors used outdoors (transformer bays) or near equipment in large ceiling areas (reactor coolant pumps) have a heat collecting canopy.

Ultraviolet Flame Detection Systems are provided in areas where oil is present, for example Diesel Generator Building and fuel oil pump area.

Flame detectors operate on a principle using a Geiger-Mueller gas type cathode tube designed to detect flame-radiated rays in the extreme low end of the radiation spectrum. They are of split-architecture construction having a NEMA 7, explosion-proof housing. They use a quartz lens, have a built-in checking system for optical integrity, and have the capability to reject high intensity ultraviolet radiation emitted from sources such as lightning by using an internal time delay circuit. Each has a swivel mounting assembly suitable for vertical or horizontal mounting.

Each flame detector controller is capable of operating more than two flame detectors and is mounted in the associated LFDCP for the fire detection zone.

Manual Fire Alarm Stations are provided throughout plant operating areas, located to be readily accessible for employee use in signaling the existence of an observed fire condition. To the extent feasible, manual fire alarm stations are grouped with fire extinguishers and hose stations. In addition to initiating a fire alert, manual fire alarm stations are used to actuate water flow to associated sprinklers or water sprays.

Single action manual fire alarm stations are used in conjunction with fire zones with ionization, air duct, or ultraviolet detectors for early warning alarm. All single action stations are non-code signaling system, non-break-glass type, with a key operated test-reset lock in order that they may be tested. The station is designed so that after actual emergency operation, it cannot be restored to normal except by use of a key. An operated station automatically conditions itself so as to alarm visually, when operated, detectable at a minimum distance of a 100 ft., front or side depending on location. This is accomplished by a pull lever. Stations are suitable for surface mounting and have a weatherproof NEMA 3 housing. Stations are electrically supervised from the LFDCP. Stations are UL listed or FM approved and in compliance with NFPA-72A.

Double action manual fire alarm stations are used in conjunction with thermal detectors that actuate various automatic fire extinguishing systems. They have features similar to single action stations. However, in order to activate the circuit two distinct operations must be performed. This is accomplished by pushing a tab and pulling a lever.

Air Duct Detectors are provided within HVAC duct systems to indicate presence of smoke and guide the control room operator to initiate from the Control Room the remote manual control of the system dampers, as required, for the selection of clean air intake of the operation of smoke removal systems (refer to Section 9.4). These detectors provide operating information for proper control of ventilating systems, in compliance with the NFPA 90A recommended practices. Indication from air duct detectors are connected to the LFDCP.

Backup Fire Response Capabilities

Fire protection systems for the plant are based on the concept of defense in depth. Each plant area is provided with more than one means of controlling and extinguishing fires.

Fire extinguishers, provided for early use on incipient fires by employees responding to a fire incident, are backed up by standpipe hose stations located throughout the plant for use on fires beyond the capability of extinguishers. Ionization type smoke detection systems are provided for early warning and alarm of an incipient fire. Ultraviolet detectors and manual fire alarm stations are also provided for detection of fires and alarm.

If the fire area contains sufficient combustibles that a fire may be beyond the control of extinguishers and hose lines or if the area is not readily accessible for manual fire control efforts, the installed fire suppression systems, such as sprinklers, or water sprays, will operate to limit the fire spread and control and suppress the fire. Thermal detection systems are used for actuation of automatic suppression systems.

As a backup to fire protection systems and equipment provided in the fire areas, hose lines may be laid from yard hydrants to permit discharge of fire streams into areas extensively involved in a fire.

Ultimate backup for plant fire control efforts is provided by letters of agreement from nearby volunteer fire departments. Manpower and mobile equipment may be used to supplement plant fire operations and equipment. The effectiveness of outside fire department involvement is directly related to the degree of preplanning and training given to all groups involved. These are detailed in the plant fire emergency response plan (see Section 9.5.1.5). 2

9.5.1.2.4 Fire Protection of Safety Related and Special Plant Areas

Areas containing particularly hazardous materials are considered in the fire hazard analysis and separation, special criteria or protection, ventilation, penetration protection, construction, detection and suppression system and supplemental fire equipment requirements are developed in the analysis.

The design includes as required:

a) fire detection

b) standpipes and hose stations

c) portable fire extinguishers

d) drainage

e) fire suppression systems

f) isolation

g) ventilation

h) fire rated barriers

i) construction techniques

The protection and extinguishing systems provided to protect the Control Room of the SHNPP and other operating areas containing safety related equipment, special equipment and cables are as follows:

a) The Control Room - The control room air lock envelope is separated
15 from all other plant areas by three hour fire walls, ceiling slabs, and floors.

All cabling entering the Control Room terminates there. There is no cabling routed through the Control Room from one fire area to another. There are no raised floors in the Control Room. The underfloor trenches for cables were reduced to the minimum possible. A cast-in-place concrete trench of approximately 11 ft. long, 2 ft. wide, 8 in. deep is provided under the HVAC
15 control board located in the Control Room. Covers were not provided for the trench, because of its small size and location, internal to the HVAC control board.

Standpipe hose stations are located outside the Control Room The immediate availability of these hose lines, together with the location of carbon dioxide and pressurized water portable fire extinguishers within the Control Room, provide adequate manual fire protection capability for fires originating within a cabinet or console, or exposure fires involving combustibles in the general room areas. Floor drains located in areas adjacent to the Control Room provide drainage of fire suppression water.

Nozzles approved for use on energized electrical equipment are provided at hose stations near the Control Room. They satisfy both actual fire fighting needs and electrical safety providing protection against electric shock to the operators and minimizing physical damage to electrical equipment from hose stream impingement.

Ionization type smoke detectors are located throughout the Control Room at ceiling level. All information from plant fire detection is transmitted to
15 the Control Room via the main fire detection control panel (MFDCP) located in the Communications Room, providing alarm and annunication. The Control Room cabinets, panels, and consoles are of the self ventilating type permitting smoke to quickly migrate to the ceiling of the room. Rapid migration of combustion by-products and quick response by highly

sensitive ionization type detectors mitigates the need for detection within cabinets and consoles.

Self-contained breathing apparatus is available for use by operators until the installed room ventilation system can evacuate the smoke.

The Control Room is designed for a positive pressure minimum air leakage envelope (see Section 6.4).

Smoke detectors are provided at the outside air makeup inlet so that smoke induction into the Control Room can be minimized by manual switchover to other inlets following smoke alarms transmitted to the Control Room. The normally recirculating (with limited makeup air) Control Room Area Ventilation System is designed so that it may be switched manually to operate in a nonrecirculating mode. This is used only for clearing the Control Room of heavy smoke concentration.

b) Primary and Secondary Containment (Figures 9.5A-2 through 9.5A-5)

1) Normal Operation - Fire protection systems and equipment are provided in the containment areas as required for most effective fire control recognizing the different types of operations in the area, accessibility and available personnel usage.

The following hazards have been identified and protection is installed in each Containment as follows:

(a) Cable penetrations, reactor coolant pumps, and external surfaces of charcoal filter housing are protected by an automatic multi-cycle sprinkler system. Closed sprinkler heads and supervisory air pressure provide adequate safeguards against inadvertent actuation. Valving and electrical equipment associated with the system are located outside the Containment Building, inside Reactor Auxiliary Building at Elevation 236 ft.

(b) The amount of transient fire loading in the Containment is strictly controlled and limited through administrative procedures.

Fire protection system operation does not compromise the integrity of the Containment or the other safety related systems. Total containment requirements are satisfied (i.e. control of contaminated liquid, gaseous and ventilation releases).

Heat and smoke detectors, alarming an annunciating in the Control Room via MFDCP located in the Communications Room are installed as follows: 15

(a) Rate compensated type thermal detectors are installed in the reactor coolant pump zones, over the charcoal filter housings and above cable tray runs in the electrical penetration areas for actuation of the multi-cycle sprinkler system.

(b) Ionization type smoke detectors are installed over the major cable tray runs.

(c) Early warning detection is provided in the Containment on a general area basis in installation of ionization type detectors in the air recirculation system ahead of the filters.

2) Refueling and Maintenance - During refueling, maintenance, and operations in Containment, additional hazards such as contamination control materials, decontamination supplies, wood planking, temporary wiring, welding and flame cutting may introduce additional fire hazards. When personnel and transient materials are present in the containment areas, fire hazards and protection of combustible materials are controlled by administrative procedures.

Fire detection and suppression systems, to the extent practical, remain operational during refueling and maintenance.

One and one-half inch hose connections, equipped with 100 ft. of hose and water spray nozzles, approved for use on energized electrical equipment and on combustible liquid fires, are permanently provided in the Containment Building as standby fire extinguishing equipment for use during refueling and maintenance. Water supplies for the hose connections are shut off during normal operation by means of shutoff valves located outside the Containment Building. Therefore, during normal operation the standpipe and hose system piping remain drained.

Self-contained breathing apparatus and portable fire extinguishers are provided near the containment building entrances.

3) Cable Spreading Room (Figure 9.5A-9) - The primary fire suppression system in the Cable Spreading Room is an automatic pre-action sprinkler system actuated by rate compensated thermal detectors, located at the ceiling level. Ionization type smoke detectors, are installed for early warning of the presence of products of combustion. Local alarm and annunciation and in the Control Room
15 via the Communications Room is provided. The local alarm for each Cable Spreading Room is a graphic display located at the LFDCP, which shows the cable spreading room layout and the location of each ionization detector. The graphic display is designed to indicate the location of the detector which alarmed first, to direct the manual fire response to the origin of the fire.

Electric cables used are of a construction which passes the flame test required by IEEE-383, and which will not fault electrically when exposed to fire suppression water discharge.

Manual hose stations and appropriate portable extinguishers provide backup fire protection for the automatic pre-action sprinkler system. Floor drainage is designed to handle the design sprinkler system discharge with minimal surcharge, overflow to adjacent areas, and discharge to storm drain system (refer to Section 9.3.3).

Multiple doors are provided for each Cable Spreading Room, as detailed in the fire hazards analysis, to insure ingress to and egress from these rooms for effective fire control. Aisle space for access within Cable Spreading Rooms was provided based on necessity for service and maintenance for each cable tray, therefore sufficient aisle space exists to insure effective manual fire fighting within the Cable Spreading Rooms.

Inside safety related Cable Spreading Rooms (RAB, Elevation 286 ft.) the cable trays are stacked from floor to ceiling, having a space of 12 in. measured from bottom to bottom of each stacked tray.

Redundant safety related cable divisions of the plant, in cable spreading rooms are separated from each other and the rest of the plant by walls, floors, and ceiling slabs having a minimum fire rating of three hours and Class A fire doors, in accordance with NFPA 251.

Smoke venting of the cable spreading area is accomplished using the normal partially recirculating ventilation system, which is capable of once-through purge operation.

4) Computer Room (Figure 9.5A-10) - The Computer Room is located adjacent to the Control Room. The Computer Room is separated by three hour fire barrier wall and a type "A" fire door from the Control Room. The room is equipped with an automatic, ionization type detection system, alarming locally and alarming and annunciating in the Control Room. Smoke purging capability is provided as described in Section 9.4.5. 15

There is a cable trench, limited to the Computer Room only, cast in the concrete floor of the room (i.e., cast in-place concrete raceway with covers), containing interconnecting cables for the computer. Drainage for water resulting from use of a fire suppression system is provided by area floor drains. An adequate supply of halon and carbon dioxide type portable extinguishers is provided for manual fire control.

5) Switchgear Rooms (Figure 9.5A-9) - The Switchgear Rooms used in connection with safety related equipment are separated by three hour fire walls from other plant areas. 15

The rooms are equipped with ionization type detectors, which alarm and annunciate in the Control Room. Standpipe connections for 1-1/2 in. hose stations are provided for this area. Drainage of fire protection water is through regular floor drains. Portable carbon dioxide extinguishers are provided for manual fire control.

The number of cables passing through the Switchgear Rooms has been minimized. Exposed cables of a redundant safety train do not pass through the other train's Switchgear Room.

6) Remote Safety Related Panel Figure 9.5A-9 - Automatic
15 ionization type fire detectors that alarm locally and alarm and annunciate in the Control Room are installed in the safety related panel areas. Portable fire extinguishers and hoseline connections are available in the areas for manual fire protection. Combustible materials are closely controlled in these areas.

15 7) Battery Rooms (Figure 9.5A-9) - Battery Rooms are separated by three hour fire barriers. Battery chargers are so regulated that overcharging, with resultant liberation of free hydrogen gases, is minimized. Rooms are provided with adequate ventilation (see Section 9.4.5.2.3) to maintain the concentration of hydrogen gas released into the room air below the specified limits. Air flow switches are provided for the battery rooms with alarm and annunciation in the main control room as depicted in FSAR Figure 7.3.1-21, Sheets 1 of 11, 2 of 11, 9 of 11, and 10 of 11.
15 Battery rooms are protected by standpipe and hose connections and portable extinguishers, located in adjacent areas.

8) Turbine Lubrication and Control Oil Storage and Use Areas
15 (Figures 9.5A-34 through 9.5A-39) - The turbine generator section of the plant is separated from safety related areas of the plant by three hour rated fire walls, with Class "A" fire doors.

9) Diesel Generator Areas (Figures 9.5A-21 and 9.5A-22) - The Diesel
15 Generator Building is located approximately 175 ft. from the main plant structure. The diesel generators and the day tanks are each separated by three hour fire barriers. These compartments are ventilated to avoid accumulation of oil fumes. These compartments are protected by automatic multicycle sprinkler systems, backed up by yard hydrants and hoselines and carbon dioxide and dry chemical portable extinguishers.

Due to spatial separation of this building from the main structure and to the fire barrier separations between redundant equipment, which precludes safe shutdown capability impairment from a single fire incident, interior standpipe hose stations, operable post SSE, have not been provided in these areas.

Thermal detectors are used for actuation of the multicycle sprinkler systems and detection of heat over the air starting units zone. Ionization type smoke detectors are installed in the electrical room. Ultraviolet detectors are installed in the diesel engine and exhaust silencer rooms. All detection is alarmed locally and in the Control Room. Drainage for the removal of fire protection water and the oil it may contain is routed to the building sump and from there is discharged to the yard oil separator (see Section 9.3.3). The ventilation systems serving these areas provide for smoke venting.

Each tank has 3,000 gal. capacity, based on six hours of diesel
generator operation without resupply. The tanks are segregated from
the diesel generator areas and from each other by three-hour barriers.
An automatic multi-cycle sprinkler system is provided to protect the
day tanks. The tank and associated oil piping are designed to Seismic
Category I, assuring a high degree of system integrity, minimizing the
chances of oil spills and, thus, of fires in the area. Each day tank
enclosure is provided with a non-recirculating ventilation system for
normal fume removal. As described in FSAR Appendix 9.5A.18, the
size of the day tank will not impact the safe shutdown of the plant in
case of a fire.

10) Diesel Fuel Oil Storage Area (Figure 9.5A-23) - The below grade
diesel fuel oil storage tank and transfer pump building are located 15
approximately 600 ft. from the Diesel Generator Building and
approximately 150 ft. from the principal plant structures. Redundant
transfer pumps are separated by three hour fire barriers. An
automatic multi-cycle sprinkler system is provided in pump 15
areas, actuated by a rate compensated detector annunciating to the
transfer pump area. Drainage to the yard oil separation system is
provided to accommodate sprinkler discharge (see Section 9.3.3). A
non-recirculating ventilation system is provided for normal fume
removal and smoke exhaust. Carbon dioxide and dry chemical
extinguishers are provided in and adjacent to the transfer pump area.
Yard hydrants and hoselines are used for backup protection.
Ultraviolet detectors are provided in each transfer pump room for
flame detection. They are alarmed and annunciated locally and in the
Control Room.

11) Safety Related Pumps - Safety related pumps in the main plant
area are segregated by physical barriers between pumps when
significant combustible loading is present in the immediate area of 15
the pumps or if the pumps have an integral oiling system with
capacities in excess of five gal. of oil. In addition, smoke or heat
detectors are installed and curbs are provided to the extent practical
in the areas where integral lube oil systems exceed five gal. of oil.
Where pump oil capacities exceed 50 gal., an automatic fire 15
extinguishing system is installed. Portable extinguishers and
standpipe hose stations are provided for manual fire protection in all
pump areas. Floor drains are designed to accommodate expected water
discharge from fire extinguishing systems. Equipment pedestals or
curbs and drains are provided. Concrete floors surrounding the
pedestals or pads are sloped to floor drains at low points. Smoke
removal is ensured for specific areas by the use of normal ventilating
systems.

12) New Fuel Area (Figures 9.5A-14 and 9.5A-15) - New fuel
unloading, new fuel storage, and spent fuel pool areas are located in
the Fuel Handling Building. This building is cut off from other 15
structures by three-hour fire barriers. Operations in this building
are not related to safe shutdown of the reactor, but safety related 15
equipment is present in this building.

Combustible loading is minimal. Hand portable extinguishers and standpipe hose stations are installed throughout the building.

Location of the hose stations in the new fuel storage area and wetting by fire protection water is considered acceptable, because the new fuel storage racks are designed to retain the subcriticality of the storage array even when flooded by unborated water. Due to the absence of combustible materials and the large room volume and excessive ceiling height, automatic fire detectors are not provided in general areas. However, in confined areas where safety related equipment is present, detectors are provided. For example, in the HVAC areas (FHB Elevation 261), which contains the Emergency Exhaust System, thermal detectors are provided over the charcoal filters, for actuation of the multi-cycle sprinkler system, and ionization type smoke detectors are provided inside the MCC room. Manual fire alarm stations are located throughout the Fuel Handling Building near hose stations with local alarm and annunciation in the Control Room.

13) Spent Fuel Pool Area (Figures 9.5A-14 and 9.5A-15) - Protection for the spent fuel pool area is provided by portable extinguishers and hose stations. Due to minimal combustible loading in this zone and excessive ceiling height, fire detectors were not provided in general areas. However, in confined areas where safety related equipment is present, such as spent fuel pool cooling pumps and heat exchangers, thermal, rate compensated detectors are provided for the actuation of the multi-cycle sprinkler system installed in the room. Manual fire alarm stations are provided in strategic locations thoughout the Fuel Handling Building, usually near a hose station. They will alarm and annunciate in the Control Room.

14) Waste Processing Building (Figures 9.5A-6, 9.5A-8, 9.5A-14, 9.5A-18, and 9.5A-24 through 9.5A-33) - Waste processing areas in the
15 Waste Processing Building separated by three-hour fire barriers from other plant areas. Administrative offices, locker rooms, and laundries are separated from other areas in the building. The ventilation system within this building is independent of any other plant ventilation system. Portable extinguishers, standpipe connections for 1-1/2 in. hose, and manual fire alarm stations are provided throughout the building.

Pre-action sprinkler systems, controlled by automatic thermal detection systems, are provided on Elevation 261 ft., 276 ft., and 291 ft. (Figures 9.5A-27, 9.5A-29 and 9.5A-30), thus protecting administrative offices, various storage areas, hot and cold laundry, and the area over charcoal filter housings. Ionization type smoke detectors are provided over major cable tray runs.

15) Decontamination Areas - The decontamination areas are located in
15 the Waste Processing Building at Elevation 211 (Figure 9.5A-24) and in the Reactor Auxiliary Building at Elevations 236 ft. and 261 ft.

(Figures 9.5A-7 and 9.5A-8). They are not used for storage of combustible liquids or combustible materials.

Decontamination areas in the Reactor Auxiliary Building is protected 15
by multi-cycle sprinkler systems actuated by rate compensated thermal
detectors alarming locally and alarming and annunciating to the
Control Room via the Communications Room. Backup protection is 15
provided from standpipe hoselines and portable extinguishers.

Decontamination areas in the Waste Processing Building are equipped
with automatic smoke detectors and are protected by standpipe
hoselines and portable fire extinguishers. Manual fire alarm
stations are provided at strategic locations throughout the building,
in the vicinity of hose stations. They alarm locally and
annunciate in the Control Room via the Communications Room. 15

16) Safety Related Water Tanks (Figure 9.5A-11) - The refueling water storage tank, reactor makeup water storage tank, and the condensate storage tank are located in the Tank Building. Standpipe hose stations and portable extinguishers are provided. No safety related tanks are exposed to the outdoors, with the exception of the reactor makeup water storage tank and the refueling water storage tank which are located in the open within the Tank Building (see Figure 9.5A-11).

17) Cooling Tower (Figure 1.2.2-1) - The hyperbolic
Cooling Tower is of non-combustible construction. Its basin is not 15
utilized for decay heat removal or for fire protection water supply.
Yard hydrants and hoselines are provided in the immediate vicinity of
the cooling tower at strategic locations. 15

18) Miscellaneous Areas (Figure 1.2.2-2) - Miscellaneous areas such as plant administrative offices, shops, warehouses, and auxiliary boilers are located so that a fire or effects of a fire, including smoke, do not adversely affect any safety related systems or equipment, since most will be located in separate, detached buildings. Fire protection consisting of sprinklers, standpipe and hose stations and portable extinguishers are provided, as dictated by the fire loadings present in these areas.

The record storage facility is enclosed within 2 hour fire rated barriers constructed in accordance with ANSI N45.2.9 as referenced by Regulatory Guide 1.88. It is located in the Administration Building, separate from main plant structures and does not present a fire exposure to any safety related equipment, therefore BTP CMEB 9.5-1 does not apply. Fire protection for the record storage facility is in accordance with NFPA standard 12A and consists of an automatic Halon 1301 system, providing a 5 percent to 8 percent concentration within ten seconds from the discharge. A thermal detection system is installed for the automatic release of the agent. An automatic ionization detection system is installed for early warning of a smoke condition and automatic closure of dampers and fire doors. Fire protection for the Administration Building consists of a sprinkler system, portable extinguishers, and standpipe hoselines.

The fuel oil tanks for auxiliary boilers are above ground surrounded by dikes sized to contain the entire tank content of oil and are equipped with a semi-fixed manual foam system.

19) Storage Areas for Dry Ion Exchange Resins (Figure 1.2.2-2) - Bulk resins storage is maintained in an area that does not house or expose areas containing safety related systems. Portable extinguishers and standpipe hoselines are provided for these areas.

Selected storage areas are adequately drained, and curbed as necessary.

20) Materials Containing Radioactivity (Figure 1.2.2-2) - Materials that collect and contain radioactivity such as spent ion exchange resins, charcoal filters, etc., will be stored in metal containers located in areas which do not expose safety related systems or equipment.

21) Hazardous Chemicals (Figure 1.2.2-1) - Bulk hazardous chemical storage is maintained in an area that does not house or expose areas containing safety related systems.

Portable fire extinguishers are provided. Hoselines are provided for those chemicals which will not react with water.

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9.5.1.3 Safety Evaluation (Fire Hazard Analysis)

The fire protection program has been designed to allow the plant to maintain the ability to perform safe shutdown functions and minimize radioactive releases to the environment in the event of a fire. The effectiveness of the fire protection program is verified through the fire hazards analysis by evaluation of fire hazards, postulation of realistic potential fires, and assessment of effects of these fires in fire areas throughout the plant.

The purpose of the fire hazard analysis is to demonstrate that fire protection facilities, suitable for control of the area hazards, have been provided. During the analysis, the following considerations were addressed:

a) Spread of fire (direction, speed, intensity) assuming a point of ignition and other possible effects of the fire.

b) Potential extent of damage to essential equipment, loss of safety function, or of radiological release to the environment.

c) Containment of the fire and its consequences within the considered fire area, and/or effect on other fire areas.

d) Provision of detectors properly located to sense area fire or smoke conditions so that prompt fire control response can be made.

e) Effective use of manual fire control equipment and backup systems.

f) Adequate smoke removal to permit personnel to enter the fire area, assess the fire condition, and use manual equipment.

g) Effects of damage, smoke and heat from the postulated fire on required operation of essential equipment in the area.

h) Protection of redundant systems, equipment or trains, if located in the same fire area, to maintain operability. Separation or isolation of redundant equipment.

The fire hazard analysis was initiated by establishing the fire areas listed
in Table 9.5.1-1. These are delineated in (Figures 9.5A-2 through 9.5A-40). 15
Boundaries for these areas were based on the nature of occupancy of the plant
space, the amount and distribution of combustible materials within the area,
and the location of safety-related systems and equipment.

Plant areas important to the plant's capability for safe shutdown, such as electrical penetration area, cable spreading rooms, diesel generator areas, switchgear and battery rooms, were designated as fire areas. Other plant areas were considered as fire zones within the overall building fire areas.

Fire areas are bounded by barriers with construction that provide a minimum three hour fire rating. Fire zones within fire areas may be founded entirely or partially with barriers having three hour fire rating or less or may be defined by the area limits of fire protection systems or of occupancies of different nature based upon the results of the fire hazard analysis.

For each of the designated fire areas, listed in Table 9.5.1-1, the fire hazard analysis, as detailed in Appendix 9.5.A, covers the following:

a) Identification

b) Occupancy

c) Boundaries

d) Combustible Loading

e) Control of Hazards

f) Fire Detection

g) Access and Initial Response

h) Fire Suppression Systems

i) Analysis of Effects of Postulated Fires

j) Fire Area Equipment

The content of each part of the fire hazard analysis is described briefly in the analysis methodology below:

a) Identification - The portion of the plant covered in each fire hazard
analysis is identified by elevation building, area, zone or room, as 15
applicable. Reference is made to figures on which the configuration of

the space is shown. Approximate dimensions are given primarily to indicate the magnitude of the area relative to the total plant structure.

b) Occupancy - Major operational equipment or systems (both safety and non-safety related) located in the room, zone or area are identified to define the general nature of occupancy or use of the area. Identified major equipment is assumed to have a normal complement of associated controls, wiring and cabling, required for its operation.

A detailed listing of major equipment and supporting facilities, as well as their function, is given in Part 10 of each area fire hazard analysis.

c) Boundaries - The construction of walls, floor and ceiling or roof of each fire area is described. Where applicable, the fire resistance rating of barriers is given.

The use of structural steel or equipment support members in the area is indicated and, where required, the type of protection provided to minimize heat damage effects.

The type of fire rating is given for closures of access openings provided in boundary fire barriers for movement of personnel and handling of equipment. (Fire-stop protection for service penetrations of fire barriers is described in Part 5 of each fire hazard analysis).

d) Combustible Loading - The severity of fire that may develop and the damage that may result in the most extreme fire occurrence in a fire area is a function of the amount of combustibles present and the total heat of combustion generated. As combustibles in an area are not point-source source concentrated, a more realistic measure of the relative fire hazard or exposure to fire damage of an area is determined by spreading this combustible loading over the floor area of the space or, in the case of a localized concentration of combustibles, over the floor area within the sphere of influence of the postulated fire.

The configuration of fire loading varies from area to area. Some areas are devoid, or essentially so, of combustible materials; other areas contain one or more localized fuel concentrations, spatially separated from each other. A localized concentration of combustible material is delineated by finite parameters beyond which the fire loading is sharply reduced. Examples of local fuel concentrations include cable insulation in MCC units or electrical cabinets, charcoal beds in filter housings, oil in equipment reservoirs, waste materials in containers or on skids, and similar items. Linear concentrations of combustibles are usually associated with cable trays either solely within the fire area or extending through several fire areas by penetration of intervening fire barrier walls.

To simplify the calculation of area combustible loadings, conservative calorific values, based on National Fire Protection Association Handbook and specific manufacturer's data (for cables), were adopted for classes of combustible materials which were representative of heat values of specific materials grouped within the class. These are:

Ordinary Combustibles	8,000 Btu/lb.
Combustible or Flammable Liquids	20,000 Btu/lb.(108,000 Btu/gal.)
Charcoal	10,000 Btu/lb.

Combustible loading for minor amounts of grease, integral with equipment, not exceeding one lb. each, was not inventoried since it does not create a significant fire hazard.

Using manufacturer's data on cable construction of typical cables used in SHNPP and the Btu content of the isolation materials, Btu values were derived for each running foot (RF) of 24 in. wide, 40 percent loaded, power, control and instrumentation cable trays.

These are:

Power	180,000 Btu/RF
Control	157,000 Btu/RF
Instrumentation	95,000 Btu/RF

These values are adjusted proportionally for trays of different width or cable tray loading.

The combustible loading for all cables routed in conduit, cast concrete trenches, or contained within metallic cabinets or consoles was not inventoried since they do not create a fire hazard.

In addition to the combustibles normally present in an area, transient combustibles which might realistically be introduced into areas as a part of planned operation are considered, as detailed in fire hazard analysis for each fire area or zone. In most cases, the introduction of transient combustible materials into areas where such material may expose safety related equipment will coincide with scheduled station maintenance. Combustible materials that may be introduced in quantities sufficient to require special attention include:

1) Construction materials - (i.e., scaffolding, shoring, forms, etc.)

2) Resins in bulk quantities and associated packaging materials

3) Charcoal

4) Combustible liquids (lubricating oils and paints)

5) Grease

6) Plastic bags and protective sheeting

7) Packaging materials and containers (plastics, wood, paper, etc.

8) Flammable liquids and gases (solvents and volatile fuels)

9) Rags

10) Anti-contamination clothing

The quantity, movement, use and handling of all such materials as well as the provision of supplemental fire protection measures will be administratively controlled in the plant through written procedures. For this reason, the fire loss exposure resulting from the addition of transient combustibles in an area during these periods of increased plant surveillance, strict procedural control, and augmented area manning has been considered as being no greater than that from the inventories of nontransient combustibles normally present in each area, except for major plant outages.

After inventory of all combustible materials in a fire area within the proper class, total Btu and Btu per sq. ft. values are calculated and then summed to indicate the total combustible fire loading for the overall fire area.

The derived combustible fire loading of an area is then used to compare the area fire hazard relative to those of other fire areas, to judge the adequacy of the area boundary fire barriers, and to verify the proper selection of adequate fire control and suppression systems and equipment.

As a generally accepted fire protection practice, each fire loading increment of 80,000 Btu/sq. ft. indicates the need for an additional one hour of fire rating for the barriers. The relative fire hazard of an area may be considered as low if the combustible fire loading is below 80,000 Btu/sq. ft., moderate if below 160,000 Btu/sq. ft. and high if above 160,000 Btu/sq. ft.

e) Control of Hazards - Supplemental building features are provided to maintain the integrity of area boundaries and to separate and control hazards within the area. These include fire barrier service penetration fire-stops and seals, confinement and disposal of flammable or combustible liquids, isolation of equipment and cabling, removal of smoke, and control of radioactive releases.

f) Fire Detection - Areas provided with fire detection systems are identified by the type of detectors used and the design basis for their selection is stated. The location of the local panel serving the detectors is given and the functions of the local panel for signal annunciation, local alarm and fire protection system actuation are indicated. For each detection system, the transmittal to the main fire detection control panel of signals for annunciation and for alarm is indicated.

g) Access and Initial Response - The means of access to the area from adjacent corridors, stair towers, adjoining buildings or yard areas is described. The type of portable fire extinguishers and hose stations provided for use by personnel responding to the area is given.

h) Fire Suppression Systems - The fire suppression systems provided in the area are described, indicating type, coverage, actuation and supervision. Protection of plant equipment against damage from the operation of the fire protection system and disposal of sprinkler discharge water is covered.

i) Analysis of Effects of Postulated Fires - The effect of the most severe postulated realistic fire in the area on the capability of the plant to achieve safe reactor shutdown and to minimize radioactive releases to the environment is analyzed.

In the analysis, the type and quantity of combustibles is identified and the means of limiting the combustibles involved in the fire and of limiting the damage are described. The most significant combustible load is selected for the postulated fire and the means of detection of the fire is indicated. Ability of employees to gain prompt access to the affected area for initial manual response to the fire is described. If provided, the operation of backup fire suppression systems is described.

The extent of the fire damage to the area and equipment is estimated using manual fire response facilities and, additionally, with automatic fire extinguishing systems where installed. The impact of the fire on the capability of the plant for safe shutdown and for control of radioactive releases is then assessed.

j) Fire Area Equipment - Mechanical and electrical equipment both safety and non-safety related shown on the plant general arrangement drawings for each fire area is listed. The structure, system or equipment named is identified by number and safety class: its safety function is indicated, and the separation provided between redundant units is described.

The effects of failures in fire protection systems and equipment on the overall fire protection of the plant and on safety related equipment in the plant, and design features to minimize these effects on the plants habitability and its capability for safe shutdown are discussed in the description of these systems (Section 9.5.1.2) and in the individual fire hazard analysis as pertinent.

9.5.1.4 Inspection and Testing Requirements

a) Construction and initial acceptance period operational integrity of the Fire Protection System is assured by:

1) Inspection of fire protection system components and equipment according to design specifications and procurement documentation;

2) Installation of the Fire Protection System according to accepted industry practice;

3) Inspection of the installed Fire Protection System against design-specified standards or criteria;

4) Testing of the Fire Protection Systems against design performance criteria. These systems are subjected to preoperational and startup tests as described in Section 14.2.2.

As an integral part of the fire protection system design, features were included to facilitate inspection and testing of Fire Protection Systems. For example, the fire pumps are provided with testhose manifolds; the automatic sprinkler, water spray, or deluge system control valves are fitted with flow-test connections and pressure gages; and detector relays and panels, and fire-pump controllers are equipped with test circuit connections. After installation, acceptance tests are performed in accordance with NFPA standards and Section 14.2.12. (See also description of Fire Protection Quality Assurance Program, Section 9.5.1.5).

b) Continuing Plant Operation Period - Operational integrity of the various components of the Fire Protection System provided as part of the plant design will continue to be assured through the implementation by the plant of detailed procedures for periodic inspection and testing. These procedures will be based on the guidance given in applicable NFPA standards and regulatory guidelines. Findings of these inspections and tests as well as the progress of indicated corrective actions, if required, will be documented.

Periodic tests are required, as described in the Technical Specifications (Section 16.2).

These detailed procedures will be developed as an integral part of the plant operating procedures. (See Section 9.5.1.5.c).

9.5.1.5 Personnel Qualification and Training

a) Fire Protection Engineering and Plant Personnel Fire Training Fire Protection Engineer Qualifications - In order to provide a unified and effective Fire Protection System, qualified fire protection engineers and/or consultants are providing the necessary expertise, during conceptualization, design, construction, testing and startup periods. In the course of this work, they:

1) Analyze fire hazards and potential loss exposures in all plant areas;

2) Establish fire protection system requirements to minimize and control loss exposures;

3) Promulgate fire protection criteria to be satisfied in all phases of plant design and development of operational procedures;

4) Assist and consult in the design of various components of the Fire Protection System and in the selection and development of fire protection equipment;

5) Develop overall and specific fire protection programs, including:

(a) Inspection, testing, and maintenance of installed and portable Fire Protection Systems and equipment,

(b) Fire-hazard inspections of operating areas,

(c) Operation of fire-control organizations, and

(d) Fire training of plant and fire brigade personnel;

6) Assist and consult in the inspection and testing of completed components of the Fire Protection System; and

7) Assist and consult in the training of personnel and in the institution of effective plant fire prevention and protection programs.

The extent of training, experience, and education of the personnel utilized for the above work is equivalent to that required to qualify for the grade of Member in the Society of Fire Protection Engineers which includes applicable experience in consultation covering:

1) Fire-safe design and construction of new plants and facilities,

2) Identification of structural requirements for fire safety,

3) Segregation and reduction of hazards creating loss potentials, and

4) Specification of fire protection and control equipment. This experience is of a quality and to a technical depth that, applied in the design and commissioning of a nuclear power plant, is adequate to:

(a) Achieve basic safety from fire, explosion, flood, windstorm, and other perils,

(b) Mimimize loss probability,

(c) Assure conformance with regulatory requirements of Federal, State, and Local authorities,

(d) Assure compliance with nationally recognized fire protection standards and codes, and

(e) Satisfy insurance carrier requirements.

b) Plant Personnel Fire Training - Training in the recognition, reduction, and control of fire hazards and in the confinement, control, and extinguishment of postulated and actual fires will be provided to all plant operational people, and, in greater detail, to those who are members of the plant fire brigade. Specialized training will also be provided to those personnel who are responsible for the inspection, testing, and maintenance of installed and portable fire protection equipment in the plant and the recording of these activities. (Training is described in greater detail in the Fire Protection Procedure, Section 9.5.1.5.e). | 2

c) Administrative Procedures - Administrative procedures required for maintaining the performance of the plant Fire Protection Systems and personnel are described in the Fire Emergency Response Plan, Section 9.5.1.5.e.

Procedures under the Fire Emergency Response Plan assign responsibilities by organization titles for routine testing and inspections of the fire detection and protection systems, and will prescribe frequency and detailed procedures for testing.

The plant procedures contain instructions to maintain fire protection capabilities during periods when the Fire Protection Systems or other fire defenses are impaired and to control hazardous operations during normal or maintenance periods. The latter include:

1) "Hot work" permit procedures during welding, cutting or other ignition source type operations, or

2) Procedures for the control of combustible material use and storage in plant areas.

Applicable industry standards on fire protection, such as those promulgated by the NFPA, are utilized in developing and implementing administrative procedures applicable to the fire protection program, system and personnel. These include:

NFPA 1201 - Organization for Fire Services

1 NFPA 1202 - Organization for Fire Departments

NFPA 27 - Private Fire Brigades

NFPA 803- Fire Protection For Nuclear Power Plants

d) Quality Assurnace Program - A quality assurance program has been developed for fire protection. (The Design Construction QA Program is described in the PSAR and was approved by the NRC Staff. The Operational Quality Assurance Program is described in Section 17.2). However, for components of the Fire Protection System designed, specified, orocured, manufactured, fabricated, or installed prior to the institution of the Fire Protection Quality Assurance program (February 18, 1977), the program was followed to the extent practicable. The Engineering and Construction fire protection quality assurance program was approved by the NRC during the construction permit review.

The fire protection QA program, which is under the management control of th QA organization, has assured the satisfaction of QA guidelines during the design, procurement, installation and acceptance testing of fire protection equipment and systems provided for the plant and will assure their continued inspection, testing, maintenance and administrative control after the plant becomes operational.

As part of their management control, the QA organization has:

1) Developed a fire protection QA program, incorporating suitable requirements necessary for the provision of an effective Fire Protection System,

2) Verified the acceptability of the fire protection QA program to the management responsible for fire protection, and

3) Verified, through review, audit and surveillance, the effectiveness of the QA program for fire protection.

e) Fire Protection Procedure - The organization, training and equipping of all personnel who might be involved in adequate responses to fire emergencies at the plant, including operating personnel, security forces, fire brigade members, visitors and local outside fire department members, are described in detail in the Fire Protection Procedure (FPP). Salient features of the FPP are described below. Procedures providing for a fire brigade, the minimum equipment to be provided them, and necessary drilling of the brigades as per IAW BTP CMEB Section C.3 will be developed. 5

The purpose of the FPP is to assure effective responses to fire emergencies can be made. To accomplish this, the FPP covers:

1) The periodic maintenance and testing of fire protection equipment and systems to ensure operational capability at all times,

2) The continuing fire response training, by instruction and drills of members of the fire brigade,

3) The fundamental fire prevention and fire response education of all members of each shift crew and of support plant personnel,

4) The training, through joint drills with the fire brigade and plant operators, of the local fire department to develop both familiarity with their role in a plant-fire response and awareness of special precautions they may have to take within plant areas, and

5) The coordination of the efforts of the security forces during a fire emergency response.

Some of the specific areas covered by the FPP include:

1) Specialized training is provided to those personnel who are responsible for the inspection, testing, and maintenance of installed and portable fire-protection equipment in the plant and for the recording of these activities.

The training includes use of design features to facilitate inspection and testing of Fire Protection Systems. For example, the fire pumps will be tested using test-hose manifolds; the automatic sprinkler, water-spray, or deluge system control valves will be tested using flow-test connections and pressure gauges; and fire-pump controllers and detector relays and panels will be tested using test-circuit connections. Training details the tests to be performed in accordance with NFPA standards or other design-specified criteria.

2) The guidance provided in Regulatory Guide 1.101 (see Section 1.8) is utilized as applicable in the organizing, training, and equipping of plant fire brigades. Applicable fire protection industry standards such as NFPA and other pertinent industry reference materials are used in developing the fire brigade training program. Courses in fire protection and fire suppression sponsored by the fire protection industry are utilized as applicable.

Training of the plant fire brigade will be coordinated with local fire departments so that responsibilities and duties are delineated in advance of a fire emergency. Details covering the combined operations are included in the plant fire brigade training program and implemented into the training of the local fire department staff.

3) To ensure fire protection coverage at all times, members of each shift crew are trained in the recognition, reduction, and control of fire-hazards, and in the confinement, control, and extinguishment of postulated and actual fires. This training is provided to all plant operational people and, in greater detail, to those who are members of the plant fire brigade. The goals of the basic training program are to provide:

(a) Operation as a team,

(b) Knowledge of individual duties,

(c) Familiarity with plant layout and with fire protection equipment location and operation,

(d) Periodic drills under conditions of smoke, poor lighting, and congestion in the plant areas and on the fire grounds,

(e) Planning and critiques of drills,

(f) Joint drills with local fire departments, and

(g) The means of evaluating effectiveness of communications among all plant personnel during simulated fire emergencies.

4) The plant has been designed to be self-sufficient with respect to fire control activities; however, it will rely on public response only for supplemental and/or backup capability. Effective liason has been established with the Raleigh public professional fire department, the Sanford volunteer fire department, and with other volunteer fire departments within response distance to the plant.

Availability to the plant of manpower and equipment from these departments during a fire emergency will be assessed. Need for familiarity visits to the plant and for joint training in fire control and extinguishing procedures will be identified. A program for effective use of nearby public fire department will be developed and implemented. The local fire department will be trained in operational precautions when fighting fire on nuclear power plant sites. They will also be made aware of the need for radioactive protection of personnel and of the special hazards associated with a nuclear power plant.

Procedures will be developed to maintain the primary system pressure during hot shutdown in the event the pressurizer heaters are rendered inoperable by fire damage, or bringing the plant to cold shutdown in a safe, controlled manner. 5

TABLE 9.5.1-1

FIRE AREAS

Fire Areas Designation	Fire Area Description	Reference FSAR Figure(s)	Reference Fire Hazards Analysis, Appendix No.
1-A-ACP	Reactor Auxiliary Building, Auxiliary Control Panel	9.5A-9 and 9.5A-13	9.5A.2
1-A-BAL	Reactor Auxiliary Building, Balance	9.5A-6 through 9.5A-9, 9.5A-11 through 9.5A-13, and 9.5A-26	9.5A.3
1-A-BATA	Reactor Auxiliary Building, Battery Room 1A	9.5A-9 and 9.5A-13	9.5A.4
1-A-BATB	Reactor Auxilairy Building, Battery Room 1B	9.5A-9 and 9.5A-13	9.5A.4
1-A-CSRA	Reactor Auxiliary Building, Cable Spreading Room 1A	9.5A-9, 9.5A-12 and 9.5A-13	9.5A.5
1-A-CSRB	Reactor Auxiliary Building, Cable Spreading Room 1B	9.5A-9 and 9.5A-13	9.5A.6
1-A-EPA	Reactor Auxiliary Building, Electrical Penetration 1A	9.5A-8 and 9.5A-12	9.5A.7
1-B-EPB	Reactor Auxiliary Building, Electrical Penetration 1B	9.5A-8 and 9.5A-12	9.5A.7
1-A-SWGRA	Reactor Auxiliary Building, Switchgear Room 1A	9.5A-9, 9.5A-12 and 9.5A-13	9.5A.8
1-A-SWGRB	Reactor Auxiliary Building, Switchgear Room 1B	9.5A-9, 9.5A-12 and 9.5A-13	9.5A.9
12-A-BAL	Reactor Auxiliary Building, Balance	9.5A-9, 9.5A-10 and 9.5A-13	9.5A.10

TABLE 9.5.1-1 (Continued)

Fire Areas Designation	Fire Area Description	Reference FSAR Figure(s)	Reference Fire Hazards Analysis, Appendix No.
12-A-CR	Reactor Auxiliary Building, Control Room	9.5A-10, 9.5A-12 and 9.5A-13	9.5A.11
12-A-CRC	Reactor Auxiliary Building, Control Room Complex	9.5A-10, 9.5A-12 and 9.5A-13	9.5A.12
12-A-HV & IR	Reactor Auxiliary Building, HV and Instrument Repair	9.5A-10 and 9.5A-13	9.5A.13
1-C	Containment Building	9.5A-2 through 9.5A-5	9.5A.1
1-D-DGA	Diesel Generator Building, Diesel Generator 1A Balance	9.5A-21 and 9.5A-22	9.5A.17
1-D-DGB	Diesel Generator Building, Diesel Generator 1B Balance	9.5A-21 and 9.5A-22	9.5A.17
1-D-DTA	Diesel Generator Building, Diesel Generator Day Tank 1A	9.5A-21 and 9.5A-22	9.5A.18
1-D-DTB	Diesel Generator Building, Diesel Generator Day Tank 1B	9.5A-21 and 9.5A-22	9.5A.18
1-G	Turbine Building	9.5A-34 through 9.5A-39	9.5A.23
12-I-ESWPA	Intake Structure, Emergency Service Water Pump	9.5A-40	9.5A.21
12-I-ESWPB	Intake Structure, Emergency Service Water Pump	9.5A-40	9.5A.21

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TABLE 9.5.1-1 (Continued)

Fire Areas Designation	Fire Area Description	Reference FSAR Figure(s)	Reference Fire Hazards Analysis, Appendix No.	
1-O-PA	Diesel Fuel Oil Storage Area, Diesel Oil Pump Room 1A	9.5A-23	9.5A.19	
1-O-PB	Diesel Fuel Oil Storage Area, Diesel Oil Pump Room 1B	9.5A-23	9.5A.19	
12-O-TA	Diesel Fuel Oil Storage Area, Diesel Fuel Oil Storage Tank 1	9.5A-23	9.5A.20	15
12-O-TB	Diesel Fuel Oil Storage Area, Diesel Fuel Oil Storage Tank 1	9.5A-23	9.5A.20	15
5-F-BAL	Fuel Handling Building Balance	9.5A-14 through 9.5A-20	9.5A.14	
5-F-CHF	Fuel Handling Building Emergency Exhaust	9.5A-15 and 9.5A-18	9.5A.15	
5-F-FPP	Fuel Handling Building Fuel Pool Heat Exchangers	9.5A-14 and 9.5A-18	9.5A.16	
5-W-BAL	Waste Processing Building	9.5A-6. 9.5A-8, 9.5A-14, 9.5A-18, and 9.5A-24 through 9.5A-33	9.5A.22	

TABLE 9.5.1-2

UNUSUALLY HAZARDOUS MATERIALS

1. FLAMMABLE LIQUIDS

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Gasoline	30,000 gal.	Yard Storage Buried Tanks	Ambient	10 min./10 timas/day
Paint	100 gal.	Paint and Mobile Equipment Shop, Yard Storage Paint and Oil Storage Building	Ambient	Intermittent
Paint Thinner	25 gal.	Yard Storage Paint and Oil Storage Building	Ambient	Intermittent
Propane (in bottles)	2 bottles	Waste Processing Building (Elevation 276) Labs, Chemical Storage	Ambient	Constant

2. Strong Oxidizing Agents

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Oxygen (cryogenic)	1050 gal.	Yard Storage (Elevation 261)	250 psig	Continuous
Oxygen	0.7	Waste Processing Building (Elevation 211) Waste Gas Recombiners	70 psig & 150 F max.	Continuous

TABLE 9.5.1-2 (Continued)

2. Strong Oxidizing Agents (Continued)

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use	
Oxygen (in bottles)	2 bottles	Waste Processing Building (Elevation 276) Labs, Chemical Storage	Ambient	Constant	15
Oxygen (in bottles)	800	Maintenance Yard Storage (For Cutting and Welding)	2000 psig Ambient	Intermittent	
Chlorine (liquified)	30 tons	Yard Storage Elevation 261	Ambient	20 min., 3 times/day	
Chlorine (liquified)	25,000 lb./day	Chlorinators Chlorination Building	Ambient	20 min. 3 times/day	15
Chlorine	25,000 lb./day	Circulation and Service Water Intake Strucure of Cooling Tower	Ambient	20 min., 3 times/day	
Potassium Chromate and Dichromate	50 lb.	WPB Chemical Storage	Ambient	Constant	
Potassium Permanganate	3 lb.	WPB Chemical Storage	Ambient	Constant	

TABLE 9.5.1-2 (Continued)

2. Strong Oxidizing Agents (Continued)

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Sodium Peroxide	2 lb.	WPB Chemical Storage	Ambient	Constant
Potassium Chlorate and Perchlorate	5 lb.	WPB Chemical Storage	Ambient	Constant
Sodium Bromate	2 lb.	WPB Chemical Storage	Ambient	Constant
Sodium Dithionite	5 lb.	WPB Chemical Storage	Ambient	Constant

3. Compressed Gases
(1) Flammable

Hazardous Material	Approximate Amount	Plant Location	Condition of Use	Expected Time Duration of Use
Hydrogen (cryogenic)	3,500 gal.	Yard Storage	200 psig.	Intermittent
Hydrogen (from yard)	(CP&L)	Waste Processing Building (Elevation 276) Hot and Low Activity labs	Ambient	Constant
Hydrogen	4,000 cu. ft.	Turbine Building (Elevation 314) Turbine Generator	75 psig	Static

TABLE 9.5.1-2 (Continued)

3. Compressed Gases (Continued)

(1) Flammable (Continued)

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Hydrogen	500 cu. ft.	Turbine building (Elevation 314) Turbine Generator	75 psig	475 cu. ft./day
Hydrogen	400 cu. ft.	RAB (Elevation 261) Chemical Volume Control System Volume Control Tank	120 psig	Constant
Hydrogen	400 gal.	Containment Building (Elevation 236 & 270) Reactor Coolant Drain Tank	4 psig, 170 F	Constant

(2) Nonflammable

Hazardous Material	Approximate Amount	Plant Location	Condition of Use	Expected Time Duration of Use	
Carbon Dioxide (Cryogenic)	10,000 lb.	Yard Storage	300 psi, 0 F	Intermittent	
Carbon Dioxide	4,000 cu. ft.	Turbine Building (Elevation 314) Turbine Generator	45 psig	Intermittent	15
Carbon Dioxide	6,000 cu. ft.	Turbine Building (Elevation 314) Turbine Generator (Air Purge)	95 cfm	One hr./purge	15

TABLE 9.5.1-2 (Continued)

3. Compressed Gases (Continued)
(2) Nonflammable (Continued

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Carbon Dioxide	8,000 cu. ft.	Turbine Building (Elevation 314) Turbine Generator (Hydrogen Purge)	130 cfm	One hr./purge
Nitrogen (Cryogenic)	22,000 lbs.	Yard Storage	175 psi	Intermittent
Nitrogen	150 gal.	Fuel Handling Building (Elevation 236) Nitrogen Accumulators (2)	350 psig	Permanent
Nitrogen	100 gal.	RAB (Elevation 261) Nitrogen Accumulator	350 psig	Permanent
Nitrogen (Compressed gas)	1,600 cu. ft.	Containment Building (Elevation 261) SIS Accumulator Tanks	750 psig	Intermittent
Nitrogen	1,500 cu. ft.	Containment Building (Elevation 236) RCS Pressure Relief Tank	100 psig	Intermittent
Nitrogen	400 cu. ft.	FHB (Elevation 236) Filter Backwash Nitrogen Accumulator	3 cfm 350 psig	5 min.-5 times/day

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TABLE 9.5.1-2 (Continued)

3. Compressed Gases (Continued)

(2) Nonflammable (Continued)

Hazardous Material	Approximate Amount	Plant Location	Condition of Use	Expected Time Duration of Use	
Nitrogen	400 cu. ft.	FHB (Elevation 236) Filter Backwash Nitrogen Accumulator	3 cfm 350 psig	5 min.-5 times/day	
Nitrogen	8,000 gal.	RAB (Elevation 216) Containment Spray Additive Tank	100 psig	Intermittent	15
Nitrogen	400 cu. ft.	RAB (Elevation 261) CVCS Volume Control Tank	3 cfm 100 psig	Intermittent	15

4. Corrosive Materials

(1) Acids

Hazardous Material	Approximate Amount	Plant Location	Condition of Use	Expected Time Duration of Use
Sulfuric Acid (66 Be)	48,000 gal.	Yard Storage	Ambient	Intermittent
Sulfuric Acid (66 Be)	2,000 gal.	Turbine Building (Elevation 240)	Ambient	Intermittent
Sulfuric Acid	200 gal.	WPB (Elevation 236) Acid Additive Tank, Solid Waste Area	93 % Concentration Ambient	Permanent

TABLE 9.5.1-2 (Continued)

4. Corrosive Materials (Continued)
(1) Acids (Continued

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Perrchloric Acid 70%	2 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Nitric Acid 90%	30 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Nitric Acid 68%	60 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Sulfuric Acid 100%	30 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Phosphoric Acid 85%	30 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Hydrochloric Acid 37%	60 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Hydrofluoric Acid 48%	2 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Glacial Acetic Acid 100%	30 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Acetic Anhydride	30 Pints max.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Hypophosphorous Acid	1 Pint	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Hydroiodic Acid	2 Pints	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant

TABLE 9.5.1-2 (Continued)

4. Corrosive Materials (Continued)

(1) Acids (Continued)

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Electrolyte (Sulfuric Acid)	420 gal.	RAB, Elevation 286 Battery Room 1A-SB, in Batteries	Ambient	Permanent
Electrolyte (Sulfuric Acid)	420 gal.	RAB, Elevation 286 Battery Room 1B-SB, in Batteries	Ambient	Permanent
Electrolyte (Sulfuric Acid)	420 gal.	RAB, Elevation 286 Battery Room Neutral, in Batteries	Ambient	Permanent
Electrolyte (Sulfuric Acid)	1,200 gal.	Turbine Building Elevation 261 Electrical Room, in Batteries	Ambient	Permanent
Electrolyte (Sulfuric Acid)	36 gal.	Intake Structure, in Battery	Ambient	Permanent
Electrolyte (Sulfuric Acid)	120 gal.	Switchyard	Ambient	Permanent

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TABLE 9.5.1-2 (Continued)

4. Corrosive Materials (Continued)
(2) Caustics

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Sodium Hydroxide (50% solution)	25,000 gal.	Yard Storage	70 F	Intermittent
Sodium Hydroxide (50% solution)	2,000 gal.	Turbine Building (El 240)	70 F	Intermittent
Caustic	200 gal.	WPB (Elevation 291) Caustic Additive Tank	40 % Concentration Ambient	Permanent
Caustic	200 gal.	WPB (Elevation 236) Caustic Additive Tank, Solid Waste Area	40 % Concentration Ambient	Permanent
Sodium Pellets & Hydroxide 50% Solution	10 lb.	WPB (Elevation 276) Labs and Storage Rooms	Ambient	Constant
Potassium Hydroxide (Pellets)	10 lb.	WPB (Elevation 276) Laboratories and Storage Rooms	Ambient	Constant
Lithium Hydroxide	5 lb.	WPB (Elevation 276) Laboratories and Storage Rooms	Ambient	Constant

TABLE 9.5.1-2 (Continued)

5. Explosives or Highly Flammable Materials

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Acetylene	200	Yard Storage	400 lb., Ambient Temperature	Intermittent
Ethyl Alcohol	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Methyl Alcohol	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Isopropyl Alcohol	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Butyl Alcohol	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Acetone	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Methyl Isobutyl Ketone	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Cyclohexanone	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant

TABLE 9.5.1-2 (Continued)

5. Explosives or Highly Flammable Materials

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Methyl Ethyl Ketone	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Diethyl Ether	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Dipropyl Ether	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Pentane	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Hexane	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Cyclohexane	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Material Oil	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Kerosine Purified	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant

TABLE 9.5.1-2 (Continued)

5. Explosives or Highly Flammable Materials

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Parafine	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Chlorinated Solvents	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Methylene Chloride	5 gal.	WPB (Elevation 276) Chemical Storage and/or Storage Areas	Ambient	Constant
Ethyl Alcohol	1 gal.	WPC (Elevation 276) Laboratories	Ambient	Constant
Methyl Alcohol	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Isopropyl Alcohol	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Butyl Alcohol	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Acetone	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Methyl Isobutyl Ketone	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant

TABLE 9.5.1-2 (Continued)

5. Explosives or Highly Flammable Materials

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Cyclohexanone	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Methyl Ethyl Ketone	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Diethyl Ether	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Dipropyl Ether	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Pentane	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Hexane	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Cyclohexane	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Material Oil	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Kerosine Purified	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Parafine	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant

TABLE 9.5.1-2 (Continued)

5. Explosives or Highly Flammable Materials

Hazardous Material	Approximate Amount	Plant Location	Conditions of Use	Expected Time Duration of Use
Chlorinated Solvents	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant
Methylene Chloride	1 gal.	WPB (Elevation 276) Laboratories	Ambient	Constant

TABLE 9.5.1-3

PRE-ACTION SPRINKLER SYSTEMS

1. Cable Spreading Rooms - RAB, Elevation 286 and Charcoal Filter Room - RAB, Elevation 286.

2. HVAC (Charcoal Filter) Room, Over Air Cleanup Unit- RAB, Column Lines 41 through 45, I through L Elevation 305. 15

3. Cable Vault (Elevation 250), Area Below the Turbine Operating Floor with Extension Over Oil Lines at Bearings of the Turbine Generator, Between Columns 9 and 27, Turbine Building.

4. H&V Room (Elevation 240), Area Below the Turbine Operating Floor with Extension Over Oil Lines at Bearings of the Turbine Generator Between Columns 27 and 43. Turbine Building.

TABLE 9.5.1-3 (Continued)

PRE-ACTION SPRINKLER SYSTEMS

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5. Hot Laundry, Cold Laundry, Clean Storage Area, Health Physics Records and Storage, Health Physics Office and Storage - WPB, Elevation 261.

6. Health Physics Storage, Chemical Records and Storage - WPB, Elevation 276.

7. HVAC Charcoal Filter Rooms - WPB, Elevation 291.

TABLE 9.5.1-4

MULTI CYCLE SPRINKLER SYSTEMS

1. Containment Building, Covering Reactor Coolant Pumps (Elevation 221), Charcoal Filter Housings (Elevation 221) and Cable Tray Runs (Elevation 261).

2. Containment Spray and Residual Heat Removal Pumps 1A-SA, RAB, Elevation 190.

3. Containment Spray and Residual Heat Removal Pumps 1B-SB, RAB, Elevation 190.

4. Cable Trays in Corridors, Component Cooling Water Heat Exchangers, Component Cooling Water and Steam Generator Auxiliary Feed Pumps, RAB, Elevation 236.

5. Electrical Penetrations (Area SA and SB), Charcoal Filter Rooms, Cables in Corridors, Miscellaneous H&V Equipment, RAB, Elevation 261.

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TABLE 9.5.1-4 (Continued)

MULTI CYCLE SPRINKLER SYSTEMS

6. Diesel Generator 1A and Day Tank 1A Rooms, Diesel Generator Building, Elevation 261.

7. Diesel Generator 1B and Day Tank 1B Rooms, Diesel Generator Building, Elevation 261.

8. Diesel Oil Pump Room 1A, Diesel Fuel Oil Storage Area, Elevation 242.25. 15

9. Diesel Oil Pump Room 1B, Diesel Fuel Oil Storage Area, Elevation 242.25.

10. Emergency Exhaust Filter Room, Fuel Handling Building Elevation 261.

11. Fuel Pool Cooling Pumps and Heat Exchangers Room, Fuel Handling Building, Elevation 235.

TABLE 9.5.1-5

WATER SPRAY SYSTEMS

1. Hydrogen Seal Oil Unit Curbed Area, Turbine Building, Elevation 261.

2. Turbine Reservoir and Lube Oil Curbed Area, Turbine Building, Elevation 261.

3. Condensate Booster Pumps Curbed Area, Turbine Building, Elevation 261.

4. Steam Generator Feed Pumps Curbed Area, Turbine Building, Elevation 261. 15

5. Condensate Pumps and Sump Area, Turbine Building, Elevation 261.

6. Main Transformer 1A.

7. Main Transformer 1B.

8. Main Transformer 1C.

9. Start Up Transformer 1A.

10. Start Up Transformer 1B.

TABLE 9.5.1-5 (Continued)

WATER SPRAY SYSTEMS

11. Unit Auxiliary Transformer 1A.

12. Unit Auxiliary Transformer 1B. 15

TABLE 9.5.1-6

JOHN ALBORA

Associate Fire Protection Engineer
Building Services Engineering

EXPERIENCE SUMMARY

Graduate Fire Protection Engineer in charge of engineering of fire protection systems in power plants and industrial applications. Responsibilities include plant layout, preparation of specifications, interdisciplinary interface, and design and acceptance testing of fire protection systems.

REPRESENTATIVE EXPERIENCE

Client	Project	Size	Fuel	Position
Carolina Power & Light Company	Shearon Harris Nuclear Power Plant Units 1 & 2	900 MWe each	Nuclear	Support
Arkansas Power & Light Company	Coal to Medium BTU Gas			Support
HNG Synfuels Company Texaco, Inc.	The River Plant Coal to Methanol			Support

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EMPLOYMENT HISTORY

Ebasco Services Incorporated, New York, NY; 1981 - Present

* Associate Fire Protection Engineer

Lockwood Greene Engineering Incorporated, New York, NY; 1981

* Fire Protection Engineer

General Services Administration, Atlanta, Georgia; 1979

* Fire Prevention Engineer

Brown & Root, Incorporated, Houston, Texas; 1978

* Safety and Fire Protection Engineer

EDUCATION

University of Maryland, BS Fire Protection Engineering - 1980

REGISTRATIONS

Engineer in Training (EIT), Maryland

TABLE 9.5.1-7

JAMES R. McVEY

Principal Engineer

EXPERIENCE SUMMARY

Graduate Mechanical Engineer with 26 years experience including engineering and design of equipment for naval plants; engineering design and application of safety relief devices for nuclear and fossil fueled plants; fire protection engineering for nuclear and fossil plants and synthetic fuel plants.

Responsibilities include technical and administrative management of fire protection systems for the projects listed below.

REPRESENTATIVE EXPERIENCE

Client	Project	Size	Fuel	Position
Houston Lighting & Power Company	Limestone Electric Electric Generating Station Units 1 & 2	750 MW each	Lignite	Lead Engineer
Carolina Power & Light Company	Shearon Harris Nuclear Power Plant Units 1 & 2	900 MWe each	Nuclear	Lead Engineer
Taiwan Power Company	Chin Shan Nuclear Plant, Units 1 & 2	604 MWe each	Nuclear	Lead Engineer
Knolls Atomic Power Laboratory	Knolls Facilities Modification Program		Nuclear	Lead Engineer
Clark Oil & Refining Corp	Feasibility Study of Producing Gasoline from Coal			Lead Engineer
Arkansas Power & Light Company	Coal to Medium BTU Gas			Lead Engineer
HNG Synfuels Company Texaco, Inc.	The River Plant Coal to Methanol			Lead Engineer

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EMPLOYMENT HISTORY

Ebasco Services Incorporated, New York, NY; 1979 - Present

* Principal Fire Protection Engineer

Frank B. Hall & Company of New York Inc., New York, New York; 1973-1979

* Vice President, 1974-1979

* Asst Vice President, 1973-1974

Marsh & McLennen, Inc, New York, New York; 1967-1973

* Senior Nuclear Consultant

General Dynamics, Electric Boat Division, Groton, Connecticut; 1965-1967

* Senior Project Engineer 5

Desser Industries
Industrial Valves and Instrument Division, Alexandria, Louisiana; 1960-1965

* Resident & Application Engineer

Westinghouse, Bettis Atomic Laboratory, Pittsburgh, Pennsylvania; 1955-1960

* Engineer

EDUCATION

Polytechnic Institute of Brooklyn, BSME - 1954

PROFESSIONAL AFFILIATIONS

ASME - Member

NY Academy of Sciences, Member

TABLE 9.5.1-8

MARGARETA A. SERBANESCU

Principal Engineer

EXPERIENCE SUMMARY

Graduate Mechanical Engineer with 17 years experience in engineering and design of fire protection, plumbing and water pollution control systems. Nine years of experience on nuclear and fossil-fuelled electric generating stations with responsibility for coordination of fire protection and life safety considerations, development of company fire protection standards, preparation of licensing documents, active charge of fire protection system engineering and design from conception through procurement and installation, technical and administrative supervision of engineering and design teams, meeting with Clients and authorities having jurisdiction.

Present responsibilities include technical and administrative management of personnel working on the projects listed below. In addition, responsible for management of personnel engaged in various technical overhead activities such as preparation of proposals and development of engineering standards and standard specifications.

REPRESENTATIVE EXPERIENCE 5

Client	Project	Size	Fuel	Position
Louisana Power & Light Company	Waterford SES Unit No. 3 Combustion Engineering Pressurized Water Reactor Unit	1165 MW	Nuclear	Supervisor
Washington Public Power Supply System	WPPSS Unit Nos. 3 & 5 Combustion Engineering Pressurized Water Reactor	1300 MW each	Nuclear	Supervisor
Taiwan Power Company	Chin Shan Unit Nos. 1 & 2 GE Boiling Water Reactor Units	600 MW each	Nuclear	Supervisor Lead
Carolina Power & Light Company	Shearon Harris Nuclear Power Plant Units 1,2,3 and 4 Westinghouse Pressurized Water Reactor Units	900 MW each	Nuclear	Supervisor Lead Support
Iowa Public Service	G Neal Unit No. 4	576 MW	Coal	Support

MARGARETA A. SERBANESCU

REPRESENTATIVE EXPERIENCE (Cont'd)

Client	Project	Size	Fuel	Position
Houston Lighting & Power Company	Allens Creek Nuclear Generating Station, Unit No. 1 General Electric Boiling Water Reactor Unit	1200 MW	Nuclear	Supervisor
	Limestone Electric Generating Station Units 1 & 2	750 MW each	Lignite	Supervisor
Orange and Rockland Utilities Inc.	Lovett Station Coal Conversion Unit Nos. 4 & 5	200 MW	Coal	Supervisor
Florida Power and Light Company	St. Lucie Power Plant Unit No. 1 Combustion Engineering Pressurized Water Reactor Unit	MW	Nuclear	Supervisor Lead 5
	St. Lucie Power Plant Unit No. 2 Combustion Engineering Pressurized Water Reactor	890 MW	Nuclear	Supervisor Lead
Comision Federal de Electricidad de Mexico	Laguna Verde Power Plant General Electric Boiling Water Reactor	675 MW each	Nuclear	Support
Knolls Atomic Power Laboratory	Knolls Facilities Modification Program		Nuclear	Supervisor
Clark Oil and Refining Corp	Feasibility Study of Producing Gasoline from Coal		Synthetic	Supervisor

MARGARETA A. SERBANESCU

REPRESENTATIVE EXPERIENCE (Cont'd)

Client	Project	Size	Fuel	Position
Arkansas Power and Light Co.	Coal to Medium BTU Gas		Synthetic	Supervisor
HNG Synfuels Company, Texas Inc.	The River Plant Coal to Methanol		Synthetic	Supervisor
Virginia Electric and Power Company	Surry Units 3 & 4 Babcock & Wilcox Pressurized Water Reactor Units	950 MW each	Nuclear	Lead Support
Power Authority of the State of New York	Astoria Unit No. 6	830 MW	Oil	Support
	Green County Nuclear Power Plant Babcock & Wilcox Pressurized Water Reactor Unit	1300 MW	Nuclear	Support
Electra de Viesgo, SA Spain	Santillian Nuclear Power Plant	1100 MW	Nuclear	Lead
People's Republic of China	Shiheng Power Plant	300 MW	Coal	Supervisor
	Huai-Han Power Plant	600 MW	Coal	Supervisor
Ebasco Services	Nuclear Standardization Programs	1200 MW	Nuclear	Supervisor
	GE Boiling Water Reactor Unit, Combustion Engineering Pressurized Water Reactor Unit, Westinghouse Pressurized Water Reactor Unit			Support
Ebasco Services Inc.	Coal Fired Reference Plant	400 MW 600 MW 800 MW	Coal Coal Coal	Supervisor

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MARGARETA A. SERBANESCU

EMPLOYMENT HISTORY

Ebasco Services Incorporated, New York, New York: 1978 - Present

* Supervising Engineer, 1980 - Present
* Senior Engineer, 1978 - 1980

Stone and Webster Engineering Corporation, New York, New York: 1973 - 1978

* Engineer in Power

Hydrotechnic Corporation, New York, New York; 1969 - 1973

* Mechanical Design Engineer 5

Spotnails, Incorporated, New York, New York; 1966 - 1969

* Mechanical Draftsman - Designer

Interzoo, Caserta, Italy; 1965 - 1966

* Design Engineer

EDUCATION

Polytechnic Institute of Bucharest, Master of Mechanical Engineering - 1965

Trane Educational Division, Trane Air Conditioning Clinic - completed course 1977

PROFESSIONAL AFFILIATIONS

* National Fire Protection Association - Member

9.5.2 COMMUNICATION SYSTEMS

9.5.2.1 Design Bases

A comprehensive communications system is provided to assure reliable intraplant communication, offsite commercial telephone service, and offsite emergency communication capabilities.

9.5.2.2 System Description

The communication facilities are as follows:

a) Intraplant voice communication is provided by a Private Automatic Branch Exchange (PABX) telephone system which also interconnects with the central office of the Southern Bell Telephone System.

b) Intraplant voice paging is provided by a system of centralized audio power amplifiers and speakers located throughout the site.

c) Site alarm signals are carried by the paging system.

d) A sound powered headset intercom system provides communication for operational and maintenance purposes.

e) Two radio communication systems are provided, one for security communication and the other for operation and maintenance.

f) Plant working stations located throughout the plant site are provided with all or a portion of these communication facilities so that personnel can communicate with other working stations, the Control Room and the auxiliary control room. 15

g) The control room and auxiliary control room are provided with PABX dial telephone, PA paging, radio, and sound-powered headset communication facilities.

h) Telecommunications support is provided to the plant security system by the telephone and paging systems.

i) 120V AC power for the communication systems is supplied from a non-Class IE uninterruptible power supply (UPS) system through power distribution panels. During normal plant operation, power to the UPS system is supplied by 480V non-safety related MCC's. Upon loss of normal AC power the UPS system receives its power from the non-safety related 125V dc system.

j) Two-way voice communication, vital to safe shutdown and emergency response in the event of a fire, is provided by the plant operations and maintenance radio system in accordance with Appendix A of BTP 9.5-1. This system is independent of the plant security radio system and will not interfere with the communication capabilities of the plant security force.

The communication systems are shown on Figures 9.5.2-1 through 9.5.2-5.

9.5.2.2.1 Intraplant Communication

a) Two PABX telephone switching units will be provided. Both units will be owned and maintained by Carolina Power & Light Company. The primary unit will be connected to all telephones. The backup unit will be connected to selected essential telephones. A tie cable and automatic transfer switch will interconnect the two units. In this way, the essential telephones are connected to two switching units. The primary unit can support 2,250 simultaneous conversations (non-blocking) on a pushbutton basis between stations strategically located throughout the plant site. The backup unit can support 900 simultaneous conversations (non-blocking). Initially, only 900 lines are being installed to the primary unit and 600 lines to the backup unit. Certain instruments have direct access to the Bell Telephone System. Other instruments are "restricted" to intraplant telephone calls only. The PABX is modular and utilizes plug-in type components.

The telephone operator can check through his/her console the status of the system. Any malfunction can be easily detected and usually corrected by replacing the affected module. If a line is severed or shorted, it will be automatically isolated by the switching equipment until it is repaired and the rest of the system will continue to function normally. In case of power failure, the switches will send an alarm signal to the Control Room.

Desk, wall and weatherproof-type telephone instruments are installed as required and connected to the central switching unit with shielded cable. Each PABX telephone station has access to all other telephones in the plant and will have access to the loudspeaker-paging network.

The central switching equipment is located in the Administration Building. The switching units are separated by a firewall and have automatic fire detection and protection systems. The backup PABX telephones and their supporting equipment are provided with AC power from the auxiliary diesel engine generator for non-nuclear applications on loss of normal power.

b) The site paging system consists of three separate equipment racks capable of functioning independently. Each rack has pre-amplifiers, power amplifiers, an override module, site alarm signal module, power supply module, test panel, supervisory detection module and annunicator panel.

The output of the power amplifiers feed independent 70 volt audio/signal transmission lines to which loudspeakers of various types are parallel connected, via line matching transformers. To enhance system reliability, the transmission lines are run in pairs so that loudspeakers located in any given area can be alternately connected.

To improve operational efficiency the site paging system is divided into four zones plus an all zone mode. The zones are as follows:

Zone	Area Covered
A	Reactor, Reactor Auxiliary, Turbine and Diesel Generator Buildings
C	Fuel Handling and Waste Processing Building

15

D	Perimeter/Outlying Buildings
E	Administration Building

Zones A and C each have a dedicated paging equipment rack. Zones D and E have a common equipment rack.

The pre-compressor amplifiers, power amplifiers, and active tone generators (described in Paragraph c below) are monitored by a supervisory signal. Failure of any of these components is detected and annunciated locally at the rack and in the Control Room. 15

Failure of a pre-compressor amplifier will mute half or one quarter of the loudspeakers in a paging zone. Malfunction of a power amplifier will affect one quarter or one eighth of the loudspeakers in a zone. In no case will an area or building lose total coverage.

Each paging equipment rack is provided with a spare preamplifier and power amplifier (to replace any of the active units) which is normally connected to the subsystem with plug-in devices, and a standby tone generator (described in Paragraph c below) that will automatically be connected in each equipment rack in case of primary equipment failure.

If a transmission line is severed, loudspeakers connected downstream of the break will be muted. If a transmission line is shorted the channel is muted.

Voice paging signals are initiated from plant PABX telephones through the PABX telephone switching unit and interface equipment, and by "Communication Stations" located in the Control and Auxiliary Control Rooms. The paging 15
zones are accessed from the telephones by dialing the appropriate code number. The "Communication Stations" provide direct input to the paging system bypassing the PABX telephone system and have priority over the PABX telephone initiated signal. A selector switch is provided at each of these "Communication Stations" to select zone priority access or all zone priority access control.

c) Each paging equipment rack has a site alarm signal module provided with two solid state tone generators. The tone generators are arranged such that one generator is active and the other is standby. If the active generator fails, the standby generator will be automatically connected and an annunciation signal sent to the Control Room. They are remotely controlled by pushbutton stations on the Control Room and auxiliary control panel. The tone 15
generator signals are fed to the paging amplifiers and broadcasted through the loudspeaker system covering the entire site.

Plant evacuation signals are in accordance with 10CFR50, Appendix E. Fire alarm signals meet appropriate NFPA Standards.

d) The sound-powered headset communication system consists of remote jack stations, master panels, sound powered headsets and wiring. It provides communication between the Control Room and auxiliary control panel and technicians adjusting remote instrumentation and performing other routine maintenance. The system is available for use by all plant personnel. It is segmented so that the Waste Processing Building and the remainder of the plant
15 have independent five channel systems. The refueling operation has one dedicated channel in this system. The systems are accessed via jack stations located at control panels, relay cabinets, instrument racks, switchgear, MCC's, motors, pumps and important equipment. Channels terminate in the
15 Control Room where plug-in patches, to allow temporary circuit interconnections, can be made at the master panel should the need arise.

Each channel/circuit consists of a two-conductor shielded line interconnecting the remote stations. A five jack assembly is provided at each remote station, into which the portable headset equipment can be plugged. This arrangement allows for handsfree operation and requires no amplifiers. This system also serves as back-up to the normal communications system (PABX).

If a zone cable is severed producing an open circuit, the jack stations connected downstream will be lost, if the wires are shorted sound powered
15 communication in the independent five channel system will be partially or totally lost.

The sound powered system is a simple system that does not require a power supply. Component failure is a minimum.

e) An interior antenna system for inside building radio signal coverage is provided. This antenna system will be used by the security radio system and the plant operations and maintenance radio system. Should any transmission or control lines be faulted, depending on the faults location and nature, a portion of the system will still be operative.

All radio stations and auxiliary equipment are located in air-conditioned, limited access areas.

f) Working stations which may require attention during transient events are shown in Table 9.5.2-1. Communication facilities are provided between these working stations and the main control and auxiliary control rooms to mitigate the consequences of transient, accident and fire conditions.

All areas meet the Occupational Safety & Health Administration noise requirements which are 115 db(a) for emergency and transient conditions and 90 db(a) for normal conditions.

Communication between personnel performing cold shutdown can be established by the use of the installed PBX system, the installed sound powered telephone system or the walkie-talkie routinely used by operations personnel. Adequate manpower will be available to complete all necessary action in the time required to bring the plant to a stable cold shutdown condition following a postulated fire in any single fire area.

The following criteria are used to maintain reliable, distinct, and clear communication between the Control Room and auxiliary control room and the referenced working stations having the indicated background and/or maximum noise levels: 15

a) Areas with noise levels above 100 Decibels, db(a)

1) For telephone stations, a sound-proof booth or waist-high acoustical shield and a noise cancelling microphone in the handset instrument are provided.

2) The paging system coverage is reinforced by providing paging loudspeakers with additional audio power (through line matching transformers) and locating them closer together.

3) The sound powered headset, used in these areas, is provided with a noise shielded microphone and is specially designed to operate clearly in areas with noise levels up to 130 db(a).

4) Portable handheld radios can be provided with plug-in type headsets furnished with noise shielded microphones, designed to operate in areas with noise levels of 120 db(a) as required.

b) Areas with noise levels between 80 and 100 Decibels, db(a)

1) Telephones are provided with noise cancelling microphones. A waist-high acoustical shield is provided as required for each station.

2) Paging coverage procedures similar to the ones stated in Paragraph a)2) above are followed.

3) Sound-powered headsets are provided with a boom microphone designed to operate within this noise level range.

4) Portable handheld radios can be provided with plug-in type headsets furnished with boom microphones as required.

c) Areas with noise levels below 80 Decibels, db(a)

1) Communication facilities at working stations located in these areas are individually evaluated to determine if there is a need to provide them with special equipment as noted in Paragraph b) above. If Paragraph b) requirements are not necessary, standard type communication instruments are furnished.

The following communication facilities are provided at or near each working station described in a), b), and c) above:

a) A telephone station

b) A paging speaker

c) A sound-powered jack station

d) Radio communication is also available to those working stations that are able to receive radio signals. An interior antenna system for inside radio signal coverage is provided for this purpose.

The communication system and its associated power supplies are provided as described below:

a) High Level Intraplant Paging System - 120V AC power is supplied from the non-Class 1E Uninterruptible Power Supply (UPS) bus through power distribution panels. The non-Class 1E UPS System consists of rectifier/inverter source. Inverter is normally supplied through its rectifier from a non-Class 1E 480V MCC (1D21). Should this voltage drop below the required level, the inverter is supplied automatically from the 250V DC battery (DP-1-250). In addition, each inverter can be bypassed manually and directly fed through the 480V non-Class 1E MCC.

The configuration of the UPS System is shown on Fig. 8.1.3-3 of SHNPP FSAR.

b) Radio Communication System (Operations/Maintenance & Security) - Same as Intraplant Paging System

c) Sound Powered Headset Intercom System - Does not require Electrical Power Supply

d) PABX System

1) Primary Unit (2250 Line): During normal plant operation, 480V AC power is supplied from 480V power center located in the administrative building 1-4A71. Upon loss of normal AC power a battery is provided to keep the PABX System operating for approximately one hour after power interruption. The battery and charger is located in the backup unit (900 Line) PABX room.

2) Backup Unit (900 Line): A 480V feed from the Motor Control Center 5D in the security building is provided to supply power to the 900 Line PABX System. In the event of loss of normal power this MCC will be automatically supplied by the auxiliary (security) diesel engine generator assuring a reliable power supply to the 900 Line PABX.

e) Microwave Equipment - Same as described for 900 Line PABX System

f) Southern Bell - Same as described for 900 Line PABX System

Besides the reliability provided with each subsystem, the strength of the onsite communication system lies in the overlapping coverage given by the subsystems.

9.5.2.2.2 Offsite Communication

During normal operations, offsite telephone service is provided to the plant by Southern Bell central office trunks and dial tie trunks connected to the CP&L telephone network. In the event that commercial telephone service is lost, tie lines may be used or an emergency communications link can be set up from the Control Room or from the central alarm station via the two-way radio system, and/or CP&L's microwave system, which are both available to the plant.

9.5.2.2.3 Communications During Fire Emergencies

During a fire emergency, the operation and maintenance two-way radio system will be used by the fire brigade and other operations personnel required to achieve safe plant shutdown. This system is totally independent from the plant security radio system and will not interfere with it in any manner. The system is designed to satisfy the requirements of Appendix A of BTP 9.5-1.

9.5.2.3 Inspection and Testing

Preventive and corrective maintenance programs will be implemented by Carolina Power & Light Company. Communication equipment purchasing specifications require vendors to furnish complete operating and maintenance instructions for power plant personnel use.

A functional test will be performed to assure effective communications between plant personnel in all vital areas during maximum plant noise conditions under various operating conditions. All systems are to be inspected regularly and undergo operational checks to ensure service readiness and effectiveness. A complement of necessary spare parts, tools and test equipment are available.

Communication system protective measures are in some cases built in the equipment, in other instances they are provided in the design of the subsystems. Each of the subsystems is provided with a dedicated conduit system. The wiring is sectionalized by areas, floors and/or buildings to facilitate trouble-shooting.

The PABX and loudspeaker paging systems are monitored by control room annunciators.

9.5.2.4 Instrumentation

The following are annunciated in the Control Room: 15

a) Loss of power to the PABX Telephone System and

b) Loss of output of any of the paging preamplifiers, power amplifiers or the site alarm generators.

TABLE 9.5.2-1

SUMMARY OF ONSITE COMMUNICATION SYSTEM CAPABILITIES AND NOISE CONSIDERATION DURING TRANSIENTS AND/OR ACCIDENTS

STATION	MAXIMUM ANTICIPATED SOUND LEVELS dBA	COMMUNICATION SYSTEMS AVAILABLE AND MAXIMUM BACKGROUND NOISE FOR EFFECTIVE COMMUNICATIONS			
		TELEPHONE (dBA) (h)	SOUND POWERED JACK STATIONS (dBA) (h)	HIGH LEVEL PAGING (dBA) (g)	PORTABLE UHF RADIO (dBA) (h)
Main Control Room	70	80 (b)	80 (b)	115	80 (a)
Auxiliary Control Panel Area	75	80 (b)	80 (b)	115	80 (a)
Containment Spray Pump Areas	95	100 (c)	100 (e)	115	100 (e)
Shutdown Cooling Heat Exchanger Areas	95	100 (c)	100 (e)	115	100 (e)
Diesel Generator Rooms	115	125 (d)	130 (f)	115	120 (f)
Charging Pump Areas	95	100 (c)	100 (e)	115	100 (e)
L.P. Safety Injection Pump Areas	95	100 (c)	100 (e)	115	100 (e)
CCW Pump Areas	95	100 (c)	100 (e)	115	100 (e)
Auxiliary Feedwater Pump Areas	95	100 (c)	100 (e)	115	100 (e)
H.P. Safety Injection Pump Areas	95	100 (c)	100 (e)	115	100 (e)
Essential Switchgear Rooms	85	100 (c)	100 (e)	115	100 (e)

Notes:

a) Subject to verification during startup.
b) Standard type communication equipment.
c) Telephone equipped with noise cancelling microphones.
d) Soundproof booth or acoustic sheild and noise cancelling microphones.
e) Boom microphone with ear-muff type headset.
f) Noise shielded microphone with ear-muff type headset.
g) Provided with additional power and additional spacing as appropriate.
h) After the plant is operational communication capability in light of actual background noise will be evaluated. Modifications will be made if necessary.

10

9.5.3 LIGHTING SYSTEMS

9.5.3.1 Design Bases

Lighting Systems are designed to provide illumination throughout the plant during normal and other than normal plant operation. The levels of illumination are the minimum average, maintained foot candles as specified in the Illuminating Engineering Society Handbook, fourth edition. Mercury-containing illumination sources (flourescent, mercury, metal halide and high-pressure sodium lamps, all containing small amounts of mercury) are prohibited in the vicinity of systems that could return mercury contamination to the primary system. The above criteria prohibits the use of mercury illumination sources in the Containment, and areas where fuel is handled (this does not include the entire Fuel Handling Building). Where mercury illumination sources are prohibited, incandescent sources are utilized.

The lighting systems and their power sources are designed to provide sufficient illumination to enable the plant operators to perform all manual operations required at all times and to move safely through essential areas of the plant.

9.5.3.2 Systems Description

Plant lighting is divided into three main systems:

a) Normal AC Lighting System

b) Normal/Emergency (N/E) AC Lighting System

c) DC Emergency Lighting System

Normal AC Lighting System

The normal AC lighting is energized continuously from the plant nonsafety related 480V auxiliary system motor control centers through 3 phase, 4 wire, 480 -480Y/277V or 480 -208Y/120V dry type transformers. These transformers feed local area lighting panels. The Normal AC Lighting System is operable when the plant is in a normal operating mode or when offsite power is available. The normal operating mode includes the plant startup mode with offsite power available, the plant running mode with the unit auxiliary transformers supplying auxiliary power, and the plant hot or cold shutdown mode with offsite power available. The normal lighting system provides approximately 80 percent of the total plant illumination.

Normal/Emergency (N/E) AC Lighting System

The Normal/Emergency AC Lighting System which is non Class IE, non-Seismic Category I is energized continuously from the plant safety related 480V auxiliary system motor control centers through 3 phase, 4 wire, 480 -480Y/277V or 480 -208Y/120V dry type transformers.

These transformers feed normal/emergency local area lighting panels. The normal emergency lighting is available under all plant conditions. A redundant system consisting of two separate and distinct trains, A and B, of N/E lighting is provided. Upon normal offsite power failure, each train of the N/E lighting load is reenergized automatically from its associated emergency diesel generator source. N/E lighting comprises approximately 20 percent of the normal plant lighting load. Either train of the N/E lighting provides the necessary lighting essential to the safe and orderly operation of the plant during loss of normal AC power.

Normal/Emergency lighting is provided to all plant areas, including those areas required for safe shutdown of the reactor and evacuation of personnel in the event of an accident, except for Turbine Building Elevation 314 ft. and the Yard Area. The Yard Area is serviced by security lighting.

Appropriate isolation is provided between the non safety related N/E lighting and the safety related equipment.

DC Emergency Lighting System

The DC Emergency Lighting System, which is non Class IE and non-Seismic Category I, provides illumination during loss of either train of the normal emergency lighting sources in the Control Room, the auxiliary control panel, and the computer room. The source of power for the DC Emergency Lighting System, which is automatically energized upon loss of either train A or B of
15 the normal/emergency lighting system, is the station 125V battery. Operation of the DC Emergency Lighting System is annunciated in the Control Room to prevent accidental depletion of the battery.

In the balance of plant areas, DC emergency lighting is provided by self-contained storage battery lighting fixture assemblies.

9.5.3.3 Safety Evaluation

Lighting systems provide illumination throughout the plant during normal and abnormal plant operation. Upon loss of normal power, the DC Emergency Lighting System is automatically energized. Approximately 10 seconds after the loss of normal AC power, the redundant AC Normal Emergency Lighting System (A and B) receives power from the standby diesel generators so failure of one system will not result in failure of the other system, and the DC Emergency Lighting System is automatically deenergized. The DC Emergency Lighting System is automatically energized in the event that the redundant AC Normal/Emergency Lighting System fails.

These provisions are further enhanced in the control room by providing a support system for the lighting and suspended ceiling that has been seismically designed for the design basis seismic event. In all other safety related areas of the plant, seismically designed lighting supports are utilized in locations where their failure would adversely affect safe shutdown of the reactor.

9.5.4 DIESEL GENERATOR FUEL OIL STORAGE AND TRANSFER SYSTEM

The function of the Diesel Generator Fuel Oil Storage and Transfer System (DGFOSTS) is to store, maintain, and supply fuel oil to the standby diesel generators as required for all modes of diesel generator operation during normal and abnormal site and plant conditions.

9.5.4.1 Design Bases

The DGFOSTS design is based on the following requirements and criteria:

a) The onsite storage capacity of the system provides sufficient fuel oil for continuous operation of each diesel generator at maximum rated load for at least seven days.

b) The system ensures the availability of fuel to at least one of the two diesels assuming any single active or passive failure of one of its components. 15

c) The system is designed to Seismic Category I requirements and as such will remain functional during and after the safe shutdown earthquake (SSE).

d) The system is protected from the effects of other natural phenomena including the probable maximum flood, the design basis wind loading, and the design basis tornado.

e) The system is protected from the effects of internally generated missiles, high energy line breaks and through wall leakage cracks associated with moderate energy pipe ruptures.

f) Redundant elements of the system are physically separated to the extent necessary to ensure that no single active failure in the system will affect redundant components. 15

g) All system components are designed and arranged to permit inspection, cleaning, maintenance, and repair of the system.

h) The system is designed to minimize the chance of deleterious material from entering the system during refilling periods.

i) The emergency Diesel Fuel Oil Storage and Transfer System complies with all requirements of ANSI Standard N195-1976, "Fuel Oil Systems for Standby Diesel Generators," except for the following:

a) "An over-flow line from the day or integral tank to the supply tank shall be provided

b) "A strainer shall be provided for each engine....The strainer shall be of duplex design."

c) "One differential pressure indicator for each duplex strainer and control room alarm." 15

The day tank overflows to the building floor drain system and then is pumped to an oil separator unit located in the yard for eventual disposal. This arrangement has sufficient margin between the day tank high level signal and the overflow connection to allow for thermal expansion and permit the return of unused fuel oil to the tank without overflow. In addition, if the fuel oil transfer pump fails to stop upon receipt of high day tank level signal, the solenoid operated valve, located in the inlet to the day tank, will close on high-high level signal, thereby preventing overflow.

The diesel fuel oil transfer pumps are provided with a single basket strainer in the pump suction line. The strainer was conservatively sized and the pressure drop across the strainer is negligible at the design flow rate even when the strainer is 90 percent clogged. Therefore, clogging during seven days of operation of the diesel generator is unlikely. However, for pump protection, the suction line is provided with a flow switch to alarm abnormal conditions.

9.5.4.2 System Description

15 The system consists of two separate, independent fuel oil supply subsystems, each serving one of the two standby diesel generator engines. Each of these redundant subsystems consists of one fuel oil storage tank, one transfer pump,
15 one day tank, interconnecting piping valves, and associated instruments and controls. The flow diagram is shown on Figure 9.5.4-1.

The two fuel oil storage tanks are horizontal, reinforced concrete tanks with steel liners, located underground in the yard and designed to Seismic Category I requirements. Fuel consumption of the diesel generator at rated
15 load is 445 gal/hr. Each fuel oil storage tank will contain enough diesel fuel for continuous operation of the diesel generator for seven days at rated load plus adequate additional capacity for testing in accordance with ANSI N195-1976. A comparison of design basis fuel oil consumption and fuel oil storage tank capacity is shown in Table 9.5.4-1. This storage capacity provides ample time for obtaining additional fuel oil, since additional fuel oil is readily available within eight hours. See Section 9.5.4.6 for a discussion of local sources of fuel oil. Fuel delivery to the plant is by rail car or truck. Two rail car fuel oil unloading pumps are provided for the two fuel oil storage tanks. The fuel oil unloading pumps transfer the fuel oil from the delivery vehicle to the fuel oil storage tanks. Two connections are provided so that fuel can be received from trucks.

The diesel fuel oil transfer pump is a horizontal, centrifugal pump located below grade in a separate compartment adjacent to the fuel oil storage tank. The fuel oil transfer pump powered by its associated diesel generator is sized to provide a flow of approximately three times the maximum engine consumption rate and is automatically controlled through the use of level switches activated by day tank fuel level. Upon demand, the diesel fuel oil is pumped from the fuel oil storage tank and through one simplex strainer into the diesel fuel oil day tank. A recirculation line is provided at the discharge of the fuel oil transfer pump to protect the pump in the event of flow blockage.

In each fuel oil supply subsystem, the fuel oil transfer pump maintains the fuel oil level within its associated diesel generator day tank. The day tanks are vertical steel tanks located in separate, isolated, fire resistant compartments, and situated so as to assure sufficient positive pressure at the engine fuel pumps. The volume of each day tank provides approximately six hours of storage assuming maximum engine fuel consumption. The tank drains and overflows to the building floor drain system and is then delivered to an oil separator unit located in the yard for eventual disposal. The handling of excess fuel is at variance with the SRP 9.5.4 Paragraph III-5d. However, this arrangement is acceptable since sufficient margin is provided between day tank high level signal and the overflow connection to allow for thermal expansion of the contents and to permit the return of unused fuel oil to the tank without overflow. In addition, if the fuel oil transfer pump fails to stop upon receipt of high day tank level signal, the solenoid operated valve, located in the inlet to the day tank, will close on high-high level signal thereby preventing overflow.

The diesel day tank enclosures are provided with exhaust ventilation to the outside, with three hour fire rated walls and doors and can contain the maximum oil spill resulting from a day tank failure.

Upon receipt of a signal initiating diesel start, the diesel engine shaft driven fuel pump takes suction from its associated day tank and pumps fuel oil to the diesel as required and recirculates that portion not consumed by the diesel back to the day tank. A manual isolation valve is located at the day tank nozzle in the fuel oil supply piping to the diesel engine.

Design parameters for the system components are listed in Table 9.5.4-1.

9.5.4.3 Safety Evaluation

The Diesel Generator Fuel Oil Storage and Transfer System (DGFOSTS) is a safety related system required to support diesel generator operation following loss of offsite power under all postulated conditions.

Each fuel oil storage tank provides a source of fuel oil to an independent supply train serving the diesel of one redundant train and each tank contains 15
the design basis onsite storage capacity for each associated diesel. A single failure analysis of the system is presented in Table 9.5.4-2.

All fuel oil piping commencing at the first flange outside the main fuel oil 15
storage tank and continuing up to the diesel engine mounted piping and components is ASME Section III, Class 3. Engine mounted piping and components are non-ASME III and designed to ASTM requirements. Figure 9.5.4-2 shows fuel oil piping schematic.

Fuel oil supply piping to the main fuel oil storage tank is non-safety related and not required to support the operation of the diesel generator. The fuel 15
oil storage capacity provides the design basis onsite storage capacity for two

5 diesels and is provided with a manway located on the top which could be used to fill the tank. Non-ASME, Section III, Class 3 tank penetrations are embedded in the reinforced concrete walls of the storage tank.

The DGFOSTS, except for the fuel unloading pumps, the fuel oil storage tanks, the fuel oil transfer pumps and associated piping and valves, is located within the confines of the Diesel Generator Building as shown on Figure 9.5.4-1. The Diesel Generator Building is designed to withstand the effects of the safe shutdown earthquake, the design bases tornado, the probable maximum flood with the associated wave runup, and the design bases wind as discussed in Chapter 3. This precludes damage to protected portions of the system from these sources.

Those components not within the Diesel Generator Building are protected against design basis natural phenomena as follows:

a) The fuel oil unloading pumps and associated piping require no protection since an alternate means of filling the fuel oil storage tank is provided in the form of a manway located at the top of each tank;

b) The fuel oil storage tanks, and fuel oil transfer pumps with associated piping and valves are located below plant grade. This combined with the reinforced concrete design of the storage tanks and transfer pump rooms assures protection from tornado effects. These components are also designed to withstand SSE effects;

c) The fuel oil storage tanks' vent and fill pipes are located at an elevation so as to provide design flood level protection, and protection from maximum net water accumulation for design storm conditions in the plant area. The fuel oil storage tank vent is equipped with a flame arrestor, which provides fire protection, and is located within a concrete enclosure which provides protection from tornado missiles; and

d) The only buried piping (labeled yard on Figure 9.5.4-1) in the DGFOSTS is cathodically protected and protected from missiles by approximately five feet of earth cover. Refer to Section 3.5 for missile protection of buried components.

The routing of fuel oil lines between the diesel oil storage tanks and the Diesel Generator Building is such that they pass under the two railroad tracks, several roadways, and over the circulating water intake and discharge pipes.

The portions of fuel oil lines under the railroad tracks and roadways are
5 located 6 ft. 7 in. below the grade elevation. The circulating water intake and discharge pipes are located 3 ft below the fuel oil lines (measured between the pipe outside diameters).

The fuel oil piping will have a uniform bedding for the entire length of the crossing under the railroad and the roadway. The angle of intersection between the fuel oil lines and the railroad/highway is 90 degrees. The depth of the fuel oil lines underneath the railroad/roadway is such that the combined circumferential stress in the pipe created by the maximum anticipated internal pressure and/or the external loads at the crossing does not exceed the maximum stress allowables for ASME materials.

Calculations using Boussinesg's equation demonstrate that with 6 ft. or more soil cover, the surface loads (external loads) have a negligible effect on pipe wall stresses. It is highly unlikely for a break in the circulation water pipe to undermine the 10-15 foot span required to result in exceeding the allowable stress levels for unsupported two (2) inch fuel oil pipe. It should be noted that following a Loss of Offsite Power, the non-safety related circulating water system will no longer operate, thereby limiting the area which could be undermined by postulated flooding. Additionally, the diesel generator fuel oil day tanks allow approximately 7 hours of uninterrupted operation without makeup at the maximum rate of consumption. Manual day tank replenishment could be initiated should be need arise. 5

The DGFOSTS and associated structures have been evaluated to determine the effects of internally generated missiles, considering separation and compartmentalization of subsystem components. The results show that system equipment and structures are capable of withstanding internally generated missiles without a loss of function in redundant components. The consequences of the limited size wall cracks in the moderate energy fire protection system piping within the complex have been evaluated and are acceptable.

Diesel Generator trains A and B are completely separated from each other by a twenty-four inch thick reinforced concrete wall. There are no openings located in this wall. This concrete wall will provide adequate missile protection and physical separation between the two redundant diesel generator units.

The Diesel Generator design also incorporates an overpressure protection system in order to minimize the occurrence of internally generated missiles. Each starting air receiver tank is provided with a relief valve normally set at 275 psi. The diesel generator lube oil system is protected from overpressure events by the use of an internal relief valve normally set at 70 psi. The engine crankcase pressure is provided with a pressure switch which initiates an alarm in the control room on high pressure. The engine is also provided with relief vents and valve covers which will operate in case of high crankcase pressure. In addition to these overprotection devices, the twenty-four inch thick concrete wall is considered to be an adequate barrier for any credible missile. 5

Missile protection is discussed in Section 3.5. High and moderate energy piping systems, criteria for protection against postulated breaks, and evaluations are discussed in Section 3.6. Flood protection measures for Seismic Category I structures and components are discussed in Section 3.4.

Check valves are provided in the Floor Drain System at each fuel oil transfer pump compartment to prevent backflow to the various pump compartments.

A program for regular surveillance of the quality of the stored fuel oil is included in the plant Technical Specifications (see Chapter 16). Growth of algae in the diesel fuel oil storage tank will be prevented by use of a fuel additive containing a biocide. If in the unlikely event the fuel oil quality 5 falls below an acceptable level, tank drain connections are provided in each fuel oil transfer pump compartment for removing fuel oil by means of mobile pumping units. This assures that the fuel oil will be of satisfactory quality at all times.

There are no specific provisions in the design of the fuel oil storage fill system to minimize the creation of turbulence of the sediment in the bottom of
5 the storage tank. However, each diesel generator is provided with fuel from a separate fuel oil storage tank. If operation is required beyond seven (7) days and tank "A" requires filling, redundant division "B" Loads will be operated from diesel generator "B" which is supplied with fuel oil from tank "B".

The individual diesel day tanks are located within three hour fire barrier cubicle walls with same rating fire doors. The diesel oil tanks are each located in individual cubicles in the Diesel Generator Building, thus separating them from potential ignition sources such as high energy electrical lines and hot surfaces such as the diesel exhaust lines. The connecting fuel oil piping is routed to minimize exposure to these ignition sources. Automatic fire detection and extinguishing systems are provided for diesel generator units and diesel fuel oil transfer pump area. For a detailed description refer to Section 9.5.1.2.

The two reinforced fuel oil storage tank structures are located below grade more than 50 feet from the nearest building in excess of the minimum distance called for in NFPA 30, "Flammable and Combustible Liquids Code." Thus, in the unlikely occurrence of a fuel oil storage tank fire, the effect of the fire will be confined to the area of the tank and will not affect reactor operation and safety.

A three-hour firewall separates each of the fuel oil transfer pumps, thus ensuring that a single event such as a fire will not cause the failure of more than one pump. Due to the non-explosive characteristics of diesel oil, if in an unconfined atmosphere, an explosion is not considered a credible occurrence.

The fuel oil storage tank liner will be coated with 3 to 5 mils of inorganic zinc primer to protect against corrosion. The liner will be cleaned and sandblasted prior to coating. Following are the applicable industry standards:

SSPC-PA-1	Shop Field and Maintenance Painting
SSPC-PA-2	Measurement of Dry Paint Thickness with Magnetic Gauges
SSPC-SP-3	Power Tool Cleaning
5 SSPC-SP-10	Near-White Blast Cleaning.

Buried field oil piping will be provided with a cathodic protection system and either coated with hot applied coal tar enamel and asbestos felt or wrapped with plastic tape. Properties of hot applied enamel are per AWWA Spec C-203, Section 2.2.

Physical properties of asbestos felt wrap materials are per AWWA Spec C-203, Section 2.6. Tape material shall be 20 mil pressure sensitive tape such as Scotchwrap #51, Trantex #V-20 or equal, 2 in. wide and 1/2 in. lap.

9.5.4.4 Instrumentation Application

The control of each subsystem is identical. It maintains the proper supply of diesel oil in each day tank by means of interlocks between the high and low-level switches in the day tank, the corresponding fuel oil transfer pump motor starters, and supply valves at each day tank inlet. The Main Control Room is provided with high and low level annunciators for all day tanks and fuel oil storage tanks in the system, and control switches for remote control of each complete transfer system train.

Each diesel fuel oil storage tank is provided with a level transmitter which gives high level alarm, low level alarm and level indication on the fuel oil storage tank panel which is located near the fuel oil unloading pumps. Control switches are provided on the fuel oil storage tank panel for control of the fuel oil unloading pumps.

Each day tank is provided with alarms and indication on its respective diesel engine control panel and on the main control room panel to: 15

a) Open supply valve on low-level, if necessary, and start transfer pump

b) Stop the fuel oil transfer pump on high level

c) Energize a control room and a local annunciator on low-low level

d) Close supply valve and energize a control room and a local annunciator on high-high level

e) Monitor oil level by a level indicator

Each of the fuel oil transfer pump strainers is equipped with discharge flow switches which cause an alarm in the Control Room and local engine control panel whenever the low flow setpoint is reached. Each fuel oil transfer pump discharge line is provided with a pressure indicator.

Each fuel oil transfer pump and its associated day tank inlet valve is provided with control on its respective diesel engine panel and on the main control panel. Primary control is provided from the Main Control Room. 15
However, control can be transferred to the corresponding diesel engine panel via a selector switch on the diesel engine panel. If the Main Control Room is evacuated and plant control is transferred to the auxiliary control panel, then control of the DGFOSTS will automatically be transferred to its respective diesel engine panel.

Instrumentation and Control Design Criteria are discussed in Sections 7.1 and 7.6.

9.5.4.5 Inspection and Testing Requirements

The system is tested in conjunction with the periodic diesel generator test (Refer to Chapter 16 for details). The system is subject to the in-service inspection requirements of ASME XI in accordance with 10CFR50.55a(g) (refer to Section 6.6). Isolation valve bypass piping, and pressure test connections are provided to allow pressure testing of that portion of the piping which is buried in the yard. Manways are provided to allow inspection of the buried fuel oil storage tanks and their instrumentation, and allows access for tank cleaning if required. The access hatch to the tank manways is shown in Figure 3.8.4-22 (intersected by Section A-A on elevation 263.00 ft.). The system components are inspected and cleaned prior to installation. Instruments are calibrated during periodic testing and automatic controls are tested for actuation at the proper setpoints. Alarm functions are checked for operability and limits during plant preoperational testing and during every periodic diesel test. At the end of each diesel test period, the fuel oil transfer pump is automatically started to raise the fuel oil day tank level to full. Fuel oil transfer pumps are operated and tested during plant preoperational testing. Fuel oil transfer pumps are operated and tested initially to check factory test curves and to determine the initial pump characteristic as installed. Periodically during normal Unit operation, fuel oil storage tank and day tank levels are checked with a hand gage; fuel oil transfer pump and motor availability is checked by conducting a flow test from the storage system to the fuel oil day tank.

Surveillance of the quality of the fuel oil is accomplished by periodic sampling for water and other contaminants in the storage system, and sampling of new fuel oil prior to transfer to the storage system. Sampling procedures shall be in accordance with ASTM Standard D270-75. Fuel oil samples shall be
8 tested per ASTM Standard D975-81 and shall meet the specifications listed in Table 1 of ASTM D975-81.

9.5.4.6 Diesel Fuel Distribution Sources

The primary supplier of diesel fuel is located in Greensboro, North Carolina. Deliveries are made from:

Selma, North Carolina, approximately 45 miles
Greensboro, North Carolina, approximately 75 miles
Charlotte, North Carolina, approximately 140 miles
Spartanburg, South Carolina, approximately 200 miles
Wilmington, North Carolina, approximately 120 miles

Deliveries are routinely made under unfavorable environmental conditions such as storms, snow, ice, etc. With the amount of time that deliveries can be scheduled, no problems are anticipated.

TABLE 9.5.4-1

DIESEL GENERATOR FUEL OIL STORAGE
SYSTEM COMPONENT DESIGN DATA

1. Diesel Fuel Oil Storage Tanks

Quantity	2	15
Capacity	175,000 gallons*	
Type	Horizontal	
Design Pressure, psig	Atmospheric	
Maximum Design Temperature, °F	105 (Note 1)	
Materials	Reinforced Concrete with Carbon Steel Liner	
Code (Liner)	ASME B&PV Code, Section VIII (Note 2)	
Seismic Category	I	

2. Diesel Fuel Oil Transfer Pumps

Quantity	2	15
Capacity	40 gpm	
Type	Horizontal, centrifugal stainless steel	
Code	ASME B&PV Code, Section III, Class 3	
Seismic Category	I	

3. Diesel Fuel Oil Day Tanks

Quantity	2	15
Capacity	3,000 gallons	
Type	Vertical	
Design Pressure, psig	Atmospheric	
Design Temperature, °F	125	
Materials	Carbon Steel	
Code	ASME B&PV Code, Section III, Class 3	
Seismic Category	I	

4. Fuel Oil Strainers

Quantity	2	15
Type	Basket Strainer with Mesh Liner	
Code	ASME B&PV Code, Section III, Class 3, Subsections ND-3600 & NA	
Seismic Category	I	

Notes:

1) The steel liner was designed considering the maximum design temperature and a differential temperature between the tank/liner and the tank's contents.

2) The liners were fabricated and erected in accordance with the ASME B&PV Code, Section VIII, and thermal stresses were evaluated using the rules of the ASME B&PV Code, Section III, Subsection NE.

TABLE 9.5.4-1 (Cont'd)

DIESEL GENERATOR FUEL OIL STORAGE SYSTEM COMPONENT DESIGN DATA 15

5. Valves

Design Pressure, psig	100
Design Temperature, F	125
Material	Carbon Steel
Codes	ASME B&PV Code, Section III, Class 3, NA & ND 3500
Seismic Category	I

6. Piping

Design Pressure, psig	100
Design Temperature, F	125
Material	Carbon Steel
Codes	ASME B&PV Code, Section III, Class 3, NA & ND 3600
Seismic Category	I

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* Design Basis Fuel Oil Consumption = $\frac{\text{445 Gal}}{\text{Diesel-Hr}} \times \frac{\text{24 Hr}}{\text{Day}} \times 8$ days = 85,400 Gal. 15

TABLE 9.5.4-2

SINGLE FAILURE ANALYSIS FOR DIESEL GENERATOR FUEL OIL SYSTEM

Component	Malfunction	Comments and Consequences	
Fuel Oil Storage Tank	Rupture	The redundant system (i.e. Train A and B) is capable of tolerating the passive failure of one fuel oil storage tank due to the fact that the redundant diesel generator is not supplied from the same tank.	15 15 15
Fuel Oil Transfer Pump	Pump fails to start	Fuel transfer capability to one diesel generator will be lost. Since redundant, independent diesel generator trains are provided the failure of any component in one train will not preclude the availability of at least one diesel.	15
	Pump fails to stop	Day Tank high-high level signal closes solenoid inlet valve to prevent overflow.	
Fuel Oil Transfer Piping	Piping Rupture	Same as pump fails to start.	
Fuel Oil Transfer Valves	Valves fail to open	Same as pump fails to start.	
Fuel Oil Day Tank	Rupture	Same as pump fails to start.	

9.5.5 DIESEL GENERATOR COOLING WATER SYSTEM

9.5.5.1 Design Basis

The Diesel Generator Cooling Water System is designed to:

a) provide full load cooling to the diesel engines in order to maintain proper operating temperatures under all loading conditions,

b) withstand Saf Shutdown Earthquake (SSE) loads without loss of function,

c) assure that a single active failure of any system component, assuming a loss of offsite power, cannot result in a complete loss of functional capability of the diesel generators, and

d) maintain the diesel generator cooling water in a warm condition to facilitate starting.

The diesel generator jacket water heat exchanger is designed to Safety Class 3 and Seismic Category I requirements. Compliance with the requirements of Regulatory Guide 1.68 is described in Section 1.8.

9.5.5.2 System Description

The Diesel Generator Cooling Water System is shown on Figure 9.5.5-1. Component design parameters are given in Table 9.5.5-1.

Each diesel engine is provided with a separate closed loop cooling water system. This system is a forced circulation cooling water type to directly remove heat from the engine by means of jacket water. The closed loop system is designed and supplied by the equipment manufacturer and includes an engine driven jacket water pump, standpipe and heat exchanger with the required interconnecting piping. The closed loop subsystem is equipped with an electric immersion heater and a motor-driven keep-warm circulating pump which maintains the engine in a ready-to-start condition. The tube side of the heat exchanger is supplied with cooling water from the Emergency Service Water System. (The Service Water System is described in Section 9.2.1 and those portions pertaining to the diesel generator are shown in Figure 9.5.2-2). The standpipe is initially filled by the potable water supply. The jacket cooling water circulating pump is an engine driven centrifugal pump, designed to provide cooling water during all diesel engine loadings. The pump draws water from the bottom of the standpipe and discharges through the heat exchanger before entering the diesel engine cooling passages. The standpipe serves two purposes: it is the storage tank for the system, and it absorbs the changes in cooling water volume as the diesel engine heats up and cools down. Makeup to the system is from the potable water supply. Normal water level in the standpipe is above the highest point in the engine (refer to FSAR 5
Section 9.5.5.3).

A three-way temperature controlled valve controls the flow through the heat exchanger to maintain the required water temperature, (170 F to 180 F) during diesel generator operation.

During periods of diesel generator standby, the jacket water cooling system is automatically maintained at 150 F by means of an electric jacket water keep-warm heater, jacket water keep-warm thermostat, and a motor driven jacket water keep-warm pump (see Figure 9.5.5-1). High and low temperature alarms monitor the jacket water temperature and the "keep warm" pump is tripped automatically upon start of the engine. The jacket water heater is provided with power from a non-safety power distribution panel in the diesel generator building.

Engine cooling water system design precludes trapping of air within the engine spaces. Vents are provided in the jacket water cooling system standpipe in order to assure that all spaces are filled with water. Provisions are
5 provided to treat the jacket water by adding or removing chemicals. Corrosion is controlled by utilizing potassium chromate, within limits specified by the manufacturer, and maintaining water pH. Sodium hydroxide and sodium hypochloride will be used to control pH and organic fouling, respectively. These chemicals are compatible with the diesel generator cooling water system materials and are in conformance with the engine manufacturer's recommendations.

The jacket water heater is conservatively sized and will maintain jacket water at 150 F when the room ambient temperature drops to a minimum of 50 F. The minimum room temperature of 50 F will be maintained by two electric unit heaters and is based on an outside air temperature of -2 F. A description of the Diesel Generator Building Ventilation System is provided in FSAR Section 9.4.5.

Freezing of the jacket water is precluded by the addition of an antifreeze compound ethylene glycol, which is recommended by the manufacturer and is compatible with the diesel generator cooling water system materials. The total heat rejection at 110 percent load from the jacket water heat exchanger is 18,078,456 Btu/hr based on 95 F Emergency Service Water maximum inlet temperature. The heat exchanger is designed to a duty of 20,662,000 Btu/hr.

9.5.5.3 Safety Evaluation

The Diesel Generator Cooling Water System is designed to have adequate capability to carry away the waste heat from diesel generator units under all loading and ambient conditions. The diesel generator is capable of operating fully loaded without secondary cooling for a minimum of one minute. Sufficient water is contained in the engine and standpipe to absorb the heat generated during this period. The normal supply of cooling water for the diesel generator is the normal service water pump. Upon loss of offsite power the emergency service water pump will supply cooling water to the diesel generator after a period of 20-25 seconds.

The Diesel Generator vendor, Transamerica De Laval, ran a continuous 24 hour load test on a diesel engine-generator set similar to Shearon Harris' unit.
5 The test engine ran for 22 hours at 100 percent load, followed by two (2) hours at 110 percent load. Test indicated that less than three (3) gallons of water was lost due to evaporation, boil off, and minor leaks.

The NPSH requirement for the engine jacket water pump corresponds to a minimum standpipe level of 53 1/16 in. Normal water level is at 212 3/4 in. and low water level alarm is at 185 1/2 in. Assuming a standpipe water level of 186 1/2 in. at start of seven (7) days of continuous 100 percent load operation, approximately 400 gallons of water is available between elevation 186 1/2 in. and 53 1/16 in. The standpipe, with a capacity of 400 gallons, provides more than adequate water to maintain the required pump NPSH and make-up for seven days of continuous operation. 5

All components of the Diesel Generator Cooling Water System are designed to Seismic Category I requirements. The jacket water heat exchanger and connections to the Emergency Service Water System are also designed to Safety Class 3 requirements. Failure of any non-Seismic Category I structures and components will not affect the safety related performance of the system. The diesel engine mounted cooling water system piping was designed, manufactured, and inspected in accordance with ASTM standards. 5

Each diesel generator has its heat exchanger's tube side connected to the respective emergency service water system train. Therefore, a single failure of a component, or the loss of a cooling source will not reduce the safety related functional performance capabilities of the system. The jacket water standpipe is provided with low level instrumentation for leak detection. In addition each diesel generator room is equipped with a sump and sump pump to collect and dispose of leaking fluids within the Diesel Generator Building. The sump pumps are automatically actuated on high sump level. Pump operation is annunciated in the Control Room.

This system is housed in a Seismic Category I Structure (Diesel-Generator Building) that is capable of withstanding the effects of natural phenomena such as earthquakes, tornadoes, hurricanes, floods, and missiles. As shown on Figures 1.2.2-86 and 1.2.2-87, each diesel generator is located in a separate room. Protection against postulated piping failures in high and moderate energy fluid systems is discussed in Section 3.6.

9.5.5.4 Testing and Inspection

Testing of the diesel generator is discussed in Section 8.3.1.1. All instrumentation, which is provided to monitor the cooling water temperature, pressure, standpipe water level and to alarm abnormal water jacket temperature, will receive annual calibration and inspection to verify their operability and accuracy.

The cooling water in the closed loop system is periodically analyzed to monitor its condition and treated as required to maintain its quality.

9.5.5.5 Instrumentation Application

The following alarm points with local annunciation are provided in the Diesel Generator Cooling Water System for each diesel generator:

a) jacket water inlet high/low temperature

b) jacket water outlet high/low temperature

c) jacket water high temperature trip

d) standpipe low level

e) jacket water pressure

f) jacket water low pressure trip

Jacket water pressure switch (PS-22C) and jacket water low pressure trip (PS-21C) are separate pressure switches which are connected to a common process tap (refer to Figure 9.5.5-1).

Pressure settings for jacket water pressure switch is 12 psi and decreasing (alarm point), jacket water low pressure trip switch is 10 psi and decreasing.

Operation of any of the above mentioned local alarms is indicated by annunciation on the Diesel Generator Control Panel and also "trip" or "trouble" alarms on the Main Control Board. In addition, pressure and temperature devices are provided for local indication and thermocouples are provided for remote indication of temperature. Temperature settings for jacket water low temperature inlet/outlet alarm switch actuation is 140 F
5 decreasing respectively. This alarm is functional only during the diesel generator operational mode. In addition, temperature settings for the jacket water high temperature inlet/outlet alarm switch actuation is 175 F increasing and 190 F increasing respectively. One thermocouple is placed in the piping between the return header and standpipe (jacket water outlet high/low temperature) and the second thermocouple is placed in the piping between the heat exchanger and the diesel engine (jacket water inlet high/low temperature). A high temperature of 200 F will trip the diesel generator if an engineered safety feature signal is not present.

The jacket water low pressure trip is designed to be an anticipatory trip to protect the diesel from a loss of cooling water if the diesel is started by a non-emergency start. This trip is not functional if the diesel receives an automatic, emergency start signal.

TABLE 9.5.5-1

DESIGN PARAMETERS FOR DIESEL GENERATOR COOLING WATER SUBSYSTEM

Standpipe		
Capacity, gal.	733	
Engine Driven Jacket Water Pump		
Flow, gpm	2000	
Total dynamic head, ft.	70	
Jacket Water Keep Warm Heater		
Power, KW	75	
Voltage, v	480 V AC	
Jacket Water Cooler		
Quantity	1	
	Shell	Tube
Flow, gpm	1800	1250
Discharge pressure, psig	75	75
Temperature, Inlet, F	175	95
Temperature, Exit, F	152	128
Code	ASME Section III TEMA Class R	

9.5.6 DIESEL GENERATOR AIR STARTING SYSTEM

9.5.6.1 Design Bases

The Diesel Generator Air Starting System is designed to the following bases:

a) Each starting air receiver will supply sufficient compressed air to crank the cold diesel engine five times without recharging the receiver. Each cranking cycle brings the diesel generator up to a speed of 200 rpm.

b) Operate under the same environmental conditions as the diesel generator which it serves.

c) The portions of the air starting system necessary for emergency operation meet Seismic Category I, Safety Class 3 requirements.

d) Complete redundancy so that in the case of a single faiure of any component, the diesel generator can be safely started.

The air receivers, piping and valves from the receivers up to the diesel engine are designed to Safety Class 3 and Seismic Category I requirements (refer to Table 3.2.1-1).

9.5.6.2 System Description

The Diesel Generator Air Starting System is shown on Figure 9.5.6-1. The general arrangement diagram for the Diesel Generator Air Starting System is shown on Figures 1.2.2-86 and 1.2.2-87. There are no interconnections among the systems serving separate diesel generators.

A physically separate air starting system is provided for each of the diesel generators. The starting air system consists of two AC motor driven air compressors, two air dryers and two air receivers each capable of five cold start attempts. The system is designed such that failure of one receiver will not interfere with the ability of the remaining receiver to deliver the required quantity of air. Each compressor is capable of recharging both receivers within thirty minutes after a discharge corresponding to five starting attempts. Each air receiver is equipped with an air dryer and tank drainage capability.

The two compressor discharges for each diesel engine feed both air receivers. Therefore, either compressor has the capability of filling both receivers. Each air receiver is equipped with a safety valve (set at 275 psig), a drain valve, and isolation valves. The air receivers are maintained at a nominal pressure of 250 psig by automatic starting of the compressor at 200 psig receiver pressure, and stopping at 250 psig.

Each air receiver is connected to the diesel engine starting mechanism independently. Upon receipt of a diesel generator start signal, all start air admission valves are opened simultaneously, delivering air to the air distributors and the individual air start valves in proper sequence, admitting starting air directly into the engine cylinders for cranking. Adequate cranking power is obtained from any one of the start air admission valves. A description of diesel generator starting signals is found in Section 8.3.1.1.2.14.

The starting air dryer has two desiccant filled towers and provides air at a design dewpoint of -40 F. One tower is used to dry the inlet air while the other tower is being reactiviated. An automatic control system reverses the tower's operation and provides continuous drying of the starting air.

Regeneration is accomplished by depressurizing the tower and then purging it with a small amount of dry outlet air at atmospheric pressure. Air flow is upward during drying and downward during reactivation. This limits moisture
5 accumulation to the inlet side of the dryer and provides the driest desiccant at the outlet end of each tower to assure a maximum drying of the air.

The dessicant will retain its ability to absorb moisture for a long period of time under normal service so that generally no maintenance of the towers is required.

The dryer is provided with a pre-filter and an after-filter to prevent contamination of the desiccant and ensure that starting air is free of desiccant carried over from the drying tower.

Air supply to each receiver is provided by a safety-related motor driven air compressor and is isolated from the receiver by a safety grade check valve. The engine is started by the air in the tank. The compressor is used to maintain pressure in the tank by pressure switches provided on the air receivers. Each air receiver is capable of starting the engine at least five times without being pressurized by the compressor.

9.5.6.3 Safety Evaluation

Each Diesel Generator Air Starting System is capable of supplying a sufficient quantity of air from its associated air receivers to ensure a successful starting operation of the diesel engine independent of normal plant power sources.

Each engine has redundant and independent air starting facilities of adequate starting capacity. Each engine can be started by either one or both of the dual train pressurized air starting systems. These air starting systems do not depend on normal plant power or any other plant system for starting power once the air receivers are charged. However, safety related 125V DC power of the same division is provided for initial control, field flashing and solenoid valve operation. The safety related 125V DC power is discussed in Section 8.3.2. Alarms are provided to alert the operating personnel if the air receiver pressure falls below the minimum allowable value specified by the manufacturer. A drain valve for each air receiver receiver is provided to periodically blowdown accumulated moisture and foreign material.

The air starting systems for one diesel are physically and electrically separated from those for the other diesel to assure that no single failure in an air-starting system can lead to a loss of function of the other diesel engine.

The starting air system piping mounted on the diesel engines was designed, manufactured, and inspected in accordance with ASTM standards. 5

The essential portions of this system external to the engine necessary for emergency operation, which consist of air receivers, valves, instrumentation and associated piping are designed in accordance with Seismic Category I requirements and ASME Section III Code Class 3. This essential portion is housed within a Seismic Category I structure to protect the system from extreme natural phenomena. Failure of any non-Seismic Category I structure or component will not affect the safety related performance of the system.

Protection against postulated piping failures in high and moderate energy fluid system breaks is discussed in Section 3.6.

9.5.6.4 Tests and Inspection

Testing of the diesel generator is discussed in Section 8.3.1.1. The starting air compressors for each diesel engine are periodically test-started to assure continued operability. Inspection and scheduled maintenance will be performed periodically using the manufacturer's recommendations and procedures and in accordance with Chapter 16.

The starting air dryer desiccant will be periodically inspected for evidence of deterioration and will be replaced when it no longer meets the manufacturer's specifications. The dryer pre-filters and after-filters will be inspected as part of normal maintenance procedures and cleaned or replaced as needed. 5

Specific testing, calibration, and inspection procedures and their frequencies will be developed for the diesel air starting system by utilizing the manufacturers' recommendations, the relevant regulatory requirements, and included in the plant preventative maintenance program.

For compliance with the requirements of Regulatory Guide 1.68 as related to preoperational and start up testing of the Diesel Generator Air Starting System, refer to Section 1.8.

9.5.6.5 Instrumentation Application

The following instruments are provided in the Diesel Generator Air Starting System for each diesel generator:

a) Pressure switches on each air receiver which control the operation of the corresponding compressor, and

b) local pressure indicator on each air receiver.

The following alarm points are provided in the air starting system, with local annunciation on the Engine Control Panel.

a) Air starting system low pressure (each receiver),

b) Barring device engaged. When the barring device is engaged for maintenance, the diesel engine cannot start.

Operation of any of these alarms is indicated by a "trouble" alarm in the Control Room.

The following indicators are provided on the diesel generator engine control panel (local):

a) Starting air pressure (left bank)

b) Starting air pressure (right bank)

TABLE 9.5.6-1

DESIGN DATA - DIESEL ENGINE STARTING SYSTEM COMPONENTS

Air Compressor	
Quantity	2
Type	Two Stage Piston
Capacity, scfm	88
Discharge pressure, psig	250
Discharge temperature, F	140 Approx.
Speed, rpm	790
Code	ANSI N45.2.2
Driver	
Type	Electric AC Motor
Motor Rating	30 HP, 3 Phase, 460V AC, 60 Hz
Air Dryer	
Quantity	2
Type	Heaterless Desiccant Dryer
Flow rate, scfm	76.1
Pressure operating/design, psig	0-275 Operating/275 Design
Temperature operating/design, F	70-140 Operating/300 Design
Drying Chambers, quantity	2
Desiccant	Activated Alumina
Dew Point, F	-40 5
Air Receiver	
Quantity	2
Type	Vertical-cylinder with Dished Head
Capacity, cu. ft.	305
Diameter, in.	60
Height, ft.	18-3/4 approx. (including lifting eyes)
Design pressure, psig	300
Design temperature, F	250
Material	SA 515, Gr 70, Shell and Heads
Code	ASME Section III Code, Class 3
Piping and Valves	
Pressure, operating/design, psig	250 operating/300 design
Temperature, operating/design, F	140 operating/400 design
Material	ASME SA-106 Gr. A

9.5.7 DIESEL GENERATOR LUBRICATION SYSTEM

9.5.7.1 Design Basis

The Diesel Generator Lubrication System (DGLS) is designated to the following bases:

a) To provide essential lubrication to the components of the diesel generator unit during all modes of operation.

b) To have the ability to maintain the required quality of the oil during engine operation.

c) To automatically maintain the temperature of the lubricating oil above a minimum value.

d) To ensure that a single active failure cannot cause loss of both diesel generators.

e) To preclude the possibilities of damage due to natural phenomenon and pipe rupture.

The components required for safety are designed to Seismic Category I requirements.

9.5.7.2 System Description

The Diesel Generator Lubrication System is shown in Figure 9.5.7-1. The lubrication system piping mounted on the diesel engine was designed, manufactured, and inspected in accordance with ASTM standards. Design parameters for system components are provided in Table 9.5.7-1. 5

The system consists of the following equipment (per diesel engine generator set):

a) one engine driven pump,

b) one motor driven standby pump (motor driven auxiliary lube oil pump),

c) one lube oil cooler,

d) three lube oil strainers,

e) two lube oil filters (one duplex filter and one keep warm filter),

f) one lube oil keep warm pump

g) one lube oil prelube electric heater (lube oil heater), and

h) piping, valves and instrumentation

The main circulating lube oil pump is an engine driven screw type pump which takes its suction from a lube oil sump tank located on the auxiliary module, through a strainer and circulates oil while the diesel engine is running.

The lube oil is pumped through the lube oil cooler, filters and strainer before it flows to the diesel engine bearings. The filter is capable of filtering out particulates >10μ. The lube oil system is equipped with two full capacity lube oil filters with replaceable cartridges. Change of these cartridges can be effected while the engine is operating. Heat is rejected via the lube oil cooler, to the Diesel Generator Cooling Water System discussed in Section 9.5.5.

The lubricating oil header pressure is controlled by a pressure regulating valve
5 located in the pump discharge piping. It is set at 50 psig, senses header pressure,
and regulates the bypass volume to maintain header pressure at 50 psig.

During periods of diesel generator standby, the lubricating oil is kept at the proper temperature (150 F) by circulating it with a motor driven keep warm
5 pump through an automatically controlled electric heater located in the lube
oil sump tank. This assures optimum viscosity and lubricating properties and provides for pre-start lubrication.

The ASME Section III 100 percent capacity auxiliary lube oil pump is a Class IE motor driven back-up to the main engine driven lube oil pump. This pump is required to operate only when the engine is running and the main
5 engine driven lube oil pump has failed. The auxiliary lube oil pump is
controlled via pressure switches located in the lube oil piping. The auxiliary lube oil pump is not required for an emergency start. Power for the auxiliary lube oil pump motor is provided from the 480V safety related MCC located in the diesel generator building, so that power to the auxiliary lube oil pump will be available during a loss of offsite power. The lube oil system is designed to preclude the entry of deleterious material into the system, having a blind bolted flange padlocked to the charging terminal.

To prevent excessive wearing of the turbocharger bearings due to lack of lubrication before the engine starts, a tap from the keep warm system provides a slow drip of oil onto the bearings.

5 Admission of air into the lube oil system is prevented by the coolers being
located below the generator lube oil level.

The starting sequences for a normal start and an emergency start are the same except that most of the trips associated with the automatic safety shutdown system are disarmed after an emergency start. Engine overspeed, generator differential, and generator bus faults are the only trips active in the emergency mode.

9.5.7.3 Safety Evaluation

The Diesel Generator Lubrication System is capable of supplying sufficient lubrication to the diesel generators under all loading conditions. All components of this system required for safety are designed to Seismic Category I requirements.

5 The instrumentation, service, location, and description of alarms provided for
monitoring the diesel engine lubrication oil system are provided in Table 9.5.7-2

If a failure in the system prevents the operation of its associated diesel generator, the remaining diesel generator is not affected.

Each Diesel Generator Lubrication System is housed in the same Seismic Category I structure as its own diesel generator and, therefore, is independent and physically separated from the redundant diesel generator system (Figures 1.2.2-86 and 1.2.2-87). Failure of any non-Seismic Category I structures and components will not affect the safety related performance of the system.

The system is protected from tornado winds, externally generated missiles, and flooding by virtue of its location inside the Diesel Generator Building. As each lube oil system associated with its diesel generator is located in that diesel generator room with no interconnecting piping, missiles generated by one diesel generator will not damage the lube oil system associated with the other diesel generator. Relief valves, relief doors, and crankcase vents have 5
been provided in order to prevent crankcase explosions and to mitigate the consequences should such an unlikely event occur.

Protection against postulated piping failures in high and moderate energy fluid systems is discussed in Section 3.6. The Diesel Generator Lubrication System is designed by the diesel generator manufacturer. Design parameters for system components are provided in Table 9.5.7-1.

The lube oil sump tank is provided with low level instrumentation for leak detection. In addition, each diesel generator room is equipped with a sump and sump pump to collect and dispose of leaking fluids within the Diesel Generator Building. The sump pumps are automatically actuated on high sump level. Pump operation is annunciated in the Control Room.

Oil may be safely added to the system via the sump tank while the engine is running or with the engine stopped. 5

9.5.7.4 Inspection and Testing Requirements

For the initial preparation for operation, the system will be flushed and then all filters used during the flushing process will be either cleaned or discarded and replaced.

Testing of the diesel generator is discussed in Section 8.3.1.1. The Diesel Generator Lubrication System is operationally tested during the startup and checkout of the diesel generator. Lube oil pressure and temperature are monitored to ensure operability of the engine driven pump. Operation of the lube oil keep warm and sump removal pump and electric heater are evidence of their operability. Inspection and testing of the system can be performed without disturbing normal plant operations.

Representative oil samples will be submitted to a qualified laboratory for analysis on a periodic basis to ensure that the engine manufacturer's specifications are met. The following tests will be conducted: oil viscosity, water/glycol contamination, neutralization value, pentane and bezine insolubles and spectrographic analysis. A review of these test results 5
by Carolina Power and Light, the oil supplier, and the testing laboratory will be the basis for deciding whether or not the oil needs to be changed.

The diesel generator lubrication system sensors will be calibrated on an annual basis. The reliability of the electrical circuitry, with the

associated alarms, interlocks, and trip activation signals, will be tested on
5 the same frequency as the associated instrument by simulating the alarm/trip condition.

9.5.7.5 Instrumentation Application

The following local alarm points are provided in the lube oil system for each diesel generator:

a) low oil pressure

b) low oil pressure trip

c) low oil temperature; in/out

d) high oil temperature; in/out

e) high oil temperature trip

f) high differential pressure across filter

g) high differential pressure across strainer

h) low oil level in the sump

i) low turbocharger oil pressure; left/right

j) low turbocharger oil pressure trip

k) auxiliary lube oil pump on

l) high crankcase pressure trip

Operation of any of the alarms is indicated by "trouble" or "trip" alarms in the Control Room.

In addition, the following pressure and temperature switches are provided for tripping the diesel engine unless the diesel generator is operating due to a loss of offsite power or an engineered safety feature actuation signal (ESFAS):

a) high oil temperature,

b) low oil pressure

c) low turbocharger oil pressure, right or left

d) high crankcase pressure

The following pressure and temperature devices are provided for local indication. Thermocouples are located downstream of the filter and crankcase for remote monitoring.

a) lube oil pressure

b) differential pressure-lube oil filter

c) turbocharger oil pressure; left/right

d) crankcase pressure

e) lube oil sump tank level

TABLE 9.5.7-1

DESIGN PARAMETERS FOR DIESEL GENERATOR LUBE OIL SYSTEM COMPONENTS

Engine Driven Lube Oil Pump		
Type	Screw	
Flow, gpm	60	
Discharge Pressure, psig	50	
Lube Oil Keep Warm Pump		
Type	Positive Displacement, Screw	
Flow, gpm	99	
Discharge Pressure, psig	20	
Motor Rating	7.5 HP, 3 Phase, 480V AC, 60 Hz	
Speed, rpm	1800	
Motor Driven Auxiliary Lube Oil Pump		
Type	Positive Displacement, Screw	
Flow, gpm	575	
Discharge Pressure, psig	85	
Motor Rating	60 HP, 3 Phase, 480V AC, 60 Hz	
Speed, rpm	1200	
Lube Oil Heater (Lube Oil Prelube Electric Heater)		
Quantity	1	
Power, kW	50	
Voltage V	480 V AC	
Lube Oil Coolers		
Quantity	1	
	Shell	Tube
Flow, gpm	500	800
Discharge Pressure, psig	75	75
Temperature, Inlet F	185	152
Temperature, Exit F	158.7	160.4 5
Lube Oil Strainer		
Quantity	3	
Pressure, psig	100 (Operating)	
Flow, gpm	500	
Temperature, F	148	

TABLE 9.5.7-1 (continued)

Lube Oil Filter, Full Flow

Quantity	1 Duplex
Pressure, psig	100 (Operating)
Flow, gpm	500
Temperature, F	200
Filtration	10 Micron

2

Lube Oil Valves

a - 3-way plug

Pressure, psig	100 ± 10% (Operating)
Temperature, F	185

b - Check

Pressure, psig	150
Temperature, F	185
Code	ANSI - B16.1

c - Ball

Pressure, psig	0 - 50 ± 10% (Operating)
Temperature, F	185

TABLE 9.5.7-2

Annunciation for the Diesel Engine Lubrication Oil System

Instrument Number*	Service	Location	Description
PS-25C	Low Lube Oil Pressure	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the Main Control Board. This alarm annunciates on the MCB under a trouble signal. The alarm is actuated when falling lube oil pressure reaches a set value of 40 psig.
PS-42C	Low Lube Oil Pressure Trip	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the Main Control Board. This alarm annunciates when the diesel generator trips on low lube oil pressure. Annunciation will appear under the "Generator Trip" window. The trip is actuated when falling lube oil pressure reaches 30 psig.
N/A	Low Lube Oil Temperature IN/OUT		Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the Main Control Board. This alarm annunciates on the MCB under the annunciator window for generator trip. The alarm is actuated when the lube oil temperature in reaches 140°F and temperature out reaches 140°F falling.
N/A	High Lube Oil Temperature IN/OUT		Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on Annunciator Light Box on the Main Control Board. This alarm annunciates on the MCB under the "Generator Trouble" annunciator window. The alarm is actuated when the lube oil temperature reaches a high temperature value of 175°F rising (in) and 190°F rising (out).

* EBASCO's or Vendor's tag number

5

TABLE 9.5.7-2 (Continued)

Instrument Number*	Service	Location	Description
PS-16C	High Lube Oil Temperature Trip	Mounted on Engine	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the MCB. This alarm annunciates under the "Generator Trouble" annunciator window. The trip is actuated when the lube oil temperature reaches a high temperature value of 200°F and rising.
Δ P-4	High Differential Pressure Across Filter	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the MCB. This alarm annunciates under the "Generator Trouble" annunciator window. The alarm is actuated when the differential pressure across the filter reaches 20 psig and rising. 5
Δ P-1	High Differential Pressure Across Strainer	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the MCB. This alarm annunciates under the "Generator Trouble" annunciator window. This alarm is actuated when the differential pressure across the strainer reaches 20 psig and rising.
LS-2	Low Lube Oil Level In the Sump	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the MCB. This switch annunciates under the "Generator Trouble" annunciator window. The alarm is actuated on low sump level.

* EBASCO's or Vendor's tag number

TABLE 9.5.7-2 (Continued)

Instrument Number*	Service	Location	Description
PS-20C/PS-43C	Low Turocharger Oil Pressure left/right	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the MCB. This alarm annunciates on the MCB under the "Generator Trouble" annunciator window. Pressure setting for alarm actuation is 20 psig falling left/right respectively. The trip is actuated at 15 psig falling.
PS-19C	Low Turbocharger Oil Pressure	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on Annunciator Light Box on the MCB. The alarm annunciates under the "Generator Trouble" annunciator window. The alarm is actuated when the turbocharger oil pressure reaches a low value of 15 psig and falling.
N/A	Auxiliary Lube Oil Pump	Engine Control Panel	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the MCB. Status lights indicate pump activity (start - red, stop - green, auto - amber). The alarm for the auxiliary lube oil pump operation will appear under the "Generator Trip" annunciator window.
PS-27C	High Crankcase Pressure Trip	Engine mounted	Annunciates on the Diesel Engine Control Panel and redundant annunciation appears on the Annunciator Light Box on the MCB. The alarm for high crankcase pressure is annunciated under the "Generator Trouble" annunciator window. The alarm is actuated at .3 to .5 psig and rising above a present value. The trip is actuated when the crankcase pressure reaches .3 psig and rising.

5

* EBASCO's or Vendor's tag number

9.5.8 DIESEL GENERATOR COMBUSTION AIR INTAKE AND EXHAUST SYSTEM

9.5.8.1 Design Basis

The Diesel Generator Combustion Air Intake and Exhaust System is designed to supply adequate combustion air to the diesel generators and to exhaust the combustion products to the atmosphere. As shown on Figures 1.2.2-86 and 1.2.2-87, the combustion air intakes are arranged in a manner that affords protection from external missiles and high winds. The combustion air intakes and exhausts are designed to withstand safe shutdown earthquake and tornado forces. The system meets minimum safety requirements assuming a single failure.

9.5.8.2 System Description

The diesel generator combustion air intakes and exhausts are shown on Figure 9.5.5-2.

The combustion air intakes are composed of intake screens (bird screens) located on the exterior wall of Diesel Generator Building at Elevation 297 ft. and intake ducts located in the missile protection wall behind the bird screens at Elevation 307 ft. The vertical offset between the bird screens and intake ducts acts to protect the combustion air intakes from external missile damage. The intake ducts vent to a plenum formed by the floor at Elevation 292 ft., the roof at Elevation 312 ft., the vertical walls forming the exhaust silencer enclosure and the vertical diesel generator building walls extending from Elevation 292 ft. to 312 ft. A dry type intake filter and silencer for each diesel generator is installed indoors with intake piping of adequate size to prevent excessive pressure drop. The exhaust piping from each diesel generator exhaust outlet to the exhaust silencer is located above Elevation 279 ft. The exhaust silencer is located at Elevation 292 ft. Exhaust piping from the silencer exits the Diesel Generator Building through a missile protected enclosure above roof Elevation 312 ft. The exhaust piping is of sufficient size to prevent excessive back pressure. The engine is provided with an 8 in. non-safety, non-seismic atmospheric vent to prevent buildup of crankcase pressure. Refer to Figures 1.2-86 and 1.2-87 for equipment location. 5

Expansion joints for exhaust and intake piping are provided to protect the equipment from forces due to thermal expansion or vibration.

9.5.8.3 Safety Evaluation

The combustion air intake to each diesel generator is designed to Safety Class 3 and Seismic Category I requirements (see Section 3.2), protected from tornado generated missiles, and shielded from direct wind, rain or snow. The systems are designed such that a single active failure in an engine combustion air intake or exhaust system will not lead to the loss of function of more than one diesel generator. These intake and exhaust systems are independent, and they are sized and physically arranged such that no degradation of engine function will be experienced when the diesel generator set is required to operate continuously at the maximum rated power output. The combustion air intake system is provided with filters in order to reduce airborne particulate material over the entire time period that emergency power is required, assuming the maximum airborne particulate concentration at the combustion air intake. The combustion products exhaust system is designed to Safety Class 3 and Seismic Category I requirements as described in Table 3.2.1-1. The exhaust system piping is fabricated and designed in accordance with ANSI B31.1. A 10 CFR 50 Appendix B QA program has been applied to the exhaust system. The hot gases are exhausted approximately 30 ft. above and 100 ft. laterally from the air intakes, thus avoiding the possibility of recirculation of diesel combustion products.

15 The air intakes for each diesel generator compartment are located at Elevation 292.00 ft. in the east wall of the diesel generator building. This air is supplied through the combustion air intake filter located on Elevation 292.00 ft. to the diesel generator located on Elevation 261.00 ft. There are two exhaust ducts penetrating the west wall of the diesel generator compartment at about Elevation 280.0 ft. These ducts continue west from this wall to the vicinity of the west wall of the building, turn up at 90° piercing the concrete floors at Elevations 292.00 ft. and 312.00 ft., respectively, to terminate in separate exhaust plena. Each plenum exhausts to atmosphere through an opening located just under the roof at Elevation 327.00 ft. in the west wall of the building.

In the event of a fire in a diesel generator compartment coincident with a single failure of the fire protection system, the hot air and smoke would be exhausted through the openings in the west wall of the diesel generator building air exhaust plena which are at a higher elevation than that of the air intakes located in the east wall of the diesel generator building.

In the event of a fire in the diesel fuel oil day tank room, the heat and smoke from this area will be discharged from one of the plena described above.

Since air intake and exhaust openings are about 105 feet apart at opposite ends of the diesel generator building with hot air and smoke being discharged at an elevation higher than the intake for the cooler air, the combustion air for the remaining diesel will not be degraded by a fire.

Diesel generator exhaust piping is fabricated and tested in accordance with the requirements of ANSI B31.1 and meets all Quality Assurance requirements of Safety Class 3 piping. Intake piping is fabricated and tested in accordance with ASME Section III, Class 3 requirements.

Intake and exhaust system components (silencers, filters, and expansion joints) are manufactured in accordance with applicable industry standards and meet Seismic Category I requirements.

To minimize the amount of concrete dust, the floors, walls, and ceilings on the inside of the diesel generator building will be painted or coated. See Section 9.4.5.2.5 for other dust control measures.

15

15

The location of chemical storage facilities has been evaluated such that for an accident involving the complete severance of the largest pipe connected to any chemical storage tank, the minimum oxygen concentration (18 percent by volume) required for diesel engine operation would be maintained at the diesel engine combustion air intakes.

Protection against postulated piping failures in high and moderate energy fluid systems is discussed in Section 3.6.

Failure of any non-Seismic Category I structures and components will not affect the safety related performance of the system.

The pressure drop due to a tornado, which is the lowest barometric pressure expected, is taken into consideration in the design of the diesel generator air intake and exhaust flow. As stated in FSAR Section 2.3.1.2.1 the SHNPP site lies in Region I for Design Basis Tornado. For a Region I Design Basis Tornado the pressure drop is 3.0 psi and the rate of pressure drop is 2.0 psi/sec.

The diesel generator building is designed to withstand the 3 psi pressure drop in 1.5 seconds (rate 2 psi/sec) as a result of tornado. Interior walls are 5
designed for 2 psi differential pressure.

Transamerica-DeLaval, the manufacturer of the Shearon Harris diesel generator, has performed a test to evaluate the "Dynamic Performance of Enterprise Diesel Engine". The test results indicate no adverse effect on the performance of the diesel generator set due to a pressure drop of 3 psi in 1.5 seconds.

9.5.8.4 Test and Inspection

To ensure the integrity of the diesel engine combustion air intake and exhaust subsystems, scheduled inspection will be performed as part of the overall engine performance check. All filters will be replaced in accordance with manufacturer's recommendation.

The Diesel Generator Combustion Air Intake and Exhaust System instrumentation will be calibrated annually. Testing of the system will occur with the 5
periodic tests of the emergency diesel generators per Regulatory Guide 1.108.

For compliance with the requirements of Regulatory Guide 1.68 as related to preoperational and start-up testing of the combustion air intake and exhaust subsystems, see Section 1.8.

9.5.8.5 Instrumentation

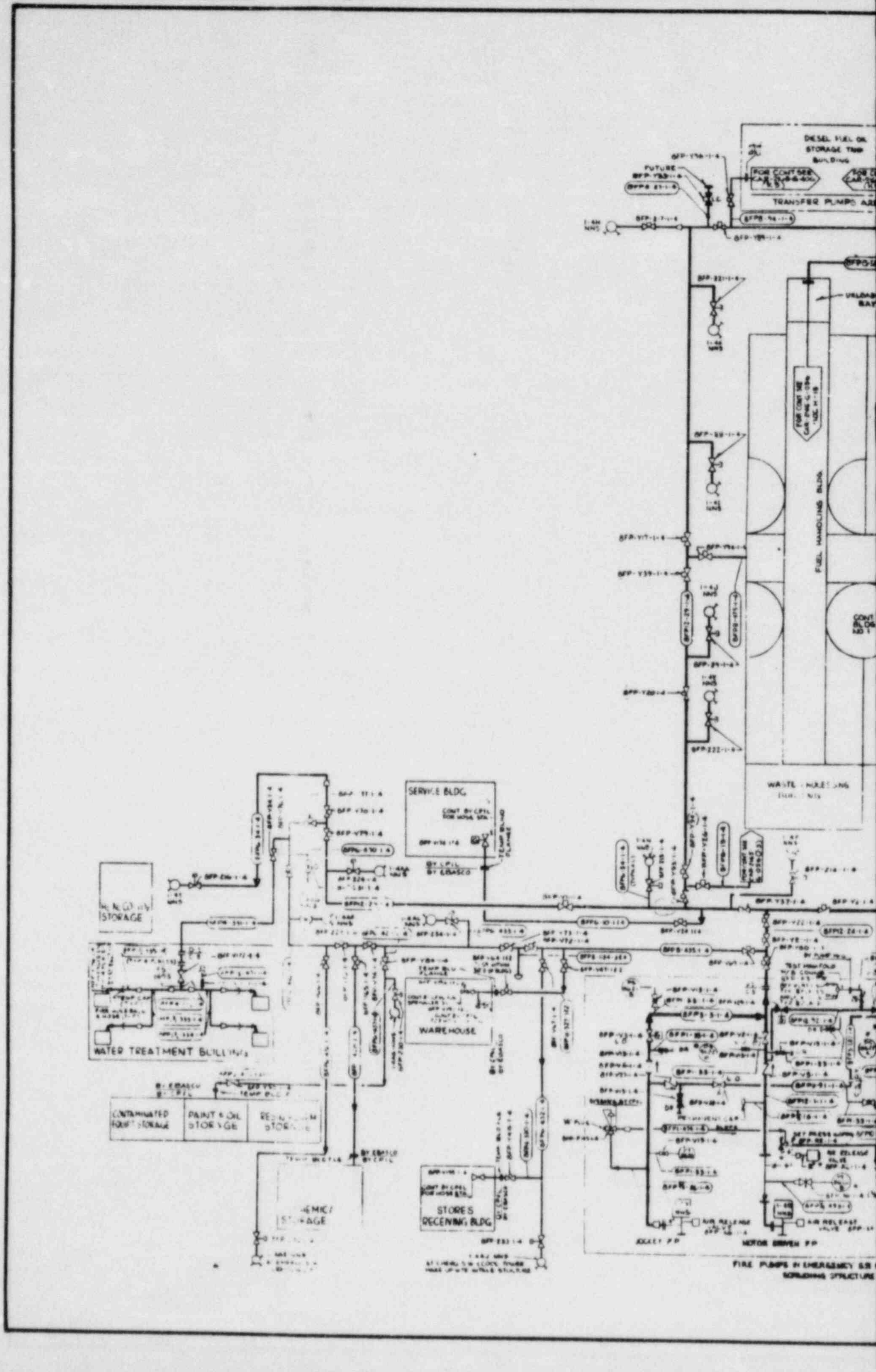
Local indicators are provided for the following combustion air and exhaust gas parameters:

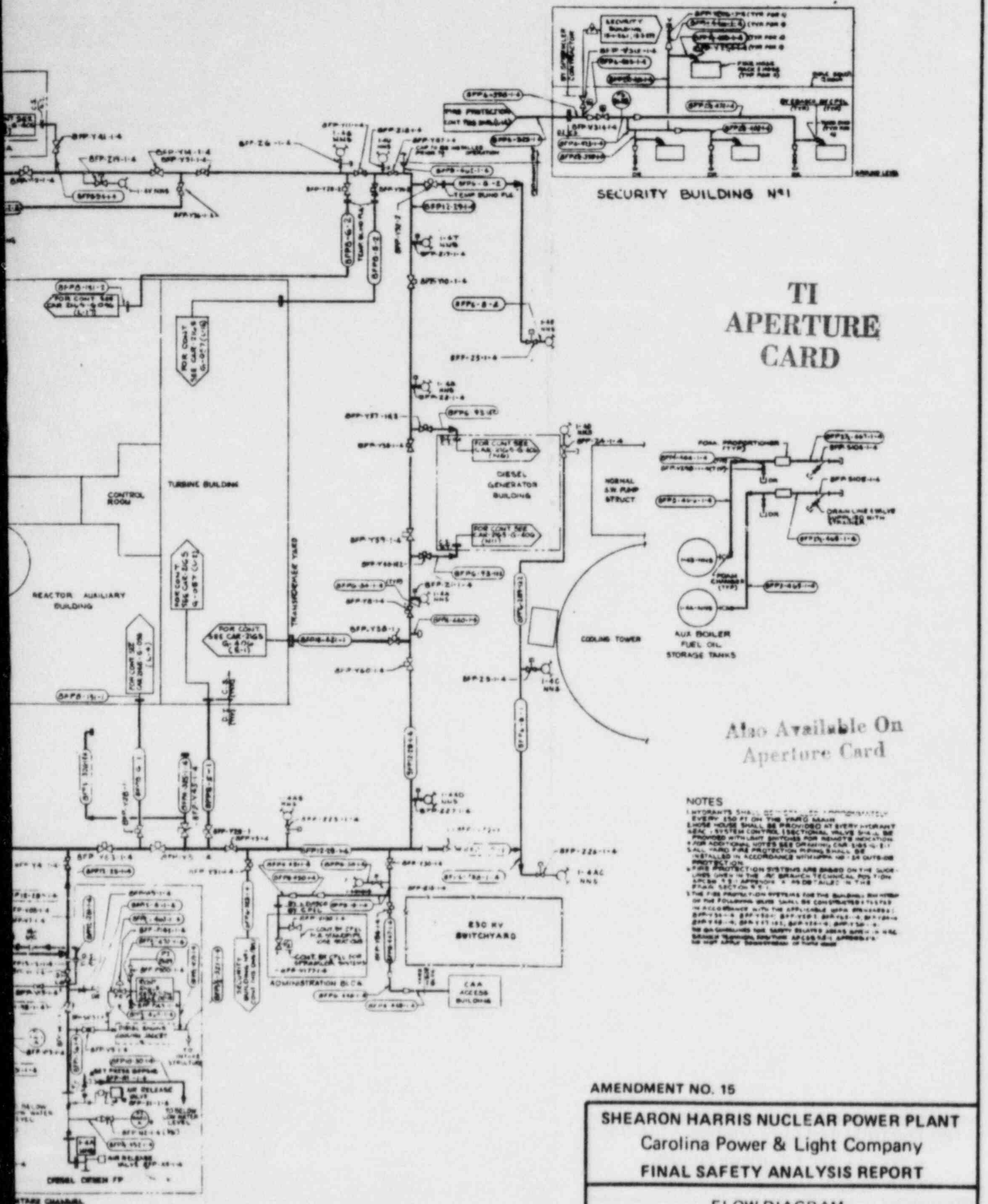
a) Combustion Air Pressure - Combustion air pressure gauge located on the diesel generator control panel provides the operator with a visible means, without alarm or annunciation, of determining the performance of the turbocharger. No interlock is required. 5

b) Cylinder Temperature (left bank, right bank) - Cylinder temperatures are determined during the operator's periodic inspection of the operation of the diesel generator. Temperatures for both banks of cylinders are obtained by the operator turning the temperature controlled selector switch, which is mounted on the Diesel Generator Control Panel, to the desired cylinder for temperature investigation. No alarm, annunciation, or interlocks are required.

c) Exhaust Manifold Temperature (left, right) - Exhaust manifold temperatures are determined during the operator's periodic inspection of the diesel generator. Temperatures for the left manifold and right manifold are obtained by the operator turning the temperature controlled selector switch, which is mounted on the Diesel Generator Control Panel, to the desired exhaust
5 manifold for temperature investigation. No alarm, annunciation, or interlocks are required.

The Diesel Generator Combustion Air Intake and Exhaust System instrumentation will be calibrated annually. Testing of the system will occur with the periodic tests of the emergency diesel generators per Regulatory Guide 1.108. None of the Diesel Generator Combustion Air Intake and Exhaust System instrumentation provide an alarm condition to alert the operator. An out-of-specification valve will present itself as a decrease in engine performance, i.e., less load carrying capability or uneven engine operation (increased vibration) which are monitored or alarmed at the local and remote control panels. These allow operator action to localize the source of the abnormal condition and to prevent damage to the diesel engine.


DIESEL FUEL OIL
STORAGE TANK
FUTURE
FUEL HANDLING BLDG
SERVICE BLDG
WAREHOUSE
WATER TREATMENT BUILDING
CONTAMINATED EQUIPT STORAGE
PAINT & OIL STORAGE
STORES RECEIVING BLDG
MOTOR DRIVEN FP



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AMENDMENT NO. 15

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

FLOW DIAGRAM
FIRE PROTECTION SYSTEM
SHEET 1
FIGURE 9.5.1-1

REF DWG: CAR-2165-G-055 (REV. 10, OPEN)

8408140036-01

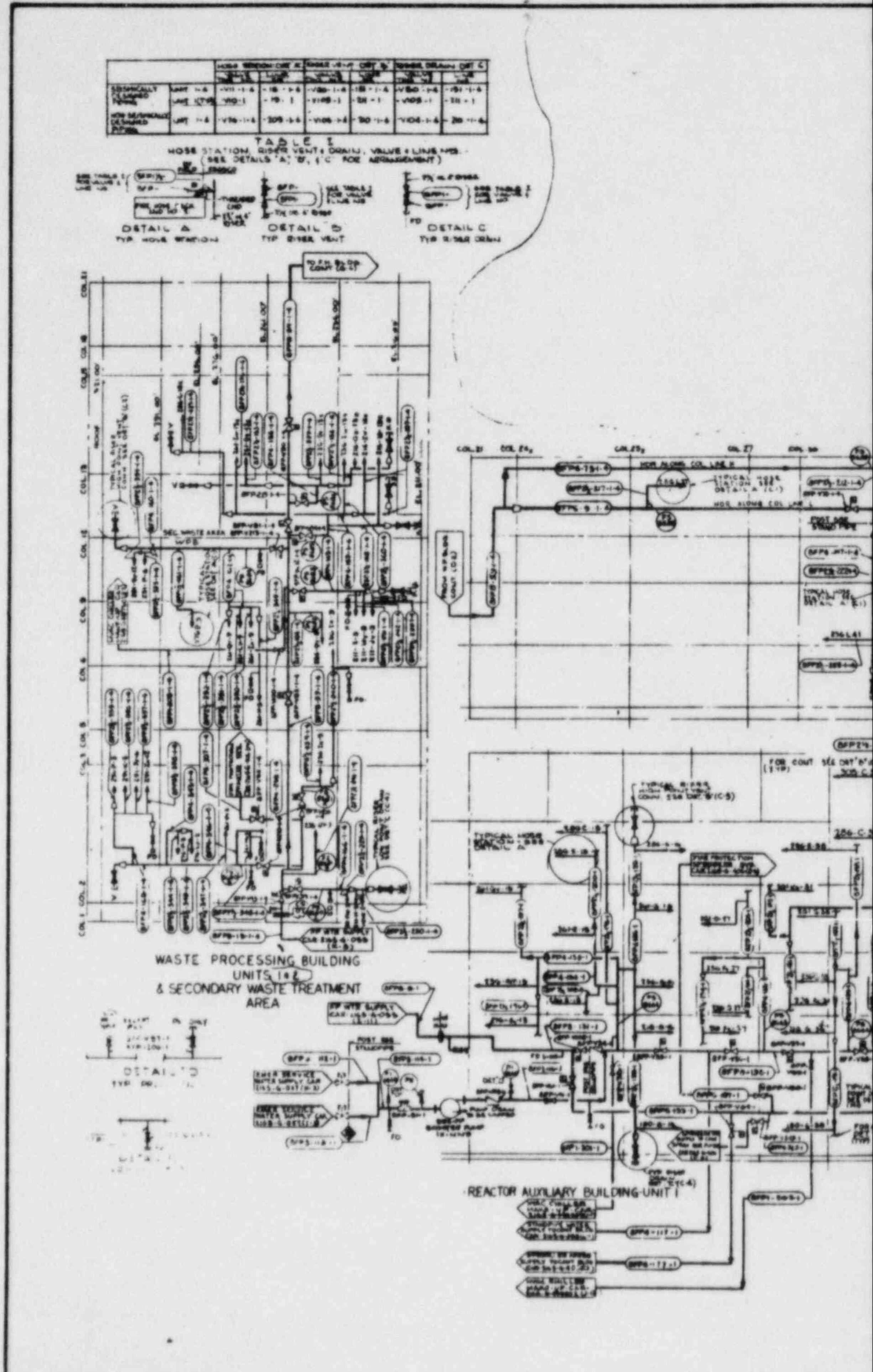
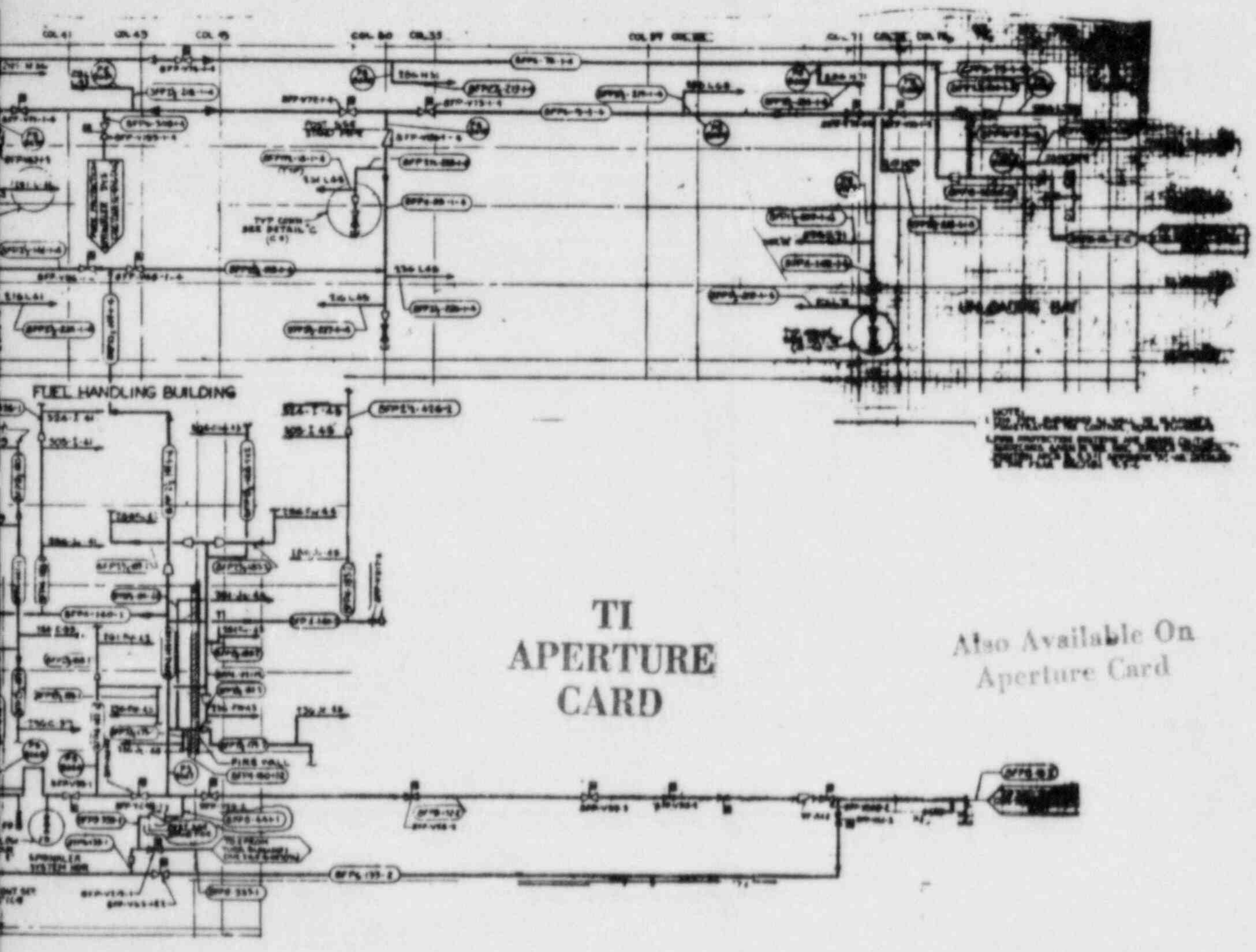


TABLE I
HOSE STATION, RISER VENT & DRAIN, VALVE & LINE NOS.
DETAIL A
TYP. HOSE STATION
DETAIL B
TYP. RISER VENT
DETAIL C
TYP. RISER DRAIN
WASTE PROCESSING BUILDING
UNITS 1&2
& SECONDARY WASTE TREATMENT
AREA
REACTOR AUXILIARY BUILDING-UNIT 1



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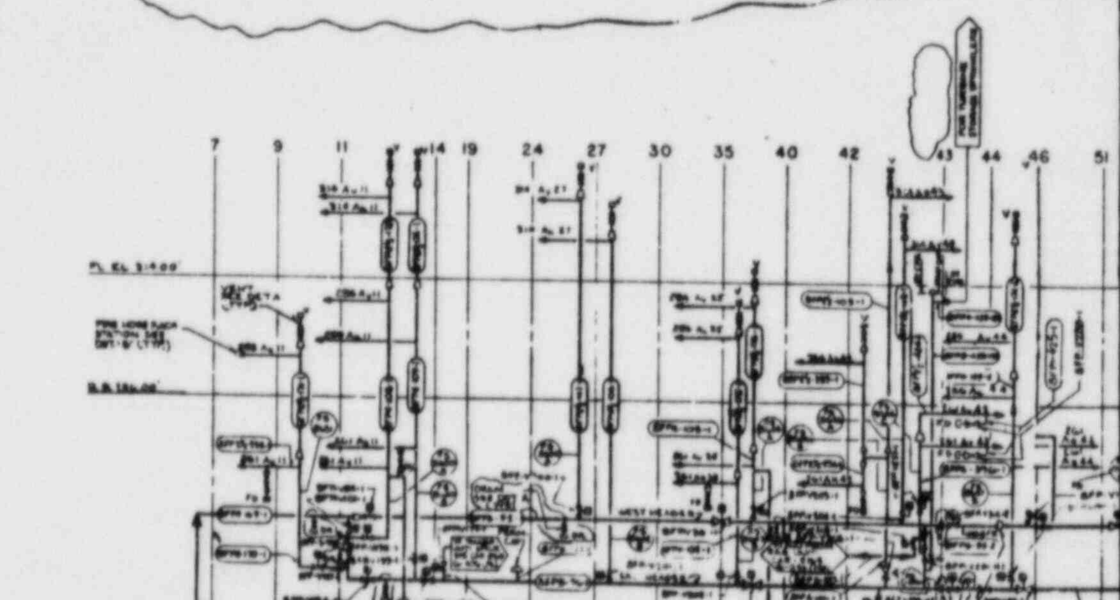
FLOW DIAGRAM
FIRE PROTECTION SYSTEM
SHEET 2

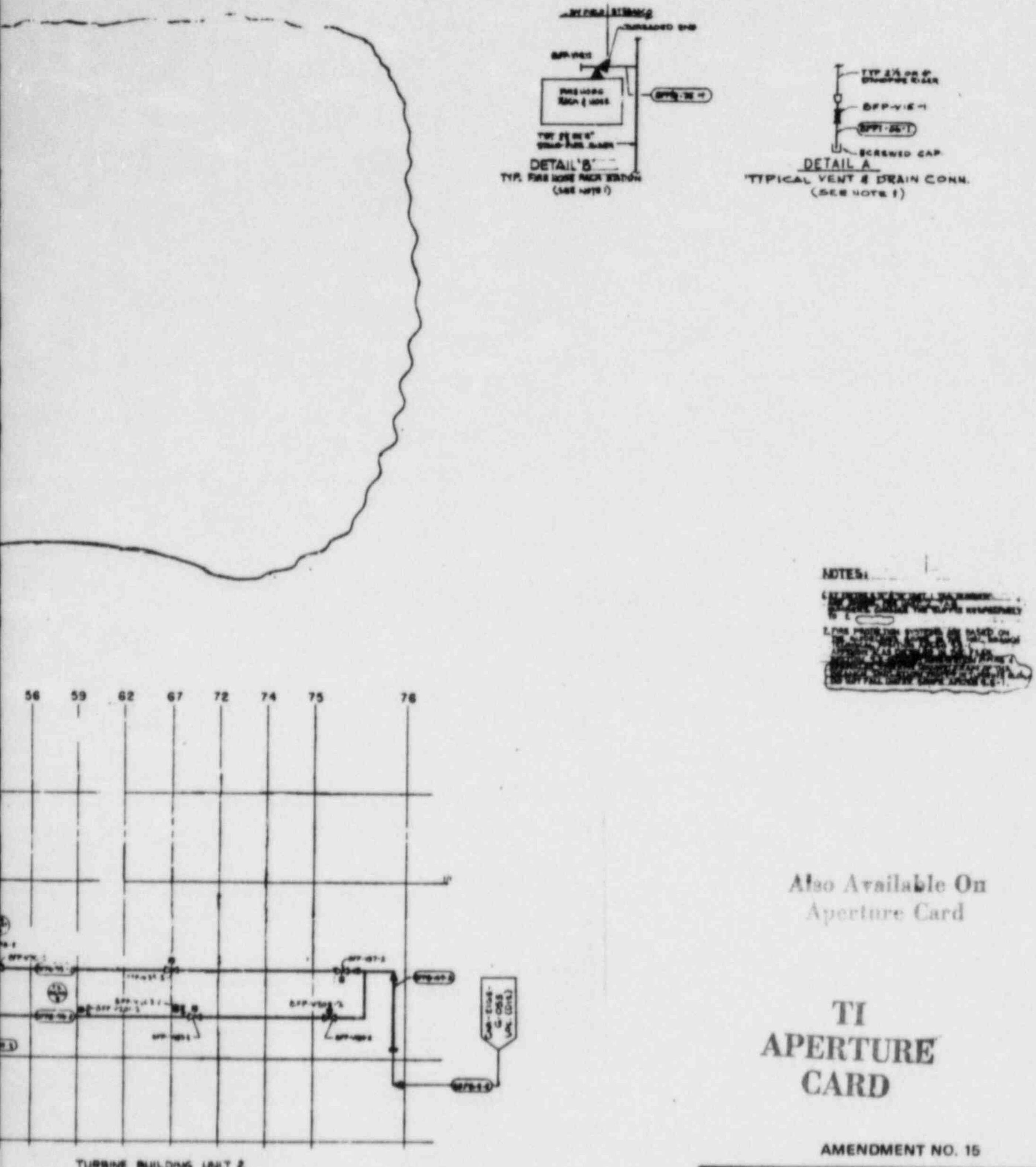
FIGURE 9.5.1-2

REF DWG: CAR-2165-G-056 (REV 6)

8408140036-02



TURBINE BUILDING UNIT 1



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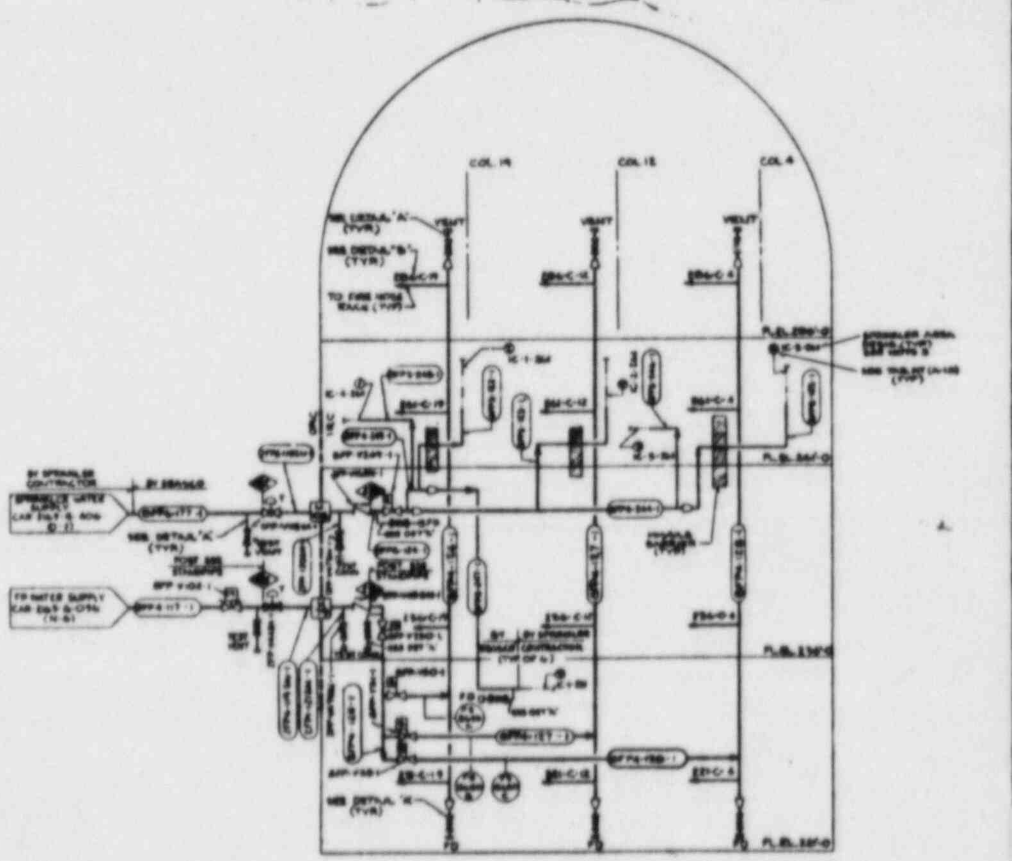
FLOW DIAGRAM
FIRE PROTECTION SYSTEM
SHEET 3

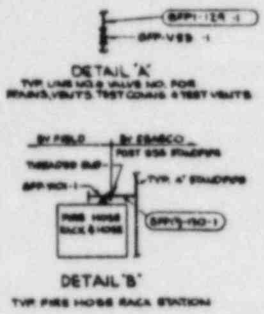
FIGURE 9.5.1-3

REF DWG: CAR-2165-G-057 (REV 6)

8408140036-03



CONTAINMENT BUILDING



NOTES

2. [illegible]

3. FOR ADDITIONAL NOTES SEE CAR 2165-G-[illegible]

4. [illegible] IN THE FSAR SECTION 9.5.1

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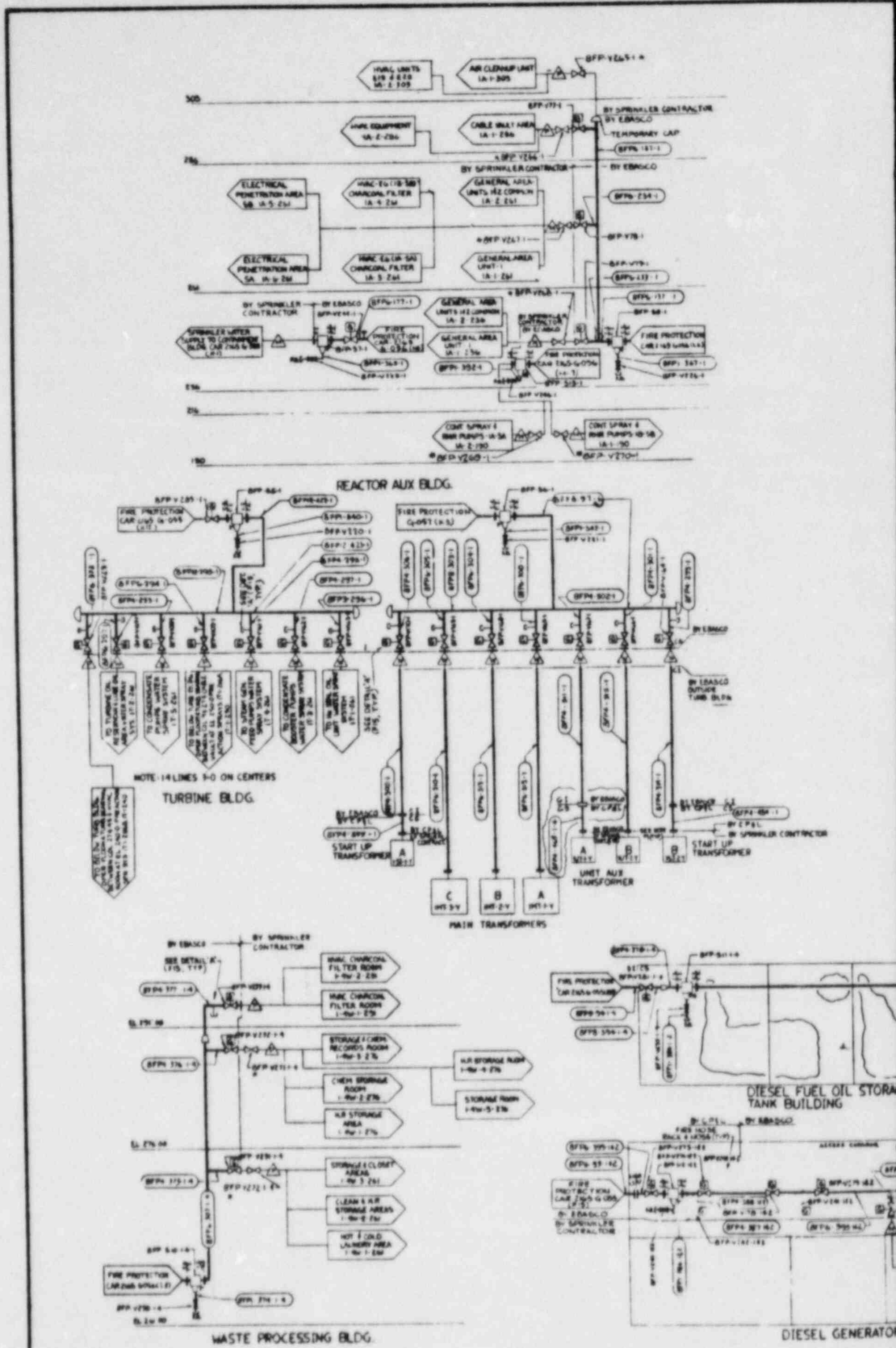
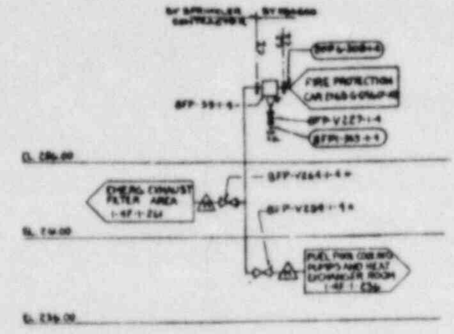
FLOW DIAGRAM
FIRE PROTECTION SYSTEM
SHEET 4
FIGURE 9.5.1-4

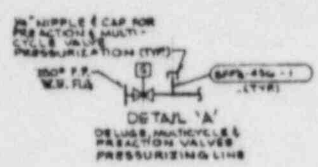
REF DWG: CAR-2165-G-388 (REV 5)

8408140036 -04



REACTOR AUX BLDG.
TURBINE BLDG.
NOTE: 14 LINES 1'-0 ON CENTERS
START UP TRANSFORMER
UNIT AUX TRANSFORMER
MAIN TRANSFORMERS
WASTE PROCESSING BLDG.
DIESEL FUEL OIL STORAG
TANK BUILDING
DIESEL GENERATOR
BY SPRINKLER CONTRACTOR
BY EBASCO
TEMPORARY CAP





LEGEND FOR SPRINKLER AREA DESIGNATION

- A - REACTOR AUXILIARY
- C - CONTAINMENT
- T - TURBINE
- W - WASTE PROCESSING
- F - FUEL HANDLING
- FO - DIESEL FO STORAGE TANK
- D - DIESEL GENERATOR
- MT - MAIN TRANSFORMER
- ST - STARTUP TRANSFORMER
- UT - UNIT AUXILIARY TRANSFORMER
- S - SECURITY
- DENOTES MULTI-CYCLE SPRINKLER SYSTEM EQUIPMENT AREA
- DENOTES PRE ACTION SPRINKLER SYSTEM EQUIPMENT AREA
- DENOTES WATER SPRAY SYSTEM EQUIPMENT AREA
- DENOTES WET PIPE SPRINKLER SYSTEM EQUIPMENT AREA (ALARM CHECK VALVE)

NOTES:

1. CAST IRON TO TERMINATE WITH A FLANGE [illegible]
2. ALL PIPING BY SPRINKLER CONTRACTOR [illegible]
3. [illegible] SPRINKLER CONTRACTOR
4. FIRE PROTECTION SYSTEMS ARE BASED ON THE [illegible] SCOPE APCSB 9.5-1.

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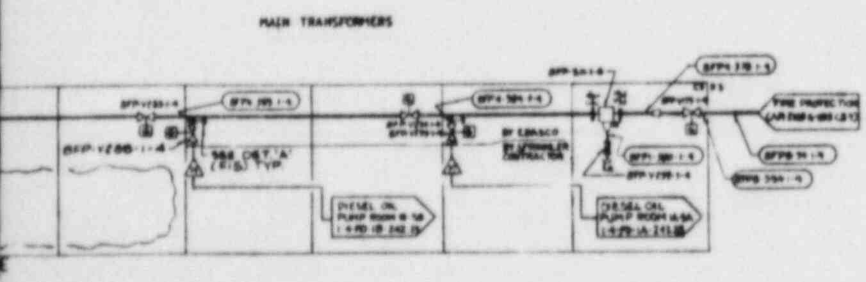

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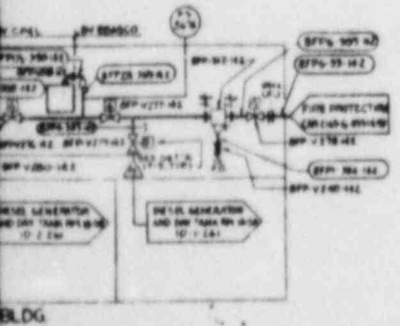
Aperture Card



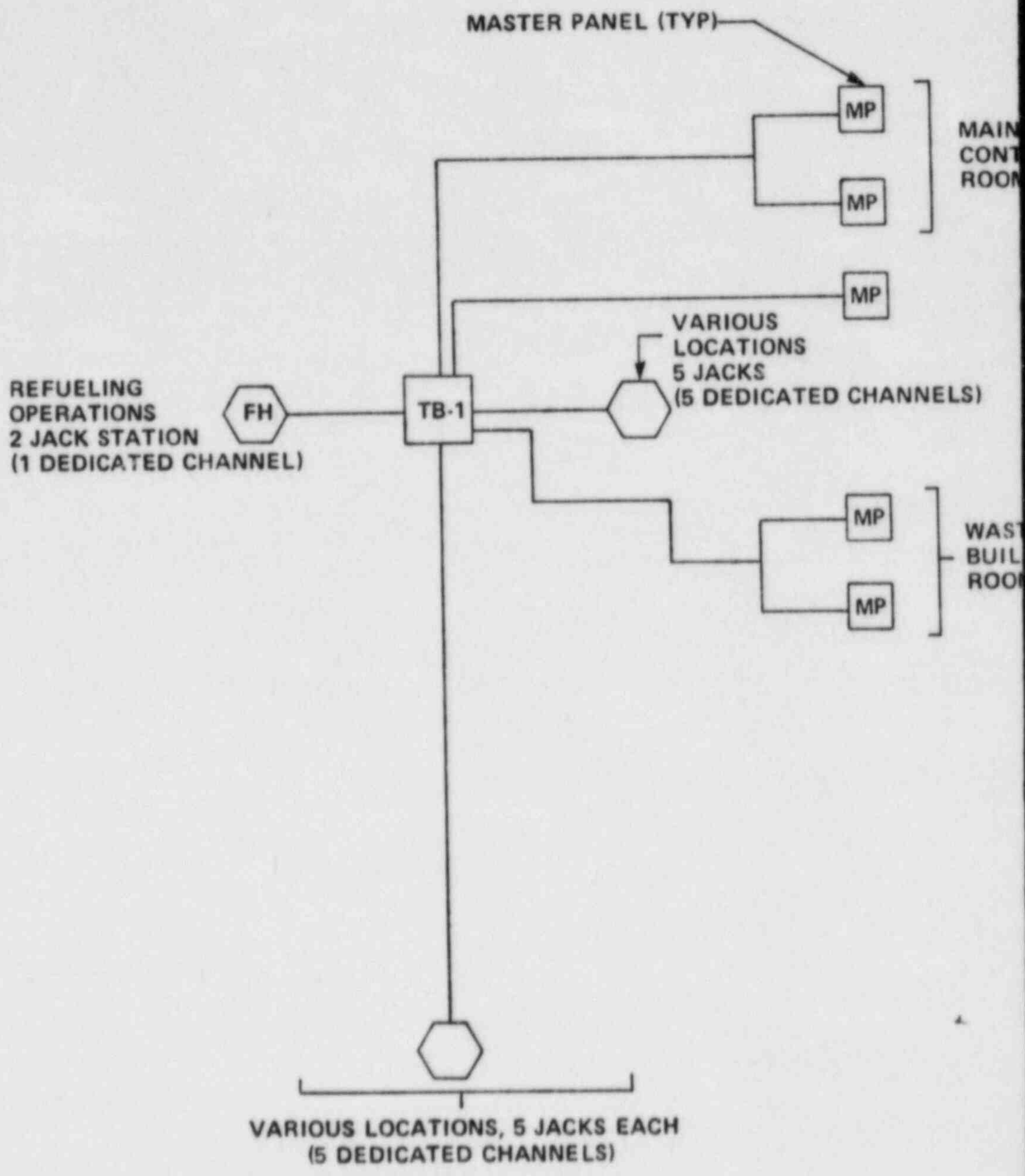
AMENDMENT NO. 15

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

FLOW DIAGRAM – FIRE PROTECTION
SPRINKLER SYSTEMS AND MISC BUILDINGS
SHEET 5
FIGURE 9.5.1-5

REF DWG: CAR-2165-G-406 (REV 5)

8408140036 -05



NOTE:

1) FOR CIRCUIT ALLOCATIONS TO MASTER PANELS SEE ATTACHED SUMMARY.

ROL
M

E PROCESSING
DING CONTROL
M

(MAIN & AUXILIARY CONTROL ROOMS)
CIRCUIT NO. 1
CIRCUIT NO. 2
CIRCUIT NO. 3
CIRCUIT NO. 4
CIRCUIT NO. 5
REFUELING OPERATION
FUEL HANDLING BUILDING JACKS
JACK NO. 1 FOR MP'S
WPB CONTROL ROOM
CONTROL ROOM INTER-UNIT TIE LINE
CONTROL ROOM INTER-UNIT TIE LINE
OUTLYING AREAS

WASTE PROCESSING BUILDING CONTROL ROOM
CIRCUIT NO. 1
CIRCUIT NO. 2
CIRCUIT NO. 3
CIRCUIT NO. 4
CIRCUIT NO. 5
FUEL HANDLING BUILDING JACK NO. 5
CONTROL ROOM
SPARE
SPARE
SPARE
SPARE
SPARE

AMENDMENT NO. 15

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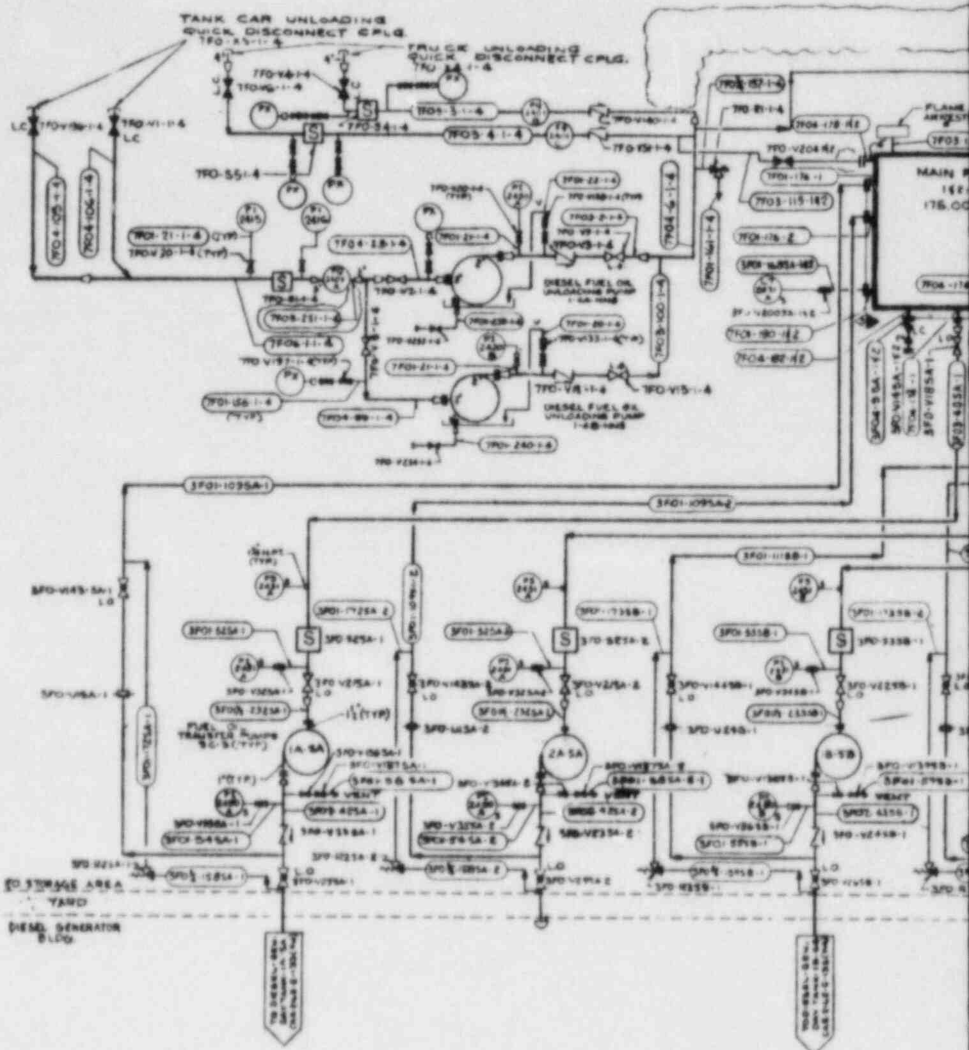
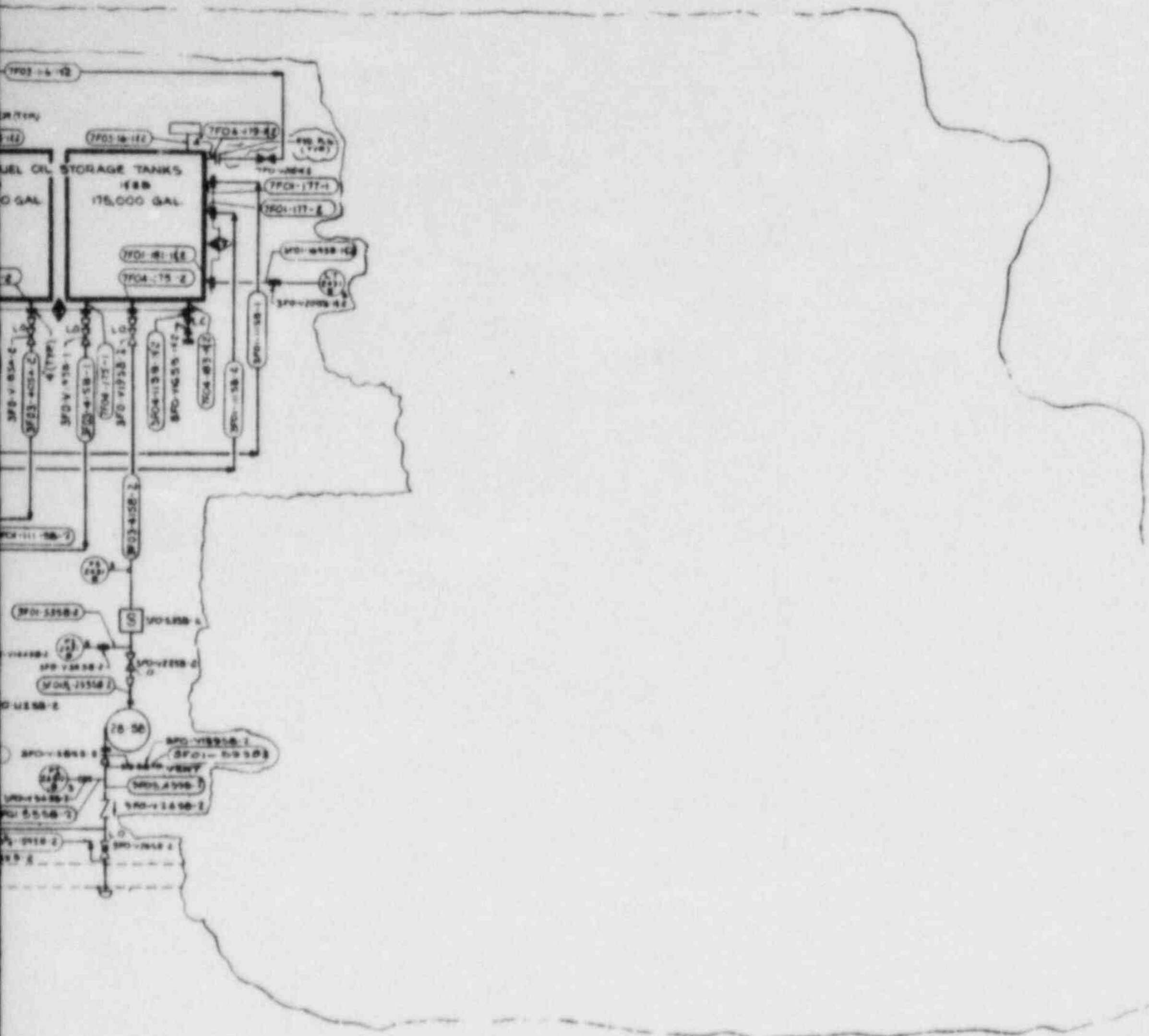
FINAL SAFETY ANALYSIS REPORT

SOUND POWERED
SYSTEM – BLOCK DIAGRAM

FIGURE 9.5.2-3



TANK CAR UNLOADING
QUICK DISCONNECT CPLG.
TRUCK UNLOADING
QUICK DISCONNECT CPLG.
DIESEL FUEL OIL UNLOADING PUMP
TO STORAGE AREA
YARD
DIESEL GENERATOR BLDG.



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AMENDMENT NO. 15

SHEARON HARRIS NUCLEAR POWER PLANT
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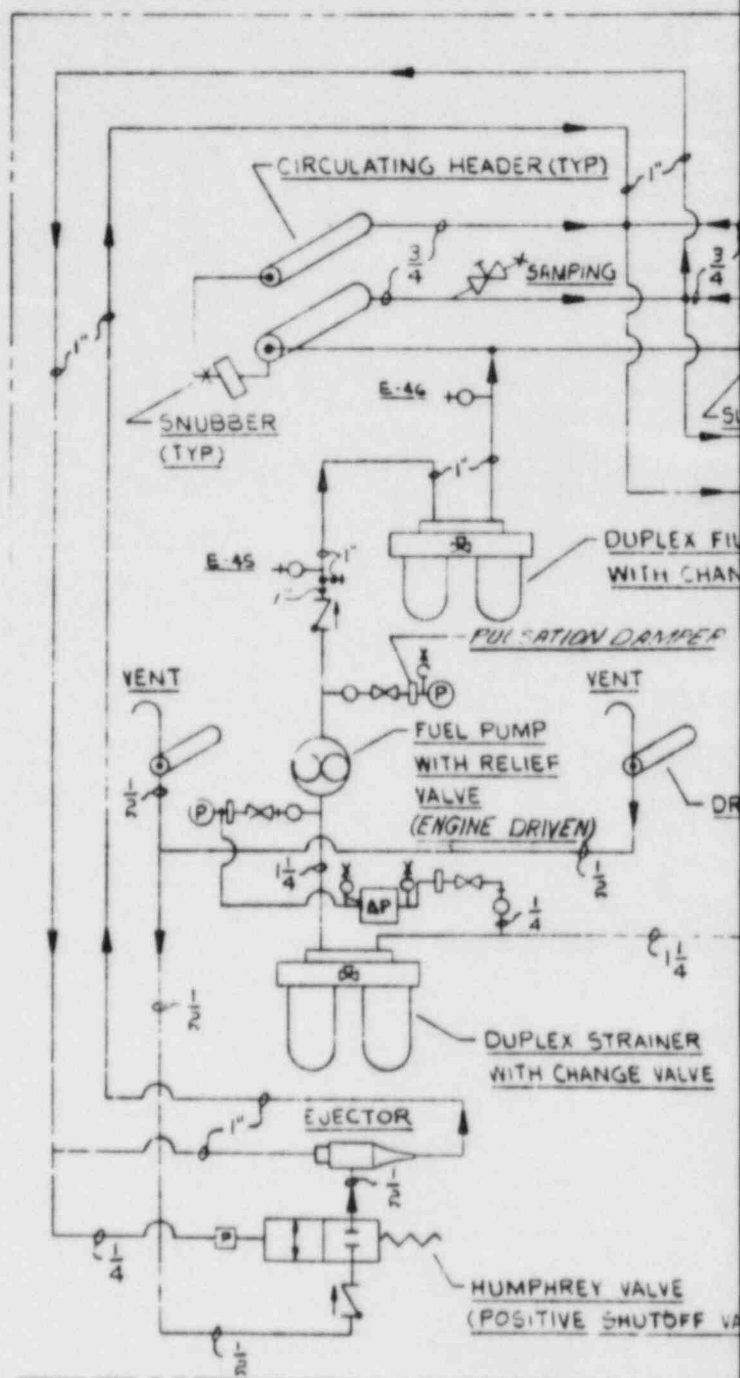
FINAL SAFETY ANALYSIS REPORT

FLOW DIAGRAM
DIESEL FUEL OIL SYSTEM

FIGURE 9.5.4-1

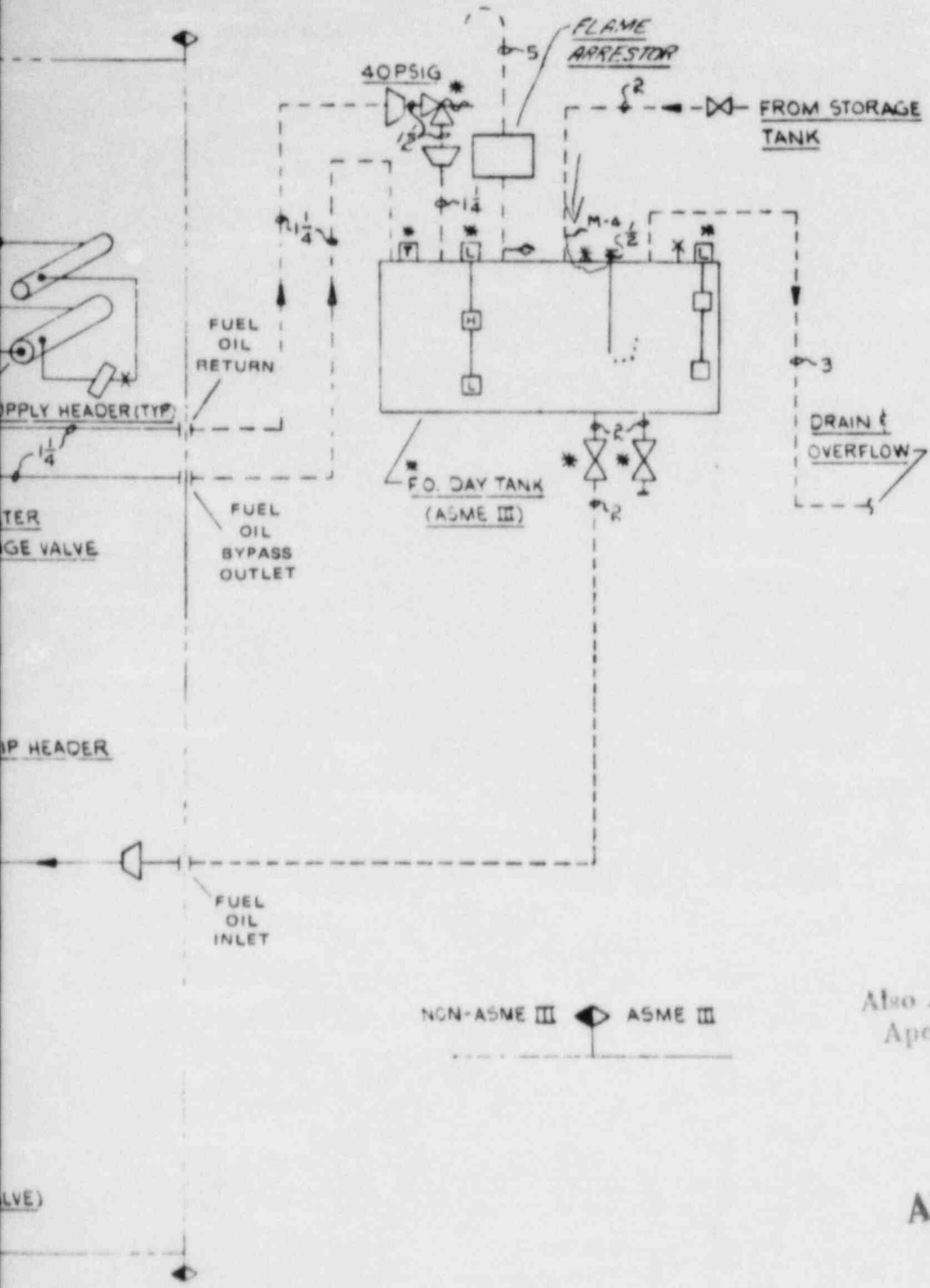
REF DWG: CAR-2165-G-063 (REV 6)

8408140036-07



CIRCULATING HEADER (TYP)
SAMPING
SNUBBER (TYP)
E-44
E-45
DUPLEX FI
WITH CHAN
PULSATION DAMPER
VENT
VENT
FUEL PUMP WITH RELIEF VALVE (ENGINE DRIVEN)
DUPLEX STRAINER WITH CHANGE VALVE
EJECTOR
HUMPHREY VALVE (POSITIVE SHUTOFF VA

*ENGINE



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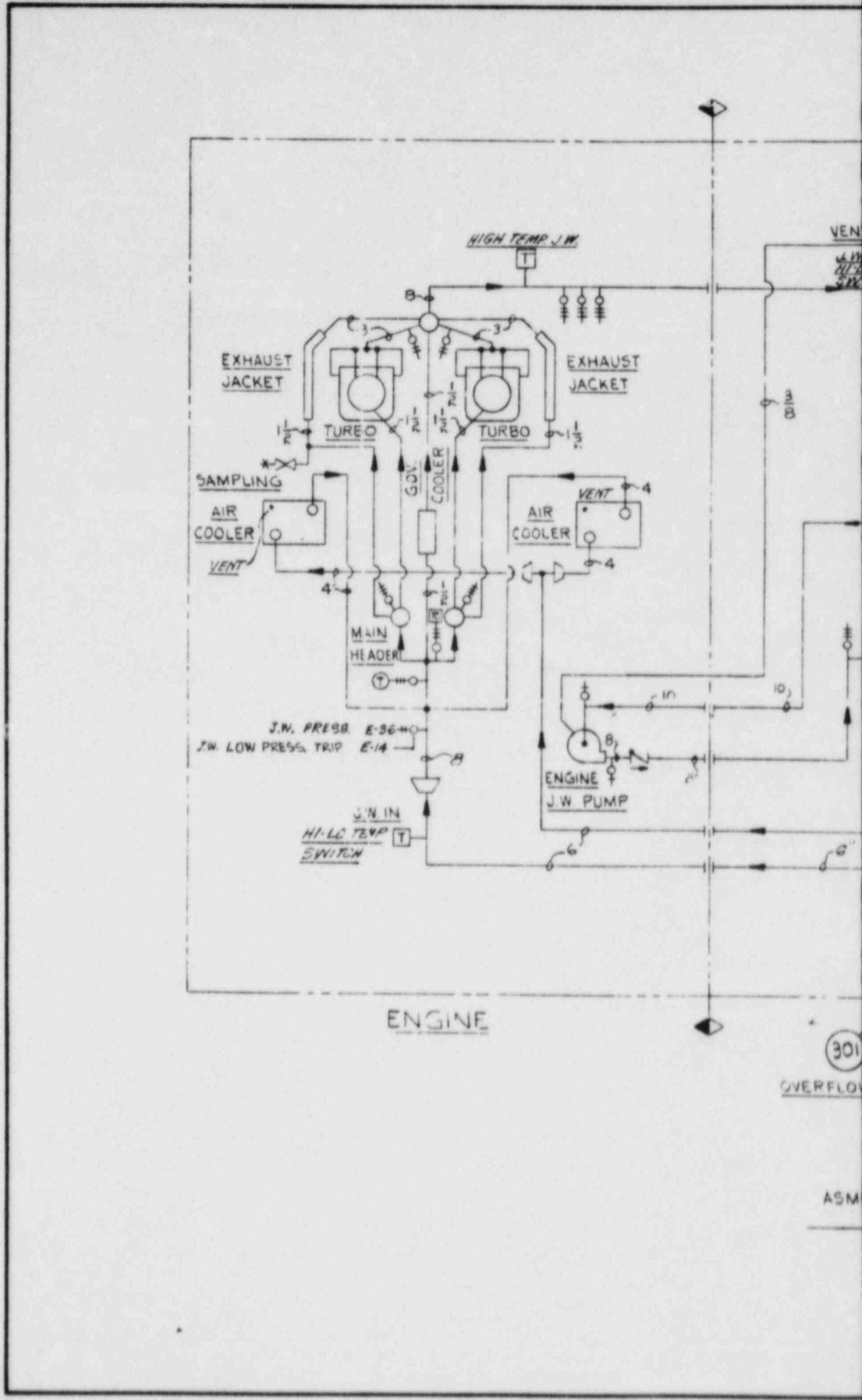
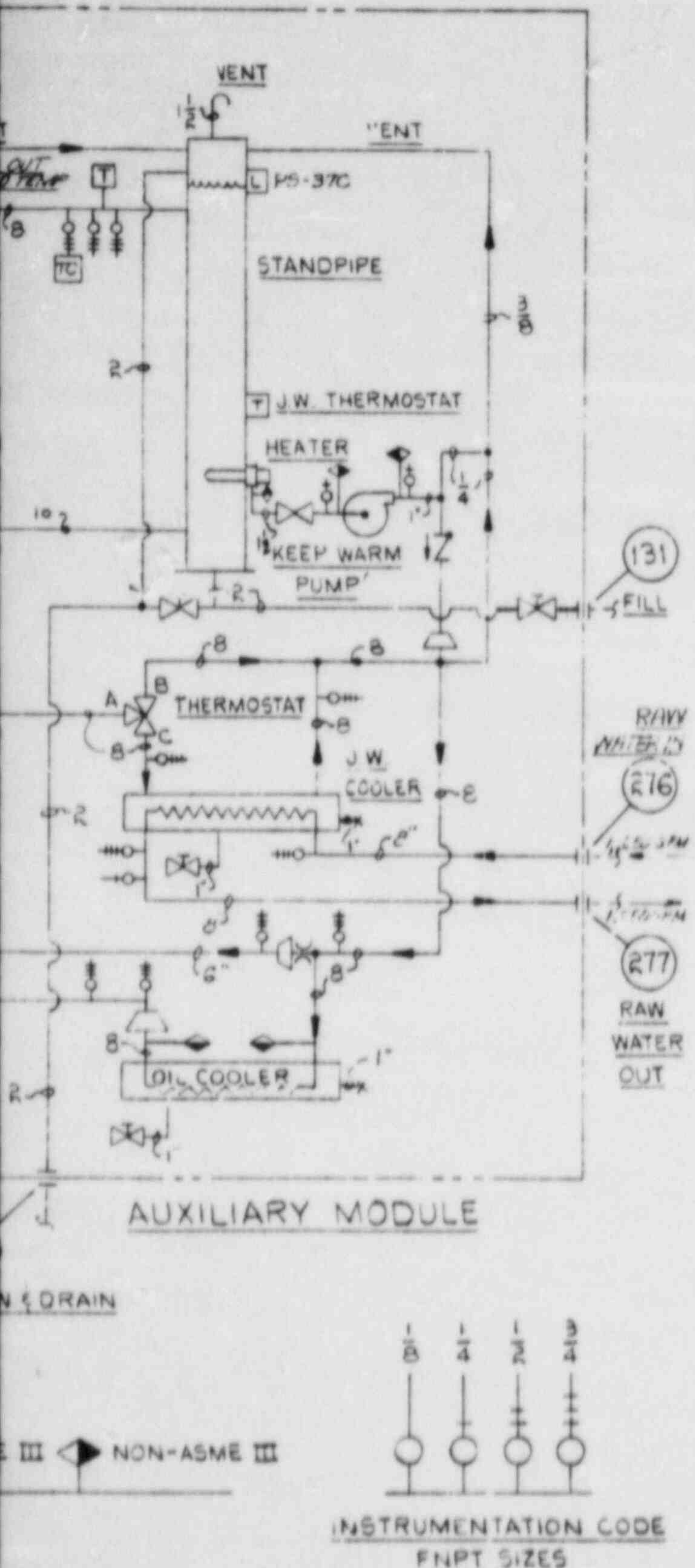
FUEL OIL PIPING SCHEMATIC
FIGURE 9.5.4-2

REF DWG: EMDRAC DWG NO. 1364-7818 (REV 6)

8408140036-08



HIGH TEMP J.W.
EXHAUST JACKET
EXHAUST JACKET
TURBO
TURBO
SAMPLING
AIR COOLER
AIR COOLER
VENT
VENT
GOV. COOLER
MAIN HEADER
J.W. PRESS. E-36
J.W. LOW PRESS. TRIP E-14
J.W. IN HI-LO TEMP SWITCH
ENGINE J.W. PUMP
ENGINE
301



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REF DWG: EMDRAC-1364-7812 (REV 1)

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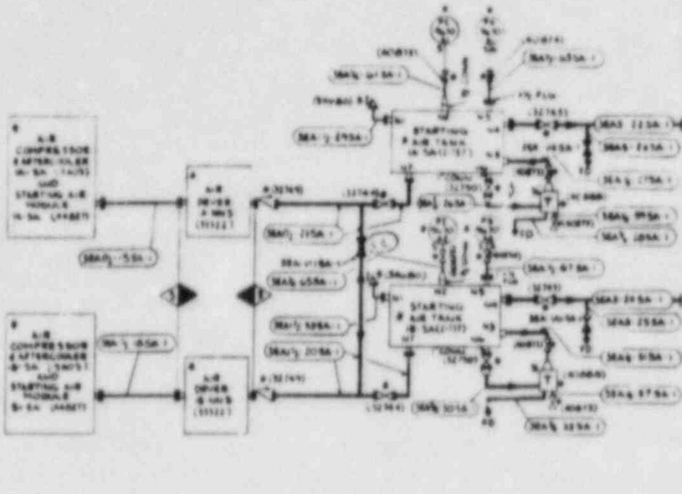
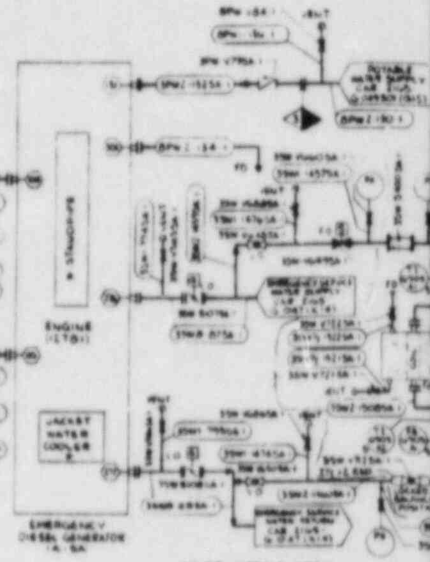
DIESEL GENERATOR
COOLING WATER SYSTEM
FIGURE 9.5.5-1

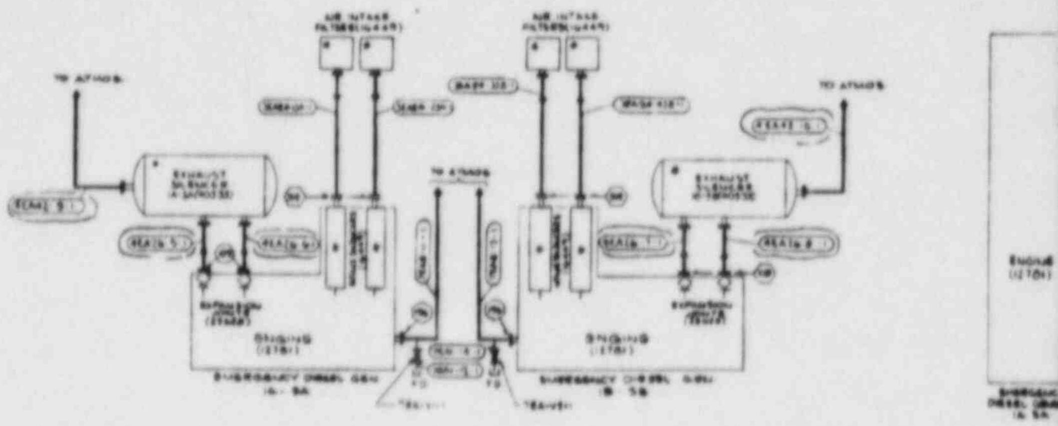
8408140036-09



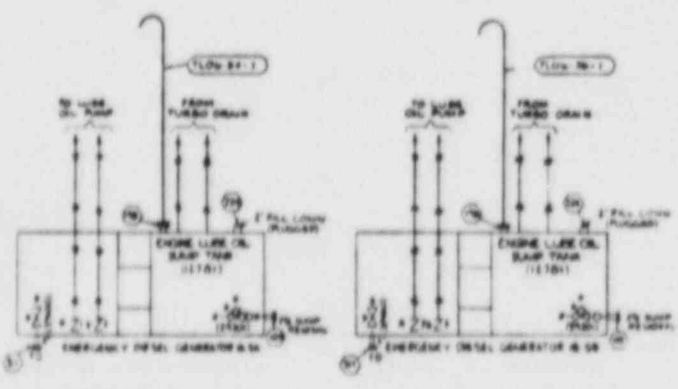
STARTING AIR SYSTEM



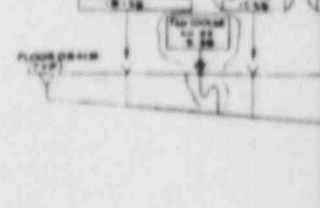
JACKET WATER SYSTEM

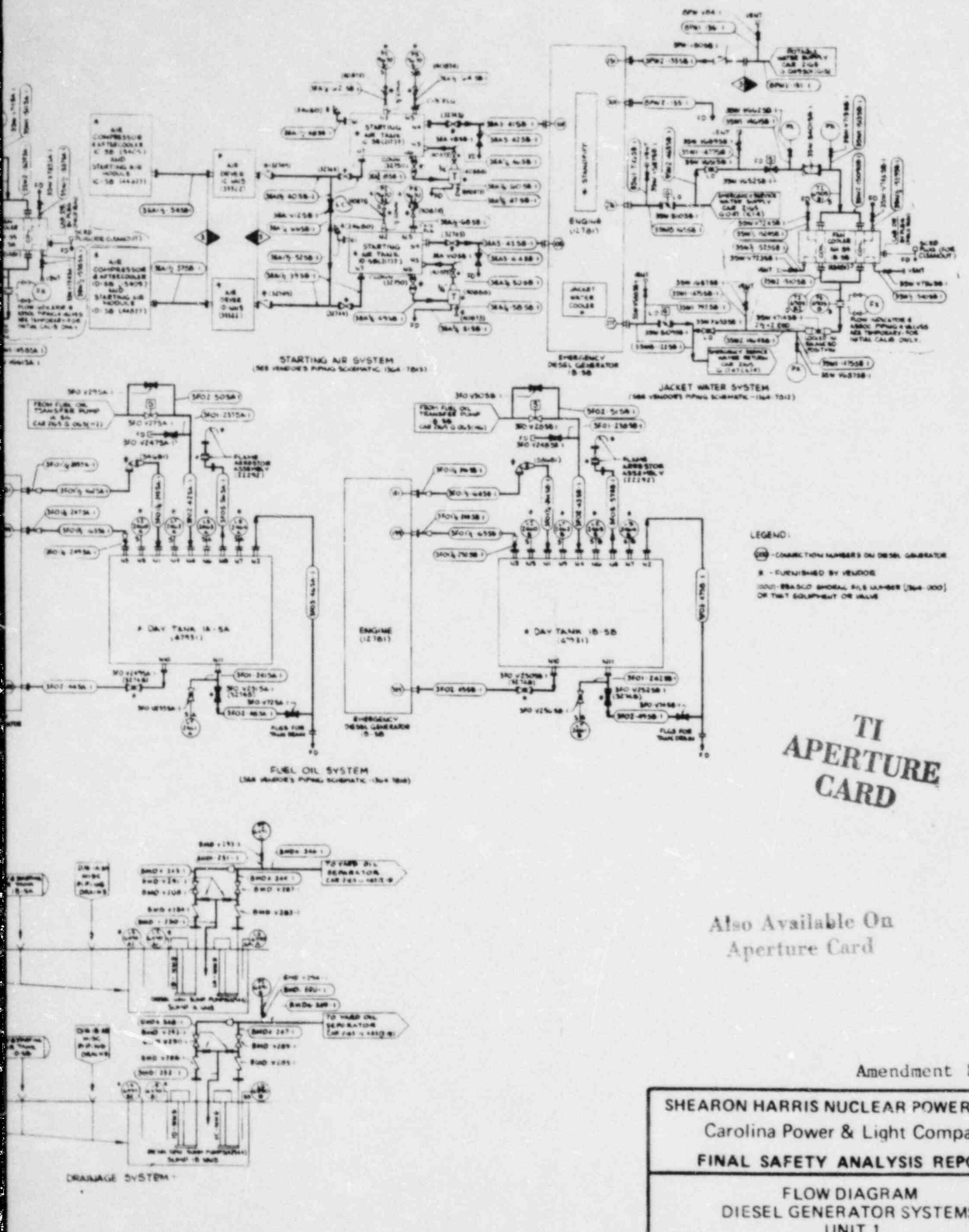


AIR INTAKE AND EXHAUST SYSTEM



LUBE OIL SYSTEM





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SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
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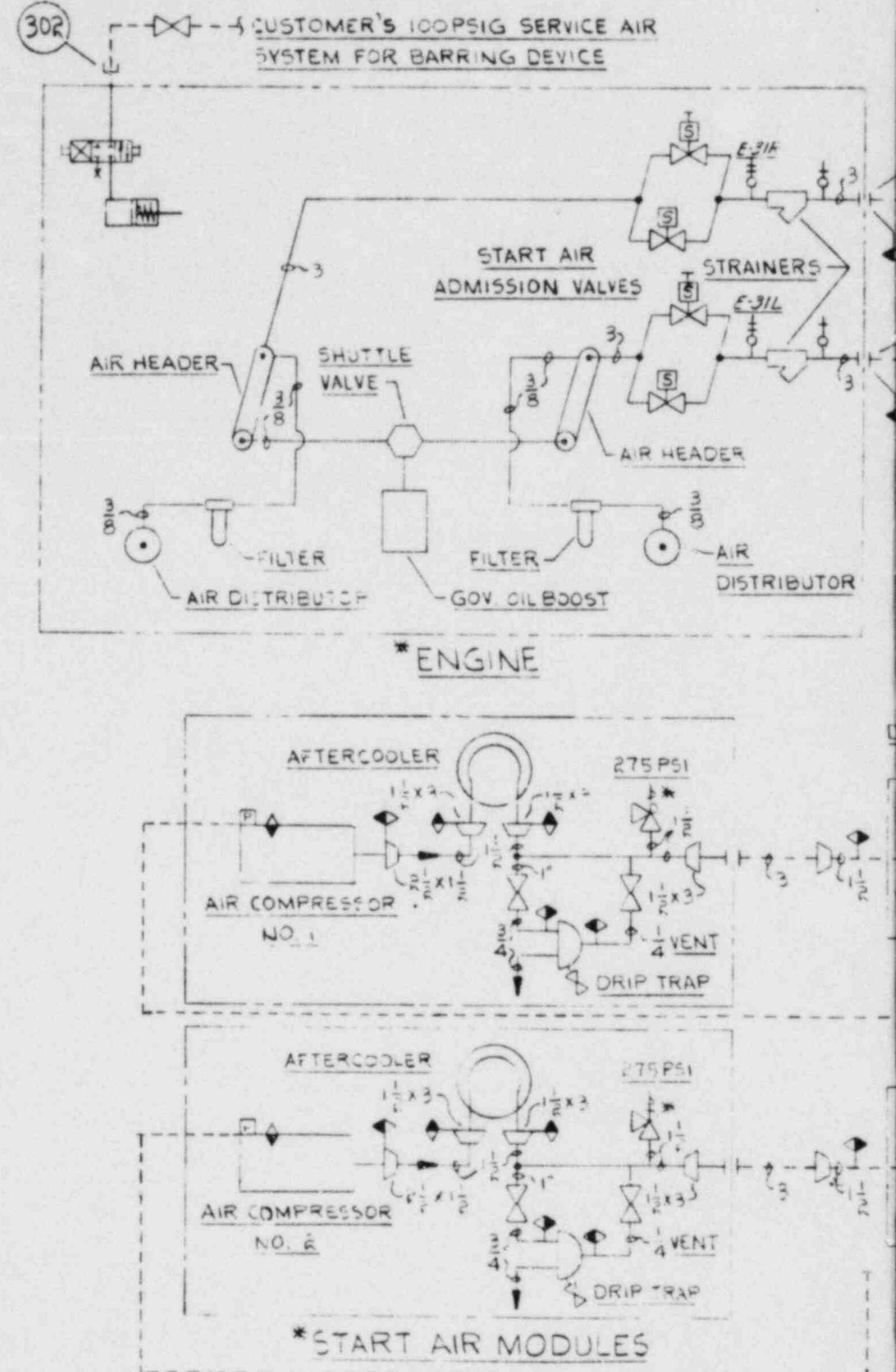
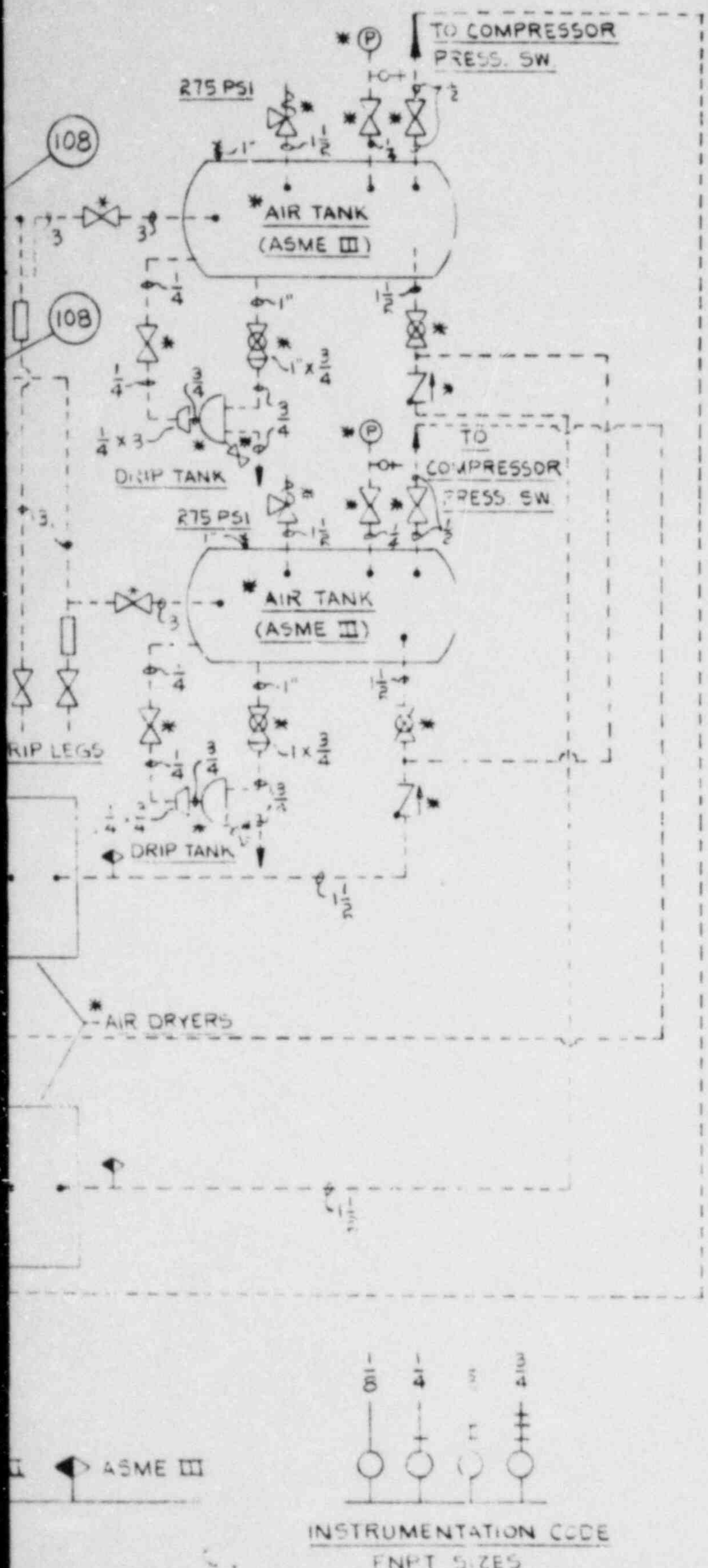
FLOW DIAGRAM
DIESEL GENERATOR SYSTEMS
UNIT 1
FIGURE 9.5.5-2

REF DWG: CAR-2165-G-133 (REV 3, OPEN)



302
CUSTOMER'S 100PSIG SERVICE AIR
SYSTEM FOR BARRING DEVICE
E-31F
START AIR
ADMISSION VALVES
STRAINERS
E-31L
AIR HEADER
SHUTTLE
VALVE
AIR HEADER
FILTER
FILTER
AIR
DISTRIBUTOR
AIR DISTRIBUTOR
GOV. OIL BOOST
*ENGINE
AFTERCOOLER
275 PSI
AIR COMPRESSOR
NO. 1
VENT
DRIP TRAP
AFTERCOOLER
275 PSI
AIR COMPRESSOR
NO. 2
VENT
DRIP TRAP
*START AIR MODULES

NON-ASME I



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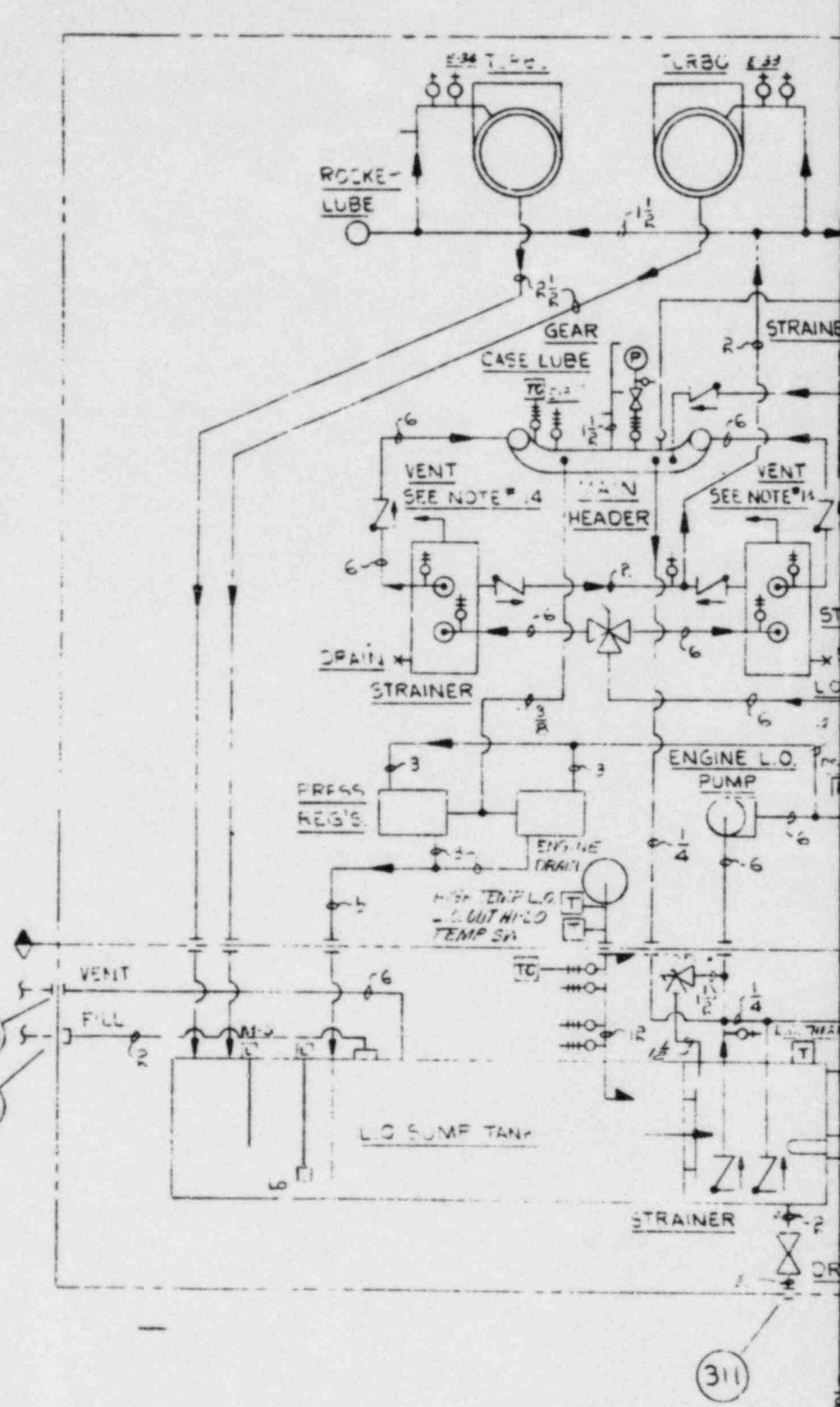
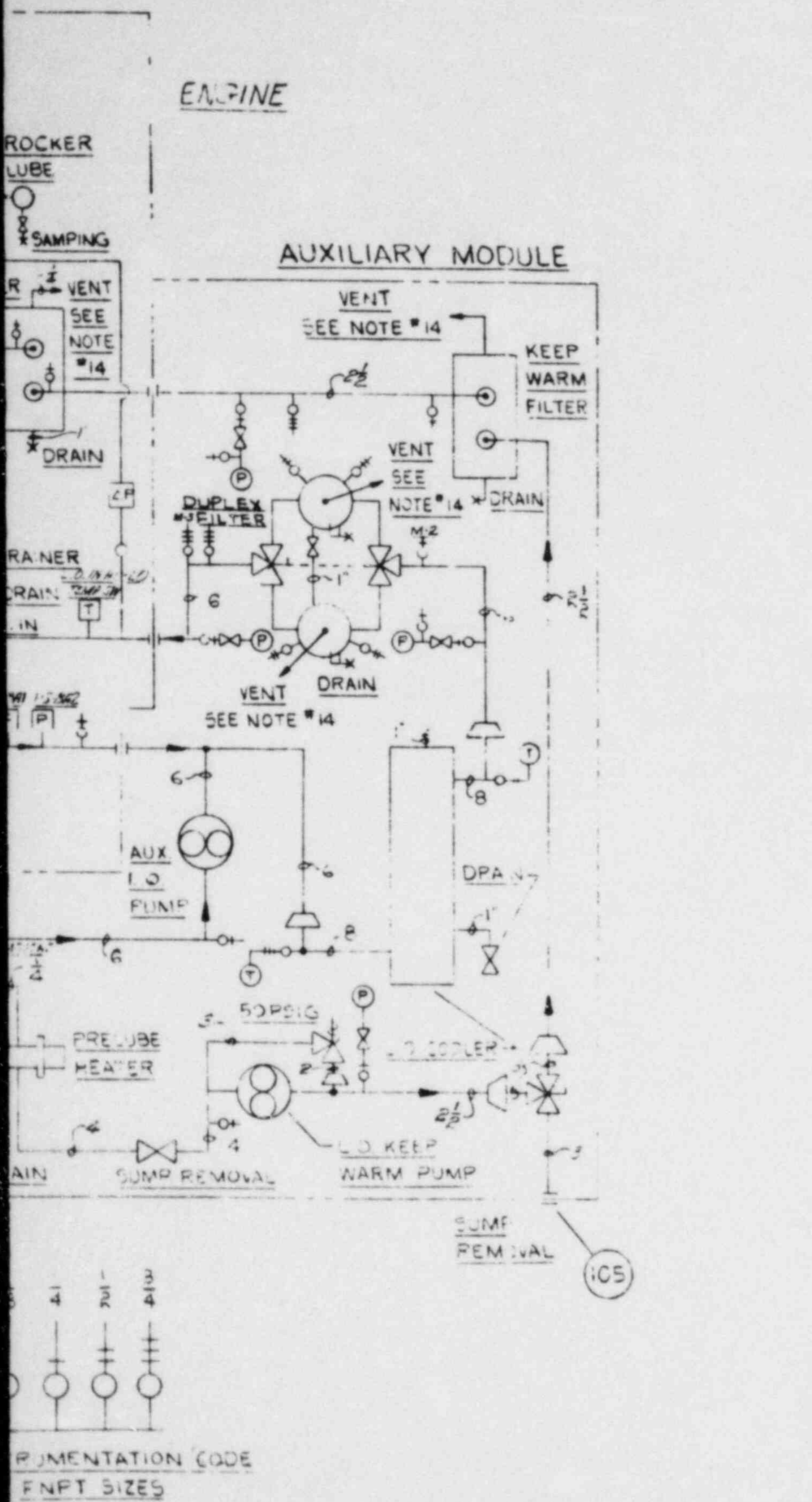
DIESEL GENERATOR
AIR STARTING SYSTEM
FIGURE 9.5.6-1

REF DWG: EMDRAC-1364-7813 (REV 1)

8408140036-11



TURBO
TURBO
ROCKER LUBE
GEAR CASE LUBE
STRAINER
VENT SEE NOTE # 14
MAIN HEADER
VENT SEE NOTE # 14
DRAIN
STRAINER
PRESS REG'S.
ENGINE L.O. PUMP
ENGINE DRAIN
HIGH TEMP L.O. SHUTOUT HI L.O TEMP SW.
VENT
FILL
198
221
L.O. SUMP TANK
STRAINER
311



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REF DWG: EMDRAC-1364-7817 (REV 1)

SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

DIESEL GENERATOR
LUBE OIL SYSTEM
FIGURE 9.5.7-1

8408140036 -12

Appendix 9.5A

Fire Protection Hazards Analysis

APPENDIX 9.5A
FIRE HAZARDS ANALYSIS

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APPENDIX 9.5A
TABLE OF CONTENTS (Cont'd)

APPENDIX 9.5A
TABLE OF CONTENTS

APPENDIX 9.5A
FIRE HAZARDS ANALYSIS

LIST OF FIGURES

APPENDIX 9.5A
FIRE HAZARDS ANALYSIS

LIST OF FIGURES (Cont'd)

APPENDIX 9.5A
FIRE HAZARDS ANALYSIS

LIST OF FIGURES (Cont'd)

APPENDIX 9.5A.1

1. Identification   Fire Area: 1-C

Building: Containment 15

Fire Area: 1-C, Containment Building

Fire Zones: Detailed under Item 4, "Combustible Loading"

Shown on Figures: 9.5A-2, 9.5A-3, 9.5A-4, 9.5A-5

Diameter (ft.): 130   Height (ft.): 155

Total Area (all fire zones) (sq. ft.): 50,000   Volume (cu. ft.): 2,400,000

2. Occupancy

The area contains the reactor vessel, steam generators, reactor coolant pumps, pressurizer, associated piping, miscellaneous equipment, associated controls, wiring in conduit and cable in trays.

3. Boundaries

Walls, floors, and roof are of reinforced concrete construction, as detailed in Section 3.8, with a fire rating of three hours. The containment walls also have a steel liner. Wall openings for personnel access are protected by containment closures which are equivalent to Class A fire doors.

A circumferential section of the reactor vessel mirror insulation between Elevation 246.6 ft. and Elevation 251.2 ft. was modified to incorporate neutron shielding. The neutron streaming shield is a composite of approximately 3 in. thick, consisting of 1 1/2 in. of "Microtherm" high-temperature insulation manufactured by Micropore Insulation Limited bonded to a varying thickness layer of "Ricorad" neutron shielding material manufactured by the Richardson Company. Each component of the composite is indicated by its manufacturer to have "Excellent Fire Resistance Properties." Furthermore, the neutron streaming shield is encapsulated in stainless steel which will provide an adequate barrier. Since the "shield assembly" is enclosed and isolated inside the reactor vessel cavity, it is not considered to have a significant combustible loading and no fire will be postulated for this feature.

4. Combustible Loading

Transient combustibles inside the Containment are present during refueling, repair and maintenance operations only and are included in the combustible loading for the fire area/zones to reflect their maximum possible fire loading.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ Sq. Ft.
15 Fire Area: 1-C, Containment Building			
Total Floor Area: 50,000 sq. ft.			
Cable Insulation			
Power	1,073	194,000	4,000
Control	335	53,000	1,000
Instrumentation	335	31,500	1,000
Liquids: oil (gal.)	930	102,000	2,000
Solids: charcoal (lb.)	7,500	75,000	1,500
Max. Transient: charcoal (lb.)	3,750	37,500	1,000
: fiber drums(lb.)	95	1,000	20
Total		494,000	10,520
Fire Zone: 1-C-1-RCP-1A, Reactor Coolant Pump 1A			
Floor Area: 800 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation (LF)	0	0	0
Liquids: oil (gal.)	310	34,000	42,000
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	8,000
Total		40,000	50,000

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ Sq. Ft.
Fire Zone: 1-C-1-RCP-1B, Reactor Coolant Pump 1B			
Floor Area: 1260 sq. ft.			
Cable Insulation			
Power (RF)	71	13,000	11,000
Control (RF) (in conduit)	0	0	0
Instrumentation (in conduit)	0	0	0
Liquids: oil (gal.)	310	34,000	27,000
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	5,000
Total		53,000	43,000
Fire Zone: 1-C-1-RCP-1C, Reactor Coolant Pump 1C			
Floor Area: 810 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids: oil (gal.)	310	34,000	42,000
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	8,000
Total		40,000	50,000

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 1-C-1-CHFA, Charcoal Filter A			
Floor Area: 390 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids:	0	0	0
Solids: charcoal (lb.)	3,750	37,500	96,000
Transients: charcoal (lb.)	3,750	37,500	96,000
fiber drums (lb.)	95	1,000	3,000
Total		76,000	195,000
Fire Zone: 1-C-1-CHFB, Charcoal Filter B			
Floor Area: 350 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids:	0	0	0
Solids: charcoal (lb.)	3,750	37,500	107,500
Transients: charcoal (lb.)	3,750	37,500	107,000
fiber drums (lb.)	95	1,000	3,000
Total		76,000	217,500

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ Sq. Ft.
Fire Zone: 1-C-3-EPA, Electrical Penetration A			
Floor Area: 3,700 sq. ft.			
Cable Insulation			
Power	510	92,000	25,000
Control	170	27,000	7,500
Instrumentation	170	16,000	4,500
Liquids:	0	0	0
Solids:	0	0	0
Transient:	0	0	0
Total		135,000	37,000
Fire Zone: 1-C-3-EPB, Electrical Penetration B			
Floor Area: 2,600 sq. ft.			
Cable Insulation			
Power	492	88,500	34,000
Control	164	26,000	10,000
Instrumentation	164	15,500	6,000
Liquids:	0	0	0
Solids:	0	0	0
Transient:	0	0	0
Total		130,000	50,000

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 1-C-1-BAL, Containment Building Balance			
Floor Area: 3,600 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids:	0	0	0
Solids:	0	0	0
Transient: oil	55	6,000	2,000
1	Total	6,000	2,000

5. Control of Hazards

Electrical, mechanical and HVAC penetration seals through the Containment walls are considered equivalent to three-hour rated fire stops.

Sloped floor drainage to the containment sump prevents spread of combustible liquids releases beyond the fire area. Structural barriers, partial or full height, are provided between redundant safety-related components within the area. Suitable fire barriers are provided at points of close proximity between safety and non-safety related cable trays where Regulatory Guide 1.75 criteria cannot be fully met. Fire breaks are provided in solid bottom cable trays with covers.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area by a rate of approximately 0.08 cfm/sq. ft. Smoke, heat and products of incomplete combustion are removed by the normal ventilation system for this area:

Supply:	AH-82(1A-NNS)	Exhaust:	ARRS-S-1A
	AH-82(1B-NNS)		ARRS-S-1B

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Recirculation (1A)	NNS	Operating	7,220	0.66

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Normal Operation Purge (1A)	NNS	Operating	1,500	0.11
Recirculation (1B)	NNS	Standby	7,220	0.66
Normal Operation Purge (1B)	NNS	Standby	1,500	0.11

Fire protection water discharges which are potentially radioactive are collected in the containment sump which discharges to the Liquid Waste Processing System.

Potential airborne radioactive releases from equipment are absorbed by charcoal filters provided in the building ventilation system at Elevation 221 ft. of the Containment Building.

6. Fire Detection

Types of detection, actuation and signaling systems provided and their functions for this fire area are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-C-1-RCP-1A	1-1	Thermal	Equipment	X	X	X	X	X	X
1-C-1-RCP-1B	1-2	Thermal	Equipment	X	X	X	X	X	X
1-C-1-RCP-1C	1-3	Thermal	Equipment	X	X	X	X	X	X
1-C-1-CHFA	1-4	Thermal	Area	X	X	X	X	X	X
1-C-1-	1-5	Thermal	Area	X	X	X	X	X	X

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
CHFB									
1-C-3-EPA	1-6	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
1-C-3-EPB	1-7	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	X	X	X
1-C-1-BAL		Manual fire alarm stations	Area	X	X	X	X	X	X

* The local fire detection control panel servicing the Containment Building -
15 is located in the RAB, Elevation 263 ft. adjacent to the containment personnel hatch.

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided at the local control panel and for a fire condition, an audible alarm sounds at the fire zone inside the Containment.

7. Access and Initial Response

Access to this area is provided through the personnel and equipment hatches located at Elevations 236 ft. and 286 ft., respectively. Carbon dioxide and dry chemical type manual fire extinguishers are provided in accordance with NFPA 10. Standpipe and hose stations are also provided in the Containment.

During normal operation the Containment is accessible through the personnel hatch, on limited basis. The standpipe and hose system are dry downstream from the Containment isolation valve which is controlled from the Control Room as required by the Control Room Operator.

During either maintenance, repair, or refueling shutdowns there is controlled access of employees to the Containment, through the personnel hatch. Should the equipment hatch be opened, controlled access may take place through either or both hatches. Because people may be present in the Containment at this stage, the standpipe and hose system is wet.

8. Fire Suppression System

The fire suppression system provided in this area is an automatic multi-cycle sprinkler system hydraulically designed to provide a density of 0.3 gpm/sq. ft. for either reactor coolant pump surface, airborne radioactivity removal unit housing top area, or cable tray run area. The system is actuated automatically by the thermal detectors located around each reactor coolant pump, over airborne radioactivity removal unit housing top, or over cable tray run area, when the area temperature reaches 200 F. The sprinkler heads open when area temperature reaches 225 F. The system water flow is shut off automatically from the control valve when the area temperature drops below 200 F. The multi-cycle control valve for the system is located outside this fire area, in the RAB, Elevation 236 ft. (Figure 9.5A-7). Sprinkler System piping is seismically supported inside the Containment, and in areas containing safety related equipment inside the RAB.

Manual actuation of the system is provided from the multi-cycle control valve emergency mechanical release. Remote manual actuation of the multi-cycle system is provided from any manual alarm station strategically located throughout the Containment Building. Electrical supervision of this suppression system includes control valve position, system valve position supervisory air pressure and lack of water flow through the control valve.

Plant equipment subject to water damage is protected by watertight enclosures and floor pedestals. Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the pitch of the floor towards floor drains provided throughout the building. Floor water surcharge is estimated to be minimal in the containment sump area. Excess water can overflow to adjacent floor areas. Runoff is directed to the containment sump.

9. Analysis of Effects of Postulated Fires

In Fire Area: 1-C, the Containment Building fire hazard combustibles include 15
normally expected amounts of cable insulation in cable trays, metallic conduit, connection boxes, limited amounts of cable insulation within control cabinets and panels, required quantities of charcoal used within airborne radioactivity removal system filters and specified quantities of lubricating oils contained within the reactor coolant pumps and steam generator snubbers.

Transient materials are not anticipated to be present in the area during normal operation. However, transient materials, such as rags, wood, plastics, charcoal, oil, etc., may be brought into the area for maintenance and repair during plant shutdown.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities is reduced.

- by the use of flame retardant cables which meet the requirements of IEEE 383, except the cable for the load cell of the containment circular bridge crane, which is neoprene insulated (the neoprene cable was considered and accepted for functional reasons. The short length of cable - 160 ft. - and its isolated location from all other cables in the Containment does not create a fire hazard).

- by limiting the continued spread of fire by the provision of fire-breaks as required, fire-stops at fire barrier penetrations, and separational barriers at points if possible fire communication.

- by the confinement of released combustible liquids through provision of drainage of released oil to area sumps.

- by controlling the introduction of transient combustibles through administrative procedures, to limit quantities to those required for immediate needs and to prescribe supplemental fire protection measures during such exposure periods.

The extent of damage within and beyond the fire area is further limited by structural barriers within the area to separate redundant trains or equipment and by fire-rated fire barriers enclosing the Containment fire area.

The types of fires postulated for the Containment are based on the types and concentrations of combustibles present in the area such as: oil, cable, and charcoal.

a. <u>Oil Fires</u>

The oil fire postulated for this area assumes ignition, and subsequent development into the most severe single fire reasonably expected in the area, of localized concentrations of oil released from a reactor coolant pump or a steam generator snubber lubricating oil system reservoir with a spillover adjacent area and impingement on nearby equipments (refer to Figures 9.5A-2
15 through 9.5A-4, Fire Zones 1-C-1-RCP-1A, -1B and -1C). Transient combustibles are present in the area only during refueling, maintenance and repair a 55 gal. oil drum, charcoal for a charcoal filter refill, wood, rags and plastic coverings.

The automatic thermal detection system installed around each reactor coolant pump senses the heat generated by the fire. When the temperature reaches 200 F, the multi-cycle sprinkler valve is actuated, as detailed under Item 8,
15 fire alarms are transmitted to the Control Room via the Communications Room, to the local fire detection control panel, and locally to the fire zone.

The potential maximum propagation of the oil fire will be reduced, by initial possible use of area fire extinguishers on incipient fires and supplemental use of hose lines on developing fires by employees either responding to this fire or present in the Containment during refueling, maintenance or repairs.

If the multi-cycle sprinker system has not actuated automatically, the postulated fire might involve the reactor coolant pump from which the lubricating oil has been released and damage contiguous associated piping, fittings, cabling, and controls within the spill area. However, the automatic multi-cycle sprinkler system can be actuated manually from either the system control valve (RAB, Elevation 236 ft.), or any manual alarm station located inside the Containment, thus reducing the potential fire consequences described above.

Even without actuation of the multi-cycle sprinkler system in the area, the oil fire will be sensed by the thermal fire detection system which will alarm fire (high temperature) and trouble (lack of water) conditions in the Control Room. The Control Room Operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual firefighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above, thus reducing the potential for the fire spread. The postulated oil fire is not considered to have sufficient potential for spread to cause failure of redundant safety-related cable trays, plant equipment and associated cabling and controls, which are isolated by spacial separation and partial structural and fire barriers. The fire area is enclosed within three-hour fire barriers.

Therefore, the capability of the plant for safe shutdown and control of radioactive releases to the environment is not impaired by an oil fire in the Containment.

b. Cable Fires

The cable fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays and in conduit located in and traversing the cable penetration areas (Refer to Figure 9.5A-3, Fire Zones 1-C-3-EPA and 1-C-3-EPB). Transient combustibles may be present in the area only during refueling, maintenance, and repair activities within the Containment. They could be small amounts of wood, rags and plastic.

The potential maximum propagation of the postulated fire is reduced by early detection through ionization type smoke detectors strategically located above the cable trays, on an area basis. The automatic detection system senses the products of combustion generated by the smoldering cable insulation fire and alerts employees locally at the fire zone and at the local fire detection control panel and in the Control Room, via the Communications Room, so that 15
manual fire response can be initiated promptly. Initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires is made possible through limited access into the

Containment from RAB during normal operation, or controlled access during either maintenance, repair, or refueling shutdowns. (As described under Item 7).

Fire protection is provided by an automatic multi-cycle sprinkler system, as detailed under Item 8, located above the cable tray stacks. Damage will then be limited to the immediate area of inception with only limited propagation along the cable tray(s), to adjacent cable trays, to other exposed adjacent cabling and adjacent transient combustibles, if any.

If the multi-cycle sprinkler system has not actuated automatically, the postulated fire might involve the cable tray in which ignition is assumed as well as the tray above it, extend to the nearest fire break along the run, or to the area fire barrier penetration seal. However, the automatic multi-cycle sprinkler system can be actuated manually from either the system control valve (RAB, Elevation 236 ft.) or any manual alarm station located inside the Containment, thus reducing the potential fire consequences described above. Damage in this case will be limited significantly and confined to the immediate area of ignition with only very limited exposure to adjacent cabling.

The early warning ionization detection system will alarm a fire condition (products of combustion) in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual firefighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above, thus reducing the potential for the fire spread. The postulated cable fire is not considered to have sufficient magnitude or potential for spread to cause failure of redundant safety-related cable trays, plant equipment and associated cabling and controls, which are isolated by spacial separation and partial structural barriers. The fire area is enclosed within three-hour fire barriers. Therefore, the capability of the plant for safe shutdown and control of radioactive releases to the environment is not impaired by a cable fire in the Containment.

c. Charcoal Fires

The charcoal fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of charcoal within filters located on Elevation 221 ft., Fire Zones 1-C-1-CHFA or 1-C-1-CHFB (Refer to Figure 9.5A-2). Transient combustibles present in the area are charcoal for filter refill and/or oil in a 55 gal. oil drum. These transients are present only during maintenance and repair or refueling shutdowns not during normal operation.

The potential maximum propagation of the postulated fire is reduced by early detection using line type detectors installed in the charcoal bed. The temperature of the air leaving the charcoal filter is monitored. On temperature rising above a pre-high temperature level visual and audible alarms on the charcoal filter housing detection panel and in the Control Room are activated. The Control Room Operator will stop the air flow through this filter allowing for cooling of the charcoal through starvation of oxygen supply to the fire.

Should the fire not extinguish itself, the temperature will continue to rise, the filter housing will become hot, and the automatic thermal detection system (using rate compensated detectors) installed on an area basis over each charcoal filter housing senses the heat generated by the fire. When the temperature reaches 200 F, the multi-cycle sprinkler system is actuated, as detailed under Item 8, fire alarms are transmitted to the Control Room via the Communications Room, to the local fire detection control panel and locally to the fire zone. 15

The potential maximum propagation of the charcoal fire will be reduced by possible initial use of area fire extinguishers on incipient fires and supplemental use of hose lines on developing fires by employees either responding to this fire or present in the Containment during refueling, maintenance or repairs in the Containment.

If the multi-cycle sprinkler system has not actuated automatically, the postulated fire might involve the charcoal filter and damage associated ducts, fittings, cabling, and controls. However, the automatic multi-cycle sprinkler system can be actuated manually from either the system control valve (RAB, Elevation 236 ft.), or any manual alarm station located inside the Containment, thus reducing the potential fire consequences described above. Damage in this case will be confined to the immediate area of inception with limited exposure to adjacent cabling, adjacent combustible materials, if any, and limited damage to exposed equipment.

The early warning (line detectors) from the charcoal bed will alarm in the Control Room. The Control Room Operator will stop the air flow through this filter and will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting if necessary, through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above, thus reducing the potential for the fire spread. The postulated charcoal fire is not considered to have sufficient potential for spread to cause failure of redundant safety related cable trays, plant equipment and associated cabling and controls, which are isolated by spacial separation and partial structural barriers. The fire area is enclosed within three hour fire barriers. Therefore, the capability of the plant for safe shutdown and control of radioactive releases to the environment is not impaired by a charcoal fire in the Containment.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment both safety and non-safety related shown on the plant general arrangement drawings for this area.

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 1-C-1-RCP-1A, Reactor Coolant Pump 1A								
- Reactor Coolant Pump	1A-SN	X				X		
- Steam Generator	1A-SN	X				X		
- Containment Fan	AH-37 (1A-NNS)		X					
Coil Unit with (2) Fans	and AH-37 (1B-NNS)		X					
Fire Zone: 1-C-1-RCP-1B, Reactor Coolant Pump 1B								
- Reactor Coolant Pump	1B-SN	X				X		
- Steam Generator	1B-SN	X				X		
- Pressurizer	1X-SN	X				X		
- Containment Fan	AH-38 (1A-NNS)		X	N/A				
Coil Unit with (2) Fans and Associated Ductwork	and AH-38 (1B-NNS)		X	N/A				
- Containment Fan	AH-39 (1A-NNS)		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Unit with (2) Fans and Associated Ductwork	and AH-39 (1B-NNS)		X	N/A				
Fire Zone: 1-C-1-RCP-1C, Reactor Coolant Pump 1C								
- Reactor Coolant Pump	1C-SN	X				X		
- Steam Generator	1C-SN	X				X		
- Sump Pumps (4)	NNS		X	N/A				
Fire Zone: 1-C-1-CHFA, Charcoal Filter A								
- Airborne Radioactivity Removal Unit	(1A-S-1)		X			X		
- Reactor Supports Cooling Fan	S-4 (1A-SA)	X				X		
- Reactor Supports Cooling Fan	S-4 (1B-SB)	X				X		
Fire Zone: 1-C-1-CHFB, Charcoal Filter B								
- Airborne Radioactivity Removal Unit	S-1 (1B-NNS)		X			X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating
- Contain- ment Fan Cooler AH-1	1B-SB	X				X		
Fire Zone: 1-C-3-EPA, Electrical Penetration A								
- Contain- ment Fan Cooler AH-3	1A-SA	X				X		
- Contain- ment Fan Cooler - AH-3	1B-SB	X				X		
- Accum- mulator	1A-SA	X				X		
- Reactor Coolant Pump Standpipe	NNS		X	N/A				
- Electric Hydrogen Recombiner	1A-SA	X				X		
Fire Zone: 1-C-3-EPB, Electrical Penetration B								
- Con- tain- ment Fan Cooler	AH-4 1A-SA AH-4 1B-SB	X X				X X		
- Accum- ulator	1B-SB	X				X		
- Accum- ulator	1C-SA	X				X		
- Emer- gency Escape Lock	NNS		X		N/A			

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating
- Reactor Coolant Pump Standpipe	NNS		X		N/A			
Fire Zone: 1-C-1-BAL, Containment Building Balance								
- Reactor Vessel	1X-SN	X		X				
- Contain- ment Fan Cooler	AH-1 (1A-SB)	X		X		X		
- Contain- ment Spray Valve Chamber (2)	1A-SA	X		X				
- Recirc- ulating Valve Chamber (2)	1A-SA	X		X				
- Reactor Coolant Drain Tank Heat Ex- changer	1X-SN	X		X				
- Reactor Coolant Drain Tank Pumps(2)	1B-NNS		X	X				
- Instru- ment Rack	C1-R1		X					
- Electric Panels (3)	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
				Barriers or Enclosures				
Name or Description	ID No. & Safety Div.	Yes	No	3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
- Primary Shield Cooling Fans	S-2 (1A-SA)	X				X		
	and (1A-SB)	X				X		
- Valve Motor	NNS		X	N/A				
- Containment Purge Exhaust	NNS	X		N/A				
- Containment Fans	AH-2 (1A-SA)	X				X		
	and (1B-SB)	X				X		
- Fuel Transfer Tube	NNS		X	N/A				
- Drivers (5)	NNS		X	N/A				
- Personnel Lock and Equipment Removal	NNS		X	N/A				
- Containment Purge Makeup	NNS		X	N/A				
- Hydrogen Purge Makeup	NNS		X	N/A				
- Regen Heat Exchanger	1X-SN		X			X		
- Reactor Coolant Drain Tank	1X-NNS		X	N/A				
- Pressurizer Relief Tank	1X-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
- Excess Let-down Heat Exchanger	1X-SN		X			X		
- Hydrogen Purge Exhaust	NNS		X			X		
- Instrument Racks (14) (NNS)	C1-R2		X	N/A				
	C1-R3		X	N/A				
	C1-R4		X	N/A				
	C1-R5		X	N/A				
	C1-R6		X	N/A				
	C1-R7		X	N/A				
	C1-R8		X	N/A				
	C1-R9		X	N/A				
	C1-R10		X	N/A				
	C1-R11		X	N/A				
	C1-R13		X	N/A				
	C1-R14		X	N/A				
	C1-R15		X	N/A				
	C1-R16		X	N/A				
- Electrical Panel	NNS		X	N/A				
- Reactor Vessel Integrated Head	1X-SN	X					X	
- Electric Hydrogen Recombiners	1A-SA and 1B-SB	X X				X X		
- Digital Rod Position Cabinets	1A-SA 1B-SB	X X				X X		
- 5-Ton Portable Jib Crane	NNS		X	N/A				
- Vacuum Relief (2)	2CB-VISA-1 2CB-VISB-2	X		N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
- Equipment Hatch	NNS		X	N/A				
- Elevator Machine Room	NNS		X	N/A				
- Removable Unloading Platform (El.292 ft.)	NNS		X	N/A				
- Strong Motion Triaxial Ac-celograph	NNS		X	N/A				
- Fuel Trans-fer System Control Panel and Hydraulic Unit	NSS		X	N/A				
- Trolley (El.376 ft.)	NNS		X	N/A				
- Circular Bridge Crane	NNS		X	N/A				
- Rod Cluster Control Changing Fixture Drive Mechanism	NNS		X	N/A				
- Rod Cluster Control Changing Fixture Guide Tube	NNS		X	N/A				

APPENDIX 9.5A.2

1. Identification Fire Area: 1-A-ACP

Building: Reactor Auxiliary 15

Fire Area: 1-A-ACP, Auxiliary Control (Panel) Room,

Elevation 286 ft.

Shown on Figures: 9.5A-9, 9.5A-13

Length (ft.): 28 Width (ft.): 11 Height (ft.): 17

Area (sq.): 310 Volume (cu. ft.): 5,250

2. Occupancy

The area contains the auxiliary control panel, associated controls, wiring in conduit and cable in trays.

3. Boundaries

Walls, floor, and ceiling are of reinforced concrete construction, with a fire rating of three hours. One wall opening for personnel access is provided and is protected by a certified three-hour A lable type fire rated door. There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb/RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 1-A-ACP, Auxiliary Control (Panel) Room			
Cable Insulation			
Power	130	23,400	76,000
Control	240	37,680	122,500
Instrumentation	120	11,400	37,000
Liquids:	0	0	0
Solids:	0	0	0
Transient (Negligible)	0	0	0
	Total	72,480	235,500

5. Control of Hazards

Electrical penetrations are sealed with three hour rated fire stops at all floors and at rated fire barrier walls. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts. Full height, three-hour rated fire barriers are provided between SA and SB safety related cable trays within the area (at E-39). Supplemental barriers are provided where safety and non-safety related cable trays are at close proximity and Regulatory Guide 1.75 criteria cannot be met fully. Fire breaks are installed in this fire area.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area by a rate of approximately 1.77 cfm/sq. ft. Smoke, heat and products of incomplete combustion will be removed by the normal ventilation for this area.

Supply:	AH13 (1A-SB) AH13 (1B-SB)	Exhaust:	E-29 (1A-SA) E-29 (1B-SB)

Function	Safety Class	Mode	Flow (Cfm)	cfm/sq. ft.)
Supply	3	Operating	550	1.77
	3	Standby	550	1.77
Exhaust	3	Operating	550	1.77
	3	Standby	550	1.77

There are no radioactive sources in this area.

6. Fire Detection

The type of detection system provided in this area and its functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-ACP	1-43	Ioniza-tion	Area	X	X	X	No	X	X

15 *The local fire detection control panel located in the RAB on Elevation 286 ft. covers the fire areas and fire zones on the same elevation.

**Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area at the local control panel and an audible alarm at the fire zone.

7. Access and Initial Response

Access to this area is provided from the adjacent switchgear Room 1B, Fire Area 1-A-SWGRB (see Figure 9.5A-9). Carbon dioxide extinguishers are provided in and adjacent to the area in accordance with NFPA 10. Standpipe hose stations have been provided adjacent to the area.

8. Fire Supression Systems

There are no automatic fire supression systems provided to protect this area.

Plant equipment subject to water damage is protected with watertight enclosures and are mounted on floor pedestals.

Damage to plant areas and equipment from the accumulation of water discharged from hose lines is minimized by the provision of a floor drainage system. Floor water surcharge is estimated to be insignificant. Excess water can overflow to adjacent areas. Runoff is directed to the storm drainage system.

9. Analysis of Effects of Postulated Fires

In Fire Area 1-A-ACP, the auxiliary control panel room, area fire hazard combustibles include normally expected amounts of cable insulation in cable trays and conduits and limited amounts of cable insulation within control cabinets. Transient materials are not normally anticipated to be present in the area. Transient materials, such as rags, may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities is reduced:

- by the use of IEEE 383 qualified cables

- by limiting the continued spread of fire by the provision of fire-breaks along cable trays and fire-stops at fire barrier penetrations

- by fire rated barriers at redundant cable tray close proximity points

- by separational barriers at points of possible fire communication

- by controlling the introduction of transient combustibles through administrative procedures.

The fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays.

The postulated fire might involve several cable trays above the tray in which ignition is assumed, extend to the first fire-break along the run or to a crossover, or to the area fire barrier fire stop.

The potential propagation of the postulated fire will be reduced by early detection using ionization type smoke detectors installed at the ceiling on an area basis. The automatic detection system senses products of combustion generated by the incipient fire and alerts employees both locally and in the

15 respective Unit Control Room via Communications Room, so that manual fire response can be initiated promptly.

Ready access is provided to the area from adjacent plant areas facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines located in adjacent areas by employees responding to the fire. The postulated electrical fire is not considered to have sufficient potential for spread to cause failure to redundant safety related plant equipment and associated cabling and controls which are separated by three hour rated fire barriers. Thus, the capability for a safe shutdown of the plant will not be impaired by the postulated electrical fire in the area.

10. Fire Area Equipment

Listed below is the electrical equipment shown on the plant general arrangement drawings for this area:

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Auxiliary Control Panel	ACP-SAB	X		X				

APPENDIX 9.5A.3

1. Identification — Fire Area: 1-A-BAL

Building: Reactor Auxiliary

Fire Area: 1-A-BAL Reactor Auxiliary Building Balance, Elevations 190, 216, 236, 261, and 286 ft. 15

Fire Zones: Detailed under Item 4

Shown on Figures: 9.5A-6, 9.5A-7, 9.5A-8, 9.5A-9, 9.5A-11, 9.5A-12, 9.5A-13 and 9.5A-26

Length (ft.): Variable   Width (ft.): Variable   Height (ft.): Variable

Area (Sq. ft.): 134,850   Volume (cu. ft.): 2,700,000

2. Occupancy

The area contains various safety and non-safety related equipment such as: pumps, tanks, filters, electrical equipment, heat exchangers, HVAC and associated controls, wiring in conduit and cable in trays.

3. Boundaries

Walls, floors, ceilings, and structural columns supporting the area boundaries are of reinforced concrete construction, with a minimum fire rating of three hours. Wall openings for personnel access are protected by certified three-hour A label type fire rated doors and by certified one-and-a-half-hour B label type fire rated doors at stair towers.

Floor, ceiling and roof openings for handling of equipment are protected by reinforced concrete hatch covers. Openings within fire area boundaries have a three hour fire rating. Concealed spaces consist of pipe tunnels, manholes, pipe chases, valve pits, valve galleries, sumps and inspection openings.

4. Combustible Loading

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 1-A-BAL, Reactor Auxiliary Building Balance 15				
Floor Area: 134,850 sq.ft.				
Cable Insulation				
Power		8,128	1,463,000	10,900
Control		7,520	1,181,000	8,800
Instrumentation		5,184	493,000	3,700
Liquids:	Grease (lb.)	2	40	0
	Oil (gal.)	158	17,000	100
Solids:	Charcoal (lb.)	2,460	24,000	200

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Transient: Oil (gal.)	55	6,000	45
Fiber Drums (lb.)	30	300	5
Charcoal (lb.)	1,230	12,300	95
1	TOTAL	3,196,640	23,845

Following is a listing of Fire Zones within Fire Area 1-A-BAL which have negligible combustible loadings:

1-A-1-ED, Equipment Drain Transfer Tank, Elevation 190 ft.

1-A-1-FD, Floor Drain Transfer Tank, Elevation 190 ft.

1-A-2-COR, Access Corridor, Elevation 216 ft.

1-A-2-PT, Pipe Tunnel, Elevation 216 ft.

1-A-3-TA, Tank Area, Elevation 236 ft.

1-A-34-RHXB Residual Heat Removal Heat Exchanger 1B, Elevation 236 and Elevation 261 ft.

1-A-4-TA, Tank Area, Elevation 261 ft.

1-A-46-ST, Steam Feedwater Tunnel, Elevation 261 ft. through 305 ft.

1-A-5-CEH, Cont. Equipment Hatch Area, Elevation 286 ft.

1-A-5-HV3 HVAC Equipment, Elevation 286 ft.

Fire Zone: 1-A-1-PA, Residual Heat Removal Pump Room 1A, Elevation 190 ft.
Floor Area: 2,900 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	109	19,600	6,700
Control	22	3,500	1,200
Instrumentation	22	2,100	700
Liquids: oil (gal.)	60	6,500	2,200
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	2,000
	Total	37,700	12,800

Fire Zone: 1-A-1-PB, Residual Heat Removal Pump Room 1B, Elevation 190 ft.
Floor Area: 2,900 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	77	13,800	4,700
Control	55	8,600	2,900
Instrumentation	22	2,100	700
Liquids: oil (gal.)	60	6,500	2,200
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	2,000
	Total	37,000	12,500

Fire Zone: 1-A-2-MP, Miscellaneous Equipment and Pumps, Elevation 216 ft.
Floor Area: 13,000 sq. ft.

Cable Insulation			
Power	134	24,000	1,900
Control	104	16,300	1,300
Instrumentation	30	2,800	200
Liquids (negligible, integral with equipment)	0	0	0
Solids	0	0	0
Transient: oil (gal.)	55	6,000	400
	Total	49,100	3,800

Fire Zone: 1-A-3-COMB, Columns 41 to 43 and B to E, Elevation 236 ft.
Floor Area: 4,400 sq. ft.

Cable Insulation			
Power	380	68,400	16,000
Control	340	53,300	12,000
Instrumentation	340	32,300	7,300
Liquids: grease (lb.)	1	20	0
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	1,300
	Total	160,020	36,600

1

Fire Zone: 1-A-3-COME, Columns 41 to 43 and E to H, Elevation 236. ft.
Floor Area: 5,200 sq. ft.

1

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	340	61,200	12,000
Control	340	53,400	10,000
Instrumentation	340	32,200	6,000
Liquids (negligible)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	11,000
	Total	152,300	39,000

Fire Zone 1-A-3-COMI, Columns 41 to 43 and I to L, Elevation 236 ft.
Floor Area: 7,200 sq. ft.

Cable Insulation			
Power	601	108,000	15,000
Control	208	33,000	4,500
Instrumentation	501	48,000	6,600
Liquids: grease (lb.)	0	0	0
Solids:	0	0	0
Transient: Oil (gal.)	55	6,000	800
	Total	195,000	26,900

Fire Zone 1-A-3-COR Access Corridor, Elevation 236 ft.
Floor Area: 2,200 sq. ft.

Cable Insulation			
Power	40	7,200	3,300
Control	0	0	0
Instrumentation	0	0	0
Liquids: Oil (gal.)	14	1,500	1,000
Solids:	0	0	0
Transient: Oil (gal.)	55	6,000	2,700
	Total	14,700	7,000

Fire Zone 1-A-3-MP Mechanical Penetration Area, Elevation 236 ft.
Floor Area: 13,000 sq. ft.

Combustible	Quantity Gal./lb./RF		BTU in 1000's	BTU/ sq. ft.	
Cable Insulation					
Power	95		17,000	1,300	
Control	45		7,000	500	
Instrumentation	30		2,800	200	
Liquids: (integral with equipment)	0		0	0	
Solids	0		0	0	
Transient: Grease (lb.)	5		< 1	0	
		Total	26,800	2,000	11

Fire Zone 1-A-3-PB Pumps and Equipment, Elevation 236 ft.
Floor Area: 15,000 sq. ft.

Cable Insulation					
Power	690		124,000	8,300	
Control	258		40,500	2,700	
Instrumentation	180		17,100	1,100	
Liquids: Grease (lb.)	1		20	0	
Solids:	0		0	0	
Transient: Grease (lb.)	5		< 1	0	
		Total	181,620	12,100	11

Fire Zone: 1-A-4-CHFA, Charcoal Filter Room 1A, Elevation 261 ft.
Floor Area: 2,900 sq. ft.

Cable Insulation				
Power	450		81,000	28,000
Control	360		57,000	20,000
Instrumentation	360		34,000	12,000
Liquids:	0		0	0
Solids: Charcoal (lb.)	1,230		12,300	4,200
Transient: Charcoal (lb.)	1,230		12,300	4,200
Fiber Drums: (lb.)	30		300	100
		Total	196,900	68,500

Fire Zone: 1-A-4-CHFB, Charcoal Filter Room 1B, Elevation 261 ft.
Floor Area: 2,600 sq. ft.

	Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
	Cable Insulation			
	Power	350	63,000	24,000
	Control	265	42,000	16,000
	Instrumentation	265	25,000	9,700
	Liquids:	0	0	0
	Solids charcoal (lb.)	1,230	12,300	4,700
	Transient: charcoal (lb.)	1,230	12,300	4,700
	fiber drums (lb.)	30	300	100
3	TOTAL		154,900	59,200

Fire Zone: 1-A-4-CHLR, Chiller Room, Elevation 261 ft.
Floor Area: 14,000 sq. ft.

	Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
	Cable Insulation			
	Power	2,730	492,000	35,000
3	Control	3,560	559,000	40,200
	Instrumentation	1,670	159,000	11,200
	Liquids: Oil (gal.)	25	2,600	1,200
	Solids	0	0	0
	Transient: Oil (gal.)	55	6,000	400
		Total	1,218,600	88,000

Fire Zone: 1-A-4-COMB, Columns 41 to 43 and B to E, Elevation 261 ft.
Floor Area: 4,200 sq. ft.

	Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
	Cable Insulation			
3	Power	400	72,900	17,400
	Control	580	91,000	21,700
	Instrumentation	370	35,150	8,400
	Liquids:	0	0	0
	Solids:	0	0	0
	Transient: Oil (gal.)	55	6,000	1,400
3		Total	205,050	48,900

Fire Zone: 1-A-4-COMB, Columns 41 to 43 and E to H, Elevation 261 ft.
Floor Area: 5,100 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	240	43,200	8,500
Control	240	37,700	7,400
Instrumentation	240	22,800	4,500
Liquids:	0	0	0
Solids:	0	0	0
Transient: Oil (gal.)	55	6,000	1,400
	Total	109,700	21,800

1

Fire Zone: 1-A-4-COME, Columns 41 to 43 and E to H, Elevation 261 ft.
Floor Area: 5,100 sq. ft.

Cable Insulation			
Power	240	43,200	8,500
Control	240	37,700	7,400
Instrumentation	240	22,800	4,500
Liquids:	0	0	0
Solids:	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
	TOTAL	109,700	21,400

Fire Zone: 1-A-4-COMI, Columns 43 and I to L, Elevation 261 ft.
Floor Area: 1,500 sq. ft.

Cable Insulation			
Power	110	19,800	13,000
Control	111	17,400	12,000
Instrumentation	111	10,500	7,000
Liquids:	0	0	0
Solids:	0	0	0
Transient: Oil (gal.)	55	6,000	4,000
	Total	53,700	36,000

1

Fire Zone: 1-A-4-COR, Access Corridor, Elevation 261 ft.
Floor Area: 2,300 sq. ft.

Combustible	Quantity Gal./lb./RF		BTU in 1000's	BTU/ sq. ft.
Cable Insulation				
Power	729		131,000	58,000
Control	259		41,000	18,000
Instrumentation	240		23,000	10,000
Liquids:	0		0	0
Solids:	0		0	0
Transient: Oil (gal.)	55		6,000	2,600
		Total	201,000	88,600

Fire Zone: 1-A-5-HVA, HVAC Room 1A, Elevation 286 ft.
Floor Area: 2,700 sq. ft.

Combustible	Quantity Gal./lb./RF		BTU in 1000's	BTU/ sq. ft.
Cable Insulation				
Power	125		22,800	8,300
Control	130		20,400	7,600
Instrumentation	65		6,800	2,300
Liquids: (integral with equipment)	0		0	0
Solids:	0		0	0
Transient: Grease (lb.)	5		< 1	0
11		Total	50,000	18,200

Fire Zone: 1-A-5-HVB, HVAC Room 1B, Elevation 286 ft.
Floor Area: 3,600 sq. ft.

Combustible	Quantity Gal./lb./RF		BTU in 1000's	BTU/ sq. ft.
Cable Insulation				
Power	440		79,000	22,000
Control	645		101,000	28,000
Instrumentation	395		37,500	10,000
Liquids: (integral with equipment)	0		0	0
Solids:	0		0	0
Transient: Grease (lb.)	5		< 1	0
11		Total	217,500	60,000

Fire Zone: 1-A-5-BATN, Battery Room Neutral (Non-Safety Related)
Elevation 286 ft.
Floor Area: 210 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	60	10,800	51,000
Control (in conduit)	0	0	0
Instrumentation (in conduit)	0	0	0
Liquids:	0	0	0
Solids:	0	0	0
Transient: Oil (gal.)	0	0	0
	Total	10,800	51,000

Fire Zone: 1-A-34-RHXA, Residual Heal Removal Heat Exchanger 1A,
Elevation 236 ft. and 261 ft.

Cable Insulation			
Power	20	3,600	8,000
Control (in Conduit)	0	0	0
Instrumentation (in Conduit)	0	0	0
Liquids: (integral with equipment)	0	0	0
Solids:	0	0	0
Transient: Oil (gal.)	0	0	0
	Total	3,600	8,000

5. Control of Hazards

Electrical penetrations are sealed with three hour rated fire stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barrier walls are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts. Partial or full height structural barriers may be provided between redundant safety related equipment within the area, as shown on the figures.
Three hour rated fire barriers were provided between redundant safety related cable trays at points of close proximity. Barriers consisting of cable tray covers were installed between safety and non-safety related cable trays, where Regulatory Guide 1.75 cannot be fully met. Fire breaks are installed throughout this fire area as required.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area by a rate of approximately 0.2 cfm/sq. ft. Smoke, heat and products of incomplete combustion are removed by the normal ventilation system for this area:

Supply:	S-3 (1A-NNS)	Exhaust:	E-17 (1X-NNS)	E-6 (1A-SA)	
	S-3 (1B-NNS)		E-18 (1X-NNS)	E-6 (1B-SB)	
			E-19 (1X-NNS)		
			E-20 (1X-NNS)		

Entire fire area except for fire zones: 1-A-5-HVA, 1-A-5-HVB, and 1-A-5-BATN.

Function	Safety Class	Mode	Flow (cfm)	cfm/sq. ft.
Supply (1A)	NNS	Operating	132,000	1.0
Supply (1B)	NNS	Standby	132,000	1.0
Normal Exhaust (E-17, E-18, E-19, E-20)	NSS	Operating	134,800	1.0
Emerg Exhaust (1A)	3	Operating	6,000	.045
Emerg Exhaust (1B)	3	Standby	6,000	.045

Fire Zone 1-A-5-HVA

Supply: AH-12 (1A-SA)
AH-12 (1B-SA)

Exhaust: E-28 (1A-SA)
E-28 (1B-SA)

Supply	3	Operating	1,800	0.67
Supply	3	Standby	1,800	0.67
Exhaust	3	Operating	1,800	0.67
Exhaust	3	Standby	1,800	0.67

Fire Zone 1-A-5-HVB

Supply: AH-13 (1A-SB)
AH-13 (1B-SB)

Exhaust: E-29 (1A-SB)
E-29 (1B-SB)

Supply	3	Operating	2,100	0.58
Supply	3	Standby	2,100	0.58
Exhaust	3	Operating	2,100	0.58
Exhaust	3	Standby	2,100	0.58

Fire Zone 1-A-5-BATN

Supply: AH-12 (1A-SA)
AH-12 (1B-SA)

Exhaust: E-28 (1A-SA)
E-28 (1B-SA)

Supply	3	Operating	300	1.4
Supply	3	Standby	300	1.4
Exhaust	3	Operating	300	1.4
Exhaust	3	Standby	300	1.4

Sources of radioactive releases for this area include: Floor and Equipment Drain Transfer Systems, component cooling water heat exchangers and pumps, RHR heat exchangers and pumps, sampling rooms, decontamination area, seal water heat exchangers, letdown heat exchangers, RAB filter backwash, recycle evaporator feed package, recycle holdup tank, charging pumps, volume control tank, refueling water storage tank, demineralizer and boron recycling system, condensate storage tank, reactor makeup water storage tank.

6. Fire Detection

The types of detection, actuation and signaling systems provided in this area and their actions are as following:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-1-PA	1-8	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
		Manual Alarm Stations	Area	X	X	X	X	X	X
1-A-1-PB	1-9	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
		Thermal	Area	X	X	X	X	X	X
1-A-1-FD	1-10	Ionization	Area	X	X	X	No	X	X
1-A-1-ED	1-11	Ionization	Area	X	X	X	No	X	X
1-A-2-COR	1-12	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
1-A-2-MP	1-14	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
1-A-2-PT	1-13	Manual Alarm Station	Area	X	X	X	No	X	X
1-A-3-PB	1-17	Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
		Ioniza-tion	Area	X	X	X	No	X	X
1-A-3-COR	1-18	Manual Alarm Station	Area	X	X	X	X	X	X
1-A-3-MP	1-19	Manual Alarm Station	Area	X	X	X	No	X	X
1-A-3-COMB	1-20	Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
		Ioniza-tion	Area	X	X	X	No	X	X
1-A-3-COME	1-21	Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
		Ioniza-tion	Area	X	X	X	No	X	X
1-A-3-COMI	1-22	Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
		Ioniza-tion	Area	X	X	X	No	X	X
1-A-4-COR	1-23	Ioniza-tion	Area	X	X	X	No	X	X
		Manual Alarm	Area	X	X	X	X	X	X
		Station	Area	X	X	X	X	X	X
		Thermal	Area	X	X	X	X	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
1-A-4-CHLR	1-24	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
		Manual Alarm Stations	Area	X	X	X	X	X	X
1-A-4-COMB	1-28	Ionization	Area	X	X	X	No	X	X
		Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
1-A-4-COME	1-26	Ionization	Area	X	X	X	No	X	X
		Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
1-A-4-COMI	1-27	Ionization	Area	X	X	X	No	X	X
		Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
1-A-4-CHFA	1-28	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
1-A-4-CHFB	1-29	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
1-A-4-TA	1-23	Manual Alarm Station	Area	X	X	X	No	X	X
1-A-5-CEH	1-32	Manual Alarm Station	Area	X	X	X	No	X	X

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-5-HVA	1-33	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
1-A-5-HVB	1-34	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Stations	Area	X	X	X	X	X	X
1-A-5-BATN	1-37	Ionization	Area	X	X	X	No	X	X
1-A-5-HV3	1-33	Manual Alarm Stations	Area	X	X	X	No	X	X

15 * The local fire detection control panels located in RAB on Elevation 190, 216, 236, 261, 286 ft. cover the fire zones and fire areas located on these elevations.

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel and an audible alarm in the fire zone.

7. Access and Initial Response

Access to this area is provided from adjacent areas, corridors and stair towers, as shown on the figures.

Carbon dioxide and dry chemical type extinguishers are provided in and adjacent to the area in accordance with NFPA 10. Standpipe hose stations have been provided in and adjacent to the area.

8. Fire Suppression System

The fire suppression systems provided in this area are four automatic multi-cycle sprinkler systems installed at the ceiling level, hydraulically designed to provide a density of 0.3 gpm/sq.ft. of floor area protected. Each system is actuated automatically by thermal detectors located also at the ceiling level when the area temperature reaches 135 F. The sprinkler heads open when the area temperature reaches 165 F. The system water flow is shut off automatically from the multi-cycle valve when the area temperature drops below 135 F. The multi-cycle control valve for these systems are located inside these fire areas, accessible from stairways or an aisle in fire area 1-A-BAL, fire zones: 1-A-4-COMB, 1-A-3-COMB, 1-A-1-PA and 1-A-1-PB (see Figures 9.5A-6 through 9.5A-8). Sprinkler systems piping is seismically supported in areas containing safety related equipment.

Manual actuation of the system is provided from each multi-cycle control valve emergency mechanical releases. Remote manual actuation of each multi-cycle system is provided from the dual action manual alarm stations located inside or outside each fire zone on the elevation, where the suppression system is provided. Electrical supervision of each suppression system includes control valve position, system valve position, supervisory air pressure and lack of water flow through the control valve.

Motors for safety-related HVAC equipment are totally enclosed. Motor control centers, switchgears and power centers, safety and non-safety related are installed on 4 in. (minimum) high pedestals, for protection against sprinkler water damage. The batteries are installed on racks for the same reason.

Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of floor drainage systems. Floor water surcharge is estimated to be insignificant since excess water can overflow to adjacent areas. Runoff is directed to the floor drainage transfer tank or storm drainage system, as detailed in Section 9.3.3.

9. Analysis of Effects of Postulated Fires

In Fire Area 1-A-BAL, the Reactor Auxiliary Building Balance (remaining zones after separating vital fire areas) fire hazard combustibles include normally expected amounts of cable insulation in cable trays, conduit, connection boxes, limited amounts of cable insulation within control panels, minor quantities of permanent Class A materials (ordinary combustibles), required quantities of charcoal used within filters, lubricating oil contained within equipment, as detailed in the combustible loading under item 4 of this analysis.

Transient materials such as charcoal in fiber drums, rags, wood, plastic sheets, cleaning solvents and lubricating oil may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires and consequently, the magnitude of these fires and the resultant damage to plant facilities is reduced:

- By the use of IEEE 383 qualified cables, except for the building elevators cables which are neoprene insulated; the neoprene insulation was accepted for use, for functional reasons.

- By limiting the continued spread of fire by the provision of fire breaks along cable trays, fire stops at fire barrier penetrations and at all floors, three hour fire barriers at redundant cable points of close proximity and separational barriers between non-safety and safety cable trays at points of possible fire communication.

- By limiting permanent quantities of ordinary combustible (Class A) materials to amounts actually required for normal operations.

- By controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of the normal ventilation system; by provision of structural barriers within the area separating redundant equipment; and by three hour barriers enclosing the 1-A-BAL fire area.

The types of fires postulated for the reactor auxiliary building balance are based on the types of combustibles present in the area and their concentrations. Charcoal, cable and oil fires are being considered in this analysis.

A. <u>CHARCOAL FIRES</u>

The charcoal fire postulated for the reactor auxiliary building balance assumes ignition and subsequent development into the most severe single fire expected in the area of localized concentrations of charcoal within filters located on Elevation 261 ft., fire zones 1-A-4-CHFA or 1-A-4-CHFB (see Figure 9.5A-8). Transient combustibles present in the area may be charcoal for filter refill and/or oil in a 55 gal. oil drum. These transients may be present only during maintenance and repair operations.

The potential maximum propagation of the postulated charcoal fire is reduced by early detection using line type detectors installed in the charcoal bed. The temperature of the air leaving the charcoal filter is monitored. On temperature rising above a pre-high temperature level, visual and audible alarms on the charcoal filter housing detection panel and in the Control Room are activated. The Control Room Operator will stop the air flow through this filter alowing for cooling of the charcoal through starvation of the oxygen supply to the fire.

Should the fire not extinguish itself the temperature will continue to rise, the filter housing will become hot and the automatic thermal detection system (using rate compensated detectors), installed on an area basis over each charcoal filter housing senses the heat and activates the fire suppression system as described at Item 8 of this analysis, fire alarms are transmitted to
15 the Control Room via the Communications Room, the local fire detection control panel and locally to the fire zone.

The potential maximum propagation of the charcoal fire will be reduced by initial use of area portable fire extinguishers on incipient fires and supplemental use of hose lines on developing fires by employees either responding to this fire or present in the area for maintenance or repairs of equipment (as described under Item 7).

If the multi-cycle sprinkler system has not actuated automatically the postulated fire might involve the charcoal filter and damage associated ducts, fittings, cabling and controls. However, the multi-cycle sprinkler system can be actuated manually from either the system control valve on Elevation 261 ft. Fire Zone 1-A-4-COMB or any dual action manual alarm station on this elevation. Damage will then be confined to the area of inception with only very limited exposure to adjacent cabling, adjacent combustible materials, if any, and damage to exposed equipment.

The early warning (line detectors) from the charcoal bed and/or the ionization smoke detectors located at the ceiling of the fire zones will alert the Control Room Operator to stop the air flow through the filter and dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting, if necessary, through the use of portable fire extinguishers, hoselines and/or manual actuation of the automatic fire suppression system. The postulated charcoal fire is not considered to have sufficient potential for spread to cause failure of redundant safety related cable trays, plant equipment and associated cabling and controls, which are isolated by special separation, partial structural and fire barriers, and provision of an automatic fire extinguishing system. The fire area is enclosed within three-hour fire barriers. Therefore, the capability of the plant for safe shutdown and control of radiation releases to the environment is not impaired by a charcoal fire in the reactor auxiliary building balance. 15

B. CABLE FIRES

The cable fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays and in conduit located in and traversing the area, located on Elevation 190 ft. (Fire Zones 1-A-1-PA and 1-A-1-PB, See Figure 9.5A-6) Elevation 216 ft. (Fire Zone 1-A-2-MP, See Figure 9.5A-6), Elevation 236 ft. (Fire Zones 1-A-3-COMB, 1-A-3 COME, 1-A-3-COMI, 1-A-3-COR, 1-A-3-MP, 1-A-3-PB, See Figure 9.5A-7), Elevation 261 ft. (Fire Zones 1-A-4-CHFA, 1-A-4-CHFB, 1-A-4-CHLR, 1-A-4-COME, 1-A-4-COMI, 1-A-4-COR, See Figure 9.5A-8), Elevation 286 ft. (Fire Zones 1-A-5-HVA, 1-A-5-HVB, 1-A-5-BATN, See Figure 9.5A-9). Transient combustibles may be present in the area as detailed under Item 4 of this analysis.

The potential maximum propagation of the postulated cable fires are reduced by early detection using ionization type smoke detectors installed in each zone at the ceiling on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees both locally and in the Control Room, via the Communications Room, 15 so that manual fire response can be initiated promptly. Ready access is provided to the area from adjacent plant areas, as described under Item 7, facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires by employees responding to the fire, or present in the area for maintenance or repair of the equipment.

Additional fire protection defense is provided for some fire zones, as shown on the figure by the automatic multi-cycle sprinkler systems, as described under Item 8. If the multi-cycle sprinkler has not actuated automatically the postulated fire might:

- Involve other cable trays above the tray where ignition occurs.

- Extend to the first fire break along the cable run, the area fire barrier penetration seal or to the nearest floor penetration seal.

- Involve adjacent transient combustibles, if any are present in the area.

However, the automatic multi-cycle sprinkler system can be actuated manually by employees responding to the fire, either for a dual action manual fire alarm station located in or adjacent to the area or from the system control valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with very limited damage to exposed equipment.

Before the actuation of the automatic fire suppression system early warning smoke detection system (ionization detectors) will alarm a fire condition in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above thus reducing the fire spread.

The postulated fire is not considered to have sufficient potential for spread to cause failure of redundant safety related cable trays, plant equipment and associated cabling and controls which are isolated by special separation partial structural barriers, and provision of automatic suppression systems.

Therefore, the capability of the plant for a safe shutdown and control of radioactive releases to the environment is not impaired by a cable fire in RAB balance.

Should an oil fire due to the spillage of a 55 gal. oil drum occur in the Fire Zones 1-A-3-COMB, 1-A-3-COME, 1-A-4-CHLR, 1-A-4-COME, since all cable trays are located at ceiling level due to the size of the spillage area, the magnitude of the fire is not expected to affect the cable trays above. The products of combustion from the oil fire will be sensed by the fire detection system and an alarm will sound in the Control Room. The control room operator will immediately dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through use of portable fire extinguishers, hose lines and/or manual actuation of the fire suppression system.

Should the oil fire prove to be more severe than anticipated the heat released will actuate the multi-cycle sprinkler, as described under Item 8 of this analysis. This will control the fire and prevent possible damage to the redundant cable trays prior to the arrival of the Fire Brigade.

C. <u>OIL FIRES</u>

The oil fires postulated for this area assumes ignition, and subsequent development into the most severe single fire reasonably expected in the area, of localized concentrations of oil released from containment spray pumps, residual heat removal pumps (Fire Zones 1-A-1-PA, 1-A-1-PB on Elevation 190 ft.), charging pumps, auxiliary feed pumps, component cooling water pumps, service water booster pumps (Fire Zone 1-A-3-PB on Elevation 236 ft.), with spill over adjacent area and impingement on nearby equipment (see Figures 9.5A-6 and 9.5A-7). Common transient could be a 55 gal. oil drum, wood, rags and plastic coverings, used for maintenance and repair operations.

The potential maximum propagation of the postulated oil fire in Fire Zones 1-A-1-PA and 1-A-1-PB on Elevation 190 ft. and Fire Zone 1-A-3-PB on Elevation 236 ft. is reduced by early detection using ionization type smoke detectors installed at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the burning oil and alerts employees both locally and in the Control Room, via the Communications Room, so that manual fire response can be initiated promptly. 15

Ready access is provided to the area from adjacent plant areas, stairways at Columns G15 and G39, access aisles from Fire Zones 1-A-3-COMB and 1-A-3-COR, facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires by employees responding to the fire.

Additional fire protection defense is provided by the automatic multi-cycle sprinkler systems, as described under Item 8. If the multi-cycle sprinkler system has not actuated automatically the postulated fire might:

- Involve other equipment or cable trays, above area where ignition occurs.

- Extend to the area fire barrier or nearest floor penetration.

However, the automatic multi-cycle sprinkler system can be actuated manually by employees responding to the fire, either from a dual action manual fire alarm station located in or adjacent to the fire zone from the system control valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with very limited damage to exposed equipment.

Before the actuation of the automatic fire suppression system, early warning smoke detection system (ionization detectors) will alarm a fire condition in the Control Room. The Control Room Operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above thus reducing the fire spread. 15

The postulated fire is not considered to have sufficient potential spread to cause failure of redundant safety related plant equipment, associated cabling and controls, redundant safety related cable trays, which are isolated by special separation, partial and full structural barriers, provision of automatic fire suppression systems. The fire area is enclosed within three hour fire barriers. Therefore, the capability of the plant for a safe shutdown and control of radioactive releases to the environment is not impaired by an oil fire in any of these zones, within RAB balance.

10. FIRE AREA EQUIPMENT

Listed below is the mechanical and electrical equipment both safety and non-safety related shown on the plant general arrangement drawings for this area. Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating
1-A-1-FD, Floor Drain Tank Room, Elevation 190 ft.								
Floor Drain Transfer Tank	1X-NNS		X	N/A				
1-A-1-ED, Equipment Drain Tank Room, Elevation 190 ft.								
Equipment Drain Transfer Tank.	1X-NNS		X	N/A				
Equipment Drain Transfer Pumps.	1A-NNS		X	N/A				
1-A-1-PA, Residual Heat Removal Pump Room 1A, Elevation 190 ft.								
Floor drain transfer tank pumps.	1A-NNS		X	N/A				
Floor drain transfer tank pumps.	1B-NNS		X	N/A				
Equip Sump Pump	1A-NNS		X	N/A				
Equip Sump Pump	1B-NNS		X	N/A				
H&V Unit	AHS-1A-SA	X		N/A		X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Resid. Heat Removal Pump	1A-SA	X		N/A		X		
Contain Spray Pump	1A-SA	X		N/A		X		
Contain Mat Submerg. Drainage Pump.	1A-NNS		X	N/A				
Contain Mat Submerg. Drainage Pump.	1B-NNS		X	N/A				
1-A-1-PB, Residual Heat Removal Pump Room 1B, Elevation 190 ft.								
H&V Unit	AH-5 1B-SB	X				X		
Contain Spray Pump	1B-SB	X				X		
Resid. Heat Removal Pump	1B-SB	X				X		
Equip. Drain	1C-NNS		X	N/A				
Sump Pumps	1D-NNS		X	N/A				
Contain Mat	1C-NNS		X	N/A				
Submerg. Pumps	1D-NNS		X	N/A				
1-A-2-COR, Access Corridor, Elevation 216 ft.								
Safe-Shutdown	1X-NNS		X	N/A				
Fire Prot. Booster Pump			X	N/A				
10 Ton Monorail	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
				Barriers or Enclosures				
Name or Description	ID No. & Safety Div.	Yes	No	3 hr.	Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating
1-A-2-PT, Pipe Tunnel Elevation 216 ft.								
Floor Drain	1A-NNS		X	N/A				
Sump Pumps (2)	1B-NNS		X	N/A				
1-A-2-MP, Miscellaneous Equipment & Pumps, Elevation 216 ft.								
H&V Unit	AH-2P 1B-SB	X		N/A		X		
Component Cool Water Drain Tk.	1X-NNS		X	N/A				
Inst. Rack	A1-R32 NNS		X	N/A				
Inst. Rack	A1-R5 NNS		X	N/A				
Component Cool Water Drain Tank Pump	1X-NNS		X	N/A				
Boron Inject Tk.	1X-SAB	X		N/A		X		
MCC 1D22	NNS		X	N/A				
MCC 1E22	NNS		X	N/A				
Inst. Cab	A1-C1		X	N/A				
Boron Inject Recirc. Pumps (2)	1A-SA	X				X		
	1B-SB	X				X		
Inst. Rack	A1-R1-NNS		X	N/A				
Cont. Spray Additional Tk	1A-SAB	X				X		
Inst. Rack	A1-R2-NNS		X	N/A				
HVAC Condensate	1A-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Transfer Tank Pumps (2)	1B-NNS		X	N/A				
HVAC Cond. Transfer Tank	1X-NNS		X	N/A				
Inst. Rack	A1-R31		X	N/A				
HV Unit	AH-28 1A-SA	X					X	
Inst. Rack	A1-R4		X	N/A				
1-A-3-COMB, Columns 41 to 43 and B to E, Elevation 236.00 ft.								
CVCS Chillers	1A-NNS		X	N/A				
CVCS Chiller Pump	1B-NNS		X	N/A				
CVCS Chiller Pump	1A-NNS		X	N/A				
H&V Unit AH-30	1X-NNS		X	N/A				
Rinse Tanks	NNS		X	N/A				
Untrasonic Tank	NNS		X	N/A				
Drying Out Table	NNS		X	N/A				
Seal Water Heat Exchanger	1X-SN	X					X	
Sprinkler Equipment Area	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
				Barriers or Enclosures				
Name or Description	ID No. & Safety Div.	Yes	No	3 hr.	Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating
Service Water Booster Pump	1B-SB	X				X		
H&V Unit AH-8	AH-8	X				X		
Boric Acid Trans. Pump	1A-SN	X				X		
Boric Acid Trans. Pump	1B-SN	X				X		
Ultrasonic Gen.	NNS		X	N/A				
Detergent Drain Sump Pump	1X-NNS		X	N/A				
Detergent Drain Sump Pump	2X-NNS		X	N/A				
1-A-3-PB, Pumps and Equipment Elevation 236 ft.								
Component Cooling Water Heat Exch.	1B-SB	X			X	X		
Component Cooling Water Pump	1B-SB	X			X	X		
Instr. Rack	A1-R40 NNS		X	N/A				
Instr. Rack	1A-R-11 NNS		X	N/A				
REM-1CC	1B-SB	X				X		
H&V Unit	AH7-1B-SB	X				X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Aux. Steam Gen. Feed Pump (Turbine Driven)								
Pump	1X-SAB	X				X		
Turbine	1X-NNS		X			X		
Aux. Steam Gen. Feed Pump (Motor Driven)	1B-SB	X				X		
Aux. Steam Gen. Feed Pump (Motor Driven)	1A-SA	X				X		
Inst. Rack	A1-R14		X	N/A				
Monorails 3 ton	NNS		X	N/A				
Inst. Rack	A1-R13 NNS		X	N/A				
Inst. Rack	A1-R29-NNS		X	N/A				
Steam Gen. Aux. Feed Pump Control Panel	3	X				X		
REM-1CC	1A-SA	X				X		
Component Cooling Water Pump	1A-SA	X				X		
Component Cooling Water Pump	1C-SAB	X				X		
Component Cooling Water Heat Exchg.	1A-SA	X				X		
H&V Unit AH-6	1A-SA	X				X		
H&V Unit AH-6	1B-SB	X				X		
H&V Unit AH-9	1A-SA	X				X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Inst. Rack A1-R16	NNS		X	N/A				
Service Water Booster Pump	1A-SA	X						
Instr. Rack	A1-R30 NNS		X					
Instr. Rack	A1-R10 NNS		X					
Charging Pump	1C-SAB	X				X		
Charging Pump	1A-SA	X				X		
Charging Pump	1B-SB	X				X		
<u>1-A-3-COME</u>, Columns 41 to 43 and E to H, Elevation 236 ft.								
Letdown Heat Exchanger	1X-SN	X				X		
Letdown Reheat Exchanger	1X-SN	X				X		
Moderating Heat Exchanger	1X-SN	X				X		
Letdown Chiller Heat Exchanger	1X-SN	X				X		
Aux. Building Filter Backwash Transfer Pumps (2)	1X-NNS		X			X		
	2X-NNS		X			X		
Aux. Building Filter Backwash Transfer Tank	1X-NNS		X			X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Inst. Rack A1-R34	NNS		X			X		
Inst. Rack A1-R36	NNS		X			X		
1-A-3-COMI, Columns 41 to 43 and I to L, Elevation 236 ft.								
H&V Unit AH-23	1X-SA	X				X		
MCC 1-4A11	NNS		X			X		
Recycle Holdup Tank	1-2A-SN	X				X		
MCC	1A22-SA	X				X		
480V-Aux. Bus	1-4A-1	X				X		
Recycle Evaporator Feed Pump	1&2A-SN	X				X		
Recycle Evap. Package	1&2A-SN	X				X		
RE 21AC0150A	NNS		X			X		
Inst. Rack A1-R8	NNS		X			X		
Recycle Evap. Control Panel	1&2A-SN	X				X		
H&V Unit AH-63	1X-NNS		X	N/A				
1-A-3-MP, Mechanical Penetration Area								
Boron Injection Surge Tank	1X-SN	X				X		
Inst. Rack A1-R6	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
H&V Unit AH-9	1B-SB	X				X		
Gross failed Fuel Detector	NNS		X	N/A				
H&V Unit AH-11	1B-SB	X				X		
Inst. Rack A1-R7	NNS		X	N/A				
H&V Unit AH-11	1A-SA	X				X		
H&V Unit AH-10	1A-SA	X				X		
H&V Unit AH-10	1B-SB	X				X		
Hydro Test Pump	1X-NNS		X	N/A				
Inst.Rack A1-R9	NNS		X	N/A				
1-A-3-TA, Tank Area Elevation 236 ft.								
Waste Monitor Tank	1&2B-NNS		X	N/A				
Waste Monitor Tank	1&2A-NNS		X	N/A				
Waste Monitor Tk. Pumps	1&2A-NNS		X	N/A				
Radiation Monitor	REM-IMD		X	N/A				
ED Sump and Pumps	1A-NNS		X	N/A				
	1B-NNS		X	N/A				
FD Sump and Pumps (2)	1A-NNS		X	N/A				
	1B-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Tank Area Drain Pump	1X-NNS		X	N/A				
Secondary Waste Sample Tank	1&2X-NNS		X	N/A				
Radiation Monitor	REM-21WL		X	N/A				
Radiation Monitor	REM-21WS		X	N/A				
Secondary Waste Sample Tank Pumps (2)	1&2A-NNS 1&2B-NNS		X X	N/A N/A				
Reactor Makeup Water Pumps (2)	1A-S 1B-SN	X X				X X		
Condensate Transfer Pump	1X-NNS		X	N/A				
Inst. Rack A1,2-15	NNS		X	N/A				
Inst. Rack A1,2-17	NNS		X	N/A				
Inst. Rack A1,2-R37	NNS		X	N/A				
<u>1-A-34-RHXA</u>, Residual Heat Removal Heat Exchanger 1A								
RHR Heat Exchanger	1A-SA	X				X		

Equipment: Name or Description	Equipment: ID No. & Safety Div.	Safety Related: Yes	Safety Related: No	Redundant Counterpart Separation: Barriers or Enclosures 3 hr.	Redundant Counterpart Separation: Barriers or Enclosures Less	Redundant Counterpart Separation: Space Between	Redundant Counterpart Separation: Fire Resist Constr.	Redundant Counterpart Separation: Fire Retard Coating
1-A-34-RHXB, Residual Heat Removal Heat Exchanger 1B								
RHR Heat Exchanger	1A-SB	X				X		
1-A-4-CHFA, Charcoal Filter Room 1A Elevation 261 ft.								
H&V Unit E6	1A-SA	X				X		
AH Unit AH-21	NNS		X	N/A				
Air Handling Unit AH-26	1A-SA	X				X		
Normal Exhaust Plenum	NNS		X	N/A				
1-A-4-CHFB, Charcoal Filter Room 1B Elevation 261 ft.								
H&V Unit E-6	1B-SA	X				X		
Air Handling Unit AH-26	1B-SB	X				X		
H&V Unit E-4	1X-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
1-A-4-CHLR, Chiller Room Elevation 261 ft.								
HVAC Chiller WC-2	1B-SB	X				X		
Monorail	NNS		X	N/A				
Air Handling Unit AH-20	1A-SA	X				X		
Air Handling Unit AH-20	1B-SB	X				X		
Pump P7	1B-SB	X				X		
Pump P4	1B-SB	X				X		
Closed Expansion Tank	1B-SB	X				X		
Chemical Addition Tank	1B-NNS		X	N/A				
MCC 1E-12	NNS		X	N/A				
Electronic Console	NNS		X	N/A				
Chemical Mix Tank	1X-NNS		X	N/A				
Volume Control Tank	1X-SN	X				X		
Inst. Rack A1-R33	NNS		X	N/A				
Inst. Rack A1-R22	NNS		X	N/A				
Inst. Rack A1-R27	NNS		X	N/A				
Inst. Rack A1-R23	NNS		X	N/A				

Equipment			Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.		Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Inst. Rack A1-R24		NNS		X	N/A				
Inst. Rack A1-20		NNS		X	N/A				
Inst. Rack A1-19		NNS		X	N/A				
H&V Unit AH-19	1A-SA		X				X		
H&V Unit AH-19	1B-SB		X				X		
HVAC Chiller WC-2	1A-SA		X				X		
Monorail		NNS		X	N/A				
Pump P4	1A-SA		X				X		
Pump P7	1A-SA		X				X		
Chem Add. Tk.	1A-NNS			X	N/A				
Closed Expansion Tank		1A-SA	X				X		
MCC 1D12		NNS		X	N/A				
1-A-4-COME, Columns 41 to 43 and E to H, Elevation 261 ft.									
Recycle Evap. Cond. Filter	1&2A	NNS		X	N/A				
Recycle Evap. Concent. Filter	1&2A	NNS		X	N/A				
Recycle Evap. Feed Filter	1&2A	NNS		X			X		
Spare Demineralizers (3)		NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Boric Acid Filter	1X-SN	X		N/A		X		
Aux Bldg N_2 Accumulation	1X-NNS		X	N/A				
Boron Monitor System	1X-NNS		X	N/A				
Reactor Coolant Filter	1X-SN	X				X		
Seal Water Return Filter	1X-SN	X				X		
Seal Water Injection Filter	1A-SN	X				X		
Seal Water Injection Filter	1B-SN	X				X		
Cation Bed Demineralizer	1X-SN	X				X		
Spare Filters (2)	NNS		X	N/A				
3 Ton Monorail (2)	NNS		X	N/A				
Recycle Evap. Cond. Demin 1&2A	NNS		X	N/A				
Recycle Evap. Feed Demin. 1&2A	SN	X		N/A				
Mixed Bed Demin. 1B-SN		X				X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Thermal Reger Demin.	1A-SN	X				X		
Thermal Regen. Demin.	1B-SN	X				X		
Thermal Regen. Demin.	1C-SN	X				X		
Thermal Regen. Demin.	1D-SN	X				X		
MCC	1A-22SA	X				X		
MCC	1B-22SB	X				X		
Instr. Rack	NNS		X	N/A				
Mixed Bed Demin. 1A-SN		X				X		
1-A-4-COMI, Column 43 and I to L, Elevation 261 ft.								
Recycle Evap. Reagent Tank	1&2X NNS		X	N/A				
Exchange Air Plenum	NNS		X	N/A				
Elev. Shaft	NNS		X	N/A				
1-A-4-COMB, Columns 41 to 43 and B to E, Elevation 261 ft.								
Recycle Monitor Tank	1&2A NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
1-A-5-BATN, Battery Room Neutral, Elevation 286 ft.								
Emergency Shower and Eyewash Station	NNS		X	N/A				
Battery & Racks	NNS		X			X		
1-A-5-HVA, HVAC Room 1A, Elevation 286 ft.								
H&V Unit	AH-12 1A-SA	X				X		
	1B-SA	X				X		
MCC	1A-21-SA	X				X		
MCC	1A-31-SA	X				X		
MCC	1A-34-SA	X				X		
Hydrogen Recomb. Panel	3	X				X		
MCC	1D21 NNS		X	N/A				
MCC	1D11 NNS		X	N/A				
H&V Unit AH-82	1A NNS		X	N/A				
AH-82	1B NNS		X	N/A				
H&V Unit AH-81	1A NNS		X	N/A				
AH-81	1B NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
1-A-5-HVB, HVAC Room 1B, Elevation 286 ft.								
Hydrogen Recomb. 3 Panel		X		N/A				
MCC	1E21 NNS		X	N/A				
MCC	1E11 NNS		X	N/A				
MCC	1B21 SB	X		N/A		X		
Plenum	5-501B NNS		X	N/A				
	5-501A NNS		X	N/A				
MCC	1B-34-SB	X		N/A		X		
MCC	1B-31-SB	X		N/A		X		
15 1-A-5-HV3, HVAC Equipment, Elevation 286 ft.								
H&V Fan	S-3, 1A-NNS		X	N/A				
H&V Fan	S-3, 1B-NNS		X	N/A				
Duct	NNS		X	N/A				
Duct Shaft	NNS		X	N/A				
Bag Filters	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating
Electric Heating Coil	NNS		X	N/A				
P-5	1-A NNS		X	N/A				
P-5	1-B NNS		X	N/A				
EAC-1	1-X NNS		X	N/A				

APPENDIX 9.5A.4

1. Identification Fire Areas: 1-A-BATA and 1-A-BATB

Building: Reactor Auxiliary 15

Fire Areas: 1-A-BATA Battery Room 1A, Elevation 286 ft.
1-A-BATB Battery Room 1B, Elevation 286 ft.

Shown on Figures: 9.5A-9 and 9.5A-13

Length (ft.): 15 Width (ft.): 14 Height (ft.): 8

Area (sq. ft.): 210 Volume (cu. ft.): 700

2. Occupancy

The areas contain batteries, for safety trains SA and SB respectively, racks, associated controls, wiring in conduit and cable in trays.

3. Boundaries

Walls, floors and ceilings are of reinforced concrete construction, with a minimum fire rating of three hours. Only one opening in the wall of each fire area is provided for personnel access protected by a certified three-hour A label type fire rated door. There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	Btu/ sq. ft.
Fire Area: 1-A-BATA, Battery Room 1A			
Cable Insulation (RF)			
Power	20	3,600	17,500
Control (in conduit)	0	0	0
Instrumentation (in conduit)	0	0	0
Liquids	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
Total		3,600	17,500

Combustible	Quantity Gal./lb./RF	BTU in 1000's	Btu/ sq. ft.
15 Fire Area: 1-A-BATB, Battery Room 1B			
Cable Insulation (RF)			
Power	60	11,000	51,500
Control (in conduit)	0	0	0
Instrumentation (in conduit)	0	0	0
Liquids	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
	Total	11,000	51,000

5. Control of Hazards

Electrical penetrations are sealed with three hour rated fire stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within ductwork or transfer openings in safety related ducts. Curbs 6 in. high are provided at each access door to prevent the spilling of battery electrolyte into the adjacent areas.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms, 1.5 cfm/sq. ft., comparable smoke removal would be achieved for each area by a rate of approximately 0.13 cfm/sq. ft. for area 1-A-BATA and 1.0 cfm/ft. for 1 A-BATB. Smoke, heat and products of incomplete combustion are removed by the normal ventilation system for each area:

Area:	1-A-BATA	Supply:	AH-12(1A-SA)& (1B-SA)	Exhaust:	E-28(1A-SA)& (1B-SA)
	1-A-BATB		AH-13(1A-SB)& (1B-SB)		E-29(1A-SB)& (1B-SB)

Fire Area	Function	Safety Class	Mode	Flow(cfm)	(cfm/sq. ft.)
1-A-BATA	Supply	3	Operating	300	1.43
	Supply	3	Standby	300	1.43
	Exhaust	3	Operating	300	1.43
	Exhaust	3	Standby	300	1.43

Fire Area	Function	Safety Class	Mode	Flow(cfm)	(cfm/sq. ft.)
1-B-BATB	Supply	3	Operating	350	1.67
	Supply	3	Standby	350	1.67
	Exhaust	3	Operating	350	1.67
	Exhaust	3	Standby	350	1.67

There are no radioactive sources in this area.

6. Fire Detection

The type of detection and signaling systems provided in this area and its functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-BATA	1-38	Ionization	Area	X	X	X	No	X	X
1-A-BATB	1-39	Ionization	Area	X	X	X	No	X	X

* The local fire detection control panel located in the RAB, Elevation 286 ft. covers the fire areas and fire zones on the same elevation. 15

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel. Furthermore, for a fire condition, an audible alarm sounds at the fire area.

7. Access and Initial Response

Access to areas 1-A-BATA and 1-A-BATB is provided from adjacent switchgear room 1-A-SWGRA and 1-A-SWGRB respectively. Carbon dioxide extinguishers are provided adjacent to these areas in accordance with NEPA 10. Standpipe hose stations have been provided adjacent to the areas.

8. Fire Suppression Systems

There are no automatic fire suppression systems provided to protect these areas. Plant equipment subject to water damage is mounted on racks four inches high. Damage to plant areas and equipment from the accumulation of water discharged from hose lines is minimized by the provision of the Floor Drainage System. Floor water surcharge is estimated to be significant. Excess water can overflow to adjacent areas.

9. Analysis of Effects of Postulated Fires

In Fire Areas 1-A-BATA and 1-A-BATB, the Battery Room 1A and 1B respectively area fire hazard combustibles include normally expected amounts of cable insulation in cable trays. Transient materials are not anticipated to be present in the area. However, transient materials, such as rags, may be brought into the area for normal facilities maintenance and repair. The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced:

- by the use of IEEE 383 qualified cables
- by limiting the continued spread of fire by the provision of fire stops at fire barrier penetrations.
- by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire areas is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems provided in these areas and by fire-rated barriers enclosing the fire area.

The fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays. The postulated fire might involve several cable trays above the tray in which ignition is assumed, and extend to the area fire barrier fire stop.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization type smoke detectors installed at the ceiling on an area basis. The automatic detection system senses products of combustion generated by the incipient fire and alerts employees both locally
15 and in the Control Room via the Communications Room, so that manual fire response can be initiated promptly.

Ready access is provided to the area (as described under Item 7) from adjacent plant areas where extinguishers are located, facilitating initial use of portable fire extinguishers on incipient fires and supplemental use of standpipe hose lines located in adjacent areas by employees responding to the fire.

The postulated electrical fire is not considered to have sufficient potential for spread to cause failure or redundant safety related plant equipment and associated cabling and controls which are separated by three hour rated fire barriers. Thus the capability for a safe shutdown of the plant will not be impaired by the postulated fire in these areas.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment shown on the plant general arrangement drawings for this area.

NOTE: N/A - NOT APPLICABLE

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Area: 1-A-BATA, Battery Room 1A								
Battery & Racks	1A-SA	X				X		
Emergency Shower and Eyewash Station	NNS		X	N/A				
Fire Area: 1-A-BATB Battery Room 1B								
Battery & Racks	1B-SB	X				X		
Emergency Shower and Eyewash Station	NNS		X	N/A				

APPENDIX 9.5A.5

1. Identification Fire Area: 1-A-CSRA

Building: Reactor Auxiliary 15

Fire Area: 1-A-CSRA, Cable Spreading Room 1A, Elevation 286 ft.

Shown on Figures: 9.5A-9, 9.5A-12, 9.5A-13

Length (ft.): Variable Width (ft.): Variable Height (ft.): 17

Area (sq. ft.): 4,700 Volume (cu. ft.): 79,500

2. Occupancy

The area contains cable in trays and conduit associated with safety train A.

3. Boundaries

Wall, floor, ceiling, and structural columns supporting the area boundaries are of reinforced concrete construction, with a minimum fire rating of three hours. Multiple wall openings provided for personnel access are protected by certified three-hour A label type fire rated doors. The concealed space in this area is a pipe chase located at Columns 36 and B. There are no concealed floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	Btu/ sq. ft.
Area: 1-A-CSRA, Cable Spreading Room 1A			
Floor Area: 4,700 sq. ft.			
Cable Insulation (RF)			
Power (in conduit)	0	0	0
Control	4,683	735,300	157,000
Instrumentation	1,495	142,000	31,000
Liquids	0	0	0
Solids	0	0	0
Transient (Negligible)	0	0	0
	Total	877,300	188,000

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire-stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop asemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts. Three-hour rated fire barriers are provided between safety trains SA and SB at building columns E-B and 43. Barriers consisting of covers and/or fire retardant coatings are installed between safety and non-safety cable trays where Regulatory Guide 1.75 cannot be fully met. Fire breaks are provided as required.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area by a rate of approximately 1.4 cfm/sq. ft. Smoke, heat and products of incomplete combustion are removed by the smoke purge system for this area:

Supply:	AH-12 (1A-SA) AH-12 (1B-SA)	Smoke Purge:	ES-2 (1A-NNS) ES-2 (1B-NNS)

Function	Safety Class	Mode	Flow(cfm)	(cfm/sq. ft.)
Recirculation (1A-SA)	3	Operating	2,200	0.5
Recirculation (1B-SA)	3	Standby	2,200	0.5
Smoke Purge	NNS	Operating	8,000	1.7
Smoke	NNS	Standby	8,000	1.7

The normal ventilation system for this area is a recirculated system, which in case of fire, can be switched to once-through operation. The change from the normal ventilation to the smoke purge is manually initiated by the control room operator, based on the information received from the smoke detection system installed in the Cable Spreading Room 1A.

The smoke resulting from a fire in Cable Spreading Room 1A is removed by fan ES-2 (1A-NNS, 1B-NNS), which is normally turned on.

There are no radioactive sources in this area.

6. Fire Detection

The types of detection, actuation and signaling systems provided in this area and their functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-CSRA	1-41	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
		Manual Alarm Stations	Area	X	X	X	X	X	X

* The local fire detection control panel located in the RAB, Elevation 286 ft. covers the fire areas and fire zones on the same elevation. 15

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel. Furthermore, for a fire condition an audible alarm sounds at the fire zone.

7. Access and Initial Response

Access to this area is provided from adjacent fire areas, Cable Spreading Rooms: 1-A-CSRB, switchgear room 1-A-SWGRB and 12-A-BAL fire zone 12-A-5-DIH. Carbon dioxide and pressurized water fire extinguishers are provided in the area in accordance with NFPA 10. Standpipe hose stations have been provided adjacent to the fire area. 15

8. Fire Suppression Systems

The fire suppression system provided in this area is an automatic pre-action sprinkler system designed hydraulically to provide water density of 0.3 gpm/sq. ft. of the floor area protected. The system is actuated automatically by the thermal detectors located also at the ceiling level when the area temperature reaches 135 F. The spinkler heads open when area temperature reaches 165 F. The system water flow is shut off manually by authorized personnel when the fire is out. The pre-action control valve for the system is located outside of this area, in the switchgear room 1B, fire area 1-A-SWGRB (see Figure 9.5A-9). The sprinkler system piping is seismically supported.

Manual actuation of the system is provided from the pre-action control valve emergency mechanical release. Remote manual actuation of the pre-action system is provided from the manual alarm stations located inside or outside the fire area on Elevation 286 ft. and Elevation 305 ft.

Electrical supervision of the suppression system includes control valve position, system valve position, supervisory air pressure, and lack of waterflow.

Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of a floor drainage system. Floor water surcharge is estimated to be insignificant. Excess water can overflow to adjacent areas. Runoff is directed to the storm drainage system.

9. <u>Analysis of Effects of Postulated Fires</u>

In fire area 1-A-CSRA, the Cable Spreading Room 1A, area fire hazard combustibles include normally expected amounts of cable insulation in cable trays. Transient materials are not anticipated to be present in the area.

The quantity of combustible materials which may be involved in area fires, and consequently the magnitude of these fires and the resultant damage to plant facilities, is reduced:

- by use of the IEEE 383 qualified cables

- by limiting the continued spread of fire by the provision of fire-breaks along cable trays, fire-stops at fire barrier penetrations, three-hour fire barriers between safety train points of close proximity and separational barriers between non-safety and safety cable trays at points of possible fire communication.

- by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems and emergency operation of smoke purge systems provided in this area of high smoke generation potential, and by three hour fire barriers enclosing the fire area.

The fire postulated for this area assumes ignition, and subsequent development into the most severe single fire reasonably expected in the area, of localized concentrations of insulation on cables in trays. The postulated fire might involve severe cable trays above the tray in which ignition is assumed extend to the first fire-break along the run or to the area fire barrier fire stop.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization type smoke detectors installed at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees both locally and in the Control Room via the Communications Room, so that
15 manual fire response can be initiated promptly.

Ready access is provided to the area from adjacent plant areas (as described under Item 7) facilitiating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines located in adjacent areas by employees responding to the fire.

Additional fire protection defense is provided by the pre-action sprinkler system (as described under Item 8).

If the pre-action sprinkler system has not actuated automatically the postulted fire might involve other cable trays above the trays where ignition occurs and extend to the nearest fire-break along the cable tray or area fire barrier fire-stop.

However, the automatic pre-action sprinkler system can be actuated manually by employees responding to the fire either from the dual action manual fire alarm station located inside or adjacent to the fire area, or from the system valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with very limited damage to exposed cable tray.

Before the actuation of the automatic fire suppression system, early warning detection system (ionization detectors) will alarm a fire condition in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automtic fire suppression system, as described above, thus reducing the fire spread.

The postulated fire is not considered to have sufficient potential for spread to cause failure of redundant safety related plant equipment and associated cabling and controls which are separated by three hour rated fire barriers.

Thus, the capability for a safe shutdown of the plant will not be impaired by the postulated fire in the area.

10. Fire Area Equipment

The general arrangement drawings indicate no major mechanical and electrical equipment in the Cable Spreading Area 1A.

APPENDIX 9.5A.6

1. Identification — Fire Area: 1-A-CSRB | 15

Building: Reactor Auxiliary

Fire Area: 1-A-CSRB, Cable Spreading Room 1B, Elevation 286 ft.

Shown on Figures: 9.5A-9, 9.5A-12, 9.5A-13

Length (ft.): Variable Width (ft.): Variable Height (ft.): 17

Area (sq. ft.): 2,125 Volume (cu. ft.): 36,125

2. Occupancy

This area contains cable in trays and conduit associated with safety train B.

3. Boundaries

Walls, floor, ceiling and structural columns supporting the fire area boundaries are of reinforced concrete construction, with a minimum fire rating of three hours. Multiple wall openings provided for personnel access are protected by certified three-hour A label type fire rated doors. There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Area: 1-A-CSRB, Cable Spreading Room 1B			
Floor Area = 2,200 sq. ft.			
Cable Insulation			
Power (in conduit)	0	0	0
Control	2,050	321,900	151,500
Instrumentation	1,100	104,500	49,200
Liquids	0	0	0
Solids	0	0	0
Transient (Negligible)	0	0	0
	Total	426,400	200,700

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at all floors and at rated barrier walls. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts.

Three-hour rated fire barriers are provided between safety trains SB and SA at building columns E-D and 41. Barriers consisting of covers and/or fire retardant coatings are installed between safety and non-safety cable trays where Regulatory Guide 1.75 cannot be fully met. Fire breaks are provided as required.

Based on the smoke removal recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area zone room by a rate of approximately 1.0 cfm/sq. ft. Smoke, heat and products of incomplete combustion are removed by the smoke purge system for this area:

Supply: AH-13 (1A-SB) Smoke Purge: ES-2 (1A-NNS)

AH-13 (1B-SB) ES-2 (1B-NNS)

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Recirculation (1A-SB)	3	Operating	2,200	1.0
Recirculation (1B-SB)	3	Standby	2,200	1.0
Smoke Purge	NNS	Operating	8,000	3.8
Smoke Purge	NNS	Standby	8,000	3.8

The normal ventilation system for this area is a recirculated system which in case of fire can be switched to once-through operation. The change from the normal ventilation to the smoke purge is manually initiated by the control room operator, based on the information received from smoke detection system installed in the Cable Spreading Room 1B.

The smoke resulting from a fire in Cable Spreading Room 1B is removed by the fans ES-2 (1A-NNS, 1B-NNS), which are normally turned off.

There are no radioactive sources in this area.

6. Fire Detection

The types of detection, actuation and signaling system provided in this area and their functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-CSRB	1-42	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X

* The local fire detection control panel located in the RAB, Elevation 286 ft. covers the fire areas and fire zones on the same elevation. 15

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel. Furthermore, for a fire condition, an audible alarm sounds at the fire zone.

7. Access and Initial Response

Access to this area is provided from adjacent fire areas: 1-A-CSRA, 1-A-SWGRB and 12-A-BAL fire zone 12-A-5-DIP. Carbon dioxide and pressurized water fire extinguishers are provided in and adjacent to the area in accordance with NFPA 10. Standpipe hose stations have been provided in and adjacent to the fire area. 15

8. Fire Suppression Systems

The fire suppression system provided in this area is an automatic pre-action sprinkler system designed hydraulically to provide water density of 0.3 gpm/sq. ft. of the floor area protected. The system is automatically actuated by the thermal fire detectors located also at the ceiling level when the area temperature reaches 135 F. The sprinkler heads open when area temperature reaches 165 F. The system water flow is shut off manually by authorized personnel when the fire is out. The pre-action control valve for the system is located outside of this area, in the switchgear room 1B, fire area 1-A-SWGRB (see Figure 9.5A-9). The sprinkler system piping is seismically supported.

Manual actuation of the system is provided from the pre-action control valve emergency mechanical release. Remote manual actuation of the pre-action system is provided from the manual alarm stations located inside or outside the fire area on Elevation 286 ft. and Elevation 305 ft.

Electrical supervision of the suppression system includes control valve position, system valve position, supervisory air pressure and lack of water flow.

Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of the Floor Drainage System. Floor water surcharge is estimated to be insignificant. Excess water can overflow to adjacent areas. Runoff is directed to the storm drainage system.

9. Analysis of Effects of Postulated Fires

In Fire Area 1-A-CSRB, the Cable Spreading Room 1B, area fire hazard combustibles include normally expected amounts of cable insulation in cable trays. Transient materials are not anticipated to be present in the area.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced:

- by the use of IEEE 383 qualified cables

- by limiting the continued spread of fire by the provision of fire-breaks along cable trays, fire-stops at fire barrier penetrations, and three-hour fire barriers at safety related cable tray points of close proximity, and separational barriers between non-safety and safety trays at points of possible fire communication.

- by controlling the introduction of transient combustibles through administration procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems, emergency operation of smoke purge systems provided in this area of high smoke generation potential and by three-hour fire barriers enclosing the fire area.

The fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays. The postulated fire might involve several cable trays above the tray in which ignition is assumed extend to the first fire-break along the run or to the area fire barrier fire stop.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization type smoke detectors installed at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees
15 both locally and in the Control Room via the Communications Room, so that manual fire response can be initiated promptly.

Ready access is provided to the area from adjacent plant areas (as described under Item 7) facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hoselines located in the area and adjacent to the area by employees responding to the fire.

Additional fire protection defense is provided by the pre-action sprinkler system (as described under Item 8).

If the pre-action sprinkler system has not actuated automatically the postulated fire might involve other cable trays above the tray where ignition occurs and extend to the nearest fire-break along the cable tray or area fire barrier fire stop.

However, the automatic pre-action sprinkler system can be actuated manually by employees responding to the fire, either from the dual action manual fire alarm station located inside or adjacent to the fire area, or from the system control valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with very limited damage to exposed cable tray.

Before the actuation of the automatic fire suppression system, early warning smoke detection system (ionization detectors) will alarm a fire condition in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above, thus reducing the fire spread. The postulated fire is not considered to have sufficient potential for spread to cause failure or redundant safety related plant equipment and associated cabling and controls which are separated by three-hour rated fire barriers. Thus, the capability for a safe shutdown of the plant will not be impaired by the postulated fire in the area.

10. Fire Area Equipment

The general arrangement drawings indicate no major mechanical and electrical equipment in the Cable Spreading Area 1B.

APPENDIX 9.5A.7

1. Identification — Fire Areas: 1-A-EPA and 1-A-EPB | 15

Building: Reactor Auxiliary

Fire Areas: 1-A-EPA, Electrical Penetration Area 1A (Elevation 261 ft.)

1-A-EPB, Electrical Penetration Area 1B (Elevation 261 ft.)

Shown on Figures: 9.5A-8, 9.5A-12

Length (ft.): 63 Width (ft.): 58 Height (ft.): 23

Area (sq. ft.): 3,700 Volume (cu. ft.): 8,500

2. Occupancy

Each of the areas contain electrical penetrations into the Containment, air handling units MCC's, pressurizer heater controls and back up associated controls, wiring in conduit and cable in trays.

3. Boundaries

Walls, floor, ceiling, and structural columns supporting the area boundaries are of reinforced concrete construction, with a minimum fire rating of three hours. Wall openings for personnel access into each area are two certified three-hour A label type fire doors and a certified one-and-a-half-hour B label type fire rated door at each stair tower. Floor openings for handling of equipment are protected by reinforced concrete hatch covers with a three-hour fire rating. There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Area: 1-A-EPA, Electrical Penetration Area 1A			
Cable Insulation			
Power	730	131,400	35,960
Control	635	99,695	27,280
Instrumentation	375	35,625	9,750

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (Minor Integral with Equipment)	0	0	0
Solids	0	0	0
Transient (Negligible)	0	0	0
	Total	266,720	72,990

Area: 1-A-EPB, Electrical Penetration Area 1B

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	924	166,320	45,520
Control	573	89,960	24,620
Instrumentation	378	35,910	9,830
Liquids (Minor Integral with Equipment)	0	0	0
Solids	0	0	0
Transient (Negligible)	0	0	0
	Total	292,190	79,970

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at rated fire barriers. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts. Supplemental barriers, fire retardant coatings, and/or fire breaks are provided at cross-overs between safety and non-safety related cable trays at points of close proximity where Regulatory Guide 1.75 criteria cannot be fully met.

Curbs six in. high are provided at the two access openings protected by Class A fire doors, to prevent water from flowing into or out of the fire areas. These curbs also prevent spread of flammable liquids from adjacent fire area into the areas.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.), comparable smoke removal would be achieved for each area by a rate of approximately .55 cfm/sq. ft. for 1-A-EPA and .60 cfm/sq. ft. for 1-A-EPB. Smoke, heat and products of incomplete combustion are removed by the ventilation system for these areas, as follows:

Supply-Normal:	S-3 (1A-NNS)	Exhaust-Normal:	E-17 (1X-NNS)
	S-3 (1B-NNS)		E-18 (1X-NNS)
			E-19 (1X-NNS)

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Fire Area: 1-A-EPA, Electrical Penetration Area 1A				
Supply	NNS	Operating	6,200	1.7
Supply	NNS	Standby	6,200	1.7
Normal Exhaust	NNS	Operating	6,200	1.7
Normal Exhaust	NNS	Standby	6,200	1.7
Fire Area: 1-A-EPB, Electrical Penetration Area 1B				
Supply	NNS	Operating	5,600	1.5
Supply	NNS	Standby	5,600	1.5
Normal Exhaust	NNS	Operating	5,600	1.5
Normal Exhaust	NNS	Standby	5,600	1.5

There are no radioactive sources in these areas.

6. Fire Detection

The types of detection, actuation and signaling systems provided and their functions for these fire areas are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-EPA	1-30	Thermal	Area	X	X	X	X	X	X
		Ioniza-tion	Area	X	X	X	No	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
		Manual Alarm Station	Area	X	X	X	X	X	X
1-A-EPB	1-31	Thermal	Area	X	X	X	X	X	X
		Ioniza-tion	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X

15 * The local fire detection control panel located in the RAB, Elevation 261 ft. covers the fire areas and fire zones on the same elevation.

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel, an audible alarm sounds at the fire zone.

7. Access and Initial Response

Access to area 1-A-EPA is provided from the adjacent corridors (fire zones 1-A-4-COR, and 1-A-4-CHLR), from the fire area 1-A-BAL and stairwell at Col 15-G.

Access to area 1-A-EPB is provided from the adjacent fire zones 1-A-4-CHFB, 1-A-4-CHLR, part of fire area 1-A-BAL and stairwell at Col 38-G. Carbon dioxide type extinguishers are provided in and adjacent to the areas in accordance with NFPA 10. Standpipe hose stations have been provided in and adjacent to these areas.

8. Fire Suppression Systems

The fire suppression system provided in these areas is an automatic multi-cycle sprinkler system installed at ceiling level and hydraulically designed to provide water density of 0.3 gpm/sq. ft. of the floor area protected. The system is actuated automatically by thermal detectors located also at the ceiling level when the area temperature reaches 135 F. The sprinkler heads open when area temperature reaches 165 F. The system water flow is shut off automatically from the control valve when the area temperature drops below 135 F. The multi-cycle control valve for the system is located outside these fire areas, accessible from an aisle in fire area 1-A-BAL, fire zone 1-A-4-COMB (See Figure 9.5A-8).

Manual actuation of the system is provided from the multi-cycle control valve emergency mechanical release. Remote manual actuation of the multi-cycle system is provided from the dual action manual alarm stations located inside or outside each fire area on this elevation. Electrical supervision of the suppression system includes control valve position, system valve position, supervisory air pressure and lack of water flow through the control valve. Sprinkler system piping is seismically supported.

Plant electrical equipment subject to water damage is protected by four in. floor pedestals. The motor of air handling units are totally enclosed and mounted on eight in. steel support mounted on six in. concrete base. Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of the Floor Drainage System. Floor surcharge is estimated to be insignificant. Runoff is directed to the floor drain transfer tank.

9. Analysis of Effects of Postulated Fire

In Fire Areas 1-A-EPA and 1-A-EPB the fire hazard combustibles include normally expected amounts of cable insulation in cable trays, conduit, connection boxes and pull boxes. Transient materials are not anticipated to be present in the area. However, transient materials such as rags, wood, or solvents may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced:

- by the use of IEEE 383 qualified cables.

- by limiting the continued spread of fire by the provision of fire-breaks along cable trays and fire-stops at fire barrier penetrations, and separational barriers between non-safety and safety cable trays at points of possible fire communication.

- by provision of six in. curbs at the door which prevent any combustible liquid spill from getting into the fire area.

- by controlling the introduction of transient combustibles through administration procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems and by three-hour fire rated fire barriers enclosing the fire area.

The fire postulated for these areas assumes ignition and subsequent development into the most severe single fire expected in the areas of localized concentrations of insulation on cables in trays.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization type smoke detectors at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees both locally
15 and in the Control Room, via the Communications Room, so that manual fire response can be initiated promptly.

Ready access is provided to the area from adjacent plant areas (as described under Item 7 facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires by employees responding to the fire.

Additional fire protection defense is provided by the automatic multi-cycle sprinkler system (as described under Item 8).

If the multi-cycle sprinkler system has not actuated automatically, the postulated fire might:

- involve other cable trays, above the tray where ignition occurs.
- extend to the nearest fire break along the cable tray or the area fire barrier fire stop.

However, the automatic multi-cycle sprinkler system can be actuated manually by employees responding to the fire, either from the dual action manual fire alarm station located adjacent to the fire areas, or from the system control valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with very limited damage to exposed equipment.

Before the actuation of the automatic fire suppression system, early warning smoke detection system (ionization detectors) will alarm a fire condition in the Control Room. The Control Room Operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above, thus reducing the fire spread. The postulated fire is not considered to have sufficient potential for spread to cause failure of redundant safety related plant equipment and associated cabling and controls which are separated by three-hour rated fire barriers.

The capability of the plant for safe shutdown is, therefore, not impaired by the postulated cable fire for any of these areas.

10. <u>Fire Area Equipment</u>

Listed below is the mechanical and electrical equipment, both safety and non-safety related shown on the plant general arrangement drawings for this area:

N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
				Barriers or Enclosures				
Name or Description	ID No. & Safety Div.	Yes	No	3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Area 1-A-EPA, Electrical Penetration Area 1A								
Press. htr. backup group "A" distrib. panel	1A-SN	X				X		
Press. htr. backup group "D" distrib. panel	1D-SN	X		N/A				
Press. htr. control group "C" distrib. panel	1C-SN	X		N/A				
H&V Unit	AH24 1X-SA	X		X				
MCC	1A-24		X	N/A				
Containment Electrical Penetrations (Ref. Section 8.3.1.1)	IE	X						
Fire Area 1-A-EPB, Electrical Penetration Area 1B								
H&V Unit	AH25 1X-SB	X		X				
MCC	1B-24 NNS		X	N/A				
Press. htr. backup group "B" panel	1B-SN	X				X		
Press. htr. backup group "E" panel	1E-SN	X				X		
Containment Electrical Penetrations (Ref. Section 8.3.1.1)	IE	X						

APPENDIX 9.5A.8

1. **Identification** Fire Area: 1-A-SWGRA

Building: Reactor Auxiliary 15

Fire Area: 1-A-SWGRA, Switchgear Room 1A, Elevation 286 ft.

Shown on Figures: 9.5A-9, 9.5A-12, 9.5A-13

Length (ft.): 72 Width (ft.): 71 Height (ft.): 16

Area (sq. ft.): 5,200 Volume (cu. ft.): 83,000

2. **Occupancy**

The area contains 6.9 kV and 480V emergency switchgears, DC panels, diesel sequencer panel 1A-SA, transfer panel 1A-SA, battery chargers and associated controls, miscellaneous electrical panels, wiring in conduit and cable in trays.

3. **Boundaries**

Walls, floor, ceiling, and structural columns supporting the area boundaries are of reinforced concrete construction, with a minimum fire rating of three hours. Multiple wall openings are provided for personnel access protected by certified three-hour A label type fire rated doors. Floor and ceiling opening for handling of equipment are protected by reinforced concrete hatch covers with a three-hour fire rating. There are no concealed spaces or floor trenches.

4. **Combustible Loading**

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Area: 1-A-SWGRA, Switchgear Room 1A			
Cable Insulation			
Power	410	73,800	14,250
Control	165	25,900	5,000
Instrumentation	165	15,700	3,050
Liquids (minor integral with equipment)	0	0	0

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Solids	0	0	0
Transient (negligible)	0	0	0
	Total	115,400	22,300

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts. Supplemental barriers consisting of cable tray covers, fire retardant coatings, and/or fire breaks are provided at crossovers between safety and non-safety related cable trays or points of close proximity where Regulatory Guide 1.75 cannot be fully met. To prevent the spread of flammable liquids or hazardous materials spill into this area, 6 in. high curbs were provided at the access doors from fire areas 1-A-BAL (fire zones 1-A-5-HVA and 1-A-5-BATN) and 1-A-BATA.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area by a rate of approximately 0.17 cfm/sq. ft. Smoke, heat and products of incomplete combustion are removed by the normal ventilation system for this area, which in case of fire is switched remote manually to once-through operation.

Supply:	AH-12(1A-SA)	Exhaust:	E-28(1A-SA)
	AH-12(1B-SA)		E-28(1B-SA)
		Smoke Purge:	Valved Roof Vents

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	3	Operating	22,400	4.3
Supply	3	Standby	22,400	4.3
Recirculation	3	Operating	21,800	4.0
Recirculation	3	Standby	21,800	4.0
Exhaust	3	Operating	600	6.1

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Exhaust	3	Standby	600	0.1
Smoke Purge	3	Standby	21,800	4.0

There are no radioactive sources in this area.

6. Fire Detection

The type of detection and signaling system provided in this area and their functions are as follows:

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Local Control Panel* Ann	Local Control Panel* Alarm	Local Control Panel* Suppres System Actu	Main Fire Detection Control Panel Ann	Main Fire Detection Control Panel Alarm
1-A-SWGRA	1-35	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

* The local fire detection control panel located in the RAB, Elevation 286 ft. covers the fire areas and fire zones on the same elevation. 15

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel. Furthermore, for a fire condition, an audible alarm sounds at the fire area.

7. Access and Initial Response

Access to this area is provided from adjacent fire areas: 1-A-SWGRB, 1-A-BAL (fire zones: 1-A-5-HV3, 1-A-5-HVA, 1-A-5-BATN) and 1-A-BATA. Carbon dioxide portable extinguishers are provided in and adjacent to the area in accordance with NFPA 10. Standpipe hose stations have been provided adjacent to the area.

8. Fire Suppression System

There are no automatic fire suppression systems provided to protect this area.

Plant equipment subject to water damage is mounted on four in. high floor pedestals. Damage to plant areas and equipment from the accumulation of water discharged from hose lines is minimized by the provision of the Floor Drainage System. Floor water surcharge is estimated to be insignificant. Excess water can overflow to adjacent areas. Runoff is directed to the storm drain system.

9. Analysis of Effects of Postulated Fires

In Fire Area 1-A-SWGRA, Switchgear Room 1A, area fire hazard combustibles include normally expected amounts of cable insulation in cable trays, connection boxes and limited amounts of cable insulation within control panels. Transient materials are not anticipated to be present in the area. However, transient materials, such as rags, wood, solvents, etc., may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced:

- by the use of IEEE 383 qualified cables.

- by provision of six in. high curbs at the doors from areas where combustible liquids may be introduced, thus preventing propagation of combustibles into the area.

- by limiting the continued spread of fire by the provision of fire-breaks along cable trays and fire-stops at fire barrier penetrations. Fire retardant coatings and/or separational barriers are provided between safety and non-safety related cable trays at points of possible fire communication.

- by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by three hour fire barriers enclosing the fire area.

The fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area of localized concentrations of insulation on cables in trays. The postulated fire might involve several cable trays above the tray in which ignition is assumed, and extend to the first fire-break along the run or to the area fire barrier fire stop.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization type smoke detectors installed at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees
15 both locally and in the Control Room via the Communications Room, so that manual fire response can be initiated promptly.

Ready access is provided to the area from adjacent plant areas facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines located in adjacent areas by employees responding to the fire.

The postulated fire is not considered to have sufficient potential for spread to cause failure of redundant safety related plant equipment and associated cabling and controls which are separated by three hour fire barriers. Thus, the capability for a safe shutdown of the plant will not be impaired by the postulated fire in the area.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment both safety and non-safety related shown on the plant general arrangement drawing for this area:

Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
6.9 kV Emergency Switchgear	1A-SA	X		X				
480V Emergency Switchgear	1A1	X		X				
480V Emergency Switchgear	1A2-SA	X		X				
480V Emergency Switchgear	1A3-SA	X		X				
480V Switchgear	1D1-NNS		X	N/A				
6.9 kV Switchgear	1D-NNS		X	N/A				
480V Switchgear	1D2-NNS		X	N/A				
6.9 kV Switchgear	1A		X	N/A				
B-CH	1A-NNS		X	N/A				
DC-Panel	1A-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
B-CH	1B-NNS		X	N/A				
B-CH	1A-SA	X		X				
B-CH	1B-SA	X		X				
CP-EHC-28	1X-NNS		X	N/A				
DC-Panel	1A-4A		X	N/A				
DC-Panel	1A-1		X	N/A				
DC-Panel	1A-SA	X		X				
Transfer Panel A	1A-SA	X		X				
Diesel Sequencer Panel A	1A-SA	X		X				
Exhaust Fan E-28	1A-SA	X				X		
Exhaust Fan E-28	1B-SA	X				X		

APPENDIX 9.5A.9

1. Identification Fire Area: 1-A-SWGRB

Building: Reactor Auxiliary | 15

Fire Area: 1-A-SWGRB, Switchgear Room 1B, Elevation 286 ft.

Shown on Figures: 9.5A-9, 9.5A-12, 9.5A-13

Length (ft.): 76 Width (ft.): 71 Height (ft.): 16

Area (sq. ft.): 5,400 Volume (cu. ft.): 86,400

2. Occupancy

The area contains 6.9 kV and 480V emergency switchgears, DC panels, transfer panel B, diesel sequencer panel B, exhaust fans, battery chargers and associated controls, wiring in conduit and cable in trays.

3. Boundaries

Walls, floor, ceiling, and structural columns supporting the area boundaries are of reinforced concrete construction with a three-hour minimum fire rating. Multiple wall openings are provided for personnel access protected by certified three-hour A label type fire rated doors. One certified one-and-a-half-hour B label type fire rated door is provided at the stair tower. Floor and ceiling openings for handling of equipment are protected by reinforced concrete hatch covers with a three-hour fire rating. There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 1-A-SWGRB, Switchgear Room 1A			
Floor Area: 5400 sq. ft.			
Cable Insulation (RF)			
Power	1,220	219,600	40,700
Control	555	87,200	16,200
Instrumentation	680	64,600	12,000
Liquids (minor integral with equipment)	0	0	0

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Solids	0	0	0
Transient (negligible)	0	0	0
	Total	371,400	68,900

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at rated fire barrier walls. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts. To prevent the spread of flammable liquids or hazardous materials spill into this area six in. high curbs were provided at the access doors from fire areas 1-A-BAL (fire zone 1-A-5-HVB) and 1-A-BATB. Supplemental barriers consisting of covers, fire
1 breaks, and/or fire retardant coatings are provided at crossovers between safety and non-safety related cable trays or points of close proximity where Regulatory Guide 1.75 cannot be fully met.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area by a rate of approximately .51 cfm/sq. ft. Smoke, heat an products of incomplete combustion are removed by the ventilation system for this area which in case of fire is switched remote manually to once-through operation.

Supply:	AH-13(1A-SB) AH-13(1B-SB)	Smoke Purge:	Valved Roof Vents

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Recirculation	3	Operating	22,800	4.2
1 Recirculation	3	Standby	22,800	4.2
Smoke Purge	3	Standby	22,800	4.2

There are no radioactive sources in this area.

6. Fire Detection

The type of detection and signaling system provided in this area and its functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-A-SWGRB	1-35	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Stations	Area	X	X	X	No	X	X

* The local fire detection control panel located in the RAB, Elevation 286 ft. covers the fire areas and fire zones on the same elevation. 15

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel. Furthermore, for a fire condition, an audible alarm sounds at the fire area.

7. Accessible and Initial Response

Access to this area is provided from adjacent fire areas: 1-A-SWGRA, 1-A-CSRA, 1-A-CSRB, 1-A-ACP, 1-A-BATB, 1-A-BAL (fire zone 1-A-5-HVB), stair tower column 36-D and Turbine Building. Carbon dioxide portable extinguishers are provided in and adjacent to the area in accordance with NFPA 10. 15
Standpipe hose stations have been provided adjacent to the area.

8. Fire Suppression Systems

There are no automatic fire suppression systems provided to protect this area.

Plant equipment subject to water damage are mounted on four in. high floor pedestals.

Damage to plant area and equipment from the accumulation of water discharged from hose lines is minimized by the provision of a floor drainage system. Floor water surcharge is estimated to be insignificant. Excess water can overflow to adjacent areas. Runoff is directed to the storm drain system.

9. Analysis of Effects of Postualted Fires

In Fire Area 1-A-SWGRB, the Switchgear Room 1B, area fire hazard combustibles include normally expected amounts of cable insulation in cable trays, conduit, connection boxes and limited amounts of cable insulation within control panels. Transient materials are not anticipated to be present in the area. However, transient materials, such as rags, wood, solvents, etc. may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently the magnitude of these fires and the resultant damage to plant facilities, is reduced:

- by the use of IEEE 383 qualified cables;

- by provision of six in. high curbs at the doors from areas where combustible liquids may be introduced, thus preventing propagation of combustibles into the area;

- by limiting the continued spread of fire along cable surfaces by provision of fire-breaks along cable trays and fire-stops at fire barrier penetrations. Fire retardant coatings and/or separational barriers are provided between safety and non-safety related cable trays at points of close proximity.

- by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation system and by three-hour fire barriers enclosing the fire area.

The fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays.

The postulated fire might involve several cable trays above the tray in which ignition is assumed and extend to the first fire break along the run or to the area fire barrier fire stop.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization type smoke detectors installed at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees both locally and in the Control Room via the Communications Room, so that manual fire response can be initiated promptly.

Ready access (as detailed under Item 7) is provided to the area from adjacent plant areas facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines located in adjacent areas by employees responding to the fire.

The postulated fire is not considered to have sufficient potential for spread to cause failure of redundant safety related plant equipment and associated cabling and controls which are separated by three hour fire barriers. Thus, the capability for a safe shutdown of the plant will not be impaired by the postulated fire in the area.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment both safety and non-safety related shown on the plant general arrangement drawings for this area.

Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
6.9 kV Emergency Switchgear	IC-NNS		X	N/A				
6.9 kV Emergency Switchgear	1B-NNS		X	N/A				
480V Emergency Switchgear	1E1-NNS		X	N/A				
480V Emergency Switchgear	1E2-NNS		X	N/A				
6.9 kV Emergency Switchgear	IE-NNS		X	N/A				
480V Emergency Switchgear	1B2-SB	X		X				
480V Emergency Switchgear	1B3-SB	X		X				
480V Emergency Switchgear	1B1-SB	X		X				
6.9 kV Emergency Switchgear	1B-SB	X		X				
Diesel Sequencer Panel B		X		N/A				
Transfer Panel B		X		N/A				
D.C. Panel	1A-2NNS		X	N/A				
D.C. Panel	1B-SB	X		X				
S.S. Panel	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Sprinkler Equipment	NNS		X	N/A				
Exhaust Fan E-29	1A-SB	X				X		
Exhaust Fan E-29	1B-SB	X				X		

APPENDIX 9.5A.10

1. Identification   Fire Area: 12-A-BAL

Building: Reactor Auxiliary Building 15

Fire Area: 12-A-BAL, Reactor Auxiliary Building Balance, Elevation 286, 305 and 324 ft.

Fire Zones: As detailed under Item 4, Combustible Loading.

Shown on Figures: 9.5A-9, 9.5A-10 and 9.5A-13

Length (ft.): Variable Width (ft.): Variable Height (ft.): Variable

Total Floor Area (sq. ft.): 29,000   Volume (cu. ft.): 181,000

2. Occupancy

The area contains H&V units, smoke purge fans, 3-ton monorails, exhaust fans, Air Handling Units, associated controls, wiring in conduit and cables in trays.

3. Boundaries

Fire area boundary walls, floor, ceilings, roof, and structural columns supporting the area boundaries are of reinforced concrete construction, with a fire rating of three hours as marked on the figures. Wall openings for personnel access are protected by certified three-hour A label type fire rated doors, and certified one-and-a half-hour B label type fire rated doors at stair towers.

Floor openings for handling of equipment are protected by concrete hatch covers with a three-hour fire rating where required. Concealed spaces consist of valve pits approximately 5 ft. x 1.5 ft. size located in the Demineralizer Fill and Service Area in fire zone 12-A-5-DIH, on Elevation 286 ft. There are no concealed spaces in the other fire zones.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 12-A-BAL, Auxiliary Building Balance			
Total Floor Area: 29,050 sq. ft.			
Cable Insulation (RF)			
Power	895	161,100	5,550
Control	1,218	191,200	6,600
Instrumentation	1,063	101,000	3,500

15

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (Minor integral with equipment)	0	0	0
Solids:			
charcoal (lb.)	89,100	1,782,000	61,400
Transient:			
charcoal (lb.)	11,125	111,300	3,900
fiber drums (lb.)	280	2,300	80
oil (gal.)	55	6,000	200
1	Total	2,354,900	81,230

Fire Zone: 12-A-5-CHF, Charcoal Filter Room, Elevation 286 ft.

Floor Area: 7,500 sq. ft.

Cable Insulation			
Power (in conduit)	370	66,600	8,880
Control (RF)	320	50,300	6,710
Instrumentation (RF)	320	30,400	4,050
Liquids (minor)	0	0	0
Solids:			
charcoal (lb.)	44,500	445,000	59,400
Transient:			
charcoal (lb.)	11,125	111,200	14,800
fiber drums (lb.)	280	2,300	300
oil (gal.)	55	6,000	800
	Total	711,800	94,940

Fire Zone: 12-A-5-DIH, Demineralizers, Instruments, HVAC Equipment Room, Elevation 286 ft.

Floor Area: 6,100 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation (RF)			
Power	0	0	0
Control	378	59,300	9,720
Instrumentation	248	23,600	3,870
Liquids (minor integral with equipment)	0	0	0
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	1,000
	Total	88,900	14,590

Fire Zone: 12-A-6-CHF1, Charcoal Filters, Elevation 305 ft. 15

Floor Area: 3,900 sq. ft.

Cable Insulation (RF)			
Power	195	35,200	8,950
Control	180	28,300	7,200
Instrumentation	180	17,100	4,350
Liquids (minor)	0	0	0
Solids: charcoal (lb.)	22,300	223,000	57,100
Transient:			
charcoal (lb.)	11,125	111,300	28,600
fiber drums (lb.)	280	2,300	600
oil (gal.)	55	6,000	1,550
	Total	423,200	108,350

15

15

Fire Zone: 12-A-7-HV, Heating, Ventilating Room, Elevation 324 ft.

Floor Area: 7,550 sq. ft.

Cable Insulation (RF)			
Power	150	27,000	3,600
Control	160	25,100	3,350
Instrumentation	135	12,900	1,750
Liquids (minor)	0	0	0
Solids	0	0	0
Transient: oil (gal.)	55	6,000	800
	Total	71,000	9,500

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barrier walls are anchored or sealed with flexible or semi-rigid fire-stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire-stop assemblies. Fire dampers are not provided within ductwork or transfer openings in safety-related ducts. Supplemental barriers consisting of covers, fire-breaks, and/or fire-retardant coatings are provided at crossovers between safety and non-safety related cable trays or points of close proximity where Regulatory Guide 1.75 criteria cannot be fully met.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.), comparable smoke removal would be achieved for this area by a rate of approximately 0.3 cfm/sq. ft. Smoke, heat, and products of incomplete combustion are removed by the normal ventilation system for this area:

Supply: AH-14(1X-NNS) Exhaust: E-22(1X-NNS)

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	NNS	Supply	22,100	0.8
Exhaust	NNS	Exhaust	22,100	0.8

There are no radioactive sources in this area.

6. Fire Detection

The types of detection, actuation, and signaling systems provided in this area and their functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
12-A-6-CHF1	1-54	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
		Manual Alarm	Area	X	X	X	X	X	X
		Station	Area	X	X	X	No	X	X
12-A-7-HV	1-55	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
Elevator Shaft	1-56	Ionization	Area	X	X	X	No	X	X
12-A-5-CHF	1-45	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
12-A-5-DIH	1-44	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

15

* This fire area is covered by three local fire detection control panels as follows:

15 - fire zones 12-A-5-CHF and 12-A-5-DIH alarm on the panel located in the RAB, Elevation 286 ft.

15 - fire zones 12-A-6-CHF1 and 12-A-7-HV alarm on the panel located in the RAB, Elevation 305 ft.

15 - fire zone 12-A-CHF2 alarms on the panel located in the RAB, Elevation 305 ft.

**Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each detection zone at the local control panel and an audible alarm in the fire zone.

7. Accessible and Initial Response

Access to this area is provided from adjacent corridors, stair towers, and service elevators as shown on figures. Dry chemical type extinguishers are provided in fire zones 12-A-5-CHF and 12-A-5-DIH only, in accordance with NFPA 10. Standpipe hose stations have been provided in all fire zones of this area.

8. Fire Suppression Systems

The fire suppression system provided in this area is an automatic preaction sprinkler system designed hydraulically to provide area density of 0.3 gpm/sq. ft. The system is actuated automatically by thermal detectors located at the ceiling level when the area temperature reaches 135 F. The sprinkler heads open when area temperature reaches 165 F. The system water flow is shut off manually from the control valve by authorized personnel when the fire is out. The preaction control valve for the system is located in switchgear room 1B on Elevation 286 ft. Access to the pre-action valve can be gained through the stairwell located at column D36. Manual actuation of the system is provided from the pre-action control valve emergency mechanical release. Remote manual actuation of the preaction system is provided from the manual alarm stations located inside or outside each fire area on this elevation. Electrical supervision of the suppression system includes control valve position, system valve position, supervisory air pressure, and lack of water through the control valve. The sprinkler system piping is seismically supported in areas containing safety related equipment.

Plant equipment subject to water damage is protected with water tight enclosures and mounted on floor pedestals. Damage to plant areas and equipment from the accumulation of water discharge from sprinkler systems and hose lines is minimized by the provision of a floor drainage system. Floor water surcharge is estimated to be insignificant since excess water can overflow to adjacent areas. Runoff is directed to the storm drain system.

9. Analysis of Effects of Postulated Fires

In Fire Area 12-A-BAL, the RAB Balance, fire hazard combustibles include normally expected amounts of cable insulation in cable trays, conduit, connection boxes, and required quantities of charcoal used within charcoal filters. Transient materials, such as charcoal, rags, wood, solvents, etc., may be brought into the area for normal facilities maintenance and repair. 15

The quantity of combustible materials which may be involved in area fires and, consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced:

- by the use of IEEE 383 qualified cables

- by limiting the continued spread of fire by the provision of fire-breaks along cable trays and fire-stops at fire barrier penetrations and at every floor penetration for electrical cable tray and/or conduit runs

- by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke, and other products of combustion through continued operation of normal ventilation systems and by three-hour fire barriers enclosing the fire area.

The charcoal fire postulated for this area assumes ignition and subsequent development into the most severe single fire expected in the area of localized concentrations of charcoal within filters.

The potential maximum propagation of the postulated fire is reduced by early detection using line-type detectors installed in the charcoal bed. The temperature of the air leaving the charcoal filter is monitored. On temperature rising above a pre-high temperature level, visual and audible alarms on the charcoal filter housing detection panel and in the Control Room are activated. The Control Room Operator will stop the air flow through this filter, allowing for cooling of the charcoal through starvation of the oxygen supply to the fire.

Should the fire not extinguish itself, the temperature will continue to rise; the filter housing will become hot; and the automatic thermal detection system (using rate compensated detectors) installed on an area basis over each charcoal filter housing senses the heat and activates the fire suppression system as described at Item 8 of this analysis.

If the multi-cycle sprinkler system has not actuated automatically, the postulated fire might involve the charcoal filter and damage associated ducts, fittings, cabling, and controls. However, the pre-action sprinkler system can be actuated manually from either the system control valve on Elevation 286 ft. or any manual dual-action alarm station in the area. Damage will then be confined to the area of inception, with only very limited exposure to adjacent cabling, adjacent combustible materials, if any, and damage to exposed equipment.

The early warning (line detectors) from the charcoal bed will alert the Control Room Operator to stop the air flow through the filter and dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting, if necessary, through the use of portable fire extinguishers, hose lines, and/or manual actuation of the automatic fire suppression system. The postulated charcoal fire is not considered to have sufficient potential for spread to cause failure of redundant safety-related cable trays, plant equipment, and associated cabling and controls, which are isolated by spacial separation and fire barriers enclosing the Fire Area. Therefore, the capability of the plant for safe shutdown is not impaired by a
15 charcoal fire in the Reactor Auxiliary Balance.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment, both safety- and non-safety related, shown on the plant general arrangement drawings for this area.

Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 12-A-5-CHF, Charcoal Filter Room, Elevation 286 ft.								
H&V Unit	E-17 1X-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation					
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating	
H&V Unit	E-17 1X-NNS		X	N/A					
H&V Unit	E-18 1X-NNS		X	N/A					15
Fan	E-22 1X-NNS		X	N/A					15

Fire Zone: 12-A-5-DIH, Demineralizers, Instruments, HVAC Equipment Room, Elevation 286 ft.

3-ton Monorail (4)	NNS		X	N/A					
Smoke Purge	ES-1, 1A-NNS		X	N/A					15
Exhaust Fan	ES-1, 1B-NNS		X	N/A					15
	ES-2, 1A-NNS		X	N/A					
	ES-2, 1B-NNS		X	N/A					15
	ES-3, 1A-NNS		X	N/A					
	ES-3, 1B-NNS		X	N/A					
Resin Filler Hopper	NNS		X	N/A					
Sheet Metal Plenum	NNS		X	N/A					

Fire Zone: 12-A-6-CHF1, Charcoal Filters, Elevation 305 ft. 15

Exhaust Fan	E-23-NNS		X						
Exhaust Fan	E-24-NNS		X	N/A					

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
H&V Unit	E19, 1X-NNS		X	N/A				
H&V Unit	E20, 1X-NNS		X	N/A				

15

Fire Zone: 12-A-7-HV, Heating, Ventilating Room, Elevation 324 ft.

Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
H&V Unit	AH-14, 1X-NNS		X	N/A				
H&V Unit	AH-14, 2X-NNS		X	N/A				
H&V Unit	AH-57, 1-4X-NNS		X	N/A				
H&V Unit	AH-58, 1-4X-NNS		X	N/A				
H&V Unit	AH-59, 1-4X-NNS		X	N/A				
H&V Unit	AH-56, 1-4X-NNS		X	N/A				

APPENDIX 9.5A.11

1. Identification   Fire Area: 12-A-CR

Building: Reactor Auxiliary

Fire Area: 12-A-CR, Control Room
Elevation 305 ft. 15

Fire Zone: 12-A-6-CR1, Control Room

12-A-6-RT1, Terminal Cabinet Room - Unit 1

Shown on Figures: 9.5A-10, 9.5A-12, and 9.5A-13

Length (ft.): 210   Width (ft.): 52   Height (ft.): 17

Area (sq. ft.): 10,700   Volume (cu. ft.): 140,800

2. Occupancy

The area contains control room panels, computer consoles, radiation monitoring panels, alarms, incore instrumentation, desk relay panels, exhaust fans, component cooling water surge tank, associated controls, wiring in conduit, living quarters, visitor's gallery.

3. Boundaries

Walls, floor, roof, and structural columns supporting the area boundaries are of reinforced concrete construction, with a fire rating of three hours. Openings through walls for personnel use, including stairwells, are protected by airtight, seismically designed security doors with a fire rating equal to certified three-hour A label type fire-rated doors.

A cast-in-place concrete trench approximately 11 ft. long, 2 ft. wide, 8 in. deep is provided under HVAC Control Board located in the Control Room. Covers were not provided for the trench because of its small size and location, internal to the HVAC Control Board. 15

15

4. Combustible Loading

The combustible loading is assumed to be negligible since there are no cables in cable trays or other combustibles in the Control Room area at any time. The only fire hazards considered for the area are limited quantities of control and instrumentation cable insulation inside the cabinet and some computer material transients.

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire-stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire-stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire-stop assemblies. Automatic fire dampers are not provided within safety-related ducts.

Smoke, heat, and products of incomplete combustion are removed by the smoke purge system for this area:

15

Supply: AH-15 (1A-SA)&(1B-SB)

Exhaust:
Normal:
Operation: E-9 (1A-NNS)&(1B-NNS)
Smoke
Purge ES-1(1A-NNS)&(1B-NNS)

15 Fire Zones: 12-A-6-CRI and 12-A-6-RT1, Control Room and Terminal Cabinet Room

Floor Area: 5,600 sq. ft.

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Normal Supply	3	Operating	14,000	2.5
Normal Supply	3	Standby	14,000	2.5
Normal Exhaust	NNS	Operating	800	0.15
Normal Exhaust/ Smoke Purge	NNS	Standby	800	0.15
Supply/Smoke Purge	3	Operating	14,000	2.5
Supply/Smoke Purge	3	Standby	14,000	2.5
Smoke Purge	NNS	Operating	14,050	2.5
Smoke Purge	NNS	Standby	14,050	2.5

15

5. Control of Hazards (Cont'd.)

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)

15

There are no radioactive sources in this area.

6. Fire Detection

The type of detection and signaling systems provided in this area and their functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
12-A-6-CR1	1-48	Ionization	Area	X	X	X	No	X	X

6. Fire Detection (Cont'd)

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
12-A-6-RT1	1-46	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

15

**Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel. Furthermore, for a fire condition, an audible alarm sounds at the fire zone.

7. Access and Initial Response

15

Access to this area is reduced to fire areas: 12-A-CRC (fire zones 12-A-6-ARP1 and 12-A-6-CR), Turbine Building and stair tower at Column D-39. Carbon dioxide and pressurized water fire extinguishers are provided in the area in accordance with NFPA 10. Standpipe hose stations have been provided in and adjacent to the area.

8. Fire Suppression Systems

There are no automatic fire suppression systems provided to protect this area.

Plant equipment subject to water damage is mounted on floor pedestals.

Floor water surcharge is estimated to be insignificant. Excess water can overflow to adjacent areas. Runoff is directed to storm drainage system.

9. Analysis of Effects of Postulated Fires

In Fire Area 12-A-CR, the Control Room, area fire hazard combustibles include limited amounts of cable insulation within control cabinets and panels and limited quantities of ordinary combustibles necessary for the Control Room computer and instrumentation operation. Transient materials such as paper and rags may be brought into the area during normal operations or for normal facilities maintenance and repair or during plant shutdown.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced by limiting the permanent quantities of ordinary combustibles (Class A) and controlling the introduction of transient combustibles through the administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke, and other products of combustion through continued operation of normal ventilation systems, by structural barriers within the area to separate redundant trains or equipment, and by three hour fire barriers enclosing the fire area.

The fire postulated for this area assumes ignition and subsequent development into the most severe single fire expected in the area of localized concentrations of combustibles permanently present in the area.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization-type smoke detectors installed at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the incipient fire and alerts employees both at the location of the local control panel and in the Control Room via the Communications Room so that manual fire response can be initiated promptly, as 15
the fire area is permanently occupied.

In addition, ready access is provided to the area from adjacent plant area facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires by employees responding to the fire (as detailed under Item 7).

The postulated fire is not considered to have sufficient potential for spread to cause failure of redundant safety-related plant equipment and associated cabling and controls based on the fact that the Control Room is permanently attended, the control cabinets are of the self-ventilated type, and any products of combustion will quickly migrate to the ceiling of the room, where the automatic detection system will sound an alarm, which will alert the control room operators. As stated in FSAR Sections 7.4.1.2 and 7.4.1.11, in the event the Control Room must be evacuated, the plant can be safely shutdown from the Auxiliary Control Panel. The capability of the plant for safe shutdown is therefore not impaired by the postulated fire for this area.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment, both safety- and non-safety, shown on the plant general arrangement drawings for this area:

Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
15 **Fire Zone: 12-A-6-CR1, Control Room**								
Control Room Panel Area 1A1	Class 1	X		X As required				
Control Room Panel Area 1A2	Class 1	X		X As required				
Control Room Panel Area 1C	Class 1E	X		X As required				
Control Room Panel Area 1B1	Class 1E	X		X As required				
Control Room Panel Area 1B2	NNS		X	N/A				
Control Room Panel Area 1BB	Class 1E	X	X	As required				
Control Room Panel Area HVAC, D1	Class 1E	X		X As required				
Engineered Safety Features Bypass Indication		X		N/A				
Control Room Panel Area HVAC, D2,	Class 1E & NNS	X		X As required				
PEN & PAM Instrumentation	Class 1E	X		X As required				
Incore Instrumentation	NNS		X	N/A				
Nuclear Instrumentation	Class 1E	X		N/A				
Computer Operating Console	NNS		X	N/A				
Log & Alarm Typer	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 12-A-6-CR1, Control Room (Cont'd) 15								
Radiation Monitoring Panel	SA	X		No				
Radiation Monitoring Panel	NNS		X	N/A				
Radiation Monitoring Panel	SB	X		No				
Start-up Transformer Panel	NNS		X	N/A				
Generator Relay Panel	NNS		X	N/A				
Cooling Tower & River Makeup	NNS		X	N/A				
Seismic Monitoring Panel	NNS		X	N/A				
RCP Vibration Monitoring Panel	NNS		X	N/A				
Loose Parts Monitoring Panel	NNS		X	N/A				
Gross Failure Detection Console	NNS		X	N/A				
Remote Control Lighting Panel	NNS		X	N/A				
Fire Zone: 12-A-6-RT1, Terminal Cabinet Room 15								
Component Cooling Water Surge Tank	1X-SAB	X				X		
Exhaust Fan E9,	1A-NNS		X	N/A				
Exhaust Fan E9,	1B-NNS		X	N/A				
Chemical Additive Tank	1X-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 12-A-6-CR1, Control Room (Cont'd.)								
Load Frequency Cabinet	NNS		X	N/A				
Turbine Emergency Trip Cabinet	NNS		X	N/A				
7.5 kV Uninterruptible Power Supplies	1DP-1A-S1	X				X		
7.5 kV Uninterruptible Power Supplies	1DP-1A-S3	X				X		
7.5 kV Uninterruptible Power Supplies	1DP-1A-S2	X				X		
7.5 kV Uninterruptible Power Supplies	1DP-1A-S4	X				X		
Kitchenette	NNS		X	N/A				
Hydrogen Recombiner Control Panel	SA,SB	X				X		
H_2 Recombiner Frame	NNS		X	N/A				

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APPENDIX 9.5A.12

1. Identification Fire Area: 12-A-CRC1

Building: Reactor Auxiliary | 15

Fire Area: 12-A-CRC, Control Room Complex, Elevation 305 ft. | 15

Fire Zones: 12-A-6-PICR1, 12-A-6-CR, 12-A-6-RCC1, 12-A6-ARP1

Shown on Figures: 9.5A-10, 9.5A-12, 9.5A-13

Length (ft.): Variable Width (ft.): Variable Height (ft.): 17

Area (sq. ft.): 5,800 Volume: (cu. ft.): 98,400

2. Occupancy

The area contains the plant computer room process instrument and control racks, auxiliary relay panels, Communications Room, rod control cabinets, reactor trip switchgear, motor generator sets providing DC power for the control rod drive, associated controls, wiring in conduit, and cable in trays.

3. Boundaries

Walls, floor, roof, and structural columns supporting the area boundaries are of reinforced concrete construction, with a fire rating of three hours. Wall openings for personnel access are protected by certified three-hour A label type fire-rated doors. Cast-in-place concrete raceway 10 in. wide, 8 in. deep, running approximately 100 linear feet is provided in the computer room for the purpose of containing the interconnecting cables for the computers.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 12-A-CRC1, Computer Room Complex			
Cable Insulation			
Power (in conduit, concrete trenches, cabinets)	0	0	0
Control	860	135,020	23,500
Instrumentation	860	81,700	14,500

| 15

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (minor integral with equipment)	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
Total		216,720	38,000

15 Fire Zone: 12-A-6-PICR1, Process Instru. & Control Racks,

Fire Zone Area: 2,100 sq. ft.

Cable Insulation			
Power (in conduit)	0	0	0
Control	860	135,020	65,000
Instrumentation	860	81,700	39,000
Liquids (minor integral with equipment)	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
Total		216,720	104,000

The combustible loading for the remaining three fire zones: 12-A-6-CR, Computer Room, 12-A-6-RCC1, Rod Control Cabinets, 12-A-6-ARP1, and Auxiliary Relay Panels is assumed to be minor since there are no cables in trays or any other types of combustibles present in these zones. The hazards considered for these zones are limited quantities of control and instrumentation cable insulation within cabinets and panels, as well as limited quantities of computer material transients. There is a small amount of exposed PVC cable associated with the distribution frame in the Communications Room, which is an insignificant fire loading.

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire-stops at rated fire barriers. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire-stop assemblies. Fire dampers are not provided within safety related ducts. A fire wall 13 ft. long 11 ft. high x 1 ft. thick poured concrete is provided between the Motor Generator sets within the area. Supplemental barriers consisting of tray covers, fire breaks, and/or fire-retardant coatings are provided at crossovers between safety-and non-safety related cable trays or points of close proximity where Regulatory Guide 1.75 cannot be fully met.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.), comparable smoke removal would be achieved for this area by a rate of approximately 0.08 cfm/sq. ft. Smoke, heat, and products of incomplete combustion are removed by the ventilation system for this area:

Fire Zone 12-A-6-RCC1

Supply: AH-13 (1A-SA)
AH-13 (1B-SB)

Smoke Purge: To atmosphere via exhaust port

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply & Recirculation	3	Operating	4,000	2.9
Supply & Recirculation	3	Standby	4,000	2.9
Smoke Purge	3	Standby	4,000	2.9

The Rod Control Cabinet and Communications Rooms are normally ventilated by recirculation systems. They also have a manual smoke purge capability which exhausts directly to the atmosphere.

Fire Zones 12-A-6-PICRI, 12-A-6-CR, and 12-A-6-APRI

Supply: AH-16 (1A-SA)
AH-16 (1B-SB)

Smoke Purge: ES-3 (1A-NNS)
ES-3 (1B-NNS)

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply & Recirculation	3	Operating	10,820	2.5
Supply & Recirculation	3	Standby	10,820	2.5
Smoke Purge	NNS	Operating	10,820	2.5
Smoke Purge	NNS	Standby	10,820	2.5

Ventilation system is normally recirculated with a manual smoke purge capability provided for the Auxiliary Relay Panel Room (1000 cfm), Process I&C

Solid-State Protection Room (6,200 cfm) and Computer Room (3,620 cfm) through the smoke purge system fans ES-3 (1A-NNS) and ES-3 (1B-NNS).

There are no radioactive sources in this area.

6. Fire Detection

The type of detection systems provided in this area and their functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
12-A-6-RCC1	1-47	Ioni-zation	Products of Com-bustion	X	X	X	No	X	X
12-A-6-PICR1	1-52	Ioni-zation	Products of Com-bustion	X	X	X	No	X	X
12-A-6-ARP1	1-49	Ioni-zation	Products of Com-bustion	X	X	X	No	X	X
12-A-6-CR	1-50	Ioni-zation	Products of Com-bustion	X	X	X	No	X	X

* The local fire detection control panel located in the RAB Elevation
15 305 ft., fire zone 12-A-6-RT1, covering all fire areas/zones located in RAB Elevation 305 ft. and 324 ft.

** Local alarm and annunication of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel; an audible alarm sounds at each fire detection zone location.

7. Access and Initial Response

Access to this area is provided from adjacent plant areas 12-A-CR and 12-A-HV&IR. Carbon dioxide-type extinguishers are provided in and adjacent to the area in accordance with NFPA 10. Standpipe hose stations have been provided adjacent to the area.

8. Fire Suppression Systems

There are no automatic fire suppression systems provided to protect this area. There is no requirement for adequate drainage of fire suppression system water. Floor water surcharge is estimated to be insignificant since excess water can overflow to adjacent areas. Runoff is directed to storm drainage system.

9. Analysis of Effects of Postulated Fires

In Fire Area 12-A-CRC, the Control Room Complex fire hazard combustibles 15
include normally expected amounts of cable insulation in cable trays, trenches, connection boxes, limited amounts of cable insulation within control cabinets, and minor quantities of permanent Class A materials (ordinary combustibles). Transient materials, such as rags, wood, light lubricating oils, and cleaning solvents may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires and, consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced or minimized:

- by the use of IEEE 383 qualified cables.
- by limiting the continued spread of fire along cable surfaces by the provision of fire-breaks along cable trays and fire-stops at fire barrier penetrations. Barriers consisting of covers are provided at safety- and non-safety cable trays at points of possible fire communication.
- by limiting permanent quantities of ordinary combustibles (Class A) materials to amounts actually required for normal operations and by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke, and other products of combustion through continued operation of normal ventilation systems and of the smoke purge systems in areas of high smoke generation potential, as detailed in Section 9.4.5, and by three-hour fire barriers enclosing the fire area.

The fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables.

The potential maximum propagation of the postulated fire will be reduced by early detection using ionization-type smoke detectors installed at the ceiling, on an area basis. The automatic system senses products of combustion generated by the incipient fire and alerts employees both locally and in the Control Room via the Communications Room so that manual fire response can be 15
initiated promptly.

Ready access is provided to the area from adjacent plant areas facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines by employees responding to the fire. The postulated cable fire is not considered to have sufficient potential for spread to cause failure of redundant safety-related plant equipment and associated cabling and controls which are isolated by spacial separation or provision of supplemental barriers and by enclosure of this fire area within three hour fire-rated barriers. Therefore, the capability of the plant for a safe shutdown is not impaired by the postulated fire for this area.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment, both safety- and non-safety related, shown on the plant general arrangement drawings for this area:

N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 12-A-6-CR, Computer Room (Elevation 305 ft.)								
Program Console	NNS		X	N/A				
Paper Tape Read Punch	NNS		X	N/A				
Eng Console	NNS		X	N/A				
Line Printer	NNS		X	N/A				
Main Frame Cabs	NNS		X	N/A				
Main Frame Backup Cabs	NNS		X	N/A				
Mag Tape	NNS		X	N/A				
Type & Card Reader Desk	NNS		X	N/A				
Main Frame Cabs	NNS		X	N/A				

Equipment		Safety Related		Redundant	Counterpart	Separation		
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 12-A-6-CR, Computer Room (Elevation 305 ft.) (Cont'd.)								
Program Console	NNS		X	N/A				
Paper Tape Reader Punch	NNS		X	N/A				
Eng Console	NNS		X	N/A				
Line Printer	NNS		X	N/A				
Fire Zone: 12-A-6-RCC1, Rod Control Cabinets Room (Elevation 305 ft.) 15								
Rod Control Cabinets	NNS		X	N/A				
Reactor Trip Swgr	NNS		X	N/A				
Motor Generator Set A - (provides DC power for control rod drive)	NNS		X	N/A				
Motor Generator Set B - (provides DC power for control rod drive)	NNS		X	N/A				
Radio Equipment	NNS		X	N/A				

Equipment: Name or Description	Equipment: ID No. & Safety Div.	Safety Related: Yes	Safety Related: No	Redundant Counterpart Separation: Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
15 **Fire Zone. 12-A-6-PICR1, Process Instruments and Control Racks (Elevation 305 ft.)**								
Auxiliary Relay Racks Solid State Protect. Sys. Racks (Train A)	3	X				X		
Aux. Relay Racks Solid State Protect Sys. Racks (Train B)	3	X				X		
Aux. Relay Racks (8) (empty)	NNS		X					
Aux. Relay Racks (10) (empty)	NNS		X					
15 **Fire Zone: 12-A-6-ARP1, Auxiliary Relay Panels, (Elevation 305 ft.)**								
Aux. Relay Panels Main Termination Cabinets	3	X				X	X	

APPENDIX 9.5A.13

1. Identification — Fire Area: 12-A-HV&IR | 15

Building:	Reactor Auxiliary Building
Fire Area:	12-A-HV & IR, Heating, Ventilating and Instrument Repair, Elevation 305 ft.
Fire Zones:	12-A-6-HV7, 12-A-6-IRR
Shown on Figures:	9.5A-10 and 9.5A-13

Length (ft.): Variable, Width (ft.): Variable, Height (ft.): 17

Area (sq. ft.): 3,700 Volume (cu. ft.): 59,700

2. Occupancy

The area contains air handling units, heating coil control panel, two exhaust fans, MCCs radiation detectors, air cleaning unit (charcoal filter), steam generator, associated controls, and wiring in conduit.

3. Boundaries

Walls, floor, roof, and structural columns supporting the area boundaries are of reinforced concrete construction, with a fire rating of three hours. Wall openings for personnel access are protected by certified three-hour A label type fire rated doors. There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 12-A-HV&IR, Heating, Ventilating, and Instrument Repairs			
Floor Area: 3,600 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids: (negligible, integral with equipment)	0	0	0
Solids: Charcoal (lb.)	2,740	27,400	7,500
Transients: Charcoal (lb.)	1,400	14,000	4,000
Fiber Drums (lb.)	35	280	100
Grease (lb.)	55	6,000	1,700
	TOTAL	47,680	13,300

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 12-A-6-HV7, HVAC Equipment Room			
Floor Area: 2,600 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids (minor, integral with equipment)	0	0	0
Solids: Charcoal (lb.)	2,740	27,400	10,550
Transients: Charcoal (lb.)	1,400	14,000	5,400
Fiber Drums (lb.)	35	280	100
11 Grease (lb.)	5	< 1	0
	TOTAL	41,680	16,050
Fire Zone: 12-A-6-IRR, Instrument Repair Room			
Floor Area: 1,000 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
	TOTAL	0	0

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire-stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barrier walls are anchored or sealed with flexible or semi-rigid fire-stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire-stop assemblies. Fire dampers are not provided within safety-related ducts.

Based on the smoke removal rate provided for the combustible load in the Cable Spreading Rooms, 1.5 cfm/sq. ft. comparable smoke removal would be achieved for this area by a rate of approximately .09 cfm/sq. ft. Smoke, heat, and products of incomplete combustion are removed by the ventilation system for this area:

Function	Safety Class	Mode	Flow (cfm)	cfm/sq. ft.
Fire Zone 12-A-HV7				
Supply: AH-16(1A-SA) AH-16(1B-SB)			Exhaust: E-10(1A-SA)&(1B-SB) E-10(1B-SB)	
Supply	3	Operating	7,100	1.9
Supply	3	Standby	7,100	1.9
Recirculation	3	Operating	6,200	1.7
Recirculation	3	Standby	6,200	1.7
Exhaust	3	Operating	850	0.32
	3	Standby	850	0.32
Fire Zone 12-A-6-IRR				
Supply: AH-16(1A-SA) AH-16(1B-SB)			Smoke Purge: ES3(1A-NNS) ES3(1B-NNS)	
Recirculation	3	Operating	1,600	1.6
Recirculation	3	Standby	1,600	1.6
Smoke Purge	NNS	Operating	1,600	1.6
Smoke Purge	NNS	Standby	1,600	1.6

There are no radioactive sources in this area.

6. Fire Detection

The type of detection, actuation, and signaling systems provided in this area and their functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
12-A-6-HV7	1-53	Thermal	Area	X	X	X	X	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
		Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
12-A-6-IRR	1-[illegible]	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

15 * The local fire detection control panel covering all fire areas and zones in the RAB, Elevations 305 ft. and 324 ft., is located on Elevation 305 ft., adjacent to the Control Room.

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel and an audible alarm within each fire zone.

7. Access and Initial Response

Access to this area is provided from adjacent plant fire areas: 12-A-BAL, 12-A-HV&IR, and 12-A-HV8. Carbon dioxide-type extinguishers are provided adjacent to the area in accordance with NFPA 10. Standpipe hose stations have been provided in the area.

8. Fire Suppression Systems

The fire suppression system provided in this area is an automatic preaction sprinkler system hydraulically designed to provide a density of 0.3 gpm/sq. ft. over charcoal filter housing area. The system is actuated automatically by thermal detectors located also at the ceiling level when the area temperature reaches 135 F. The sprinkler heads open when area temperature reaches 165 F. The system water flow is shut off manually from the control valve by authorized personnel after the fire is extinguished. The preaction control valve for the system is located on Elevation 305 ft. of the RAB. Sprinkler system piping is seismically supported in areas containing safety-related equipment.

Manual actuation of the system is provided from the preaction control valve emergency mechanical release RAB (Elevation 305 ft.). Remote manual actuation of the preaction system is provided from the manual, dual action alarm stations located inside or outside the fire area on this elevation.

Electrical supervision of the suppression system includes control valve position, system valve position, supervisory air pressure, and lack of water flow through the control valve.

Motors of the air handling units are totally enclosed. The MCC are mounted on 4-in. pedestals. Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of a floor drainage system. Floor water surcharge is estimated to be insignificant since excess water is removed by the floor drainage system and can overflow to adjacent areas. Runoff is directed to the floor drain transfer tank.

9. Analysis of Effects of Postulated Fires

In Fire Area 12-A-HV&IR, the Heating, Ventilating, and Instrument Repair, area fire hazard combustibles include only minimal amounts of cable insulation within panels, equipment, conduit, connection boxes, and required quantities of charcoal used within filters. Transient materials, such as charcoal, wood, rags, solvents, and oil in 55-gal. drums may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced by the use of IEEE 383 qualified cables installed in conduit by limiting the continued spread of fire-stops at fire barrier penetration and by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke, and other products of combustion through continued operation of normal ventilation systems and by three-hour fire barriers enclosing the fire area.

The fire postulated for this area assumed ignition and subsequent development into the most severe single fire expected in the area, of localized concentrations of charcoal within filters.

The charcoal fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, fire zone 12-A-60HV7 of localized concentrations of charcoal within filters. Transient combustibles present in the area are charcoal for filter refill and/or lube oil in a 55-gal. oil drum. These transients are present only during maintenance and repair of the equipment in the area.

The potential maximum propagation of the postulated fire is reduced by early detection using line-type detectors installed in the charcoal bed. The temperature of the air leaving the charcoal filter is monitored. On temperature rising above a pre-high temperature level, visual and audible alarms on the charcoal filter housing detection panel and in the Control Room are activated. The Control Room operator will stop the air flow through this filter, allowing for cooling of the charcoal through starvation of oxygen supply to the fire.

Should the fire not extinguish itself, the temperature will continue to rise; the filter housing will become hot; and the automatic thermal detection system (using rate-compensated detectors) installed on an area basis over each charcoal filter housing senses the heat and actuates the fire suppression system as described in Item 8 of this analysis.

If the preaction sprinkler system has not actuated automatically, the postulated fire might involve the charcoal filter and damage associated ducts, fittings, cabling, and controls. However, the preaction sprinkler system can be actuated manually from either the system control valve on Elevation 305 ft. or any manual alarm station in the area. Damage will then be confined to the area of inception, with only very limited exposure to adjacent cabling, combustible materials, and damage to exposed equipment.

The early warning (line detectors) from the charcoal bed will alert the control room operator to stop the air flow through the filter and dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting, if necessary, through the use of portable fire extinguishers, hose lines, and/or manual actuation of the automatic fire suppression system.

The postulated charcoal fire is not considered to have sufficient potential for spread to cause failure or redundant safety-related cable trays, plant equipment, and associated cabling and controls, which are isolated by spacial separation. Other factors are the presence of an early-warning automatic detection system in the area and the area's proximity to the Control Room.

Therefore, the capability of the plant for safe shutdown is not imparied by the postulated fire in the area.

10. <u>Fire Area Equipment</u>

Listed below is the mechanical and electrical equipment, both safety and non-safety-related, shown on the plant general arrangement drawings for this area:

N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 12-A-6-HV7, HVAC Equipment Room								
H&V Unit AH-15	1A-SA	X				X		
H&V Unit AH-16	1A-SA	X				X		
H&V Unit AH-16	1B-SB	X				X		
H&V Unit HA-15	1B-SB	X				X		
Elect[illegible] Htg C[illegible] Cont[illegible]ol Panel	NSS		X	N/A				
Exhaust Fan E-10	1A-SA	X				X		
Exhaust Fan E-10	1B-SB	X				X		
MCC	NNS		X	N/A				
Steam Generator	NNS		X	N/A				
Air Cleaning Unit	NNS		X	N/A				
Fan R-2	1A-SA	X				X		
Fan R-2	1B-SB	X				X		

APPENDIX 9.5A.14

1. Identification Fire Area: 5-F-BAL

Building: Fuel Handling

Fire Area: 5-F-BAL, Fuel Handling Building Balance, Elevation 216, 236, 261, and 286 ft.

Fire Zones: Detailed in Item 4

Shown on Figures: 9.5A-14 through 9.5A-20

Length (ft.): Variable Width (ft.): Variable Height (ft.): Variable

Area (sq. ft.): 91,000 Volume (cu. ft.): 2,700,000

2. Occupancy

The area contains new and spent fuel pools, fuel transfer canals, new fuel containers, cranes, decontamination facilities, various pumps and filters, tanks, associated controls, wiring in conduit, and cable in trays.

3. Boundaries

Walls, floor, roof, and structural columns supporting the area are of reinforced concrete construction, with a fire rating of three hours.

Wall openings for personnel access are protected by certified three-hour A label type fire rated doors and by certified one-and-a-half-hour B label Type fire-rated doors at stair towers. Floor and ceiling openings for handling of equipment are protected by reinforced concrete hatch covers. There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 5-F-BAL, Fuel handling Buidling Balance			
Floor Area (sq. ft.): 91,000			
Cable Insulation			
Power	13	2,350	30
Control	13	2,050	25
Instrumentation (in conduit)	0	0	0

Combustible	Quantity Cal./lb./RF	BTU in 100's	BTU/ sq. ft.
Liquids: grease (lb.)	2	50	0
Solids			
Transient: lube oil (gal.)	55	6,000	70
	TOTAL	10,450	125

Fire Zone: 5-F-1-TK, Component Cooling Water Tank, Elevation 216 ft.
Floor Area (sq. ft.): 6,120

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids: grease (lb.)	2	50	50
Solids	0	0	0
Transient: oil (gal.)	55	6,000	1,000
	TOTAL	6,050	1,050

15 Fire Zone: 5-F-1-C1, Auxiliary Steam Condensate Tanks
Elevation 216 ft.
Floor Area (sq. ft.): 4,400

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: oil (gal.)	55	6,000	1,400
	TOTAL	6,000	1,400

15 Fire Zone: 5-F-1-C2, Auxiliary Steam Condensate Tanks
Elevation 216 ft.
Floor Area (sq. ft.): 4,400

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: oil (gal.)	55	6,000	1,400
	TOTAL	6,000	1,400

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 5-F-3-DEC, Decontamination Area Equipment Elevation 261 ft.			
Cable Insulation			
Power	13	2,350	3,100
Control	13	2,050	2,700
Instrumentation (in conduit)	0	0	0
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
	TOTAL	4,400	5,800

Total combustible loading for cable insulation and all other combustible materials for the following fire zones are found to be insignificant for the purposes of this analysis:

5-F-1-AA1, Access Aisle, Elevation 216 ft. 15
5-F-2-DEC, Decontamination Area and Transfer Tank, Elevation 236 ft.
5-F-23-NFP1, New Fuel Pool, Floor Elevation 246 ft.
5-F-23-NFP2, North Spent Fuel Pool (small), Floor Elevation 246 ft.
5-F-23-SFP1, South Spent Fuel Pool, Floor Elevation 246 ft. 15
5-F-23-SFP2, North Spent Fuel Pool (large), Floor Elevation 246 ft.
5-F-23-FTC1, Fuel Transfer Canal Floor Elevation 251 ft.
5-F-23-FTC2, Fuel Transfer Canal Floor Elevation 251 ft.
5-F-23-CLP, Cask Loading Pool, Floor Elevation 240 ft.
5-F-3-DE, Decontamination Enclosure, Elevation 261 ft.
5-F-3-CHG, Change Area, Elevation 261 ft.
5-F-3-STR, Cask Storage, Elevation 261 ft.
5-F-3-NF, New Fuel Containers, Elevation 261 ft.
5-F-3-SC, Spent Fuel Shipping by RR car, Elevation 261 ft.
5-F-3-HV, H&V Area, Elevation 261 ft.
5-F-3-MFTC, Main Fuel Transfer Canal, Floor Elevation 260 ft.
5-F-4-BAL, Elevation 286 ft.

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire-stops at all floors and at rated fire barriers. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier openings with flexible or semi-rigid fire-stop assemblies. Fire dampers are not provided within safety-related ducts. Supplemental barriers, fire-breaks, and/or fire retardant coatings are provided at crossovers between safety-and non-safety-related cable trays or points of close proximity where Regulatory Guide 1.75 criteria cannot be fully met.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.), comparable smoke removal would be achieved for this area zone room by a rate of approximately 0.001 cfm/sq. ft.

Smoke, heat, and products of incomplete combustion are removed by the ventilation system for this area:

Supply:	North:	AH-21 (1-4A-NNS)	Exhaust:	North:	E-11 (1-4A-NNS)
		AH-21 (1-4B-NNS)			E-11 (1-4B-NNS)
Supply:	South:	AH-22 (1-4A-NNS)	Exhaust:	South:	E-14 (1-4A-NNS)
		AH-22 (1-4B-NNS)			E-14 (1-4B-NNS)

Function	Safety Class	Mode	Flow (cfm)	cfm/sq. ft.
Supply	NNS	Operating (North & South)	47,000	0.5
Supply	NNS	Standby (North & South)	47,000	0.5
Exhaust	NNS	Operating (North & South)	47,000	0.5
Exhaust	NNS	Standby (North & South)	47,000	0.5

Potential radioactive releases in this area can be expected from the Spent and New Fuel Racks (where spent fuel is stored) and Spent Fuel Pools on Elevation 261 ft.

6. Fire Detection

The signaling and alarm systems provided for the Fuel Handling Building 5-F-Balance consist of manual alarm stations only, as indicated below:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
5-F-BAL	1-78	Manual Alarm Stations	Area	X	X	X	No	X	X

15 * The local fire detection control panel located in the RAB covers all fire areas in the Fuel Handling Building.

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each fire area/detection zone at the local control panel and an audible alarm in the affected fire area.

7. Access and Initial Response

Access to this area is provided from adjacent plant areas in the Reactor Auxiliary Building and from the yard as shown in the figures listed in Item 1. 15

Carbon dioxide-type extinguishers are provided in the area in accordance with NFPA 10. Standpipe hose stations have been provided in the area.

8. Fire Suppression Systems

There are no automatic fire suppression systems provided for this area. Plant damage to plant areas and equipment from the accumulation of water discharged from hose lines is minimized by the provision of an adequate floor drainage system. Floor water surcharge is estimated to be insignificant since excess water can overflow to adjacent areas. Runoff is directed to radioactive floor drain system.

9. Analysis of Effects of Postulated Fires

In Fire Areas 5-F-BAL, the Fuel Handling Building Balance, area fire hazard combustibles include normally expected amounts of cable insulation in cable trays, conduit, connection boxes, pull boxes, and control panels.

Transient materials such as rags, wood, plastic, and lube oil in 55-gal. drums may be brought into the area for normal facilities maintenance and repair. The quantity of combustible materials which may be involved in area fires and, consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced or minimized

- by the use of IEEE 383 qualified cables, except for the Fuel Handling Building elevators cables which are neoprene-insulated. The neoprene cable was found to be acceptable for functional reasons.
- by limiting the continued spread of fire by the provision of fire-breaks along cable runs and fire-stops at fire barrier penetrations and all floors;
- by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke, and other products of combustion through continued operation of normal ventilation systems and by the three-hour fire barriers enclosing the fire area.

The types of fires postulated for a fire area depend on the types of combustible materials present in the fire area and their concentrations. In the Fuel Handling Building Balance area, the predominant combustible material is cable insulation in cable trays. However, the combustible concentration of cables in trays for the Fuel Handling Building Balance is only 55 Btu/sq.ft., as shown in Item 4 of this analysis. This combustible concentration is not considered to have sufficient potential for causing a cable fire that would cause failure of plant equipment or pose a threat to plant personnel. Furthermore, manual fire fighting equipment such as CO_2 extinguishers and hose stations, as well as the manual alarm stations, will enhance the personnel ability to contain the spread of a fire in this area.

10 Fire Area Equipment

Listed below is the mechanical and electrical equipment, both safety- and nonsafety-related, shown on the plant general arrangement drawings for this area.

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 5-F-1-TK, Component Cooling Water Tank Elevation 216 ft.								
Component cooling water holdup tank	1-4X-NNS		X	N/A				
Component cooling water transfer pump	1-4X-NNS		X	N/A				
Leak-detecting stations(3)	NNS		X	N/A				
Filter backwash transfer pump	2 & 3X-NNS		X	N/A				
Filter backwash transfer tank	2 & 3X-NNS		X	N/A				
Floor drain sump pump	2 & 3B-NNS		X	N/A				
Floor drain sump pump	2 & 3A-NNS		X	N/A				
Equipment drain sump pump	2 & 3B-NNS		X	N/A				

Equipment		Safety Related		Redundant	Counterpart	Separation			
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating	
Equipment drain sump pump	2 & 3A-NNS		X	N/A					
Fuel pool & refueling water purifi-cation pump	2 & 3B-NNS		X	N/A					
Fuel pool & refueling water water purifi-cation pump	2 & 3A-NNS		X	N/A					
Fire Zone: 5-F-23-NFP1, New Fuel Pool 1, Floor Elevation 246 ft.									
New & spent fuel storage racks	NNS		X	N/A					
Fire Zone: 5-F-23-FTC1, Fuel Transfer Canal (Southend) Floor Elevation 251 ft.									15
Burnable poison rod assembly hand tool	NNS		X	N/A					
Fuel transfer system	NNS		X	N/A					15
Fire Zone: 5-F-23-SFP1 Spent Fuel Pool 1, Floor Elevation 246 ft.									
Spent fuel storage racks	NNS		X	N/A					

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 5-F-3-MFTC, Main Fuel Transfer Canal, Floor Elevation 260 ft.								
Pool gates storage (2)	NNS		X	N/A				
15 Fire Zone 5-F-23-SFP2, Spent Fuel Pool (North), Floor Elevation 246 ft.								
Spent fuel storage racks	NNS		X	N/A				
15 Fire Zone: 5-F-23-FTC2, Fuel Transfer Canal (Northend) Floor Elevation 251 ft.								
Burnable Poison Rod Assembly Hand Tool	NNS		X	N/A				
15 Fuel transfer system	NNS		X	N/A				
Spent Fuel Handling Tool	NNS		X	N/A				
New Fuel Elevator	NNS		X	N/A				
15 Fire Zone: 5-F-23-NFP2, Fuel Pool (North), Floor Elevation 246 ft.								
15 Fuel storage racks	NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation					
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating	
Fire Zone: 5-F-23-CLP									
Spent fuel shipping cask (by NLI or GE)	NNS		X	N/A					
Fire Zone: 5-F-3-STR, Cask Storage, Elevation 261 ft.									
Cask heads	NNS		X	N/A					
NLI Cask Yoke "B"	NNS		X	N/A					
G.E. Cask Yoke	NNS		X	N/A					
NLI Cask Yoke "A"	NNS		X	N/A					
Fire Zone: 5-F-3-DE, Decontamination Enclosure, Elevation 261 ft.									
Spent fuel shipping cask (by NLI or GE)	NNS		X	N/A					
Permanent stand 18" high	NNS		X	N/A					
Fire Zone: 5-F-3-NF, New Fuel Containers, Elevation 261 ft.									
New Fuel containers (6)	NNS		X	N/A					
Fire Zone: 5-F-3-DEC, Decontamination Area Equipment, Elevation 261 ft.									
Decontamination chemical additive tank	1-4X-NNS		X	N/A					

Equipment: Name or Description	Equipment: ID No. & Safety Div.	Safety Related: Yes	Safety Related: No	Redundant Counterpart Separation: Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Decontamination rinse pump	1-4X-NNS		X	N/A				
Decontamination wash pump	1-4X-NNS		X	N/A				
Exhaust Fan EB-4	1-4X-NNS		X	N/A				
Ultrasonic Generator	NNS		X	N/A				
Service Sink	NNS		X	N/A				
Rinse Tank	NNS		X	N/A				
Ultrasonic Tank	NNS		X	N/A				
Propeller Fan Fan EB-4	1-4X-NNS		X	N/A				
Fire Zone: 5-F-3-HV, H&V Area, Elevation 261 ft.								
H&V Unit	H-22-1-4A-NNS		X	N/A				
	H-22-1-4B-NNS		X	N/A				
CP-EHC-15	NNS		X	N/A				
Propeller Fan E-15	1-4X-NNS		X	N/A				
Fire Zone: 5-F-3-CHG, Change Area, Elevation 261 ft.								
Hot Water Tank	NNS		X	N/A				
Bins (8)	NNS		X	N/A				
H&V opening	NNS		X	N/A				

Equipment: Name or Description	Equipment: ID No. & Safety Div.	Safety Related: Yes	Safety Related: No	Redundant Counterpart Separation: Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Light Panels (3)	NNS		X	N/A				
Elevator shaft	NNS		X	N/A				
Detergent Drain Sump	NNS		X	N/A				
Showers (2)	NNS		X	N/A				
Lavatories (2)	NNS		X	N/A				
Fire Zone: 5-F-4-BAL								
10 Ton Auxiliary Crane	NNS		X	N/A				
150 Ton Cask Handling Crane	NNS		X	N/A				
Fuel Handling Bridge Crane	14A-NNS		X	N/A				
Fuel Handling Bridge Crane	14B-NNS		X	N/A				
Elevator Shaft	NNS		X	N/A				
Elevator Machinery Room	NNS		X	N/A				
Fire Zone: 5-F-BAL, FHB Balance, Elevation 286 ft.								
Spent Fuel pools Pools (2)	SA	X					X	
Fuel transfer canal (2)	SA	X					X	
New fuel pool (2)	SA	X	X				X	
Main fuel transfer canal (2)	SA	X					X	
Cask Loading Pool	SA	X					X	

APPENDIX 9.5A.15

1. Identification   Fire Area: 5-F-CHF

Building: Fuel Handling, Elevation 261 ft. 15

Fire Area: 5-F-CHF, Fuel Handling Building Emergency Exhaust

Fire Zones: 5-F-B-CHFA, 5-F-3-CHFB, 5-F-3DMN1, 5-F-3-DMN2 and 5-F-3-CHF-BAL, as detailed in Item 4.

Shown on Figures: 9.5A-15, 9.5A-18

Length (ft.): 160   Width (ft.): 31   Height (ft.): 23
Area (sq. ft.): 5,000 Volume (cu. ft.): 114,000

2. Occupancy

The area contains emergency exhaust systems, exhaust plenums, air conditioning units, motor control centers, auxiliary relay panels, associated controls, wiring in conduit, and cable in trays.

3. Boundaries

Walls, floor, ceiling, and structural columns supporting the area boundaries are of reinforced concrete construction, with a fire rating of three hours. Wall openings for personnel access are protected by certified three-hour A label type fire rated doors. Floor openings of handling of equipment are protected by concrete hatch covers. Concealed spaces consist of valve galleries, fuel pool demineralizer cubicle, (10 ft. - 6 in. x 9 ft. - 6 in x 13 ft.) and FHB Auxiliary Relay Room located in the fuel pool demineralizer rooms.

Relay Room located in the fuel pool demineralizer rooms.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 5-F-CHF, Fuel Handling Building Emergency Exhaust			
Floor Area: 5,000 sq. ft.			
Cable Insulation			
Power	223	40,140	8,100
Control	223	34,000	7,000
Instrumentation	136	13,000	2,600
Liquids (integral with equipment)	0	0	0
Solids: charcoal (lb.)	2,458	24,600	5,000

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Transients: oil (gal.)	55	6,000	1,200
fiber drums (lb.)	30	200	40
charcoal (lb.)	1,229	12,300	2,500
TOTAL		130,240	26,440

Fire Zone: 5-F-3-CHFA, Charcoal Filter 1-4X-SA
Floor Area: 560 sq. ft.

Cable Insulation			
Power	30	5,400	9,650
Control	30	4,750	8,500
Instrumentation	30	2,850	5,100
Liquids	0	0	0
Solids: charcoal (lb.)	1,229	12,300	22,000
Transients: charcoal (lb.)	1,229	12,300	22,000
fiber drums (lb.)	30	200	350
oil (gal.)	55	6,000	10,800
TOTAL		43,800	78,400

Fire Zone: 5-F-3-CHFB, Charcoal Filter 1-4X-SB
Floor Area: 560 sq. ft.

Cable Insulation			
Power	30	5,400	9,650
Control	30	4,750	8,500
Instrumentation	30	2,850	5,100
Liquids	0	0	0
Solids: charcoal (lb.)	1,229	12,300	22,000
Transients: oil (gal.)	55	6,000	10,800
fiber drums (lb.)	30	200	350
charcoal (lb.)	1,229	12,300	22,000
TOTAL		43,800	78,400

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 5-F-3-DMN-1, Fuel Pool Demineralizer Room				15
Floor Area: 750 sq. ft.				
Cable Insulation				
Power	83	14,950	20,000	
Control	83	13,050	17,400	
Instrumentation	38	3,600	4,800	
Liquids (minor, integral with equipment)	0	0	0	
Solids	0	0	0	
Transient: oil (gal.)	55	6,000	8,000	
	TOTAL	37,600	50,200	
Fire Zone: 5-F-3-DMN-2, Fuel Pool Demineralizer Room				15
Floor Area: 750 sq. ft.				
Cable Insulation				
Power	80	14,400	19,200	
Control	80	12,600	16,800	
Instrumentation	38	3,600	4,800	
Liquids (minor, integral with equipment)	0	0	0	
Solids	0	0	0	
Transient: oil (gal.)	55	6,000	8,000	
	TOTAL	36,600	48,800	
Fire Zone: 5-F-3-CHF-BAL, Fuel Handling Building Emergency Exhaust Balance				
Floor Area: 2,600 sq. ft.				
Cable Insulation (in conduit)				
Power	0	0	0	
Control	0	0	0	
Instrumentation	0	0	0	

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transients: oil (gal.)	55	6,000	2,300
charcoal (lb.)	1,229	12,300	4,700
fiber drums (lb.)	30	200	100
	TOTAL	18,500	7,100

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire-stops at fire barriers. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire-stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire-stop assemblies. Fire dampers are not provided within safety-related ducts. Supplemental barriers fire-breaks and/or fire-retardant coatings are provided at crossovers between safety-and nonsafety-related cable trays or points of close proximity where Regulatory Guide 1.75 criteria cannot be fully met.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms, 1.5 cfm/sq. ft., comparable smoke removal would be achieved for this area by a rate of approximately 0.2 cfm/sq. ft.

Smoke, heat, and products of incomplete combustion are removed by the normal ventilation system for this area:

Supply: AH-21(I-4A-NNS)
AH-21(I-4B-NNS)

Exhaust: E-14(I-4A-NNS)
E-14(I-4B-NNS)

Function	Safety Class	Mode	Flow(cfm)	(cfm/sq. ft.)
Supply	NNS	Operating	18,500	3.7
Supply	NNS	Standby	18,500	3.7
Exhaust	NNS	Operating	18,500	3.7
Exhaust	NNS	Standby	18,500	3.7

Sources of potentially contaminated releases in this fire area are the spent and new fuel racks (where spent fuel is stored), demineralizers, and the normal exhaust HVAC equipment.

6. Fire Detection

Types of detection, actuation and signaling systems provided in this area and their actions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
5-F-3-CHFA	1-74	Thermal	Equipment	X	X	X	X	X	X
5-F-3-CHFB	1-74	Thermal	Equipment	X	X	X	X	X	X
5-F-3-CHF-BAL	1-77	Ionization	Area	X	X	X	No	X	X
5-F-3-DMN1	1-77	Ionization	Area	X	X	X	No	X	X
	1-74	Manual Alarm Station	Area	X	X	X	X	X	X
5-F-3-DMN2	1-77	Ionization	Area	X	X	X	No	X	X
	1-74	Manual Alarm Station	Area	X	X	X	X	X	X

* The local fire detection control panel located in the RAB, Elevation 261 ft. covers all areas in the entire Fuel Handling Building. 15

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel and an alarm that sounds locally in the affected fire zone.

7. Access and Initial Response

Access to this area is provided from adjacent Reactor Auxiliary Buildings, Elevation 261 ft., fire zones, 1-A-4-CHFB, and 1-A-4-COMI. 15
and 2-A-4-CHFB.

Carbon dioxide-type extinguishers are provided in the area in accordance with NFPA 10. Standpipe hose stations have been provided in the area.

8. Fire Suppression Systems

The fire suppression system provided in this area is an automatic multi-cycle sprinkler system installed over the charcoal filter housings at the ceiling level and hydraulically designed to provide water density of 0.3 gpm/sq. ft. over the charcoal filter housings.

The system is actuated automatically by thermal detectors located also over the charcoal filter housings when the area temperature reaches 135 F.

The sprinkler heads open when area temperature reaches 165 F. The system water flow is shut off automatically from the control valve when the area temperature drops below 135 F. The multi-cycle control valve for the system is located inside this fire area, adjacent to Columns 43 & L, accessible from the door located at that column.

Manual actuation of the system is provided from the multi-cycle control valve emergency mechanical release. Remote manual actuation of the multi-cycle system is provided from the dual-action manual alatm stations located inside the fire area.

Electrical supervision of the supression system includes control valve position, system valve position, supervisory air pressure, and lack of water flow through the control valve. Sprinkler system piping is seismically supported.

Plant equipment subject to water damage is protected by being enclosed in a separate room; HVAC motors are totally enclosed; and provision of pads 4 in. to 6 in. high for electrical equipment. Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of an adequate floor drainage system. Floor water surcharge is estimated to be significant. Runoff is directed to radioactive floor drain waste.

9. Analysis of Effects of Postulated Fires

In Fire Area 5-F-CHF, the Fuel Handling Building Emergency Exhaust Systems, area fire hazard combustibles include normally expected amounts of cable insulation in cable trays, conduit, connection boxes, and limited amounts of cable insulation within control panels, as well as required quantities of charcoal used within filters. Negligible quantities of lubricating oils or grease are contained within equipment. Transient materials, such as charcoal, lubricating oil, rags, may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires and, consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced or minimized:

- by the use of IEEE 383 qualified cables.

- by enclosing cable in conduit.

- by limiting the continued spread of fire by the provision of fire-breaks along cable trays and fire-stops at fire barrier penetrations.

- by controlling the introduction of transient combustibles through administrative procedures, to limit quantities to those required for immediate needs, and to prescribe supplemental measures during such exposure periods.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems and by three-hour fire barriers enclosing the fire area.

The types of fires postulated for the Emergency Exhaust Systems Area in the Fuel Handling Building are based on the types of combustibles present in the area and their concentrations. Cable and charcoal fires are being considered in this analysis.

A. <u>Cable Fires</u>

The cable fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays, and in conduit located in and traversing this fire area (see Figure 9.5A-15, Fire Zones: 5-F-3-CHFA, 5-F-3-CHFB, 5-F-3-DMN-1, and 5-F-3-DMN-2). Transient combustibles may be present in the area during maintenance and repair. Common transients could be oil in a 55-gal. oil drum, charcoal for one charcoal filter refill in fiber drums, and small amounts of wood, rags, and plastic coverings.

The potential maximum propagation of the postulated cable fire in this fire area will be reduced by early detection using ionization-type smoke detectors installed at the ceiling, on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees both locally and in the Control Room, via the Communications Room, so that manual fire response can be initiated promptly. 15

Ready access is provided to the area from adjacent plant areas, as described under Item 7, facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires by employees responding to the fire.

Additional fire protection defense for fire zones 5-F-3-CHFA and 5-F-3-CHFB only is provided by the automatic multi-cycle sprinkler system, as detailed under Item 8. If the multi-cycle sprinkler system has not actuated automatically, the postulated fire in these zones might:

- involve other cable trays above the tray where ignition occurs.

- extend to the nearest fire-break along the cable tray or to the area fire barrier fire-stop.

However, the automatic multi-cycle sprinkler system can be actuated manually by employees responding to the fire, either from the dual-action manual fire alarm stations located in the fire area or from the system control valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception, with very limited damage to exposed equipment.

The early warning ionization smoke detection system (products of combustion) will alarm a fire condition in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines, and/or manual actuation of the auutomatic fire suppression system, as described above, thus reducing the fire spread.

The postulated cable fire is not considered to have sufficient potential for spread to cause failure of redundant safety-related plant equipment and associated cabling and controls.

Therefore, the capability of the plant for a safe shutdown and control of radioactive releases to the environment is not impaired by a cable fire in the fuel handling building emergency exhaust area.

B. Charcoal Fires

The charcoal fire postulated for this area assumes ignition and subsequent development into the most severe single fire expected in the area of localized concentrations of charcoal within filters, fire zones 5-F-3-CHFA and 5-F-3-CHFB. Transient combustibles present in the area may be charcoal for one filter refill in fiber drums, oil in a 55-gal. oil drum, and small amounts of wood, rags, and plastic coverings.

The potential maximum propagation of the postulated charcoal fire is reduced by early detection using line type detectors installed in the charcoal bed. The temperature of the air leaving the charcoal filter is monitored. On temperature rising above a pre-high temperature level, visual and audible alarms on the charcoal filter housing detection panel and in the Control Room are activated. The control room operator will stop the air flow through this filter, allowing for cooling of the charcoal through starvation of the oxygen supply to the fire.

Should the fire not extinguish itself, the temperature will continue to rise; the filter housing will become hot; and the automatic thermal detection system (using rate-compensated detectors), installed on an area basis over each charcoal filter housing, senses the heat and activated the fire suppressions system, as described under Item 8 of this analysis.

The potential maximum propagation of the charcoal fire will be reduced by initial use of area fire extinguishers on incipient fires and supplemental use of hose lines on developing fires by employees either responding to the fire or present in the area for maintenance or repair.

If the multi-cycle sprinkler system has not actuated automatically, the postulated fire might involve the charcoal filter and damage associated ducts, fittings, cabling, and controls. However, the multi-cycle sprinkler system can be actuated manually from either the system control valve or any manual dual-action alarm station in the area. Damage will then be confined to the area of inception, with only very limited exposure to adjacent cabling, adjacent combustible materials, and exposed equipment.

The early warning (line detector) from the charcoal bed will alert the control room operator to stop the air flow through the filter and dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting, if necessary, through the use of portable fire extinguishers, hose lines, and/or manual actuation of the automatic fire suppression system, thus reducing the potential for fire spread. The postulated charcoal fire is not considered to have sufficient potential for spread to cause failure of redundant safety-related cable trays, plant equipment, and associated cabling and controls, which are isolated by special separation, structural separations, and provision of automatic fire suppression system. The fire area is enclosed within three-hour fire barriers. Therefore, the capability of the plant for a safe shutdown is not impaired by a charcoal fire in the fuel handling building emergency exhaust area.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment, both safety-and nonsafety-related, shown on the plant general arrangement drawings for this area.

NOTE: N/A - Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 5-F-3-CHF BAL, Fuel Handling Building Emergency Exhaust Balance								
Exhaust fan E-14(1-4A/NNS)	NNS		X	N/A				
Exhaust fan E-14(1-4B/NNS)	NNS		X	N/A				
Air Cond Unit AH-17(1-4A-SA)	3	X				X		
Air Cond Unit AH-17(1-4B-SB)	3	X				X		
Exhaust Plenum(2)	NNS		X	N/A				
FHB Auxiliary Panels (1&4B-SB)	3	X				X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
(2&3B-SB)	3	X				X		
FHB Auxiliary Panels								
(1&4A-SA)	3	X				X		
(2&3A-SA)	3	X				X		
Exhaust Fan E-11(1-4A/NNS)	NNS		X	N/A				
Exhaust Fan E-11(1-4B/NNS)	NNS		X	N/A				
MCC 1&4A	33SA	X				X		
MCC 2&3A	33SA	X				X		
MCC 1&4B	33SB	X				X		
MCC 2&3B	33SB	X				X		
Control Panel CP-EHC-17	1-4X-SA	X		N/A				
Control Panel CP-EHC-18	1-4X-SB	X		N/A				
<u>Fire Zone: 5-F-3-CHF-A,</u> Charcoal Filter 1-4X-SA								
Emergency Exhaust System E-12 (1-4X-SA)	1-4X-SA	X				X		
<u>Fire Zone: 5-F-3-CHF-B,</u> Charcoal Filter 1-4X-SB								
Emergency Exhaust System E-13 (1-4X-SB)		X				X		
<u>Fire Zone: 5-F-3-DMN1,</u> Fuel Pool Demineralizer Room								

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Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fuel Pool Demineralizer (1&4X-NNS)	NNS		X	N/A				
MCC(1-4A-1021)	NNS		X	N/A				
MCC(1-4A-1022)	NNS		X	N/A				
Fire Zone: 5-F-3-DMN2, Fuel Pool Demineralizer Room								
Fuel Pool Demineralizer (2&3X-NNS)	NNS		X	N/A				
MCC(1-4B-1021)	NNS		X	N/A				
MCC(1-4B-1022)	NNS		X	N/A				

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APPENDIX 9.5A.16

1. Identification — Fire Area: 5-F-FPP

Building: Fuel Handling Building, Elevation 236 ft. 15

Fire Area: 5-F-FPP, Fuel Handling Building Fuel Pool Heat Exchangers

Fire Zones: 5-F-2-FPC, Fuel Pool Heat Exchangers 15
5-F-2-FPV1, Fuel Pool Valves Area 1
5-F-2-FPV2, Fuel Pool Valves Area 2

Shown on Figures: 9.5A-14 and 9.5A-18

Length (ft.): Variable Width (ft.): Variable Height (ft.): 16

Area (sq. ft.): 8,000 Volume (cu. ft.): 124,000

2. Occupancy

The area contains fuel pools heat exchangers, pumps, strainers, filters, skimmers, instrument racks, control panels, leak detection stations, Nitrogen accumulators, associated controls and wiring in conduit.

3. Boundaries

Walls, floor and ceiling are of reinforced concrete construction with a fire rating of three hours. Wall openings for personnel access are protected by certified three-hour A label type fire rated doors. Floor openings for handling of equipment are protected by concrete hatch covers with a three-hour fire rating. Concealed spaces consist of pipe and valve spaces in fire zones 5-F-2-FPV1 and 5-F-2-FPV2 and pipe trenches in fire zone 5-F-1-FPP. Trenches are provided for the purpose of containing pipe runs and are covered with metal plates.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.

Fire Area: 5-F-FPP, Fuel Handling Building Fuel Pool Heat Exchanger Elevation 236 ft.

Floor Area: 8,000 sq. ft.

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0

	Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
	Instrumentation	0	0	0
1	Liquids: grease (lb.)	2	40	5
	Solids:	0	0	0
	Transient - lube oil (gal.)	55	6000	750
1	Totals		6040	755

Fire Zone: 5-F-2-FPC, Fuel Pool Heat Exchangers, Elevation 236 ft.

Floor Area: 5050 sq. ft.

	Cable Insulation (in conduit)			
	Power	0	0	0
	Control	0	0	0
	Instrumentation	0	0	0
1	Liquids: grease (lb.)	2	40	8
	Solids:	0	0	0
1	Transient - lube oil (gal.)	55	6000	1190
	Totals		6040	1198

The combustible loading due to cable insulation for fire zones 5-F-2-FPV and 5-F-2-FPV2 was found to be insignificant since all cables are in conduit. The only combustible loading considered in this analysis is a transient lube oil drum with a capacity of 55 gal.

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at rated fire barrier walls. Mechanical piping penetrations through fire barrier walls are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this area zone room by a rate of approximately 0.006 cfm/sq. ft.

Smoke, heat and products of incomplete combustion are removed by the normal ventilation system for this area:

Supply: AH-22 (1-4A-NNS) & (1-4B-NNS) Exhaust: E-11 (1-4A-NNS) & (1-4B-NNS)

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	NNS	Operating	6,000	1.2
Supply	NNS	Standby	6,000	1.2
Exhaust	NNS	Operating	6,200	1.24
Exhaust	NNS	Standby	6,200	1.24

There are no radioactive sources released in this area, during normal operation.

6. Fire Detection

The types of detection, actuation and signaling systems provided in this area and their functions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
5-F-2-FPC	1-73	Thermal	Area	X	X	X	X	X	X
5-F-2-FPV1	1-73	Manual Alarm Station	Area	X	X	X	X	X	X
5-F-2-FPV2	1-73	Manual Alarm Station	Area	X	X	X	X	X	X

* The local fire detection control panel located in the RAB, Elevation 261 ft. covers all areas in the entire Fuel Handling Building. 15

** Local alarm and annunication of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel.

7. Access and Initial Response

Access to this area is provided from adjacent areas located in the Reactor Auxiliary Building Elevation 236 ft. 15

Carbon dioxide extinguishers are provided in the area in accordance with NFPA 10. Standpipe hose stations have been provided in the area.

8. Fire Suppression Systems

The fire suppression system provided in this area is an automatic multi-cycle sprinkler system installed at the ceiling and hydraulically designed to provide water density of 0.3 gpm/sq. ft. of the fire zone 5-F-2-FPC floor area. The system is actuated automatically by thermal detectors in fire zone 5-F-2-FPC, located also at the ceiling level, when the area temperature reaches 135 F. The sprinkler heads open when area temperature reaches 165 F. The system water flow is shutoff automatically from the control valve when the area temperature drops below 135 F. The multi-cycle control valve for the system is located inside this fire area, adjacent to columns 43 & L and are accessible through the nearby door.

Manual actuation of the system is provided from the multi-cycle control valve emergency mechanical release. Remote manual actuation of the multi-cycle system is provided from the dual action manual alarm stations located inside the fire area. Electrical supervision of the suppression system includes control valve position, system valve position, supervisory air pressure and lack of water flow through the control valve. Sprinkler piping is seismically supported.

Plant equipment subject to water damage is protected with watertight enclosures, or are mounted on floor pedestals. Damage to plant area and equipment from the accumulation of water discharge from sprinkler systems and hose lines is minimized by the provision of the floor drainage system. Floor water surcharge is estimated to be insignificant since excess water can overflow to adjacent areas. Runoff is directed to radioactive floor drain waste system.

9. Analysis of Effects of Postulated Fires

In Fire Area 5-F-FPP, the Fuel Pools Pumps & Heat Exchanger Room, area fire hazard combustibles include expected amounts of grease, cable insulation in conduit, connection boxes and control panels. Transient materials, such as rags, wood, cleaning solvents and lubricating oil in 55-gal. drums may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities is minimized by:

- use of IEEE 383 qualified cables

- limiting the amount of combustible and spread of fire through enclosure of cables in conduit

- provision of fire-breaks along cable tray runs and fire-stops at fire barrier penetrations

- controlling the introduction of transient combustibles through administrative procedures, to limit quantities to those required for immediate needs and to prescribe supplemental fire protection measures during such exposure periods.

The extent of damage within or beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through the continued operation of the normal ventilation systems and the three-hour fire barriers enclosing the fire area. 15

The type of fire postulated for the fire area 5-F-FPP assumes ignition and subsequent development into the most severe single fire expected in the fire zone 5-F-2-FPC, of localized concentrations of grease and/or transient lubricating oil in a 55-gal. drum, with spill over adjacent zones and impingement on nearby equipment (see Figure 9.5A-14). Other common transients which could be present in the area are small amounts of wood, rags and plastic coverings.

The automatic thermal detection system installed at the ceiling level of the fire zone 5-F-2-FPC senses the heat generated by the fire. When the temperature reaches 135 F, the multi-cycle sprinkler system valve is actuated as detailed under Item 8, fire alarms are transmitted to the Control Room via Communications Room, to the local fire detection control panel and locally to 15 the fire zone.

The potential maximum propagation of the oil fire will be reduced by initial use of area fire extinguishers on incipient fires and supplemental use of hose lines on developing fires by employees either responding to the fire or present in the area for maintenance and repairs.

Ready access is provided to the area from adjacent plant areas as described under Item 7, facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires.

Additional fire protection defense is provided by the automatic multi-cycle sprinkler system, as described under Item 8. If the multi-cycle sprinkler system has not actuated automatically the postulated fire might involve the fuel pool heat exchangers, and other equipment present in the area, damage contiguous associated piping, fittings, cabling and controls within the spill area and extend to the area fire barrier. However, the automatic multi-cycle sprinkler system can be actuated manually by employees responding to the fire, either from the dual action manual fire alarm stations located in the fire area or from the system control valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with limited damage to exposed equipment.

Even without actuation of the multi-cycle sprinkler system in the area, the oil fire will be sensed by the thermal fire detection system which will alarm a fire (high temperature) and trouble (lack of water) condition in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines, and/or manual actuation of the automatic fire suppression system, as described above, thus reducing the potential for fire spread. Because of spacial separation of redundant safety related equipment, provision of fire extinguishing systems, and enclosure of the fire area within three-hour fire barriers, the postulated fire does not have sufficient potential spread to impair safe shutdown or radioactive release mitigation capabilities.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment both safety and non-safety related shown on the plant general arrangement drawings for this area.

Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 5-F-2-FPC, Fuel Pool Heat Exchangers								
Fuel Pool heat exchg.	1 & 4B-SB	X				X		
Fuel Pool heat exchg.	2 & 3B-SB	X				X		
Fuel Pool heat exchg.	1 & 4A-SA	X				X		
Fuel Pool heat exchg.	2 & 3A-SA	X				X		
Leak detect sta. (2)	NNS		X	N/A				
Fuel pools strainer	1 & 4A-SA	X				X		
Fuel pools cooling pump	1 & 4A-SA	X				X		
Fuel pool strainer	1 & 4B-SB	X				X		
Fuel pools cooling pump	1 & 4B-SB	X				X		
Fuel pools cooling pump	2 & 3B-SB	X				X		
Fuel pools strainer	2 & 3B-SB	X				X		

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fuel pools cooling pump	2 & 3A-SA	X				X		
Fuel pools strainer	2 & 3A-SA	X				X		
Fire Zone: 5-F-FPV1, Fuel Pool Valves Area 1								15
Fuel pools skimmer pump	1 & 4X-NNS		X	N/A				
Nitrogen accum.	1 & 4X-NNS		X	N/A				
2 ton monorail	NNS		X	N/A				
Instr. Rack	F-R3 NNS		X	N/A				
FHB Constr. pan	F-P7 NNS		X	N/A				
Fuel pools demin. filter	1 & 4X-NNS		X	N/A				
Fuel pools & refuel. water purif. filter	1 & 4X-NNS		X	N/A				
Fuel pools skimmer filter	1 & 4X-NNS		X	N/A				
Fuel pools skimmer pump strainer	1 & 4X-NNS		X	N/A				
Instr. rack	F-R1-NNS		X	N/A				
Instr. rack	F-R2-NNS		X	N/A				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
15 Fire Zone: 5-F-FPV2 Fuel Pool Valve Area 2								
2 ton monorail	NNS		X	N/A				
Fuel pools skimmer filter	2&3X-NNS		X	N/A				
Fuel pools & refuel water, purif filter	2&3X-NNS		X	N/A				
Fuel pools & demin filter	2&3X-NNS		X	N/A				
Inst. rack	F-R4-NNS		X	N/A				
FHB Control panel	F-P8-NNS		X	N/A				
Nitrogen accum.	2&3X-NNS		X	N/A				
Fuel pools skimmer pump	2&3X-NNS		X	N/A				
Leak detect. sta. (2)	NNS		X	N/A				
Instrument rack	F-R5-NNS		X	N/A				
Instrument rack	F-R6-NNS		X	N/A				
Fuel Pools Skimmer Pump Strainer	2&3X-NNS		X	N/A				

APPENDIX 9.5A.17

1. **Identification** Fire Areas: 1-D-DGA and 1-D-DGB

Building: Diesel Generator 15

Fire Areas: 1-D-DGA, Diesel Generator 1A (Elevation 261, 280, 292 ft.)
1-D-DGB, Diesel Generator 1B (Elevation 261, 280, 292 ft.)

Fire Zones: Detailed under Item 4 "Combustible Loading"

Shown on Figures: 9.5A-21 and 9.5A-22

Length (ft.): 105 Width (ft.): 38 Height (ft.): 50

Total Area (all fire zones sq. ft.) 8,900 Volume (cu. ft.): 200,000

2. **Occupancy**

Each fire area contains the diesel generator 1A-SA and 1B-SB respectively with accessories, electrical room, HVAC equipment, associated piping, controls, and wiring in conduit.

3. **Boundaries**

Wall, floor and roof are of reinforced concrete construction, with a minimum fire rating of three hours. The East wall has an opening for air intake considered to have an equivalent of three-hour fire rating based on physical separation from other structures. Two wall openings protected by certified three-hour A label type fire rated doors are provided for personnel access. Roof opening for handling of equipment is protected by a concrete hatch to maintain three-hour fire barrier integrity. There are no concealed spaces or floor trenches. The stairway landing is separated from the Exhaust Silencer Room (Fire Zone 1-D-3-DGA-ES) by a two-hour fire rated enclosure with a certified one-and-a-half hour B label type fire rated door for personnel safety.

4. **Combustible Loading**

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Areas: 1-D-DGA or 1-D-DGB, Diesel Generator 1A-SA or 1B-SB			
Floor Area: 8,900 sq. ft.			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Instrumentation	0	0	0
3 Liquids: Lube oil (gal)	450	48,600	5,500
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	710
3	Total	54,600	6,210

Fire Zones: 1-D-DGA-RM or 1-D-1-DGB-Rm, Diesel Generator Room 1A or 1B (Elevation 261 ft.)

Floor Area: 2,300 sq. ft.

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids: Lube oil (gal.)	450	48,600	21,000
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	3,000
	Total	54,600	24,000

Fire Zones: 1-D-1-DGA-ASU or 1-D-1-DGB-ASU, Diesel Generator 1A or 1B Air Starting Units (Elevation 261 ft.)

Floor Area: 1,300 sq. ft.

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids: (integral with equipment)	0	0	0
Solids:	0	0	0
Transient: oil (gal.)	55	6,000	5,000
	Total	6,000	5,000

Fire Zones: 1-D-DGA-ER or 1-D-1-DGB-ER, Diesel Generator Room 1A or 1B Electrical Room (Elevation 261 ft.)

Floor Area: 400 sq. ft.

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids: (integral with equipment)	0	0	0
Solids:	0	0	0
Transient (negligible)	0	0	0
	Total	0	0

Fire Zones: 1-D-2-DGA-HVD or 1-D-2-DGB-HVD, Diesel Generator 1A or 1B H&V Duct Area (Elevation 280 ft.)

Floor Area: 1,300 sq. ft.

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
	Total	0	0

Fire Zones: 1-D-3-DGA-ES or 1-D-3-DGB-ES, Diesel Generator 1A or 1B Exhaust Silencer Room (Elevation 292 ft.)

Floor Area: 1,900 sq. ft.

Cable Insulation			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
	Total	0	0

Fire Zones: 1-D-3-DGA-HVR or 1-D-3-DGB-HVR, Diesel Generator 1A or 1B H&V (Elevation 292 ft.)

Floor Area: 1,700 sq. ft.

Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient (negligible)	0	0	0
	Total	0	0

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at all floors and at rated fire barrier walls. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC duct work penetrations through fire-barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies.

Equipment containing combustible liquids is enclosed within curbs and retaining walls as indicated on the drawings to limit the spread of anticipated oil releases, to retain the released oil from the diesel lube oil system and to route the releases to the diesel generator room sump from where it is pumped to the oil disposal system. Curbs, retaining walls and watertight doors prevent spread of combustible liquid releases between fire zones, beyond or into the fire area. Full height structural barriers with a fire rating of three-hours are provided between redundant adjacent safety related diesel generators 1A-SA and 1B-SB, day tank areas 1-D-DTA and 1-D-DTB. 15

Based on the smoke removal rate recommended for the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for these areas at a rate of approximately 0.18 cfm/sq. ft. Smoke, heat and products of incomplete combustible are removed by the ventilation system for this area:

Supply: By transfer
AH-85 (1A-SA, 1B-SA)

Exhaust: E61(1A-SA, 1B-SA)
E86(1A-SA, 1B-SA)

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Fire Zone: 1-D-1-DGA-RM, Diesel Generator Room 1A				
Normal Operating Condition:				
Exhaust: E-61				
(1A-SA)	3	Operating	2,100	0.9

Function	Safety Class	Mode	Flow (cfm)	cfm/sq. ft.)
(1B-SA)	3	Standby	2,100	0.9
Emergency Operation Condition				
Exhaust: E-86				
(1A-SA)	3	Operating	51,000	22
(1B-SA)	3	Operating	51,000	22

Fire Zones: 1-D-1-DGA-ASU and 1-D-2-DGA-HVD, Diesel Generator 1A, Air Starting Units and H&V Duct Area

Function	Safety Class	Mode	Flow (cfm)	cfm/sq. ft.)
Normal Operation				
Exhaust: E-61				
(1A-SA)	3	Operating	2,000	1.6
Exhaust: E-61				
(1B-SA)	3	Standby	2,000	1.6
Emergency Operation				
Exhaust: E-86				
(1A-SA)	3	Operating	6,000	4.6
Exhaust: E-86				
(1B-SA)	3	Standby	6,000	4.6

Fire Zone: 1-D-1-DGA-ER, Diesel Generator 1A Electrical Room

Function	Safety Class	Mode	Flow (cfm)	cfm/sq. ft.)
Normal & Emergency				
Recirculating:				
(AH-85 (1B-SA)	3	Operating	12,000	30
Recirculating:				
(AH-85 (1B-SA)	3	Standby	12,000	30

Function	Safety Class	Mode	Flow (cfm)	cfm/sq. ft.)
Fire Zones: 1-D-3-DGA-ES and 1-D-3-DGA-HVR, Diesel Generator 1A, Exhaust Silencer and H&V Rooms				
Normal Operation				
Exhaust: E-61				
(1A-SA)	3	Operating	1,100	0.6
Exhaust: E-61				
(1B-SA)	3	Standby	1,100	0.6
Emergency Operation				
Exhaust: E-61				
(1A-SA)	3	Operating	5,200	2.8
Exhaust: E-61				
(1B-SA)	3	Standby	5,200	2.8
Fire Zone: 1-D-1-DGB-RM, Diesel Generator Room 1B				1
Normal Operating Condition:				
Exhaust: E-61				
(1C-SB)	3	Operating	2,100	0.9
Exhaust: E-61				
(1D-SB)	3	Standby	2,100	0.9
Emergency Operating Condition				
Exhaust: E-86				
(1C-SB)	3	Operating	51,000	22
Exhaust: E-86				
(1D-SB)	3	Operating	51,000	22

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Fire Zone: 1-D-1-DGB-ASU, & 1-D-1-DGB-HVD, Diesel Generator 1B, Air Starting Units and H&V Duct Area				
Normal Operation				
Exhaust: E-61				
(1C-SB)	3	Operating	2,000	1.6
Exhaust: E-61				
(1D-SB)	3	Standby	2,000	1.6
Emergency Operation:				
Exhaust: E-86				
(1C-SB)	3	Operating	6,000	4.6
Exhaust: E-86				
(1D-SB)	3	Standby	6,000	4.6
Fire Zone: 1-D-1-DGB-ER, Diesel Generator 1B, Electrical Room				
Normal and Emergency Operations:				
Recirculating:				
AH-85 (1C-SB)	3	Operating	12,000	30
Recirculating:				
AH-85 (1D-SB)	3	Standby	12,000	30
Fire Zone: 1-D-3-DGB-ES and 1-D-3-DGB-HVR, Diesel Generator 1B, Exhaust Silencer and H&V Room				
Normal Operation:				
Exhaust: E-61				
(1C-SB)	3	Operating	1,100	0.6
Exhaust: E-61				
(1D-SB)	3	Standby	1,100	0.6

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Emergency Operation:				
Exhaust: E-61				
(1C-SB)	3	Operating	5,200	2.8
Exhaust: E-61				
(1D-SB)	3	Standby	5,200	2.8

There are no radioactive sources in these areas.

6. Fire Detection

Types of detection, actuation and signaling systems and their functions provided for this fire area are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-D-1-DGA-RM and 1-D-1-DGB-RM	1-86-1 1-89-1	Thermal	Area	X	X	X	X	X	X
		Flame (UV)	Area	X	X	X	No	X	X
		Manual	Area	X	X	X	X	X	X
1-D1-DGA-ASU and 1-D-1-DGB-ASU	1-86-2 1-89-2	Thermal	Equipment	X	X	X	No	X	X
1-D-3-DGA-ES and 1-D-3-DGB-ES	1-86-3 1-89-3	Flame (UV)	Area	X	X	X	No	X	X
1-D-1-DGA-ER and 1-D-1-DGB-ER	1-88 1-91	Smoke (Ionization)	Area	X	X	X	No	X	X

* The local fire detection control panel servicing fire areas in the Diesel Generator Building is located in the access corridor of the building, adjacent to the areas. 15

** Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel. Furthermore, for a fire condition, an audible alarm sounds at the fire area/zone location.

7. Access and Initial Response

Access to each fire area is provided from the building access corridor, Elevation 261 ft., adjacent to the areas and communicating with the yard. Manual fire fighting capability is provided by carbon dioxide and dry chemical type notable extinguishers located in these areas. Hose stations have been provided adjacent to these fire areas, located in the access corridor of the building.

8. Fire Suppression System

The fire suppression system provided for each area is on automatic multi-cycle sprinkler system hydraulically designed to provide a density of 0.3 gpm/sq. ft. for Diesel Generator Room (Fire Zone: 1-D-1-DGA-RM or 1-D-1-DGB-RM, respectively). The system is actuated automatically by thermal detectors located also at the ceiling level when the area temperature reaches 200 F. The sprinkler heads open when area temperature reaches 225 F. This system water flow is shut off automatically from the control valve when the area temperature drops below 200 F. The multi-cycle control valve for each area is located in the access corridor adjacent to the respective fire area (Figure 9.5A-21). Manual actuation of the system is provided from the multi-cycle control valve emergency mechanical release. Remote manual actuation of the multi-cycle system is provided from the dual action manual alarm station located in the access corridor, adjacent to the entrance to the respective fire area. Electrical supervision of each suppression system includes control valve position, system valve position, supervisory air pressure and lack of water flow through the control valve. Sprinkler system piping is seismically supported.

Plant equipment subject to water damage is protected with watertight enclosures and/or pedestals. Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines on Elevation 261 ft. is minimized by the provision of adequate floor drainage to the diesel generator sump. A 6 inch curb is provided at the access door to the electrical equipment room (fire zones 1-D-1-DGA-ER and 1-D-1-DGB-ER) and the electrical equipment is installed on four in. pedestals to prevent their flooding. Curbs six in. high are provided at the access doors to each diesel generator room and to the access corridor. Watertight doors and three ft. retaining walls are provided at the access to the fuel oil day tanks (fire areas 1-D-DTA and 1-D-DTB) and diesel generator rooms (fire zones 1-D-1-DGA-RM and 1-D-1-DGB-RM). Water can overflow into the corridor to adjacent areas and out into the yard.

9. Analysis of Effects of Postulated Fires

In Fire Areas 1-D-DGA and 1-D-DGB, fire hazard combustibles include cable insulation in conduit, connection boxes, cable insulation within control cabinets, panels, MCC, and limited quantities of lubricating oils contained within the diesel generator lube oil system. Transient materials, such as lubricating oil, wood, and rags may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is reduced or minimized:

- by the use of IEEE 383 qualified cables.

- by limiting the continued spread of fire by enclosing cables in metallic conduit.

- by providing fire-stops at fire barrier penetrations, to maintain the integrity of the fire barrier.

- by the controlled removal of released combustible liquids through collection in area sumps and pump out to the oil disposal systems.

- by controlling the introduction of transient combustibles through administrative procedures, to limit quantities to those required for immediate needs and to prescribe supplemental fire protection measures during such exposure periods.

The extent of damage within or beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems, by three hour fire-rated barriers enclosing the fire areas and separating the fire zones within the areas.

The fire postulated for each of these areas may occur in the Fire Zones: 1-D-1-DGA-RM or 1-D-1-DGB-RM, which contain the diesel generator units. Ignition is assumed and subsequent development into the most severe single fire reasonably expected in the area, of localized concentrations of combustible liquids released from the diesel engine lubricating oil system or oil lines with resultant spill over adjacent area and impingement on nearby equipment.

The potential maximum propagation of the postulated fire will be reduced by
early detection using flame scanning (ultraviolet) type detectors installed
at strategic locations in each Diesel Generator Room, Fire Zones: 1-D-1-DGA-RM
or 1-D-1-DGB-RM. The automatic detection system senses the flame-stage fire
and alerts employees both locally and in the Control Room, so that manual fire 15
response can be initiated promptly.

Ready access is provided to the area through the building access corridor, (as detailed under Item 7), from the yard facilitating initial use of area fire extinguishers on incipient fires and supplemental use of hoselines on developing fires, by employees responding to the fire. Prompt response by plant operators and fire brigade personnel will limit the fire damage significantly by confining it to the area of ignition.

Additional fire protection defense is provided by the automatic multi-cycle sprinkler system (as described under Item 8).

If the automatic multi-cycle fire suppression system has not actuated automatically, the postulated fire might:

- involve either of the diesel generators 1A-SA or 1B-SB from which the lubricating oil has been released

- damage contiguous associated piping, fittings, cabling in conduit and controls within the spill area of this oil

- expose HVAC equipment or exhaust silencer above to serious damage.

However, the automatic multi-cycle sprinkler system can be actuated manually by employees responding to the fire, either from the dual action manual fire alarm station located adjacent to the fire area entrance, or from the system control valve emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with very limited damage to exposed equipment.

Before the actuation of the automatic fire suppression system, early warning flame scanning detection system (ultraviolet detectors) will alarm a fire condition in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, thus reducing the fire spread. The postulated oil fire is not considered to have sufficient potential for spread to cause failure of redundant safety-related plant equipment and associated cabling and controls which are separated by three-hour rated fire barriers. Therefore, the capability of the plant for safe shutdown is not impaired by a fire in any of the Diesel Generator Fire Area.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment, both safety-and non-safety related, shown on the plant general arrangement drawings for this fire area, listed by fire zones.

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 1-D-1-DGA-RM, Diesel Generator Room 1A								
- Diesel Generator	1A-SA	X		X				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
-Diesel Generator Lube Oil Equipment Area	1A-SA	X		X				
-Jacket Water Cooler	1A-SA	X		X				
-Neutral Grounding Transformer	1A-SA	X		X				
-Lube Oil Heat Exchanger	1A-SA	X		X				
-Air Intake Manifold	1A-SA	X		X				
Fire Zone: 1-D-1-DGA-ER, Diesel Generator 1A-SA Electrical Room								
-Generator Control Panel	1A-SA	X		X				
-MCC	1A-SA	X		X				
-Engine Control	1A-SA	X		X				
-DC Panel	1A-SA	X		X				

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 1-D-1-DGA-ASU, Diesel Generator 1A-SA Air Starting Units Area								
-Air Start-ing Unit	1A-SA	X		X				
-Air Start ing Tanks (2)	1A-SA	X		X				
Fire Zone: 1-D-2-DGA-HVD, Diesel Generator 1A-SA H&V Duct Area								
-Exhaust Fans (2)	E-86 (1A-SA)	X		X				
	E-86 (1B-SA)	X		X				
Fire Zone: 1-D-3-DGA-ES, Diesel Generator 1A-SA Exhaust Silencer Room								
-Exhaust Silencer	1A-SA	X		X				
Fire Zone: 1-D-3-DGA-HVR, Diesel Generator 1A-SA H&V Room								
-Exhaust Fans (2)	1A-SA	X		X				
-Air Hand-ling Units (2)	1A-SA	X		X				
-Air In-take Fil-ters (2)	1A-SA	X		X				

Equipment		Safety Related		Redundant Counterpart Separation				
				Barriers or Enclosures				
Name or Description	ID No. & Safety Div.	Yes	No	3 hr.	Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 1-D-1-DGB-RM, Diesel Generator Room 1B-SB								
-Diesel Generator	1B-SB	X		X				
-Diesel Generator Equipment Area	1B-SB	X		X				
-Jacket Water Cooler	1B-SB	X		X				
-Neutral Grounding Trans- former	1B-SB	X		X				
-Lube Oil Heat Ex- changer	1B-SB	X		X				
-Air Intake Manifold	1B-SB	X		X				
Fire Zone: 1-D-1-DGB-ER, Diesel Generator 1B-SB Electrical Room								
-Generator Control Panel	1B-SB	X		X				
-MCC	1B-SB	X		X				
-Engine Control	1B-SB	X		X				
-DC Panel	1B-SB	X		X				

Equipment: Name or Description	Equipment: ID No. & Safety Div.	Safety Related: Yes	Safety Related: No	Redundant Counterpart Separation: Barriers or Enclosures 3 hr.	Redundant Counterpart Separation: Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Zone: 1-D-1-DGB-ASU, Diesel Generator 1B-SB Starting Units Area								
-Air Starting Unit	1B-SB	X		X				
-Air Starting Tanks (2)	1B-SB	X		X				
Fire Zone: 1-D-2-DGB-HVD, Diesel Generator 1B-SB H&V Duct Area								
-Exhaust Fans (2)	E-86 (1C-SB)	X						
	E-86 (1D-SB)	X						
Fire Zone: 1-D-3-DGB-ES, Diesel Generator 1B-SB Exhaust Silencer Room								
-Exhaust Silencer	(1B-SB)	X				X	X	
Fire Zone: 1-D-3-DGB-HVR, Diesel Generator 1B-SB H&V Room								
-Exhaust Fans (2)	1B-SB		X			X	X	
-Air Handling Units (2)	1B-SB		X			X	X	
-Air Intake Filters (2)	1B-SB		X			X	X	

APPENDIX 9.5A.18

1. Identification

Fire Areas: 1-D-DTA and 1-D-DTB

Building: Diesel Generator | 15
Fire Areas: 1-D-DTA, Diesel Generator Fuel Oil Day Tank 1A Enclosure
1-D-DTB, Diesel Generator Fuel Oil Day Tank 1B Enclosure

Shown on Figures: 9.5A-21, 9.5A-22

Length (ft.): 12 Width (ft.): 12 Height (ft.): 29

Area (sq. ft.): 144 Volume (cu. ft.): 4,200

2. Occupancy

Each area contains the diesel generator fuel oil day tank 1A-SA and 1B-SB respectively, piping in a pipe chase and tank access ladder.

3. Boundaries

Walls, floors and ceilings are of reinforced concrete construction, with a fire rating minimum of three hours. One wall opening is provided for each area for personnel access, protected by a watertight, three-hour A label type fire rated door, three ft. above the floor level to allow for a three ft. high retaining wall capable of containing approximately 110 percent of the tank volume.

There are no concealed spaces or floor trenches. A 12 in. x 12 in. air intake opening is provided in the West wall of the fire area (Elevation 303 ft.), protected by a three-hour rated automatic fusible link fire damper.

4. Combustible Loading

Combustible	Quantity Gal/lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Areas: 1-D-DTA and 1-D-DTB, Diesel Generator Fuel Oil Day Tank (1A-SA and 1B-SB) Enclosure			
Cable Insulation (in conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids: diesel oil (gal.)	3,000	324,000	2,250,000
Solids	0	0	0

Combustible	Quantity Gal/lb/RF	BTU in 1000's	BTU/ sq. ft.
Transient: (negligible)	0	0	0
	Total	324,000	2,250,000

5. Control of Hazards

Electrical penetrations are sealed with three hour-rated fire stops at the rated fire barriers. Mechanical piping penetrations through fire barriers are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC exhaust ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies.

Each diesel fuel oil day tank, containing diesel oil is located within an enclosure provided with a three ft. retaining wall (capable of retaining approximately 110 percent of the tank volume). A watertight door is also provided to prevent spread of combustible liquids releases beyond the fire area, when the floor drain valve, located in the valve pit adjacent to this area (Fire Zone 1-D-1-DGA-ASU or 1-D-1-DGB-ASU) remains closed, in its normal operating position. After the valve is manually opened the drainage flows by gravity into the Diesel Generator Room (Fire Zone 1-D-1-DGA-RM or 1-D-1-DGB-RM) sump from where it is pumped to the oil disposal system.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Room, 1.5 cfm/sq. ft. comparable smoke removal would be achieved for each of these areas by a rate of approximately 17 cfm/sq. ft. Smoke, heat and products of incomplete combustion are removed by the ventilation system for this area:

Supply: By transfer air from access corridor. Exhaust: E-61(1A-SA)
(1-D-DTA) E-61(1B-SA)
Exhaust: E-61(1C-SB)
(1-D-DTB) E-61(1D-SB)

Function	Safety Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Exhaust	3	Operating	1,100	8
Exhaust	3	Standby	1,100	8
Exhaust	3	Operating	1,100	8
Exhaust	3	Standby	1,100	8

There are no radioactive sources in this area.

6. Fire Detection

The detection and actuation system provided and its functions for this fire area are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-D-DGA-TK	1-87	Thermal	Area	X	X	X	X	X	X
1-D-DGB-TK	1-90	Thermal	Area	X	X	X	X	X	X

* The local fire detection control panel covering all fire areas is located in the access corridor of the Diesel Generator Building. 15

** Local alarm and annunciation of fire or trouble conditions, both visual and audible, are provided for each area/detection zone at the local control panel and for a fire condition, an audible alarm sounds at the fire area.

7. Access and Initial Response

Access to each area 1-D-DTA and 1-D-DTB is provided through a watertight fire door, from the adjacent fire area 1-D-DGA, Fire Zone 1-D-1-DGA-ASU and 1-D-DGB, Fire Zone 1-D-DGB-ASU, respectively, which in turn are accessible from the building access corridor.

Manual fire fighting capability is provided by portable fire extinguishers of dry chemical and carbon dioxide type, loacted in the adjacet fire areas 1-D-DGA and 1-D-DGB backed up hose stations located in the building access corridor.

Access to these areas will be gained only if the fire has been determined to be small and that opening of the fire door to the area will not cause spread of flames, oil or water to the 1-D-1-DGA-ASU and 1-D-1-DGB-ASU fire zones; which are part of adjacent fire areas 1-D-DGA and 1-D-DGB. Control of larger fires will be by operation of suppression systems installed in the tank areas.

8. Fire Suppression System

The automatic fire suppression system provided in this area is an automatic multi-cycle sprinkler system, designed hydraulically to provide area density of 0.3 gpm/sq. ft. The system is actuated automatically by thermal detectors located also at the ceiling level when the area temperature reaches 200 F. The sprinkler heads open when the temperature reaches 225 F. The system water flow is shut off automatically from the control valve while the area temperature drops below 220 F. The multi-cycle control valve for the system is located in the building access corridor. Manual actuation is provided from the multi-cycle control valve emergency manual release. Remote manual actuation is available from a dual action manual fire alarm station, located adjacent to access door to fire area 1-D-DGA or 1-D-DGB respectively. Electrical supervision of the multi-cycle system includes control valve position, system valve position, supervisory air pressure and lack of water flow, through the control valve. Sprinkler system piping is seismically supported.

This fire area is contained within a watertight cubicle. The water discharged from the sprinkler system and hose lines is drained after a fire to the Diesel Generator sump through a normally closed valved connection located outside the fire area. Excess water cannot overflow to adjacent areas, due to the presence of a retaining wall and watertight door.

9. Analysis of Effects of Postulated Fire

In Fire Areas 1-D-DTA and 1-D-DTB the diesel generator fuel oil day tank 1A-SA and 1B-SB respectively area fire hazard combustible includes the 3,000 gal. of diesel oil contained in each of the diesel generator day tanks. Transient materials are not anticipated to be present in the area. However, minimal amounts of transient materials, such as rags, wood and solvents may be brought into the area for normal maintenance and repair.

The quantity of combustible materials which may be involved in area fires, and consequently, the magnitude of these fires and the resultant damage to plant facilities, is minimized:

- by the confinement of released combustible liquids within three hours fire rated barriers provided around the day tank.

- by controlling the introduction of transient combustibles through administrative procedures, to limit quantities to those required for immediate needs and to prescribe supplemental fire protection measures during such exposure periods.

- by limiting exposed oil surfaces so that only a thin upper layer of oil is involved in a fire.

The extent of damage within the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation system which becomes a smoke purge system after the automatic closing of the fire damper on the air intake opening and by fire-rated barriers enclosing the fire areas.

The fire postulated for each of these areas assumed ignition, and development into the most severe single fire expected in each area, of localized concentrations of diesel oil released from either diesel generator fuel oil day tank (1A-SA) or (1B-SB) respectively.

The potential maximum propagation of the postulated fire will be reduced by prompt detection of the fire through the automatic thermal detection system installed at the ceiling of the enclosure on an area basis, which senses the heat generated by the fire. When the temperature reaches 200 F, the multi-cycle sprinkler valve is actuated, the piping system is filled with
15 water, fire alarms are transmitted to the Control Room via the

Communications Room, to the local fire detection control panel, and locally to the fire area. The sprinkler heads are opened when the temperature reaches 225 F. The multi-cycle valve is shut off automatically after all thermal detectors indicate that the fire is out (all detectors cease to sense heat, the temperature falls below 200 F). Thus damage will be limited to the immediate area of inception only, with limited damage to exposed equipment.

If the multi-cycle sprinkler system has not actuated automatically, the postulated fire might involve the diesel generator fuel oil day tank from which the diesel oil has been released (1A-SA or 1B-SB) and damage contiguous associated piping, fittings, cabling and controls within the spill area.

However, the automatic multi-cycle sprinkler system can be actuated manually from either the system control valve, or the manual dual action fire alarm station located in the access corridor thus reducing the potential fire consequences described above.

Even without actuation of the multi-cycle sprinkler system in the area, the oil fire will be sensed by the thermal fire detection system which will alarm fire (high temperature) and trouble (lack of water) conditions in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire-fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above, limiting the resultant fire damage and reducing the potential for the fire spread. The postulated oil fire is not considered to have sufficient potential for spread to cause failure of redundant safety related cable trays, plant equipment and associated cabling and controls, which are separated by three-hour rated fire barriers.

Therefore, the capability of the plant for safe shutdown is not impaired by an oil fire in a diesel generator fuel oil day tank.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment both safety and non-safety related, shown on the plant general arrangement drawings for this area:

Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation					
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Resid. Heat Fire Areas:	1-D-DTA and 1-D-DTB, Diesel Generator Day Tank 1A and 1B Enclosure (Respectively)							
Diesel Fuel Oil Day Tank	1A-SA and 1B-SB	X		X				

Equipment		Safety Related		Redundant Counterpart Separation			
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr. Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating
Ladder	NNS		X	N/A			
Pipe Chase	NNS		X	N/A			

APPENDIX 9.5A.19

1. Identification   Fire Areas: 1-0-PA and 1-0-PB 15

Building: Diesel Oil Storage Area

Fire Areas: 1-0-PA, Diesel Oil Pump Room 1A Elevation 242.25 ft.
1-0-PB, Diesel Oil Pump Room 1B Elevation 242.25 ft.

Shown on Figure: 9.5A-23

Length (ft.): 10.5   Width (ft.): 9   Height (ft.): 10.5

Area (sq. ft.): 95   Volume (cu. ft.): 1000

2. Occupancy

Each fire area contains the diesel fuel oil transfer pump 1A-SA and 1B-SB respectively, with associated piping, valves, fittings, the exhaust fan and duct, associated controls and wiring in conduit.

3. Boundaries

Walls, floor and roof are of reinforced concrete construction, with a fire rating of three hours. Wall openings for personnel access are protected by certified three-hour A label type fire rated doors. Wall openings for air makeup are protected by three-hour fire door dampers. Concealed spaces consist of catch basins, one for each pump room, approximately 2 ft. X 2 ft. in size.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Areas: 1-0-PA or 1-0-PB, Diesel Oil Pump Room 1A or 1B			
Cable Insulation (In Conduit)			
Power	0	0	0
Control	0	0	0
Instrumentation	0	0	0
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: oil(gal.)	55	6,000	63,000
Total		6,000	63,000

5. Control of Hazards

Electrical penetrations are sealed with three-hour rated fire stops at the rated fire barriers. Mechanical piping penetrations through fire barrier walls are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Automatic fusible like operated fire door dampers are provided within transfer openings. Catch basins provided in each area prevent spread of oil releases beyond the fire area. Structural three-hour rated barriers are provided between redundant adjacent safety-related equipment.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms, 1.5 cfm/sq. ft., comparable smoke removal would be achieved for these areas by a rate of approximately 0.5 cfm/sq. ft. Smoke, heat and products of incomplete combustion are removed by the normal ventilation system for these areas.

Supply: By Transfer   Exhaust: E-85(1A-SA) and (1B-SA)
E-85(1A-SB) and (1B-SB)

Function	Safety Class	Mode	Flow(cfm)	(cfm/sq.ft.)
Exhaust	3	Operating	1,300	13.7
Exhaust	3	Standby	1,300	13.7

There are radioactive sources in this area.

6. Fire Detection

The types of detection and actuation systems provided and their function for these fire areas are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
1-0-PA	1-92	Thermal	Area	X	X	X	X	X	X
		UV	Area	X	X	X	No	X	X
1-0-PB	1-93	Thermal	Area	X	X	X	X	X	X
		UV	Area	X	X	X	No	X	X

*The local fire detection control panel servicing fire areas 1-0-PA and 1-0-PB in the Diesel Oil Storage Area is located in the access stairway.

**Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each area/detection zone at the local control panel and an audible alarm sounds at the affected area.

7. Access and Initial Response

Access to this area is provided from the yard through access stairways and corridor. Carbon dioxide and dry chemical type extinguishers are provided in and adjacent to the area in accordance with NFPA 10. Yard hydrants and hoselines have been provided adjacent to this area.

8. Fire Suppression Systems

The fire suppression system provided in this area is an automatic multi-cycle sprinkler system, hydraulically designed to provide a density of 0.3 gpm/sq. ft. of floor area.

The system is actuated automatically by thermal detectors located at the ceiling level when the area temperature reaches 135 F. The sprinkler heads open when area temperature reaches 165 F. The system water flow is shut off automatically from the control valve when the area temperature drops below 135 F. The multi-cycle control valve for the system is located outside these fire areas, in the access corridor.

Manual actuation of the system is provided from each multi-cycle control valve emergency mechanical release.

Electrical supervision of each suppression system includes control valve position, system valve postion, supervisory air pressure and lack of water flow through the control valve. Sprinkler system piping is seismically supported.

Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of an adequate floor drainge system. This floor water surcharge is estimated to be insignificant. Runoff is directed to diesel fuel oil sump and then pumped to the yard oil separator.

9. Analysis of Effects of Postulated Fires

In Fire Area 1-O-PA or 1-O-PB the diesel fuel oil transfer pump 1A-SA or 1B-SB, area fire hazard combustibles include limited quantities of diesel oil contained within the transfer pumps, piping, valves and fittings. Transient materials such as rags, cleaning solvents and lubricating oil may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires and, consequently, the magnitude of these fires and the resultant damage to plant facilities is reduced or minimized:

- By use of IEEE 383 qualified cables.
- By limiting the spread of fire by the provision of metallic conduit and fire stops at fire barrier penetrations.
- By the confinement of released combustible liquids through provisions of drainage of released oil to diesel fuel oil sump and yard oil separator system.

- By controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond each fire area is further limited by the three-hour fire-rated barriers enclosing each transfer pump room.

The type of fire postulated in any of these areas is determined by the combustibles present in the areas and their concentrations. In the fuel oil transfer pump areas an oil fire is postulated, due to localized concentrations of diesel oil which may be released from one diesel fuel oil transfer pump, piping, valves or fittings and transient oil in the area.

The potential maximum propagation of the postulated fire will be reduced by early detection using flame scanning (ultraviolet) type detectors installed in each area at strategic locations. The automatic detection system senses the flame-stage fire and alerts employees both locally and in the Control Room
15 via the Communications Room, so that manual fire response can be initiated promptly.

Ready access is provided to each area from the yard through the building access corridor (as detailed in Item 7), facilitating initial use of area fire extinguishers on incipient fires and supplemental backup of yard hose lines on developing fires by employees responding to the fire.

Additional defense for each fire area is provided by the automatic multi-cycle sprinkler system (as described in Item 8).

If the automatic multi-cycle fire suppression system has not actuated automatically, the postulated fire might involve the diesel fuel oil pump 1A-SA or 1B-SB and equipment from which the fuel oil has been released, damage associated piping and fittings and HVAC equipment within the spill area of the diesel oil. However, the automatic multi-cycle sprinkler system can be actuated manually by employees responding to the fire from the system control valve emergency manual release, thus reducing the potential fire consequences described above. With prompt response by plant operators and fire brigade personnel, using portable fire extinguishers located in the fire area and yard hoselines from hydrants located in the yard adjacent to the building, the resultant fire damage in each area will be limited significantly and confined to the localized area of ignition.

Before the actuation of the automatic fire suppression system, early warning flame scanning detection system (ultraviolet detectors) will alarm a fire condition in the Control Room. The Control Room Operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, yard hoselines and/or manual actuation of the automatic fire suppression system, thus reducing the fire spread. The postulated oil fire is not considered to have sufficient potential for spread to cause failure of redundant safety related plant equipment and associated cabling and controls which are separated by three-hour rated fire barriers. Therefore, the capability of the plant for safe shutdown is not impaired by a fire in any of the Fuel Oil Transfer Pump Areas.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment, both safety and non-safety related, shown on the plant general arrangement drawings for these areas.

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Between	Fire Resist Constr.	Fire Retard Coating
Fire Area: 1-0-PA, Diesel Oil Pump Room 1A								
Diesel Fuel Oil Transfer Pump	1A-SA	X		X				
HVAC Fans	(1A-SA)(1B-SA)	X		X				
Fire Area 1-0-PB, Diesel Oil Pump Room 1B								
Diesel Fuel Oil Transfer Pump	1B-SB	X		X				
HVAC Fans	(1A-SB)(1B-SB)	X		X				

APPENDIX 9.5A.20

1. Identification Fire Areas: 12-0-TA and 12-0-TB

Building: Diesel Fuel Oil Storage Tank Area 15

Fire Areas: 12-0-TA, Diesel Fuel Oil Storage Tank 1A and 2A 15
12-0-TB, Diesel Fuel Oil Storage Tank 1B and 2B

Shown on Figure: 9.5A-23

Length (ft.): 66 Width (ft.): 21 Height (ft.): 18.5

Area (sq. ft.): 1,400 Volume (sq. ft.): 26,000

2. Occupancy

Each area consists of the Diesel Fuel Oil Storage Tank 1A and 1B, respectively. 15

3. Boundaries

Diesel fuel oil storage tanks are buried and of Seismic Category I construction, which is considered to be equivalent to a fire rating of three hours.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 12-0-TA or 12-0-TB			
Cable Insulation			
Power (In conduit)	0	0	0
Control (In conduit)	0	0	0
Instrumentation (In conduit)	0	0	0
Liquids: oil(gal.)	175,000	18,900,000	13,500,000
Solids:	0	0	0
Transient:	0	0	0
	TOTAL	18,900,000	13,500,000

5. Control of Hazards

Mechanical piping penetrations through fire barriers are sealed with flexible or semi-rigid fire stop assemblies. There are no electrical or HVAC penetrations.

5. Control of Hazards (Cont'd)

Natural ventilation around tank vents and hatch closures is provided which is adequate for smoke control. Flame arrestors are installed to prevent spread of fire.

There are radioactive sources in these areas.

6. Fire Detection

Detection systems are not required for this area.

7. Access and Initial Response

Access to this area is provided from the yard. Dry chemical portable fire extinguishers are provided adjacent to the area. Hose lines from yard hydrants located adjacent to the area can be used as backup.

8. Fire Suppression Systems

There are no automatic suppression systems provided to protect these areas.

9. Analysis of Effects of Postulated Fires

15 In fire area 12-0-TA or 12-0-TB, the diesel fuel oil storage tank 1A&2A or 1B&2B, area fire hazard combustible is the diesel oil contained inside each tank. Transient materials are not anticipated to be present in the area.

The extent of damage beyond the fire area is limited by the tank construction, equivalent to three-hour fire barriers. as well as installation-buried underground.

The fire postulated for each area assumes ignition and subsequent development into the most severe single fire, expected in these areas is the diesel fuel oil contained in each tank. With prompt response by plant operators and fire brigade personnel using portable fire extinguishers and hose lines from the yard hydrants for cooling and control, the resultant fire damage in each area will be limited to the area of ignition.

Even with the loss of a diesel fuel oil storage tank, the capability of the plant for a safe shutdown is not impaired by the postulated oil fire due to the tank construction and installation underground, which will contain the fire to the area of inception. The redundant diesel fuel oil storage tank will be available for the plant safe shutdown.

10. Fire Area Equipment

Listed below is the equipment present in this area.

Equipment		Safety Related		Redundant	Counterpart	Separation			
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Barriers or Enclosures Less	Space Be-tween	Fire Resist Constr.	Fire Retard Coating	
Fire Area: 12-0-TA, Diesel Fuel Oil Storage Tank 1A									15
Diesel Fuel Oil Storage Tank 1A	3	X		X					15
Fire Area: 12-0-TB, Diesel Fuel Oil Storage Tank 1B									15
Diesel Fuel Oil Storage Tank 1B	3	X		X					15

APPENDIX 9.5A.21

1. **Identification** Fire Areas: 12-I-ESWPA and 12-I-ESWPB

Building: Intake Structure

Fire Areas: 12-I-ESWPA, Emergency Service Water Pumps 1A, Elevation 262 ft. 15

12-I-ESWPB, Emergency Service Water Pumps 1B, Elevation 262 ft.

Shown on Figure: 9.5A-40

Length (ft.): 85 Width (ft.): 24 Height (ft.): 16

Area (sq. ft.): 2,100 Volume (cu. ft.): 34,000

2. **Occupancy**

Each area contains the emergency service water pumps, 1A-SA and 1B-SB, 15
respectively, associated piping and valves motor control centers, switchgear, cables in conduit and controls.

3. **Boundaries**

Walls, floor, roof and structural columns supporting the area boundaries are of reinforced concrete construction with a fire rating of three hours. Wall openings that allow access of personnel from outside the areas are protected by security doors, which are considered to have an equivalent of three hour fire rating based on the special separation from other structures and limited fire loading inside the fire area. Wall openings for personnel access witnin the areas are not protected.

4. **Combustible Loading**

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 12-I-ESWPA or 12-I-ESWPB			
Cable Insulation:			
Power (In Conduit)	0	0	0
Control (In Conduit)	0	0	0
Instrumentation (In Conduit)	0	0	0
Liquids: Oil (gal.)	82.5	9,280	4,500
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	3,000
TOTAL		15,280	7,500

5. Control of Hazards

Mechanical piping penetrations are anchored or sealed with flexible or semi-rigid fire stop assemblies. Electrical penetrations are sealed with three hour fire stops at rated fire barriers. There are no HVAC penetrations.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for these areas by a rate of approximately 0.02 cfm/sq. ft.

A once through ventilation system is provided for the pump and MCC rooms which can be used to remove smoke and products of incomplete combustion:

15 a) Pump Room 1A

Floor Area: 1,600 sq.ft.

Supply: Louvers: L-105(1A-NNS) Exhaust: E-88(1A-SA)

15

15 b) Pump Room 1B

Floor Area: 1,600 sq. ft.

Supply: Louvers: L-105(1B-NNS) Exhaust: E-88(1B-SB)

15

Function	Safety Class	Mode	Flow(cfm)	(cfm/sq. ft.)
Supply	NNS	Operating	11,750	7.3
Exhaust	3	Operating	11,750	7.3
Exhaust	3	Standby	11,750	7.3

15 c) Electrical Equipment Room 1A

Floor Area: 500 sq. ft.

Supply: AH-86(1A-SA) Exhaust: Louvers: L-109(1A-NNS)

15

d) Electrical Equipment Room 1B

Floor Area: 500 sq. ft.

Supply: AH-86(1B-SB) Exhaust: Louvers: L-109(1B-NNS)

15

Function	Safety Class	Mode	Flow(cfm)	(cfm/sq. ft.)
Supply	3	Operating	9,500 max.	19
Supply	3	Standby	9,500 max.	19
Exhaust	NNS	Operating	9,500 max.	19

There are no radioactive sources in this area.

6. Fire Detection

Detection systems are not provided in this area.

7. Access and Initial Response

Access to this area is provided from the yard provided in each area in accordance with NFPA 10. Hose lines from yard hydrants located adjacent to the area can be used as backup for fire fighting.

8. Fire Suppression Systems

There are no automatic suppression systems provided to protect this area.

9. Analysis of Effects of Postulated Fires

In fire area 12-I-ESWPA or 12-I-ESWPB, Emergency Service Water Pumps 1A, or 15
1B, fire hazard combustibles consist of lubricating oil, 41.25 gal. per
pump contained within each emergency service water pump.

All cables are IEEE-383 qualified and enclosed in metallic conduit and as such are not considered fire hazards.

Transient combustibles such as oil in a 55 gal. drum, rags, wood, etc., may be brought into the area for repairs or maintenance.

15

The extent of damage beyond the fire is limited by the three hour fire rated barriers enclosing the fire area.

The oil postulated for this area assumes ignition and subsequent development
into the most severe single fire expected in the area, of the lube oil
contained in the pump lube oil system and/or transient lube oil from a 55
gal. drum. With prompt response by plant operators and fire brigade personnel
using portable fire extinguishers and hose lines from the yard hydrants for
cooling and control, the resultant fire damage in the area will be limited and
confined to the area of ignition. In the event that a fire damages the
safety train A emergency service water pump (1A-SA), the redundant safety 15
train B pump (1B-SB) will remain functional due to the separation of the fire
areas by three hour fire barriers.

The capability of the plant for safe shutdown is therefore not impaired by a fire in this area.

10. Fire Area Equipment

Listed below is the mechanical and electrical equipment both safety- and non-safety related shown on the plant general arrangement drawings for this area.

Note: N/A = Not Applicable

Equipment		Safety Related		Redundant Counterpart Separation				
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Between	Fire Resist Constr.	Fire Retard Coating
15 Fire Area: 12-I-ESWPA, Emergency Service Water Pump, 1A								
Emergency Service Water Pump 1A-SA	3	X		X				
15								
Discharge Emergency Service Water Screen Wash Pumps (2) PIA	NNS		X	N/A				
Motor Control Centers 1A32-SA	1E	X		X				
15 1-4A1011	NNS		X	N/A				
15 Electric Unit Heaters(4)								
15 EUH-59(1A-SA)	NNS		X	N/A				
EUH-60(1B-SB)	NNS		X	N/A				
15								
480V Switchgear (1-4A 101)	NNS		X	N/A				
Air Handling Unit AH-86(1A-SA)	3	X		X				
15								

Equipment		Safety Related		Redundant Counterpart Separation					
Name or Description	ID No. & Safety Div.	Yes	No	Barriers or Enclosures 3 hr.	Less	Space Be- tween	Fire Resist Constr.	Fire Retard Coating	
Fire Area: 12-I-ESWPA, Emergency Service Water Pumps, 1A									15
Fans (2) E-59	NNS		X	N/A					
Exhaust Fans									
E-88(1A-SA)	3	X		X					15
Fire Area: 12-I ESWPB, Emergency Service Water Pumps, 1B									15
Emergency Service Water Pump 1B-SB	3	X		X					15
Discharge Emergency Service Water Screen Wash Pumps(2) P1B	NNS		X	N/A					
Motor Control Centers 1B-32SB	1E	X		X					15
1-4B1011	NNS		X	N/A					
Exhaust Fans(2)									
E-88(1B-SB)	3	X		X					15
Air Handling Units (2)									15
AH-86(1B-SB)	3	X		X					
Electric Unit Heaters (4)									
EUH-59(1B-NNS)	NNS		X	N/A					15
EUH-60(1B-NNS)	NNS		X	N/A					
480V Switchgear (1-4B101)	NNS		X	N/A					15

APPENDIX 9.5A.22

1. Identification   Fire Area: 5-W-BAL   15

Building: Waste Processing

Fire Area: 5-W-BAL

Fire Zones: Detailed in Item 4

Shown on Figures: 9.5A-6, 9.5A-8, 9.5A-14, 9.5A-18, 9.5A-24 through -33.

Length (ft.): Variable   Width (ft.): Variable

Height (ft.): Variable   Area (sq. ft.): 231,500

Volume (cu. ft.): 3,500,000

2. Occupancy

The area contains various tanks, pumps, compressors, evaporators, laboratories, drumming areas, health physics facilities, offices, laundries, locker rooms, decontamination areas, computer room, HVAC equipment, demineralizers, miscellaneous equipment, associated controls, wiring in conduit and cable in trays.

3. Boundaries

Walls, floor, roof and structural columns supporting the area boundaries are of reinforced concrete construction, with a fire rating of three hours. Wall openings for personnel access are protected by certified three hour A Label type fire rated doors. Certified one and a half hour B Label type fire rated doors are provided at stair towers. Floor and roof openings for handling of equipment are protected either by metal or reinforced concrete covers.

Concealed spaces consist of suspended ceilings and are constructed of noncombustible materials. Other concealed spaces consist of valve galleries, pipe tunnels and pipe chases.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Area: 5-W-BAL, Waste Processing Building, all floors Total Floor Area: 231,500 sq. ft.			
Cable Insulation			
Power	9,825	1,702,500	7,400

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Control	14,695	2,313,500	10,100
Instrumentation	8,315	791,000	3,400
Liquids: Oil (gal.)	24	2,500	15
Solids: Charcoal (lb.)	44,500	445,000	2,000
Transients: Charcoal (lb.)	22,200	222,000	1,000
Oil (gal.)	55	6,000	30
15 Fiber drums (lb.)	1,160	9,000	55
TOTAL		5,491,500	24,000

15 Fire Zone: 5-W-1-WHTK1, Waste Holdup Tank, Elevation 211 ft.

Floor Area: 7000 sq. ft.

Cable Insulation			
Power	530	95,400	13,600
Control	680	107,000	15,300
Instrumentation	300	28,500	4,000
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		236,900	33,900

Fire Zone: 5-W-1-FDTK, Floor Drain Tanks, WPB Elevation 211 ft.

Floor Area: 10,400 sq. ft.

Cable Insulation			
Power	380	68,500	6,500
Control	200	31,500	3,000
Instrumentation	200	19,000	2,000
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	500
TOTAL		125,000	12,000

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	580	105,000	15,000
Control	550	86,000	12,500
Instrumentation	430	41,000	6,000
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		238,000	34,500

Fire Zone: 5-W-1-VG-1, Valve Gallery 1, Elevation 211 ft.

Floor Area: 7000 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	260	47,000	6,700
Control	430	67,500	9,700
Instrumentation	260	25,000	3,600
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		145,500	21,000

1

Fire Zone: 5-W-1-TKS, Miscellaneous Tanks, Elevation 211 ft.

Floor Area: 10,400 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	370	66,600	6,500
Control	910	143,000	13,800
Instrumentation	340	32,400	3,200
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		248,000	24,500

Fire Zone: 5-W-1-VG-2, Valve Gallery 2, Elevation 211 ft.

Floor Area: 7000 sq. ft.

15 Fire Zone: 5-W-1-HCHTK, High and Low Conductivity Holding Tanks, Elevation 216 ft.

Floor Area: 4100 sq. ft.

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	65	11,600	3,000
Control	65	10,200	2,500
Instrumentation	65	6,200	1,500
Liquids (negligible integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,500
TOTAL		34,000	8,500

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 5-W-1-SW, Secondary Waste, Elevation 216 ft.			
Floor Area: 3900 sq. ft.			
Cable Insulation			
Power	110	19,800	5,100
Control	110	17,300	4,400
Instrumentation	110	10,500	2,700
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient	55	6,000	1,500
TOTAL		53,600	13,700
Fire Zone: 5-W-2-TKS1, Gas Decay Tanks Elevation 236 ft.			
Floor Area: 5600 sq. ft.			
Cable Insulation			
Power	400	72,000	12,900
Control	630	98,900	17,800
Instrumentation	400	38,100	6,800
Liquids	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		215,000	38,500

15

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 5-W-2-HTR, Heaters, Elevation 236 ft.			
Floor Area: 5800 sq. ft.			
Cable Insulation			
Power	220	40,000	6,800
Control	220	34,500	6,000
Instrumentation	220	21,000	3,700
Liquids (negligible)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		101,500	17,500
Fire Zone: 5-W-2-EVAP, Waste Evaporator, Elevation 236 ft.			
Floor Area: 5800 sq. ft.			
Cable Insulation			
Power	370	66,500	11,500
Control	640	100,000	17,200
Instrumentation	480	45,500	7,800
Liquids (negligible)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		218,000	37,500
Fire Zone: 5-W-2-HVAC, HVAC Equipment, Elevation 236 ft.			
Floor Area: 5800 sq. ft.			
Cable Insulation			
Power	320	57,600	9,900
Control	660	104,000	17,900
Instrumentation	520	49,400	8,700
Liquid (minor, integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal)	55	6,000	1,000
TOTAL		217,000	37,500

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Fire Zone: 5-W-2-RPOR, Relay and Process Instrument Room, Elevation 236 ft.			
Floor Area: 1700 sq. ft.			
Cable Insulation			
Power	0	0	0
Control	1,160	182,000	107,000
Instrumentation	410	39,000	23,000
Liquids	0	0	0
Solids	0	0	0
Transient	0	0	0
TOTAL		221,000	130,000
Fire Zone: 5-W-2-TLHSTK, Treated Laundry and Hot Shower Tanks, Elevation 236 ft. (15)			
Floor Area: 5900 sq. ft.			
Cable Insulation			
Power	270	50,000	8,700
Control	380	60,000	10,000
Instrumentation	250	24,000	4,000
Liquids (negligible)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		140,000	23,700
Fire Zone: 5-W-2-LHSTK, Laundry and Hot Shower Tanks, Elevation 236 ft. (15)			
Floor Area: 5800 sq. ft.			
Cable Insulation			
Power	170	30,600	5,400
Control	170	26,700	4,600
Instrumentation	170	16,200	3,000
Liquids (minor, integral with equipment)	0	0	0
Solids	0	0	0

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Transient: Oil (gal.)		55	6,000	1,000
	TOTAL		79,500	14,000

Fire Zone: 5-W-2-CMPT, Computer Room, Elevation 236 ft.

Floor Area: 1700 sq. ft.

Cable Insulation				
Power (in conduit)		0	0	0
Control		630	98,000	58,000
Instrumentation		500	47,600	28,000
Liquids		0	0	0
Solids		0	0	0
Transient: (negligible)		0	0	0
	TOTAL		145,600	86,000

Fire Zone: 5-W-2-CR, Waste Processing Control Room and Cable Vault, Elevation 236 ft.

Floor Area: 2200 sq. ft.

Cable Insulation				
Power (in conduit)		0	0	0
Control		1,170	184,000	84,000
Instrumentation		430	41,000	18,500
Liquids		0	0	0
Solids		0	0	0
Transient (negligible)		0	0	0
	TOTAL		225,000	102,500

15 Fire Zone: 5-W-2-LCHTK-1, Low Conductivity Holding Tanks, Elevation 236 ft.

Floor Area: 3200 sq. ft.

Cable Insulation				
Power		150	27,000	8,500
Control		150	24,000	7,500
Instrumentation		150	14,500	4,500
Liquids		0	0	0

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,500
TOTAL		71,500	22,000

2

Fire Zone: 5-W-2-COND, Solid Waste Evaporator Distillate Condenser, Elevation 236 ft.

Floor Area: 2000 sq. ft.

Cable Insulation			
Power	190	34,000	17,000
Control	320	50,000	25,000
Instrumentation	300	28,500	14,500
Liquids	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	3,000
TOTAL		118,500	59,500

Fire Zone: 5-W-34-DRM, Drumming Area, Elevation 261 ft.

Floor Area: 11,800 sq. ft.

Cable Insulation			
Power	240	43,000	3,800
Control	240	37,900	3,300
Instrumentation	240	22,800	2,000

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Fiber drums (lb.)	600	4,800	400
TOTAL		108,500	9,500

Fire Zone: 5-W-3-STR, Storage Area, Elevation 261 ft.

Floor Area: 11,800 sq. ft.

Cable Insulation			
Power	700	126,300	10,900
Control	630	98,900	8,400
Instrumentation	340	32,300	2,700
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	500
1 TOTAL		263,500	22,500

Fire Zone: 5-W-340CWHE1, Waste Processing Building Cooling Water Heat Exchangers 1-4A, Elevation 261 ft.

Floor Area: 4700 sq. ft.

Cable Insulation			
Power	820	148,000	31,500
Control	260	40,800	8,700
Instrumentation	260	24,700	5,300
Liquids (negligible)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,500
TOTAL		219,500	47,000

Fire Zone: 5-W-34-CWHE-2, Waste Processing Building Cooling Water Heat Exchangers 1-4B, Elevation 261 ft.

1 Floor Area: 4,700 sq. ft.

Cable Insulation			
Power	870	157,000	33,400
Control	330	52,000	11,400
Instrumentation	330	31,400	6,700

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.	
Liquids (negligible)		0	0	0	
Solids		0	0	0	
Transient: Oil (gal.)		55	6,000	1,500	
	TOTAL		246,400	53,000	2

Fire Zone: 5-W-34-CWP, Waste Processing Building Cooling Water Pumps 1-4

Floor Area: 2900 sq. ft.

Cable Insulation					
Power		470	85,300	29,300	
Control		220	34,500	12,000	
Instrumentation		160	15,200	5,000	
Liquids (integral with equipment)		0	0	0	
Solids		0	0	0	
Transient: Oil (gal.)		55	6,000	2,000	
	TOTAL		141,000	48,300	2

Fire Zone: 5-W-4-SWG2, Switchgear Room 2, Elevation 276 ft.

Floor Area: 1900 sq. ft.

Cable Insulation				
Power		280	50,000	26,000
Control		250	39,000	21,000
Instrumentation (in conduit)		0	0	0
Liquids		0	0	0
Solids		0	0	0
Transient (negligible)		0	0	0
	TOTAL		89,000	47,000

Fire Zone: 5-W-4-SWG1, Switchgear Room 1, Elevation 276 ft.

Floor Area: 1300 sq. ft.

Cable Insulation			
Power	220	39,600	30,500
Control	220	35,000	27,000
Instrumentation (in conduit)	0	0	0

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids		0	0	0
Solids		0	0	0
Transient (negligible)		0	0	0
	TOTAL		74,600	57,300

Fire Zone: 5-W-4-WRK, Working Area, Elevation 276 ft.

Floor Area: 4500 sq. ft.

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation				
Power (in conduit)		0	0	0
Control		290	52,300	12,000
Instrumentation		70	6,700	1,500
Liquids		0	0	0
Solids		0	0	0
Transient (neglibible)		0	0	0
	TOTAL		59,000	13,500

Fire Zone: 5-W-5-HV, H & V Area, Elevation 291 ft.

Floor Area: 5900 sq. ft.

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation				
Power		110	19,800	3,400
Control		130	20,400	3,600
Instrumentation		80	7,600	2,300
Liquids		0	0	0
Solids: Charcoal (lb.)		11,100	111,000	18,900
Transient: Charcoal (lb.)		11,100	111,000	18,900
Fiber drums (lb.)		280	2,200	400
1	TOTAL		272,000	47,500

Fire Zone: 5-W-5-FAN, Miscellaneous Fans, Elevation 291 ft.

Floor Area: 5900 sq. ft.

Combustible		Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation				
Power		240	43,200	7,300
Control		400	62,900	10,600
Instrumentation		130	12,400	2,100

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (integral with equipment)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		124,500	21,000

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Fire Zone: 5-W-5-CHF, Charcoal Filter Room, Elevation 291 ft.

Floor Area: 5900 sq. ft.

Cable Insulation			
Power	250	45,000	7,600
Control	650	102,000	17,300
Instrumentation	250	23,000	4,000
Liquids (minor)	0	0	0
Solids: Charcoal (lb.)	33,400	334,000	56,800
Transient: Charcoal (lb.)	11,100	111,000	18,900
Fiber drums (lb.)	280	2,200	400
TOTAL		617,200	105,000

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Fire Zone: 5-W-CHL, Waste Processing Building Chillers, Elevation 291 ft.

Floor Area: 5900 sq. ft.

Cable Insulation			
Power	210	37,800	6,400
Control	410	64,400	11,100
Instrumentation	120	11,400	1,900
Liquids: Oil (gal.)	24	2,600	400
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		122,200	20,800

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Fire Zone: 5-W-5-SLD, Waste Solidification Area, Elevation 291 ft.

Floor Area: 5900 sq.ft.

Cable Insulation			
Power	190	34,400	5,900
Control	220	34,600	5,900
Instrumentation	190	18,000	3,200

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
Liquids (negligible)	0	0	0
Solids	0	0	0
Transient: Oil (gal.)	55	6,000	1,000
TOTAL		93,000	16,000

The amount of combustible materials accounted for the fire zones listed below are insignificant, and thus, their combustible loading is negligible. These fire zones are:

15 5-W-1-C1, Auxiliary Steam Condenser Tank and Pumps, Elevation 216 ft.

5-W-1-C2, Auxiliary Steam Condenser Tank and Pumps, Elevation 216 ft.

5-W-1-TK, HVAC Condensate Recirculation and Transfer Tank and Miscellaneous Pumps, Elevation 216 ft.

5-W-2-DMNZ, Secondary Waste Demineralizer, Elevation 236 ft.

5-W-3-MLR, Men's Locker Room, Elevation 261 ft.

5-W-34-IC, Instrumentation and Controls Shop, Elevation 261 ft.

5-W-4-LAL, Low Activity Lab, Elevation 276 ft.

5-W-4-HL, Hot Laboratory, Elevation 276 ft.

5-W-4-DRM, Drumming Area by Drum Filling Station, Elevation 276 ft.

5-W-5-FA, Future Volume Reduction System Area, Elevation 291 ft.

5. Control of Hazards

Electrical penetrations are sealed with three hour rated fire stops at all floors and at rated fire barriers. Mechanical piping penetrations though fire barrier walls are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barriers are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within safety related ducts.

Partial or full height, structural barriers, are provided in many cases between components within the area. Supplemental barriers, fire breaks and fire retardant coatings are provided as required.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.) comparable smoke removal would be achieved for this fire area by a rate of approximately 0.2 cfm/sq. ft.

Smoke, heat and products of incomplete combustion are removed by the ventilation system for this area:

Supply:	EAC-5 (1-4X-NNS)	Exhaust:	E-45 (1-4X-NNS)	
	EAC-6 (1-4X-NNS)		E-46 (1-4X-NNS)	From
			E-47 (1-4X-NNS)	Contaminated
			E-49 (1-4X-NNS)	Spaces
			E-83 (1-4X-NNS) (Standby)	
			E-59 (1-4A-NNS)	From
			R-7 (1-4A-NNS)	non-
			R-8 (1-4A-NNS)	contaminated
				Spaces

Note: The following areas have their own independent systems which have once-through capability:

1) Control Room and Cable Vault
2) Office and Laundry Areas
3) Laboratory Areas

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	NNS	Operating	92,000	0.8
Supply	NNS	Operating	92,000	0.8
Exhaust	NNS	Operating	32,700	0.7
Exhaust	NNS	Operating	32,700	0.7
Exhaust	NNS	Operating	32,700	0.7
Exhaust	NNS	Operating	32,700	0.7
Exhaust	NNS	Operating	25,000	0.11
Exhaust	NNS	Operating	24,400	0.11
Exhaust	NNS	Operating	24,400	0.11

Potential liquid borne radioactive releases from waste processing building equipment are contained by 6 in. curbs provided in areas where such releases are likely to occur, such as Waste Holdup Tanks, Floor Drain Tanks, Low and High Conductivity Holding Tanks, etc.

Potential air borne radioactive releases from equipment are absorbed by charcoal filters provided in the building ventilation system at Elevation 291 ft.

6. Fire Detection

The types of detection, actuation and signaling systems provided in this area and their functions are as follows:

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
5-W-1-WHTK2	1-101-1	Ionization	Area	X	X	X	No	X	X
5-W-1-FDTK	1-101-2	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-1-WHTR1	1-101-3	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-1-VG2	1-101-4	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-1-TKS	1-101-5	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-1VG1	1-101-6	Ionization	Area	X	X	X	No	X	X
5-W-1-LCHTK	1-102-1	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-1-SW	1-102-2	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
5-W-1-HCHTK	1-102-3	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-2-RPIR	1-103-1	Ionization	Area	X	X	X	No	X	X
5-W-2-CR	1-103-2	Ionization	Area	X	X	X	No	X	X
5-W-2-CMPT	1-103-3	Ionization	Area	X	X	X	No	X	X
5-W-2-LCHTK2	1-103-4	Ionization	Area	X	X	X	No	X	X
5-W-2-COND	1-103-5	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-2-LCHTK1	1-103-6	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-2-TKS1	1-103-6	Ionization	ARea	X	X	X	No	X	X
5-W-2-HTR	1-103-1	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-2-LHSTK	1-103-1	Ionization	Area	X	X	X	No	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
5-W-2-TLHSTK	1-103-1	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-2-TKS2	1-103-4	Ionization	Area	X	X	X	No	X	X
5-W-2-EVAP	1-103-3	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-2-HVAC	1-103-3	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-34-DRM	1-104-7	Ionization	ARea	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-34-CWHE1	1-104-1	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-34-CHP	1-104-2	Ionization	Area	X	X	X	No	X	X
5-W-34-CWHE2	1-104-3	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X
5-W-3-MLR	1-104-4	Thermal	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
5-W-3-STR	1-104-5	Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
	1-104-6	Thermal	Area	X	X	X	X	X	X
		Ionization	Area	X	X	X	No	X	X
5-W-34-IC	1-104-7	Ionization	Area	X	X	X	No	X	X
5-W-4-DRM	1-105	Ionization	Area	X	X	X	No	X	X
5-W-4-LAL	1-105	Thermal	Area	X	X	X	X	X	X
5-W-4-WRK	1-105	Ionization	Area	X	X	X	No	X	X
		Thermal	Area	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
5-W-4-SWG1	1-105	Ionization	Area	X	X	X	No	X	X
5-W-4-HL	1-105	Manual Alarm Station	Area	X	X	X	X	X	X
5-W-4-SWG2	1-105	Ionization	Area	X	X	X	No	X	X
5-W-5-HV	1-106	Thermal	Equip	X	X	X	X	X	X
		Manual Alarm Station	Area	X	X	X	X	X	X
5-W-5-CHF	1-106	Thermal	Area	X	X	X	X	X	X
5-W-5-SLD	1-106	Manual Alarm Station	Area	X	X	X	X	X	X

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
5-W-5-FA	1-106	Manual Alarm Station	Area	X	X	X	X	X	X
5-W-5-FAN	1-106	Ionization	Area	X	X	X	No	X	X
		Manual Alarm Station	Area	X	X	X	No	X	X

*The local fire detection control panel located in the Waste Processing Building Control Room on Elevation 236 ft. covers all fire zones within the 5-W-BAL fire area.

**Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each detection zone at local control panel and an alarm sounds at the affected fire zone.

7. Access and Initial Response

Access to this area is provided from adjacent corridors at the Fuel Handling Building and Reactor Auxiliary Building at various elevations and the yard area.

Carbon dioxide and dry chemical type extinguishers are provided in and adjacent to the area in accordance with NFPA 10. Standpipe hose stations have been provided in and adjacent to the area. Yard hydrants as backup are available.

8. Fire Suppression System

The fire suppression systems provided in this area are three automatic preaction sprinkler systems hydraulically designed to provide either equipment or surface area density of 0.3 gpm/sq. ft. The system is actuated automatically by thermal detectors located at the ceiling level when the area temperature reaches 135 F. The sprinkler heads open when area temperature reaches 165 F. The system water flow is shut off manually from the control valve by qualified personnel responding to the fire. The pre-action control valves for the systems are located inside the Waste Processing Building on Elevations 261, 276, and 291 ft. (see Figure 9.5.1-5).

Manual actuation of each system is provided from each pre-action control valve emergency mechanical release. Remote manual actuation of the pre-action system is provided from the dual action manual alarm stations located adjacent to the hazards.

Electrical supervision of the suppression system includes control valve position, system valve position, supervisory air pressure and lack of water flow through the control valve.

Plant equipment subject to water damage is protected with watertight enclosures, floor pedestals or other means such as curbs at the door to the rooms where such equipment is located.

Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems and hose lines is minimized by the provision of a floor drainage system. Floor water surcharge is estimated to be insignificant since excess water can overflow to adjacent areas. Runoff is directed to sanitary drainage system for Storage Areas, Storage Room and Janitors Closet (Elevation 261 ft.), Storage Room and Chemical Records Room, Health Physics Storage Room, Health Physics Storage Area (ELevation 276 ft.) and HVAC Equipment (Elevation 291 ft.). The sprinkler water runoff from Hot and Cold Laundry Areas is drained to detergent waste hot shower and laundry tank (Elevation 236 ft.). Runoff sprinkler water from the Chemical Storage Room is directed to the radioactive floor drainage system.

9. Analysis of Effects of Postulated Fires

In Fire Area 5-W-BAL, the Waste Processing Building area fire hazard combustibles include normally expected amounts of cable insulation in cable trays, conduit, connection boxes, limited amounts of cable insulation within control panels, minor quantities of permanent Class A materials (ordinary combustibles), required quantities of charcoal used within filters limited quantities of lubricating oils contained within equipment.

Transient materials, such as clothing, rags, plastics, or wood may be brought into the area for normal facilities maintenance and repair.

The quantity of combustible materials which may be involved in area fires and, consequently, the magnitude of these fires and the resultant damage to plant facilities is reduced:

- by the use of IEEE 383 qualified cables.

- by limiting the continued spread of fire by the provision of fire breaks along cable trays and fire-stops at all floors and fire barrier penetrations, and fire retardant coatings at cable crossovers, or points of close proximity.

- by limiting permanent quantities of ordinary combustible (Class A) materials to amounts actually required for normal operations and by controlling the introduction of transient combustibles through administrative procedures. (CP&L's Operation Responsibility)

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems and by the three-hour fire barriers enclosing the fire area.

The types of fires postulated for the Waste Processing Building are based on the types of combustibles present in the area and their concentrations. Only charcoal and cable fires are being considered in this analysis, based on the combustible loading of the area.

A. <u>Charcoal Fires</u>

The charcoal fire postulated for the Waste Processing Building assumes ignition and subsequent development into the most severe single fire expected in the area, of localized concentrations of charcoal within filters located in the fire zones 5-W-5-CHF or 5-W-5-HV on Elevation 291 ft. (See Figure 9.5.A-30). Transient combustibles present in the area are charcoal filter for filter refill and/or oil in a 55 gal. oil drum for the air handling unit maintenance.

The potential maximum propagation of the postulated charcoal fire is reduced by early detection using line type detectors installed in the charcoal bed. The temperature of the air leaving the charcoal filter is monitored. On temperature rising above a pre-high temperature level visual and audible alarms on the charcoal filter housing detection panel and in the Control Room are activated. The control room operator will stop the air flow through this filter allowing for cooling of the charcoal through starvation of the oxygen supply to the fire.

Should the fire not extinguish itself the temperature will continue to rise, the filter housing will become hot and the automatic thermal detection system (using rate compensated detectors), installed on an area basis over each charcoal filter housing, senses the heat and actuates the fire suppression system as described in Item 8 of this analysis, fire alarms are transmitted to
15 the Control Room via the Communications Room, to the local fire detection control panel and locally to the fire zone.

The potential maximum propagation of the charcoal fire will be reduced by initial possible use of area fire extinguishers on incipient fires and supplemental use of hoselines on developing fires by employees responding to the fire.

If the pre-action sprinkler system has not actuated automatically the postulated fire might involve the charcoal filter and damage associated ducts, fittings, cabling and controls. However, the pre-action sprinkler system can be actuated manually from either the system control valve or any manual dual action manual alarm station located in or adjacent to the area. Damage will then be confined to the area of inception with only very limited exposure to adjacent cabling, adjacent transient combustble materials, if present at the time of fire.

The early warning (line detectors) from the charcoal bed will alert the control room operator to stop the air flow through the filter and dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting, if necessary, through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system as described above, thus reducing the potential for the fire spread. The postulated charcoal fire is not considered to have sufficient potential for spread to cause failure of safety related cable trays, plant equipment and associated cabling and controls, nor cause radioactive releases since the fire area is enclosed within three hour fire barriers. Therefore, the capability of the plant for safe shutdown is not impaired by charcoal fire in the Waste Processing Building.

B. Cable Fires

The cable fire postulated for this area assumes ignition, and subsequent development into the most severe single fire expected in the area, of localized concentrations of insulation on cables in trays and in conduit located in and traversing the various zones such as 5-W-2-CR, 5-W-1-WHTK1, 5-W-1-WHTK2, 5-W-1-TKS, etc. as shown by the presence of cables in the combustible loading for each fire zone. Transient combustibles may be present in the area during maintenance or repair activities. They could be oil in a 55 gal. drum, small amounts of wood, solvents rags and plastic.

The potential maximum propagation of the postulated cable fire in these zones will be reduced by early detection using ionization type smoke detectors installed in on an area basis. The automatic detection system senses products of combustion generated by the smoldering cable insulation and alerts employees both locally and in the Control Room, via the Communications Room, so that manual fire response can be initiated promptly.

Ready access is provided to the area from adjacent plant areas, as described under Item 7, facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hoselines on developing fires by employees responding to the fire, thus reducing the potential for maximum propagation of the fire. 15

Early warning smoke detection system (ionization detectors) will alarm a fire condition in the Control Room. The Control Room Operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines thus reducing the fire spread. Damage in this case will be limited significantly and confined to the immediate area of ignition with only very limited exposure to adjacent cabling.

The postulated fire is not considered to have sufficient potential for spread to cause failure of redundant safety related plant equipment and associated cabling and controls nor cause radioactive releases since the fire area is enclosed within three hour rated fire barriers. Therefore, the capability of the plant for a safe shutdown is not impaired by a cable fire inside the Waste Processing Building.

10. Fire Area Equipment

This fire area contains non-safety related equipment only. The mechanical and electrical equipment shown on the plant general arrangement drawings for this area are miscellaneous pumps, tanks, HVAC equipment, motor control centers, control panels, instrumentation and controls, as shown on Figures 9.5A-6, 9.5A-8, 9.5A-14, 9.5A-18 and 9.5A-24 through 9.5A-33.

APPENDIX 9.5A.23

1. Identification

Building: Turbine Building 15

Fire Area: Turbine Generator

Shown on Figures: 9.5A-34, 9.5A-35, 9.5A-36, 9.5A-37, 9.5A-38, and 9.5A-39

Length (ft.): 350 Width (ft.): 160 Height (ft.): 74

Area (sq. ft.): 164,200 Volume (cu. ft.): 4,144,000

2. Occupancy

The area contains the turbine generator, condensers, condensate pumps, water treatment system, feed pumps, turbine generator lube oil system, hydrogen seal oil system, L.P. heaters, 6.9 kV switchgear, 480V MCCs and switchgear, associated controls, wiring in conduit and cable in trays, and charcoal filter.

3. Boundaries

The Turbine Building is an open structure of non-combustible construction. The building floors (Elevation 240 ft. and 261 ft.), walls between Elevation 240 ft. and 261 ft., and structural columns supporting these floors are of reinforced concrete construction equivalent to three-hour fire rating. Above Elevation 261 ft. the building is constructed of steel and concrete slab on steel frame and metal form decking, and has no walls or roof. Steel columns and beams used for structural support are not fireproofed.

Stairways leading to Elevation 240 ft. are enclosed within two-hour fire rated construction and are provided with certified one and a half hour B label type fire rated doors.

Miscellaneous structures on each elevation, such as Switchgear Room Elevation 261 ft.) and Electrical Room (Elevation 286 ft.) are enclosed in concrete block masonry, equivalent to three-hour fire barrier construction.

Structural barriers constructed of reinforced concrete are provided between equipment on Elevation 240 ft.

Floor and ceiling openings for handling of equipment are protected by either concrete or metal hatch covers.

There are no concealed spaces or floor trenches.

4. Combustible Loading

Combustible	Quantity Gal./lb./RF	BTU in 1000's	BTU/ sq. ft.
15 Fire Area: 1-G, Turbine Generator			
Floor Area: 164,200 sq. ft.			
Cable Insulation			
Power	6,490	1,168,000	7,100
Control	6,680	1,049,000	6,400
Instrumentation	3,170	302,000	1,800
Liquids: Oil (gal.)	3,225	3,265,000	20,000
Solids: Charcoal (lb.)	7,600	76,000	500
Transients:			
oil (gal.)	55	6,000	40
charcoal (lb.)	7,600	76,000	500
Fiber drums (lb.)	380	3,000	20
	TOTAL	5,945,000	36,360
Elevation 240 ft., Basement			
Floor Area: 52,200 sq. ft.			
Cable Insulation			
Power	590	106,300	2,100
Control	680	107,000	2,200
Instrumentation	470	45,000	900
Liquids: oil (gal.)	25	2,700	100
Sol ds: charcoal (lb.)	7,600	76,000	1,500
Transients:			
oil (gal.)	55	6,000	100
charcoal (lb.)	7,600	76,000	1,500
Fiber drums (lb.)	380	3,000	100
	TOTAL	422,000	8,500

Elevation 261 ft., Ground Floor

Floor Area: 56,000 sq. ft.

Combustible	Quantity Gal./Lb./RF	BTU in 1000's	BTU/ sq. ft.
Cable Insulation			
Power	3,500	630,000	11,100
Control	2,200	345,000	6,200
Instrumentation	1,500	143,000	2,600
Liquids: oil (gal.)	30,000	3,240,000	58,000
Solids	0	0	0
Transients: oil (gal.)	55	6,000	100
	TOTAL	4,364,000	78,000

Elevation 286 ft., Mezzanine Floor

Floor Area: 56,000 sq. ft.

Cable Insulation			
Power	2,400	432,000	7,800
Control	3,800	597,000	10,700
Instrumentation	1,200	114,000	2,000
Liquids: oil (gal.)	200	22,000	400
Solids	0	0	0
Transient: oil (gal.)	55	6,000	100
	TOTAL	1,171,000	21,000

5. Control of Hazards

Electrical penetrations are sealed with three hour rated fire stops at all floors and at fire barrier equivalent. Mechanical piping penetrations through fire barrier equivalents are anchored or sealed with flexible or semi-rigid fire stop assemblies. HVAC ductwork penetrations through fire barrier equivalent are sealed between duct and barrier opening with flexible or semi-rigid fire stop assemblies. Fire dampers are not provided within ductwork.

Equipment containing combustible or flammable liquids is enclosed within curbs or sumps to retain the released oil and to route the releases to drainage systems. Curbs and drains prevent spread of combustible liquids releases beyond the fire area. Supplemental barriers, fire breaks and/or fire retardant coatings are provided as required.

Based on the smoke removal rate recommended for the combustible load in the Cable Spreading Rooms (1.5 cfm/sq. ft.), comparable smoke removal would be acheived in the cable vault on Elevation 250 ft. by a rate of approximately

0.04 cfm/sq. ft. Smoke, heat, and products of incomplete combustion are removed by the ventilation system from the Turbine Building as follows:

Condensate Polishing Demineralizer (Fl. Area = 15,100 sq. ft.)

Supply: S-60(1A-NNS)
S-60(1B-NNS)

Exhaust: E-60(1A-NNS)
E-60(1B-NNS)

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	NNS	Operating	22,500	1.5
Supply	NNS	Standby	22,500	1.5
Exhaust	NNS	Operating	24,500	1.6
Exhaust	NNS	Standby	24,500	1.6

Electrical and Battery Room (Fl. Area = 2,100 sq. ft.)

Supply: Louver L-50(1X-NNS)
AH-34(1A-NNS)
AH-34 (1B-NNS)

Exhaust: Louvers L-48, L-49(1X-NNS) and Recirc. - Elec. Rm. only
E-42(1A-NNS) Batt. Rm.
E-42(1B-NNS) only

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	NSS	Operating	39,000	18.5
Supply	NNS	Standby	39,000	18.5
Batt. Exhaust	NNS	Operating	3,000	1.4
Batt. Exhaust	NNS	Standby	3,000	1.4
Elec. Exhaust	NNS	Operating	36,000	17.2

Gen. Service Switchgear Rm. and Cable Vault (Fl. Area = 1700 sq. ft.)

Supply: Louver L-89(1X-NNS)
AH-35(1A-NNS)
AH-35 (1B-NNS)

Exhaust: Louvers: L-96 (1X-NNS) or recirc.
L-51(1X-NNS) Switchgear Rm. Only
L-99(1X-NNS) Cable Vault Only

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	NNS	Operating	9,000	5.3
Supply	NNS	Standby	9,000	5.3
Swgr. Exhaust (L-96)	NNS	Operating	3,500	2.0
Swgr. Exhaust (L-51)	NNS	Operating	3,500	2.0
Cable Vault Exh. (L-99)	NNS	Operating	2,000	1.2

Elevator Machine Room (Fl. Area = 170 sq. ft.)

	Louver L-101(1X-NNS)		Louver: L-100(1X-NNS)
Supply:	S-66(1X-NNS)	Exhaust:	or Recirculation

Function	Class	Mode	Flow (cfm)	(cfm/sq. ft.)
Supply	NNS	Operating	3,200	18.8
Exhaust	NNS	Operating	3,200	18.8

6. Fire Detection

The types of detection actuation and signaling systems provided in this area and their actions are as follows:

				Local Control Panel*				Main Fire Detection Control Panel	
Fire Zone	Det Zone	Type	Basis	Local**	Ann	Alarm	Suppres System Actu	Ann	Alarm
Cable Vault Elevation 250 ft.	1-58-1	Thermal	Area	X	X	X	X	X	X
		Ioniza-	Area	X	X	X	No	X	X
	1-58-1	Manual Alarm Station	Area	X	X	X	X	X	X
Charcoal filter room Elevation 240 ft.	1-59	Thermal	Area	X	X	X	X	X	X
	1-59	Manual Alarm Station	Area	X	X	X	X	X	X
Cable tunnel Elevation 240 ft.	1-60	Ioniza-tion	Area	X	X	X	No	X	X
MCC Elevation 240 ft.	1-58-2	Ioniza-tion	Area	X	X	X	No	X	X
H_2 Seal Oil Unit Elevation 261 ft.	1-62	Thermal	Equip.	X	X	X	X	X	X
	1-62	Manual Alarm Station	Area	X	X	X	X	X	X
Condensate Pumps Elevation 261 ft.	1-63	Thermal	Equip.	X	X	X	X	X	X
	1-63	Manual Alarm Station	Area	X	X	X	X	X	X

Fire Zone	Det Zone	Type	Basis	Local Control Panel* Local**	Ann	Alarm	Suppres System Actu	Main Fire Detection Control Panel Ann	Alarm
Turbine Oil Tanks Elevation 261 ft.	1-64	Thermal	Equip.	X	X	X	X	X	X
	1-64	Manual Alarm Station	Area	X	X	X	X	X	X
Cond. booster pump Elevation 261 ft.	1-65	Thermal	Equip.	X	X	X	X	X	X
	1-65	Manual Alarm Station	Area	X	X	X	X	X	X
St. Gen. Feed Pumps Elevation 261ft.	1-66	Thermal	Equip.	X	X	X	X	X	X
	1-66	Manual Alarm Station	Area	X	X	X	X	X	X
Switchgear Room Elevation 261 ft.	1-67	Ioniza-tion	Area	X	X	X	No	X	X
	1-67	Manual Alarm Station	Area	X	X	X	No	X	X
Operating Floor Elevation 314 ft.	1-68	Manual Alarm Stations	Area	X	X	X	No	X	X
Mezzanine Floor Elevation 286 ft.	1-69-1	Thermal	Area	X	X	X	X	X	X
	1-69-1	Manual Alarm Stations	Area	X	X	X	X	X	X
	1-69-2	Thermal	Area	X	X	X	X	X	X
	1-69-2	Manual Alarm Station	Area	X	X	X	X	X	X
Turbine Bearings Elevation 286 ft.	1-70	Thermal	Equip.	X	X	X	X	X	X
Electric Rm. Elevation 286 ft.	1-71	Ioniza-tion	Area	X	X	X	X	X	X

*This fire area is covered by 4 local fire detection control panels, as follows:

Control Panel No.	Areas Served	Panel Location
1LFDCP-8	Turbine Building Elevation 240 and 250 ft.	TB-240, Ay & 22
1LFDCP-9	Turbine Building Elevation 261 and 286 ft.	TB-261, Aa & 11
1LFDCP-10	Turbine Building Elevation 286 ft., Bearings & General	TB-286, Aa & 11
1LFDCP-11	Yard Transformers	TB-261, Aa & 11

**Local alarm and annunciation of fire or trouble condition, both visual and audible, are provided for each floor in the Turbine Building, at the local control panel and an audible alarm at the affected fire area. 15

7. Access and Initial Response

Access to this area is provided from the yard, through stairways, service elevators, Reactor Auxiliary Building at all elevations certified three hour A Label type fire rated doors. Dry chemical and carbon dioxide type extinguishers are provided in the area in accordance with NFPA 10. Standpipe hose stations have been provided in the area. Yard hydrants are available for backup protection.

8. Fire Suppression System

The fire suppression systems provided for the Turbine Building consist of two pre-action sprinkler systems provided below the operating floor with extensions to turbine bearings and five water spray systems for several areas on Elevation 261 ft., as indicated on Figure 9.5A-35. The pre-action sprinkler systems are hydraulically designed to provide area and/or equipment water density of 0.3 gpm/sq. ft. for the most remote 3000 sq. ft. and 0.2 gpm/sq. ft. of any 10,000 sq. ft. The water spray systems are hydraulically designed to provide area and/or equipment water density of 0.3 gpm/sq. ft.

Local manual actuation is provided at the respective control valves and remote manual actuation is provided at the dual action manual fire alarm stations located throughout the building. Suppression systems supervision includes control valve position, supervisory air pressure and lack of water flow.

The two pre-action sprinkler systems are automatically actuated by thermal detectors installed at the ceiling level on an area basis, for the cable vault and the charcoal filter room below Elevation 261 ft. and under the turbine generator operating floor respectively.

The thermal detectors actuating the pre-action sprinkler below Elevation 261 ft. are actuated when the area temperature reaches 135 F and the heads open when area temperature reaches 165 F. The thermal detectors actuating the pre-action sprinkler below the turbine generator operating floor are actuated when area temperature reaches 200 F and the heads open when the temperature reaches 225 F.

The water sprays are installed at Elevation 261 ft. on equipment and curbed areas basis and serve the turbine lube oil reservoir, the condensate pumps, the steam generator feed pumps, the condensate booster pumps and the Hydrogen seal oil unit. The water spray is actuated when the thermal detectors register a temperature of 200 F.

Both the pre-action sprinkler systems and the water spray systems are shut off manually by authorized personnel when the fire is out. Plant equipment subject to water damage is protected with watertight enclosures, or are mounted on pedestals.

Damage to plant areas and equipment from the accumulation of water discharged from sprinkler systems, water spray systems, and hose lines is minimized by the provision of a floor drainage system. Floor water surcharge is estimated to be insignificant since excess water can overflow to adjacent areas. Runoff is directed by means of floors sloped to floor drains to either the acid-caustic (Elevation 240 ft.) or the industrial waste sumps (Elevation 261, 286 ft.).

9. Analysis of Effects of Postulated Fires

In fire area 1-G, the Turbine Generator area fire hazard combustibles include expected amounts of cable insulation in cable trays, conduit, connection boxes, limited amounts of cable insulation within control panels, required quantities of charcoal used within filters, and limited quantities of lubricating oils contained within turbine lube oil reservoir, condensate pumps, steam generator feed pumps, condensate booster pumps, batch oil tank, oil conditioner, and seal oil unit.

Transient materials, such as lubricating oil, rags, wood, cleaning fluids, plastic coverings may be brought into the area for normal facilities maintenance and repair or during plant shutdown.

The quantity of combustible materials which may be involved in area fires and, consequently, the magnitude of these fires and the resultant damage to plant facilities is reduced or minimized:

- by the use of IEEE 383 qualified cables, except for the turbine building gantry crane cables. The gantry crane is installed above Elevation 314 ft. in an open structure where spread of fire is considered unlikely.

- by limiting the continued spread of fire by the provision of fire breaks along cable tray runs and fire stops at every floor and fire stops at fire barrier penetrations.

- by the confinement of released combustible liquids through provision of curbs around equipment containing significant amounts of oil and drainage of released oil to area sumps.

- by guarded lubricating oil pressure lines on the turbine generator with drainage and venting to remote safe discharge points.

- by controlling the introduction of transient combustibles through administrative procedures.

The extent of damage within and beyond the fire area is further limited by controlled removal of heat, smoke and other products of combustion through continued operation of normal ventilation systems provided for enclosed areas and natural circulation throughout the remainder of the building. The west wall of the RAB has a three-hour fire rating thus limiting the extent of 15
damage beyond the Turbine Building fire area.

The types of fires postulated for an area depend on the types of combustible materials present in the respective area and their concentrations.

In the Turbine Building, the type of fire postulated is an oil fire due to the breakage of a pressurized lubricating oil supply line to the turbine generator bearings. The pressure in the oil supply line will cause the oil to spill over a large area under the turbine generator operating floor and overflow to adjacent areas and impinge upon equipment in the vicinity of the pipe break.

The automatic thermal detection system installed under the operating floor, on an area basis, senses the heat generated by the burning oil, actuated the pre-action sprinkler system, as described under Item 8, and alerts employees of a fire condition, both locally and in the Control Room, via the 15
Communications Room.

The potential maximum propagation of the fire will be reduced by initial possible use of area portable fire extinguishing equipment, by employees either present in the area during maintenance or repair, or responding to the fire.

Ready access is provided to the area from adjacent plant areas, as described under Item 7, facilitating initial use of area fire extinguishers on incipient fires and supplemental use of standpipe hose lines on developing fires by employees responding to the fire.

If the pre-action sprinkler system has not actuated automatically, the postulated fire might invove the equipment from which the oil has been released and damage contiguous associated piping, fittings, cabling, and controls within the spill area. However, the automatic pre-action sprinkler systems and the spray systems can be actuated manually by employees responding to the fire, either from a dual action manual fire alarm station located adjacent to the fire area or from the system control valves emergency manual release, thus reducing the potential fire consequences described above. Damage will be limited to the immediate area of inception with limited damage to exposed equipment.

Even without actuation of the pre-action system in the area, the oil fire will be sensed by the thermal fire detection system which will alarm fire (high temperature) and trouble (lack of water) conditions in the Control Room. The control room operator will dispatch the Fire Brigade for prompt assessment of the situation and initiation of effective manual fire fighting through the use of portable fire extinguishers, hose lines and/or manual actuation of the automatic fire suppression system, as described above, thus reducing the fire spread.

The postulated oil fire in the Turbine Building is not considered to have sufficient potential to spread and cause failure of plant safety related equipment and associated cabling and controls, which are separated by structural and fire barriers. Therefore, the capability of the plant for safe shutdown is not impaired by an oil fire in the Turbine Building.

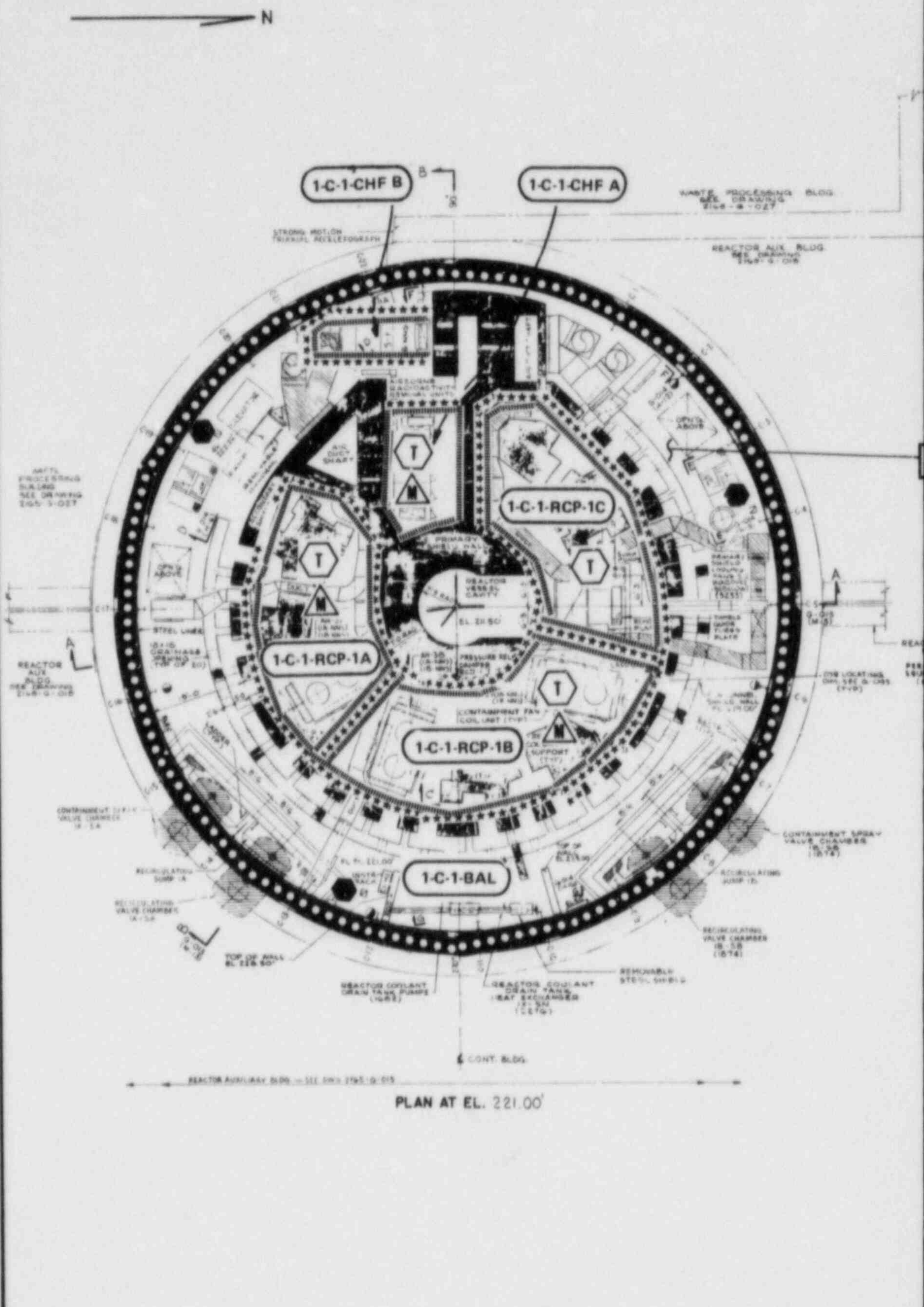
10. Fire Area Equipment

This fire area contains non-safety related equipment only. The mechanical and electrical equipment shown on the plant general arrangement drawings for the Turbine Building are: the turbine generator, the condenser and associated equipment necessary for the turbine operation such as: miscellaneous pumps, tanks, heat exchangers, H&V equipment, motor control centers, 6.2 kV and 480 V switchgear, instrumentation and controls, as shown on the Figures 9.5A-34 through 9.5A-39.

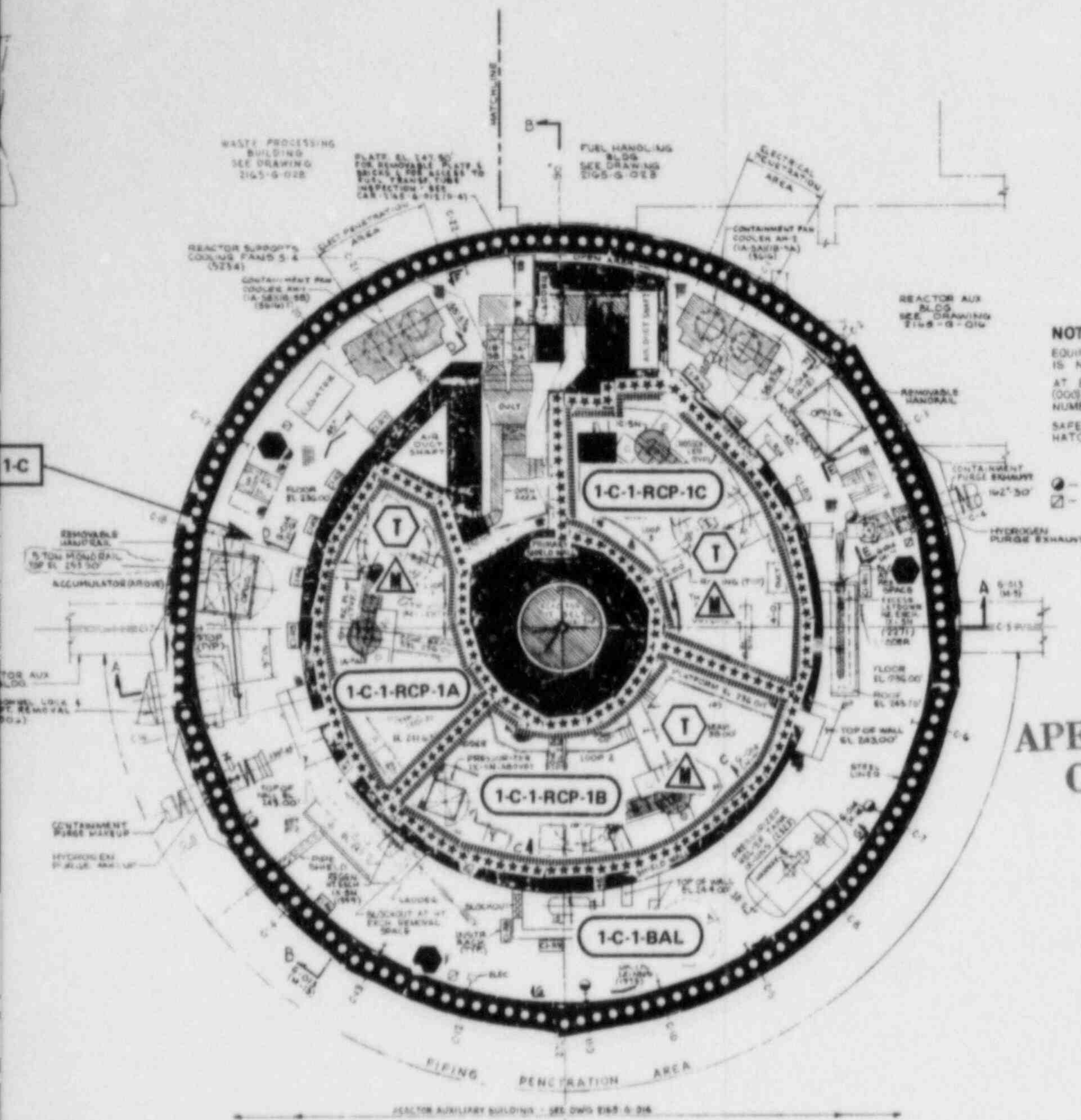
LEGEND:

I–A–BAL	FIRE AREA DESIGNATOR
I–A–3–PB	FIRE ZONE DESIGNATOR
P	PRE-ACTION SPRINKLER SYSTEM
M	MULTI-CYCLE SPRINKLER SYSTEM
W	WATER SPRAY SYSTEM
I	IONIZATION TYPE SMOKE DETECTION SYSTEM
T	THERMAL DETECTION SYSTEM
UV	ULTRA-VIOLET FLAME DETECTION SYSTEM
	MANUAL FIRE ALARM STATION
	3-HR FIRE BARRIER
	2-HR FIRE BARRIER
A	3-HR RATED FIRE DOOR
B	1-1/2-HR RATED FIRE DOOR
	SPRINKLERED/SPRAYED AREA BOUNDARY
* * * * * * * * * *	FIRE ZONE BOUNDARY

SHEARON HARRIS NUCLEAR POWER PLANT Carolina Power & Light Company FINAL SAFETY ANALYSIS REPORT	FIRE PROTECTION LEGEND	FIGURE 9.5A-1



PLAN AT EL. 221.00'



PLAN AT EL. 236.00'

NOTES

EQUIPMENT NOT LOCATED BY DIMENSION IS NOT RELEASED

AT EQUIPMENT, THE NUMBER IN PARENTHESIS (000), IDENTIFIES EBASCO EMDRAC FILE NUMBER (364-000) OF THAT EQUIPMENT

SAFETY RELATED EQUIPMENT INDICATED BY HATCH LINES

CO_2 EXTINGUISHERS

FIRE HOSE STATIONS

TI APERTURE CARD

Also Available On Aperture Card

AMENDMENT NO. 15

SHEARON HARRIS NUCLEAR POWER PLANT

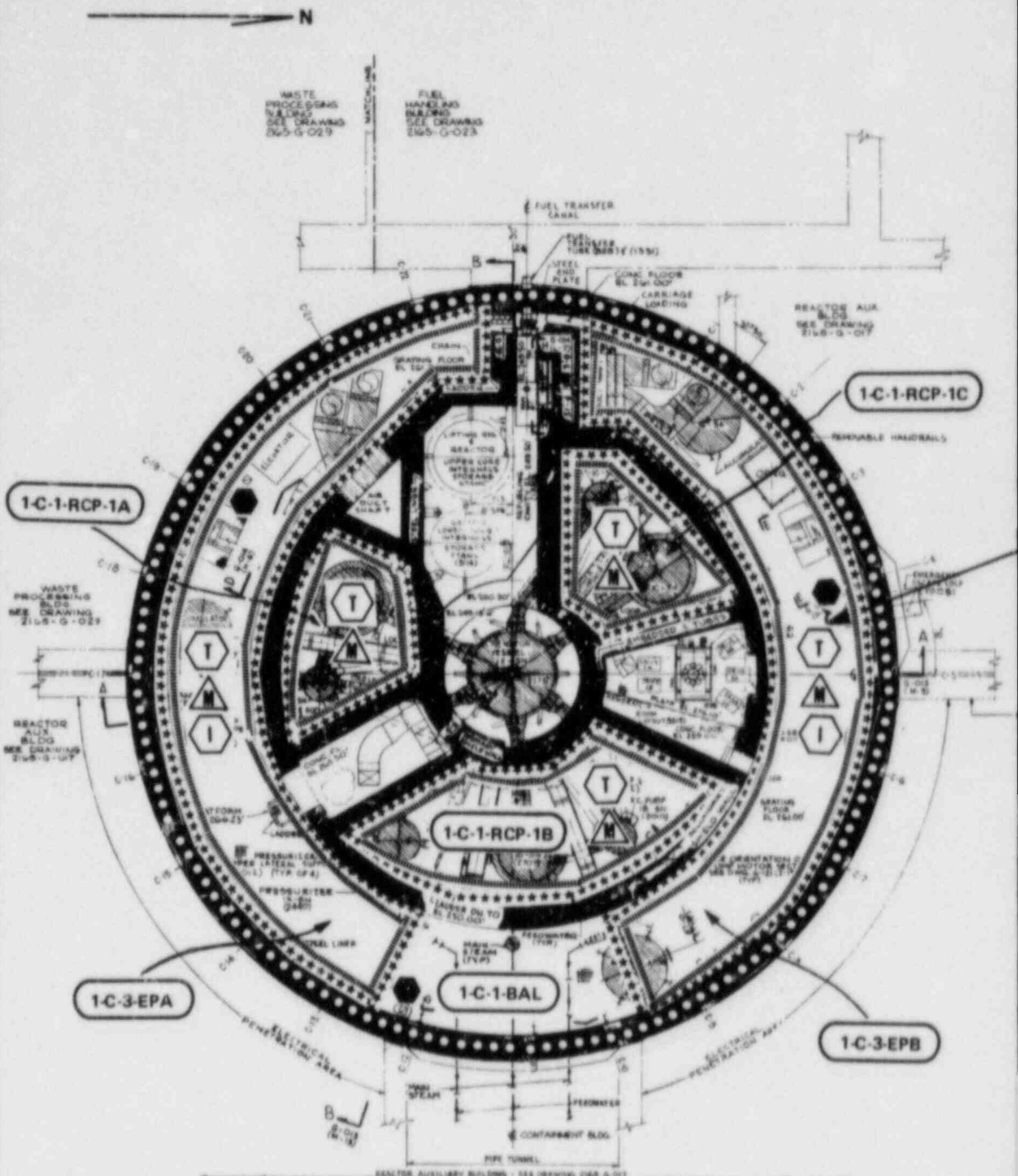
Carolina Power & Light Company

FINAL SAFETY ANALYSIS REPORT

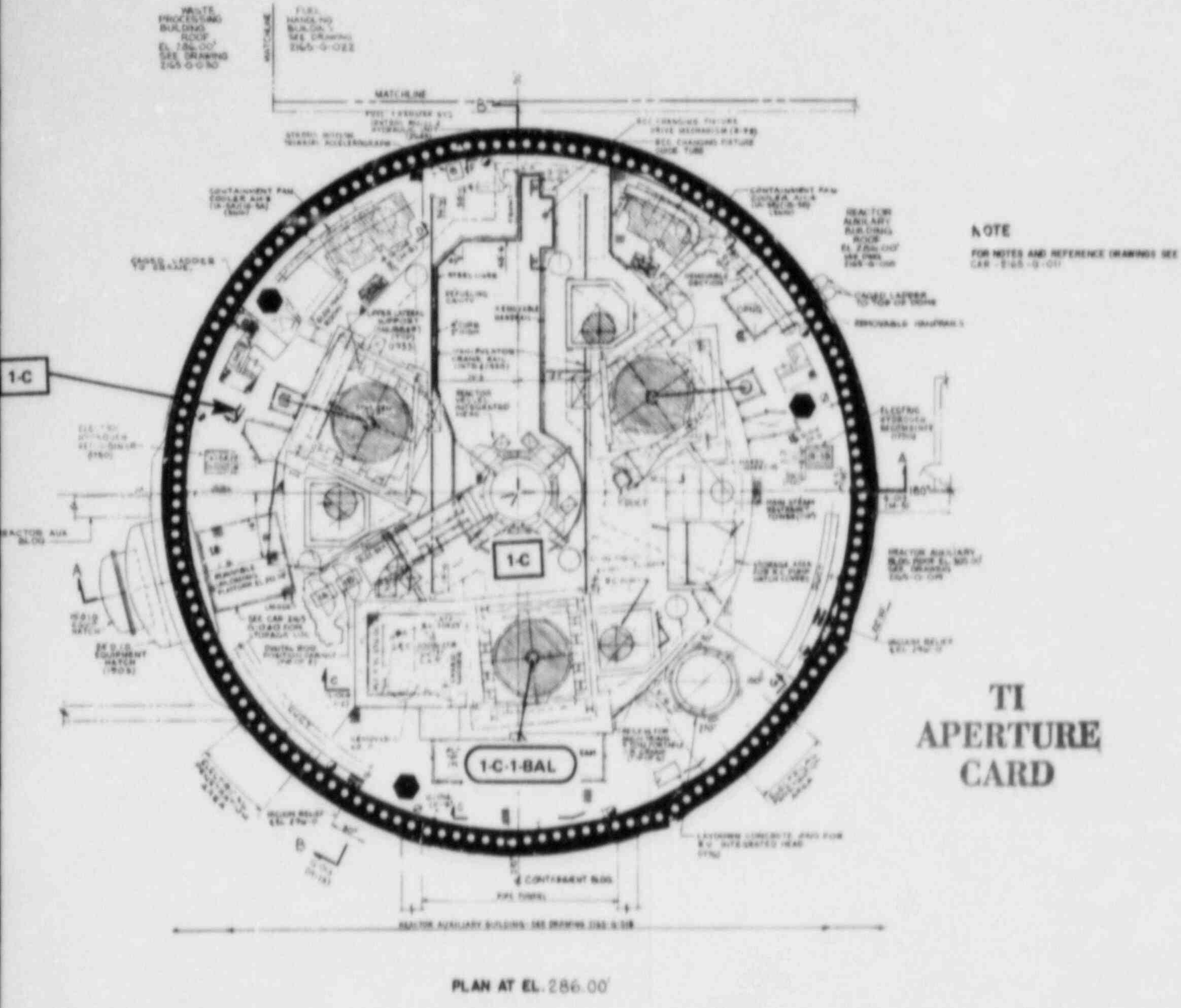
FIRE PROTECTION – CONTAINMENT BLDG PLAN EL 221.00' AND 236.00'

FIGURE 9.5A-2

8408140036-13



PLAN AT EL. 261.00'



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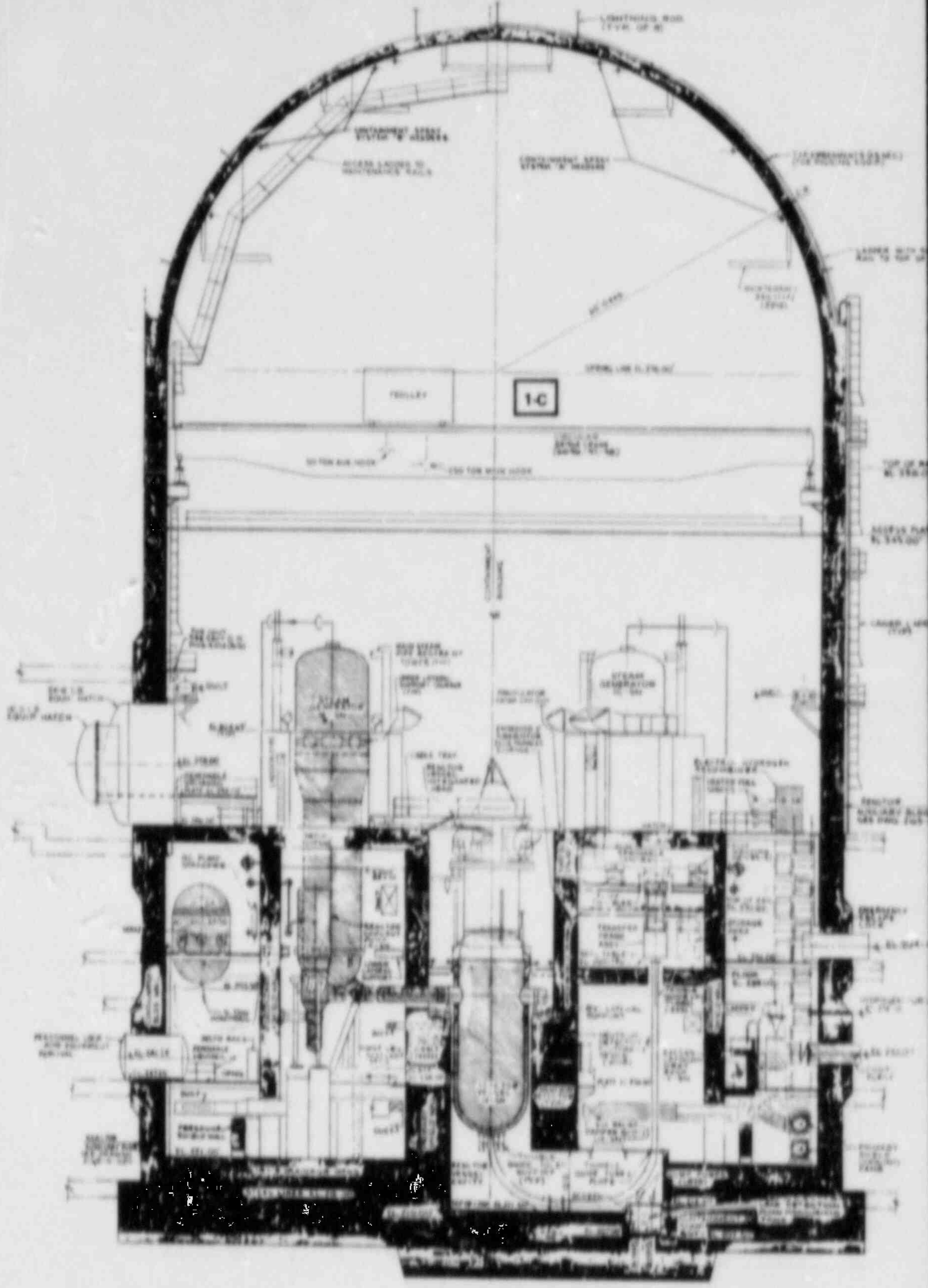
SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

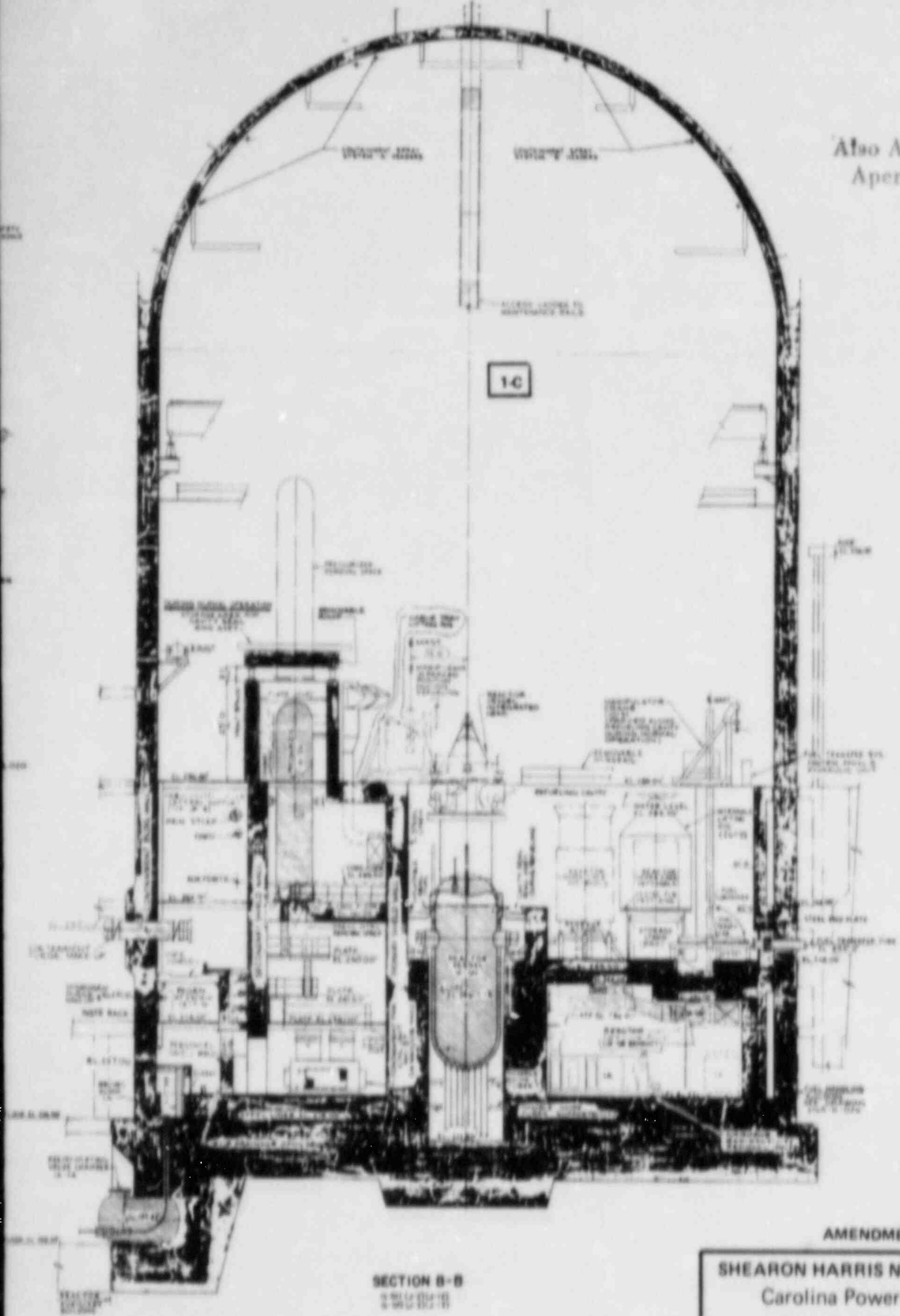
FIRE PROTECTION – CONTAINMENT BLDG
PLAN EL 261.00' AND 286.00'

FIGURE 9.5A-3

8408140036 -14



SECTION A-A



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Carolina Power & Light Company
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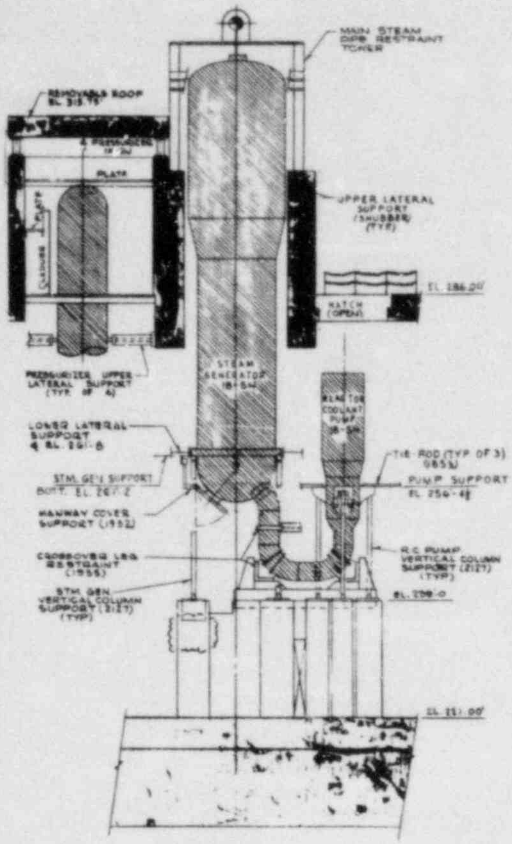
FIRE PROTECTION – CONTAINMENT BLDG
SECTIONS – SHEET 1

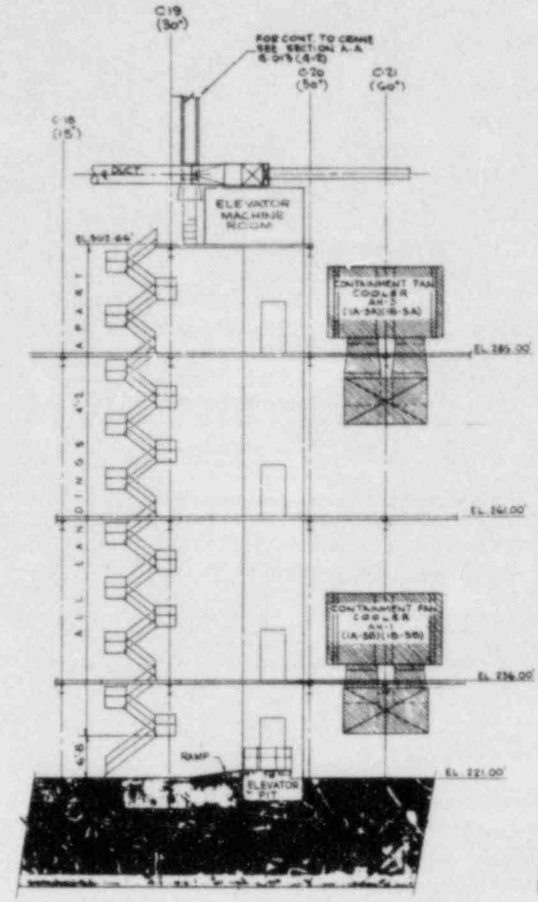
FIGURE 9.5A-4

8408140036-15



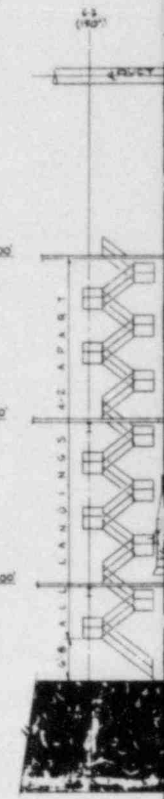
SECTION C-C

G-011 (H-6)(H-18)
G-012 (H-6)(H-18)



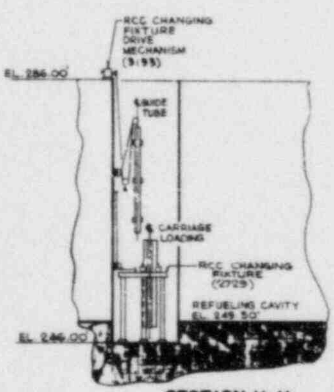
SECTION D-D

G-011 (E-6)(E-15)
G-012 (E-6)(C-15)



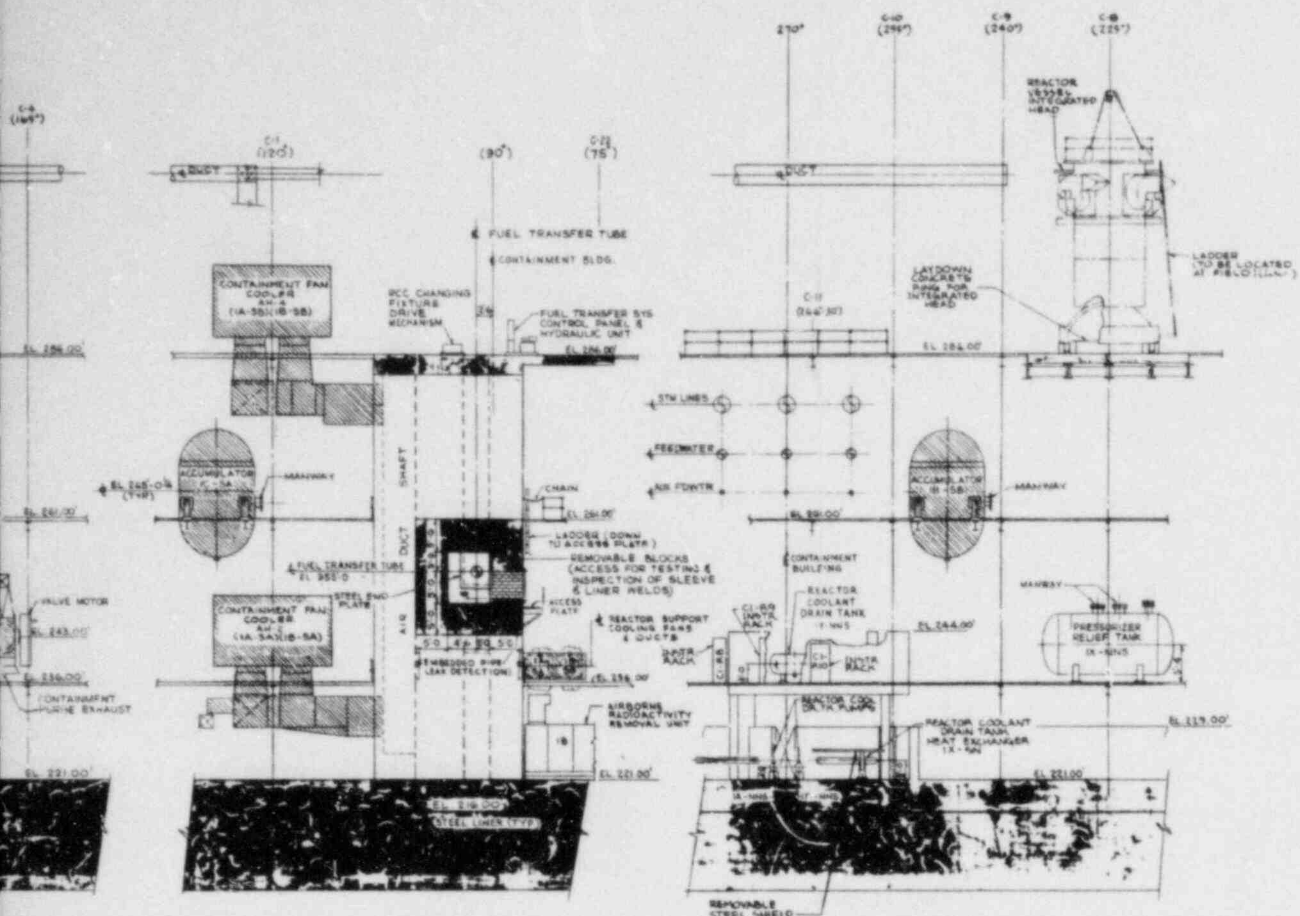
SECTION

G-011 (F-1
G-012 (F-1



SECTION H-H

G-012 (D-5, 14)



E-E

SECTION F-F

SECTION G-G

ALL FIRE AREA 1-C

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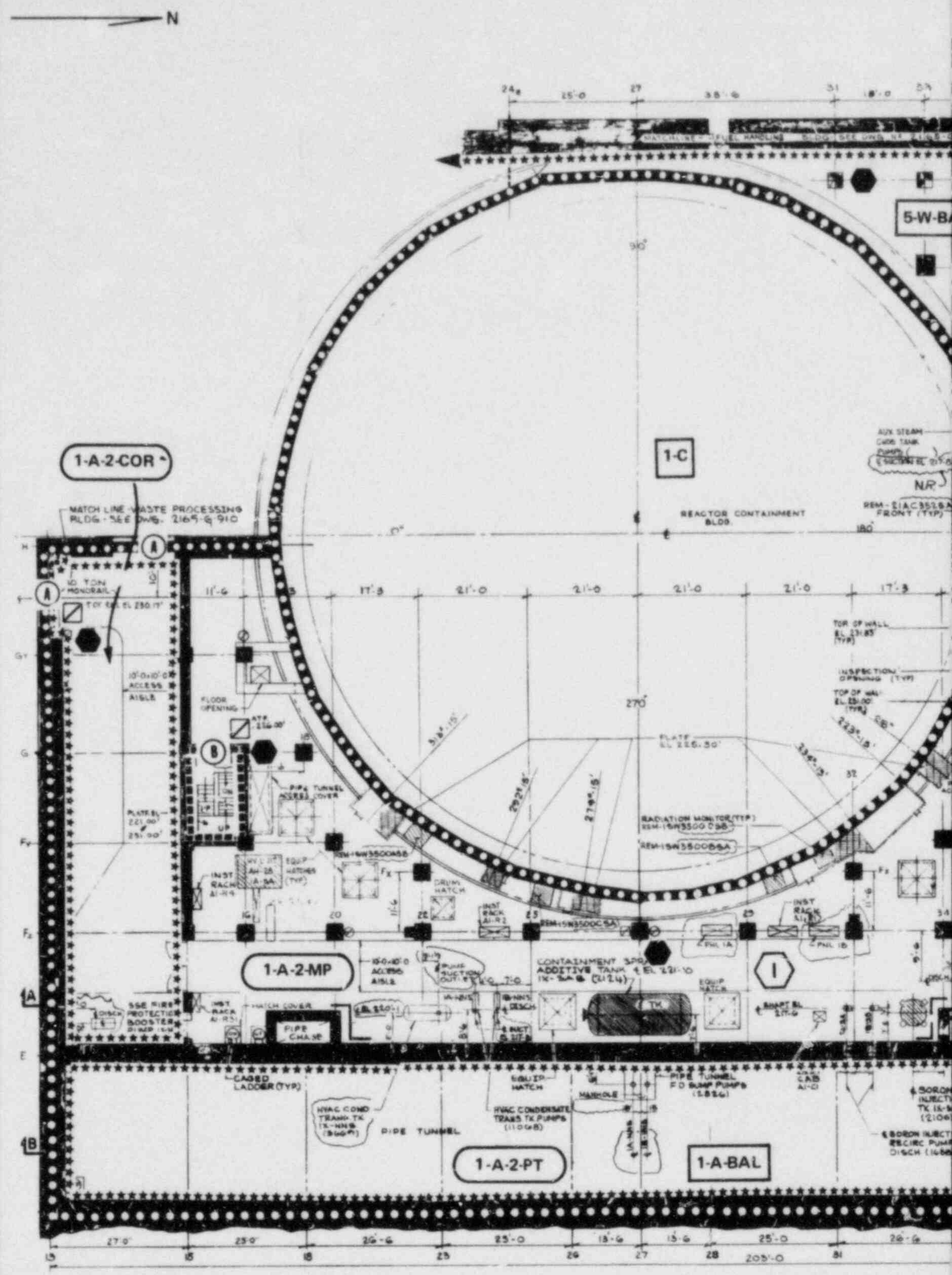
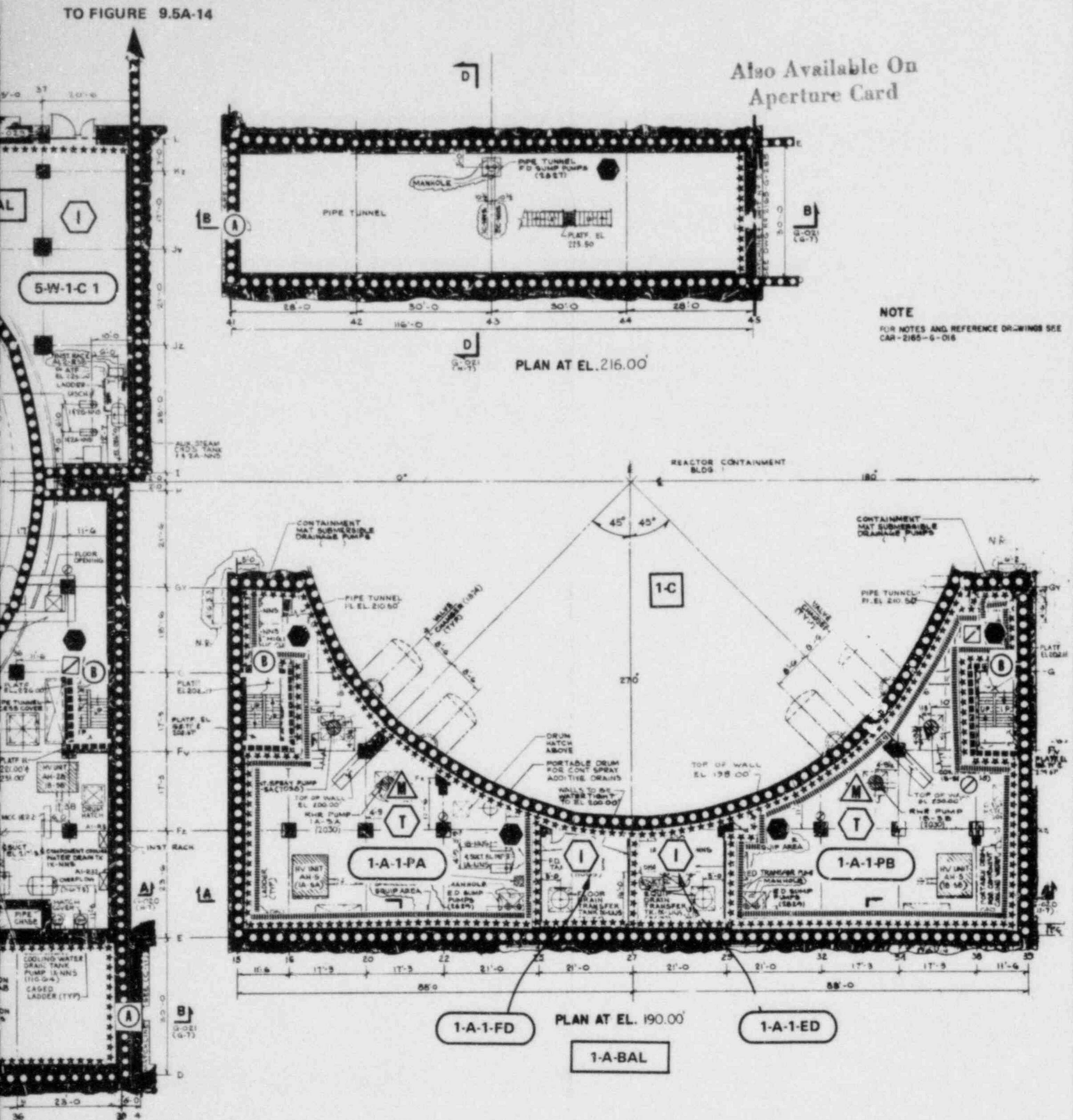
FIRE PROTECTION – CONTAINMENT BLDG
SECTIONS – SHEET 2

FIGURE 9.5A-5

8408140036-16



PLAN AT EL. 216.00'



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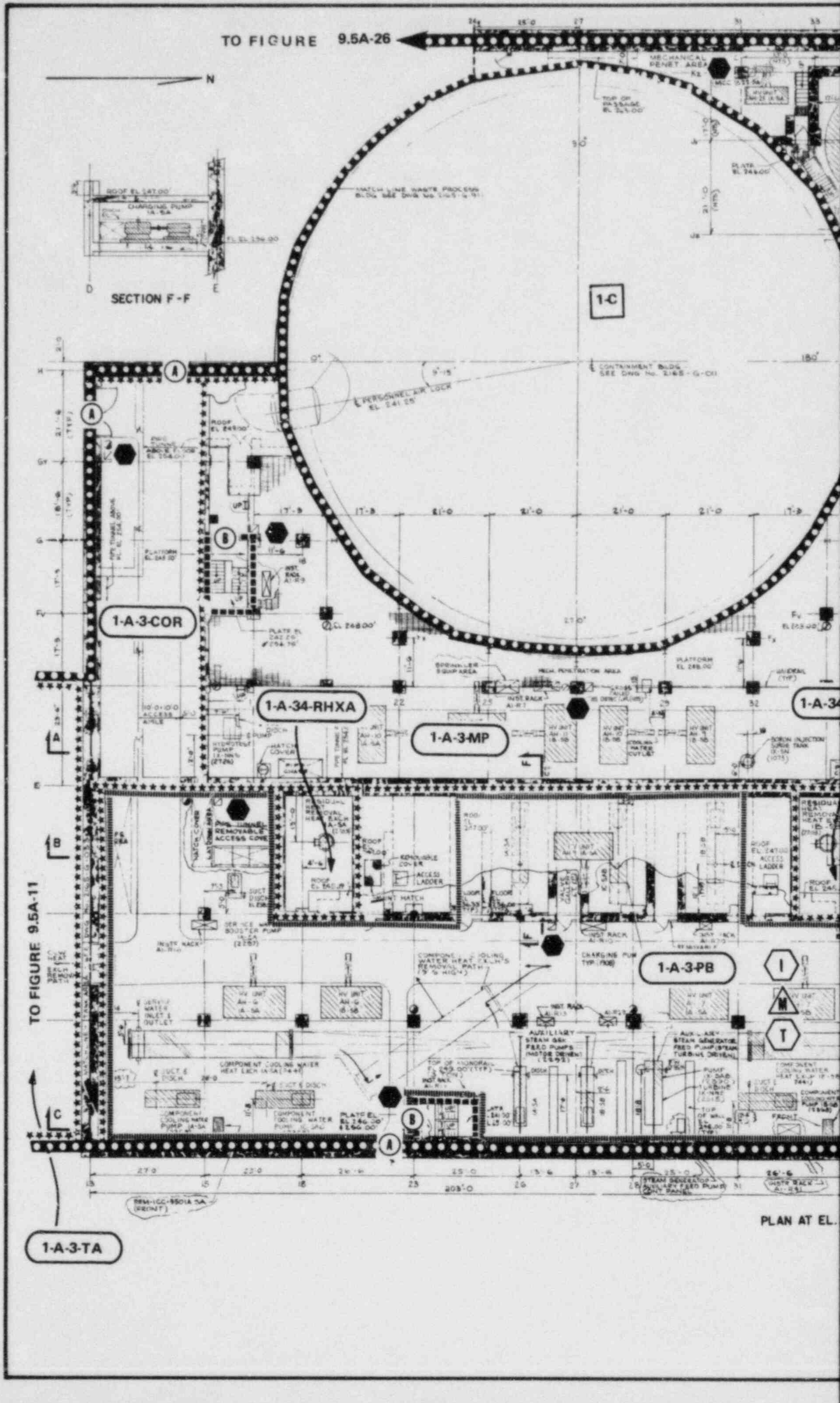
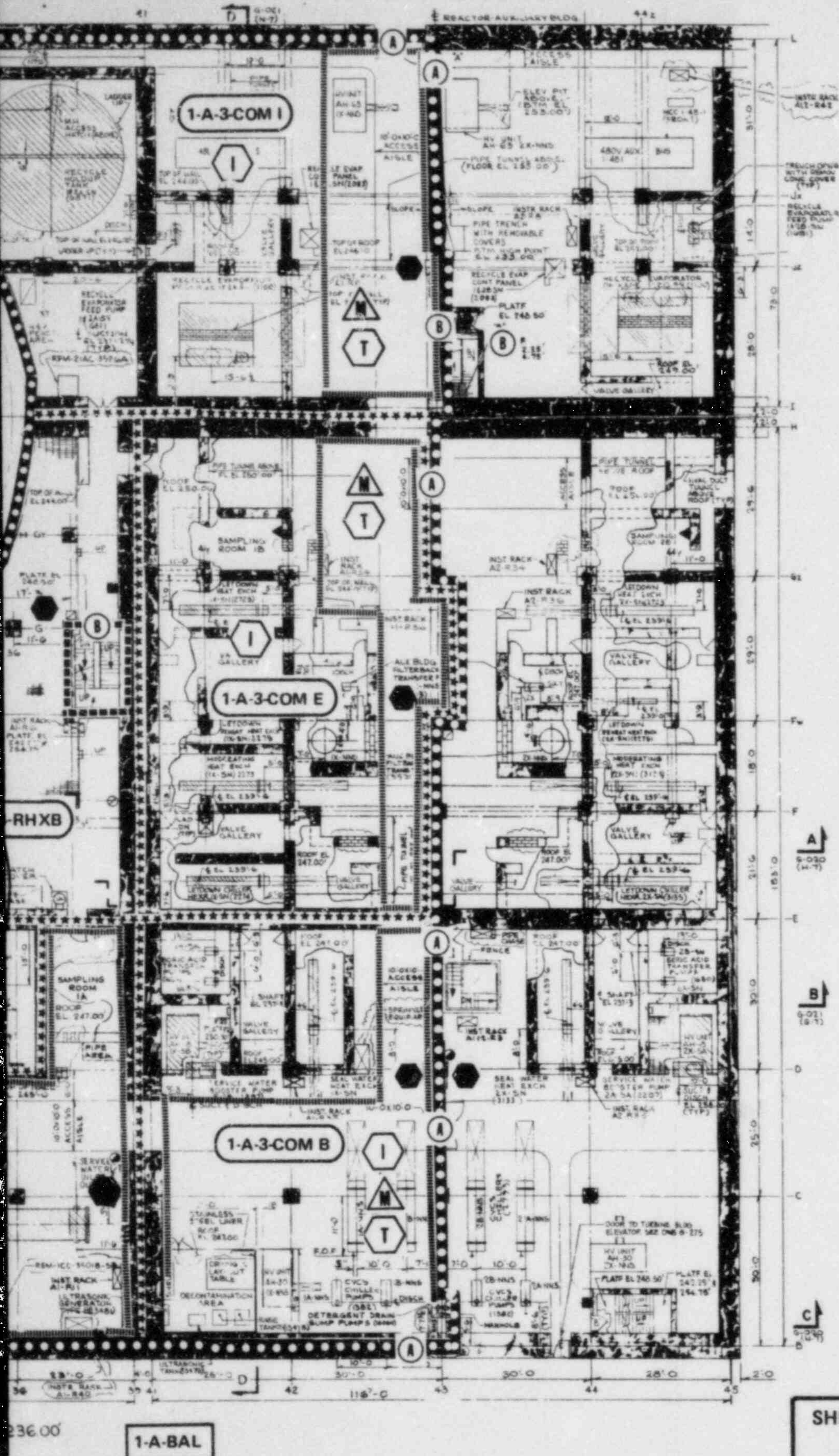
FIRE PROTECTION – REACTOR AUXILIARY BLDG–PLAN EL 190.00' AND 216.00'

FIGURE 9.5A-6



TO FIGURE 9.5A-26
N
SECTION F-F
1-C
1-A-3-COR
1-A-34-RHXA
1-A-3-MP
1-A-3-PB
TO FIGURE 9.5A-11
1-A-3-TA
PLAN AT EL.



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NOTES:

EQUIPMENT NOT LOCATED BY DIMENSION IS NOT RELEASED

AT EQUIPMENT, THE NUMBER IN PARENTHESIS (000), IDENTIFIES EBASCO EMDRAC FILE NUMBER [1364-000] OF THAT EQUIPMENT.

SAFETY RELATED EQUIPMENT INDICATED BY HATCH LINES.

FIRE PROTECTION FACILITIES
- STANDPIPE HOSE CONNECTION (1½) WITH 100 FT LONG 1½ HOSE
- DRY CHEMICAL EXTINGUISHER
- CO_2 EXTINGUISHER
- AREAS TO BE PROTECTED BY IONIZATION TYPE DETECTOR SYSTEMS
- "A" CLASS "A", 3 HOUR RATED FIRE DOOR
- "B" CLASS "B", 1½ HOUR RATED FIRE DOOR
- EMERGENCY EYEWASH STATION
- EMERGENCY SHOWER & EYEWASH STATION

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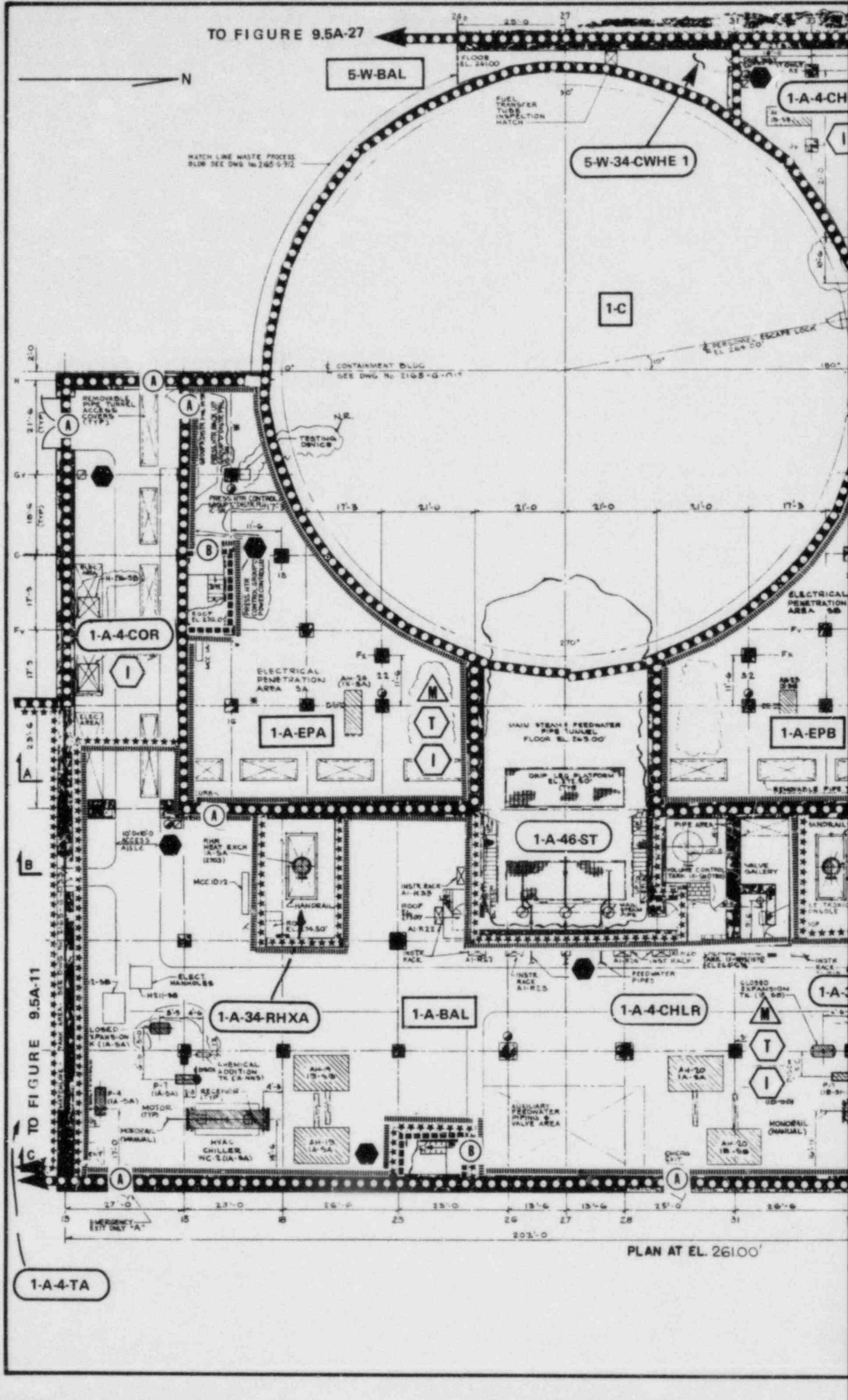
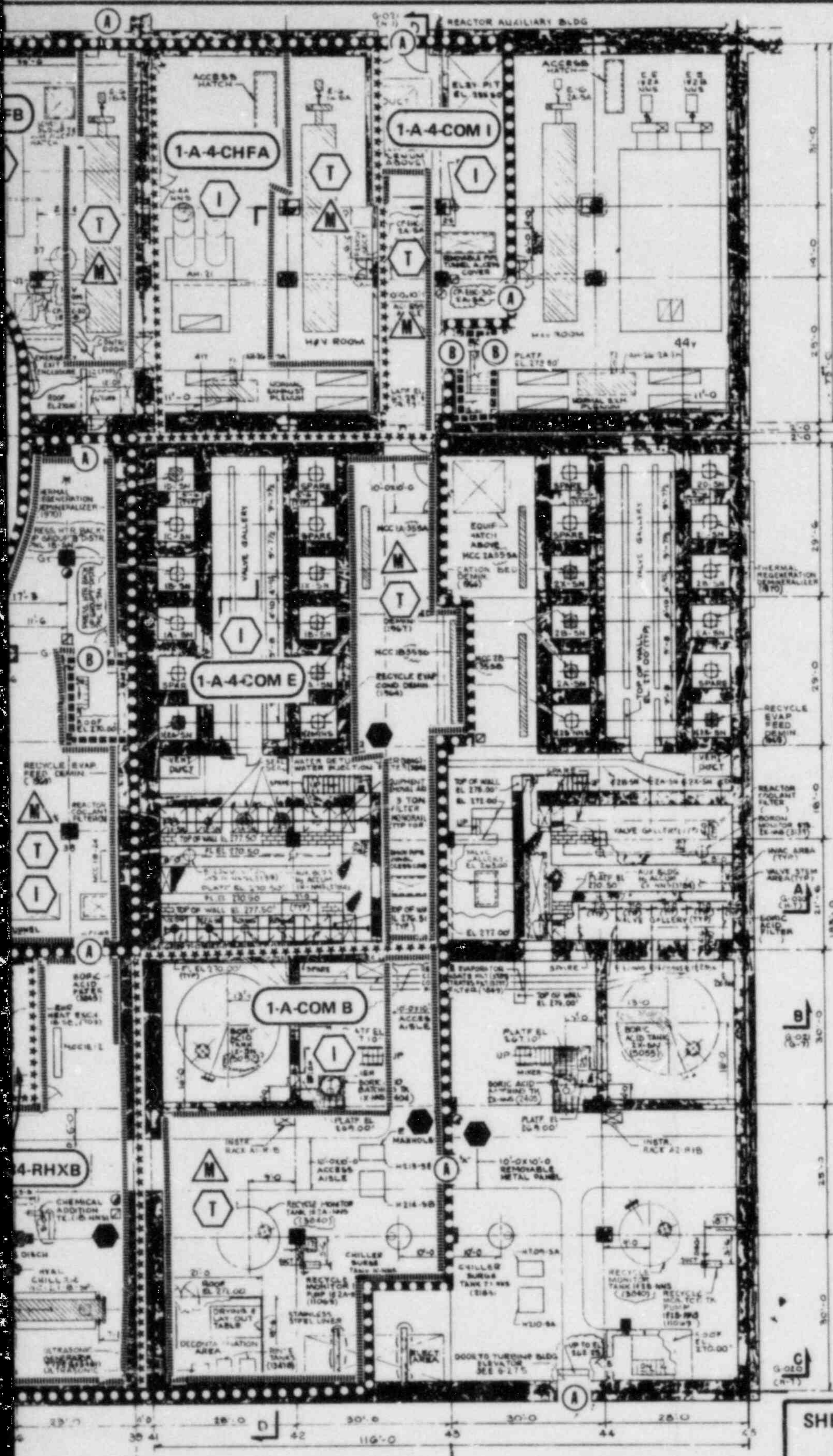
FIRE PROTECTION – REACTOR
AUXILIARY BLDG – PLAN EL 236.00'

FIGURE 9.5A-7

8408140036-/8


TO FIGURE 9.5A-27
5-W-BAL
5-W-34-CWHE 1
1-A-4-CH
1-C
1-A-4-COR
1-A-EPA
1-A-EPB
1-A-46-ST
1-A-34-RHXA
1-A-BAL
1-A-4-CHLR
TO FIGURE 9.5A-11
1-A-4-TA
ELECTRICAL PENETRATION AREA 5A
MAIN STEAM & FEEDWATER PIPE TUNNEL FLOOR EL. 265.00'
PLAN AT EL. 261.00'



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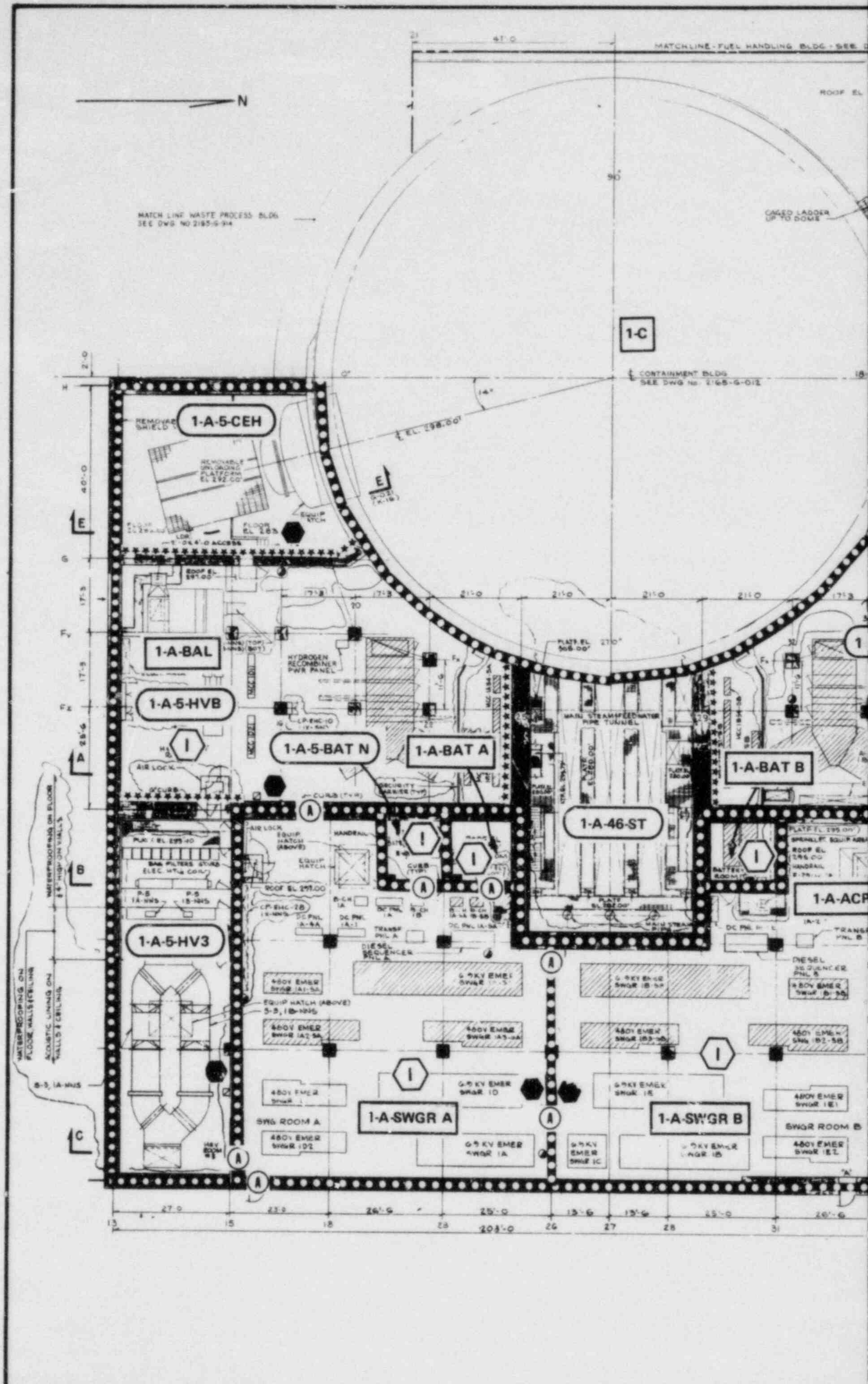
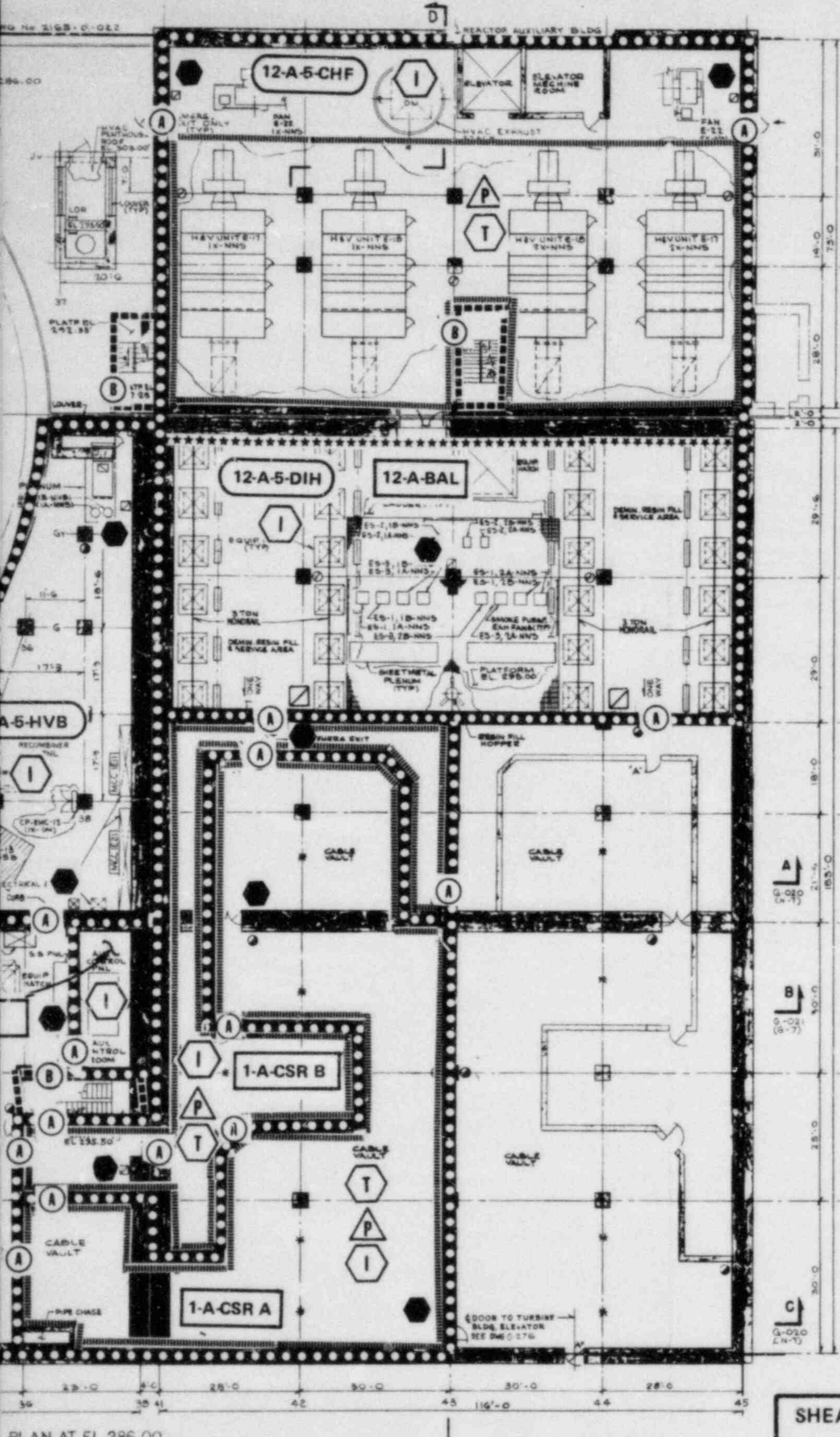
FIRE PROTECTION – REACTOR AUXILIARY BLDG – PLAN EL 261.00'

FIGURE 9.5A-8

8408140036-19



N
1-C
CONTAINMENT BLDG
1-A-5-CEH
1-A-BAL
HYDROGEN RECOMBINER PWR PANEL
1-A-5-HVB
1-A-5-BAT N
1-A-BAT A
1-A-BAT B
1-A-46-ST
1-A-5-HV3
1-A-SWGR A
1-A-SWGR B
SWG ROOM A
SWGR ROOM B



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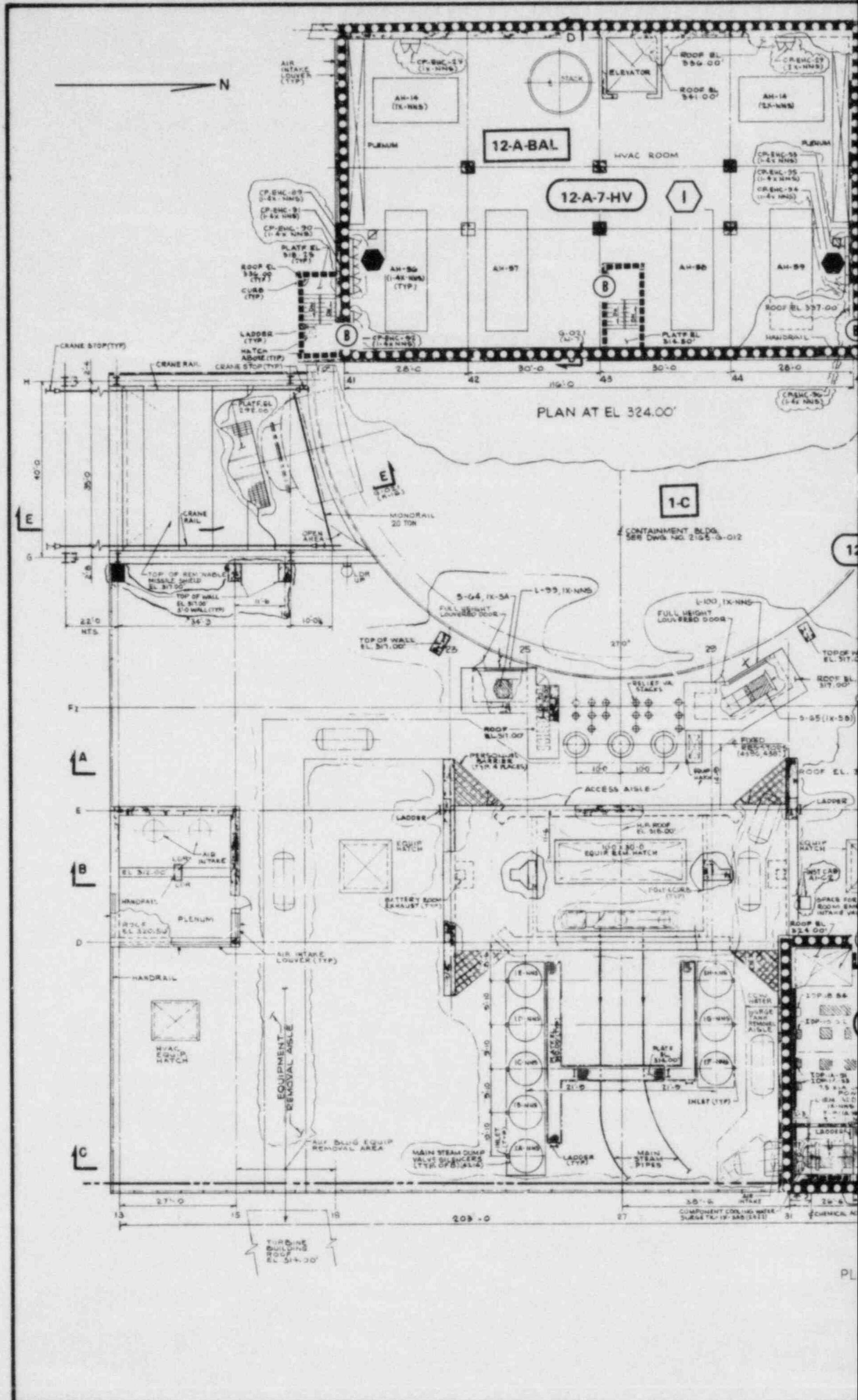
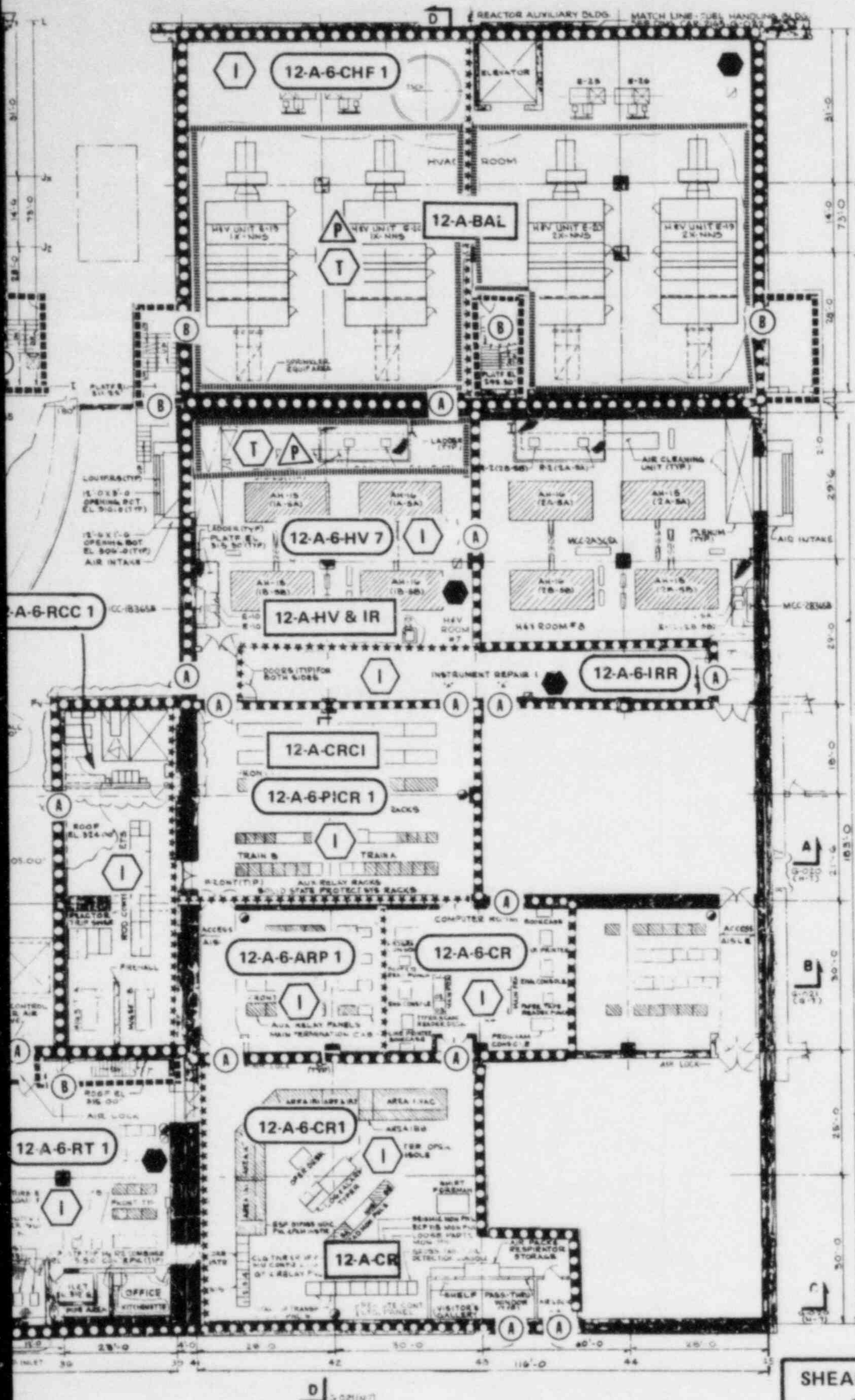
FIRE PROTECTION – REACTOR AUXILIARY BLDG – PLAN EL 286.00'

FIGURE 9.5A-9

8408140036-20


N
12-A-BAL
12-A-7-HV
HVAC ROOM
ELEVATOR
PLENUM
AH-14
AH-97
AH-98
AH-99
PLAN AT EL 324.00'
1-C
CONTAINMENT BLDG.
SEE DWG. NO. 2165-G-012
MONORAIL
20 TON
CRANE RAIL
ACCESS AISLE
EQUIP HATCH
EQUIPMENT REMOVAL AISLE
HVAC EQUIP. HATCH
PLENUM
HANDRAIL
AIR INTAKE LOUVER (TYP)
MAIN STEAM DUMP VALVE SILENCERS
MAIN STEAM PIPES
TURBINE BUILDING ROOF EL 314.00'
208'-0
116'-0



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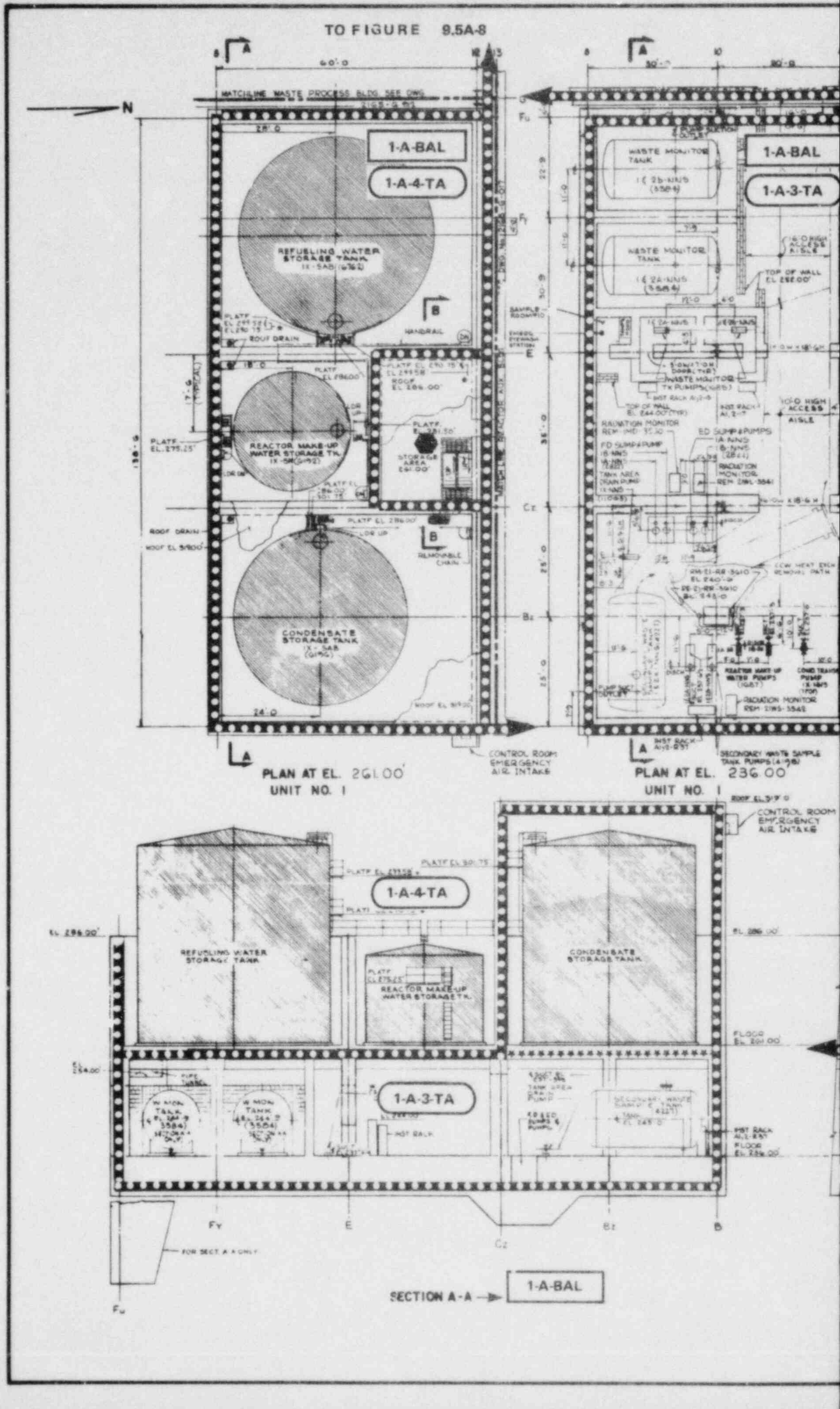
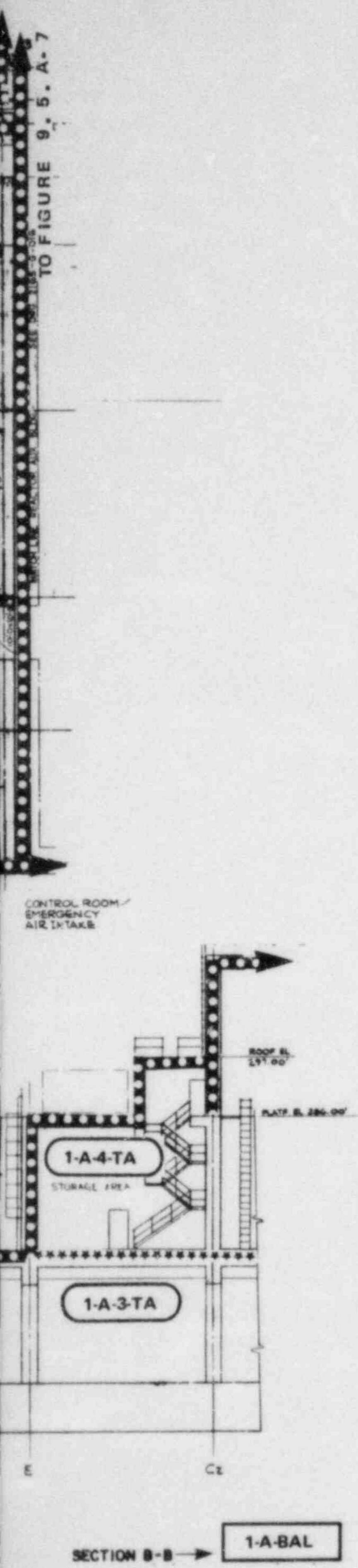
FIRE PROTECTION – REACTOR AUXILIARY BLDG – PLAN EL 305.00'

FIGURE 9.5A-10

8408140036 -21


TO FIGURE 9.5A-8
1-A-BAL
1-A-4-TA
1-A-3-TA
REFUELING WATER STORAGE TANK
REACTOR MAKE-UP WATER STORAGE TK.
CONDENSATE STORAGE TANK
WASTE MONITOR TANK
CONTROL ROOM EMERGENCY AIR INTAKE
PLAN AT EL. 261.00'
UNIT NO. 1
PLAN AT EL. 236.00
UNIT NO. 1
SECTION A-A



NOTES

1 AT EQUIPMENT, THE NUMBER IN PARENTHESIS (000) IDENTIFIES EBASCO EMDRAC FILE NUMBER [1364-000] OF THAT EQUIPMENT
2 SAFETY RELATED EQUIPMENT INDICATED BY HATCH LINES
3 ALL TANK COMPARTMENTS SHALL BE WATERTIGHT FROM EL 261.00' TO EL 286.00'
4 * = BY TANK MFR

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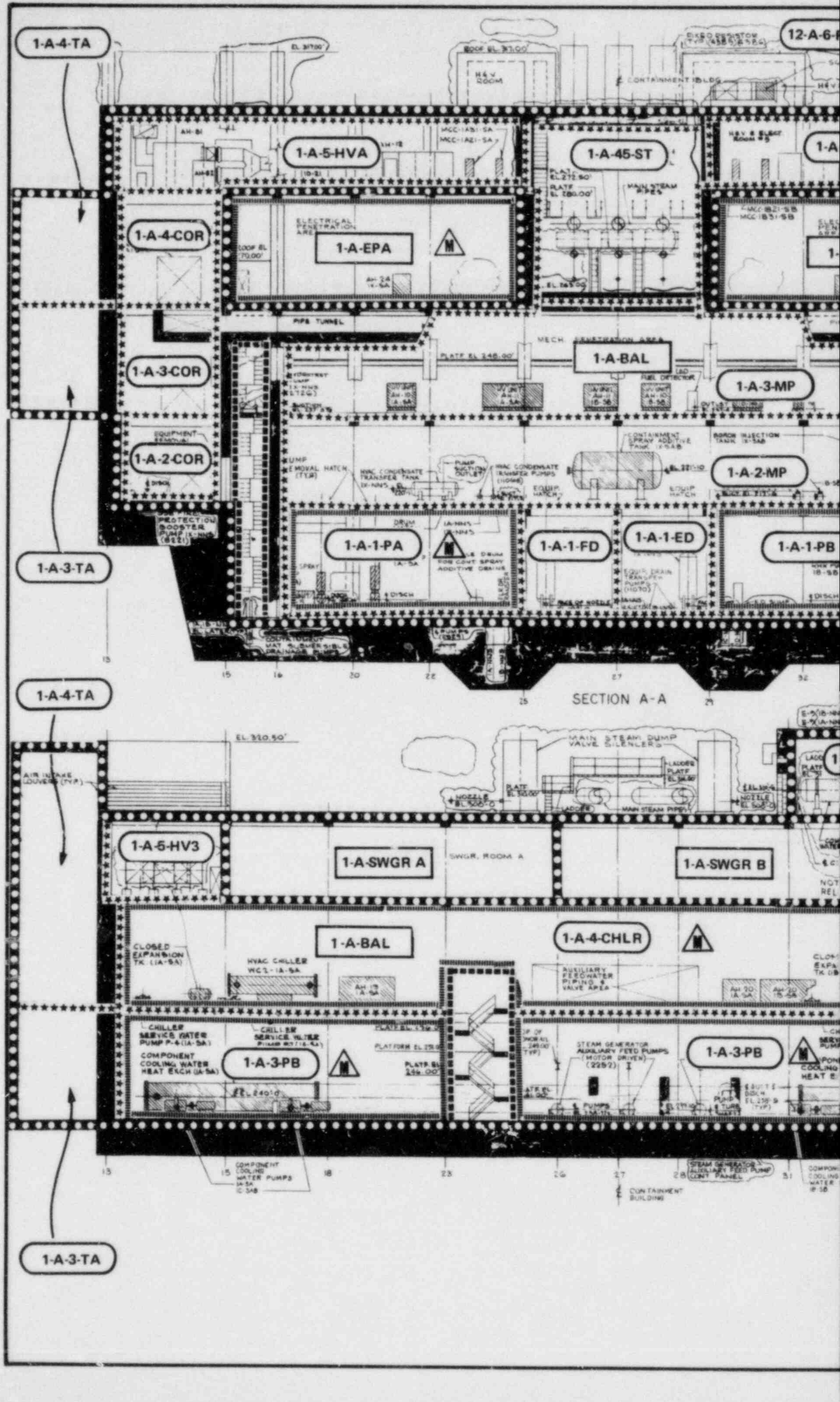
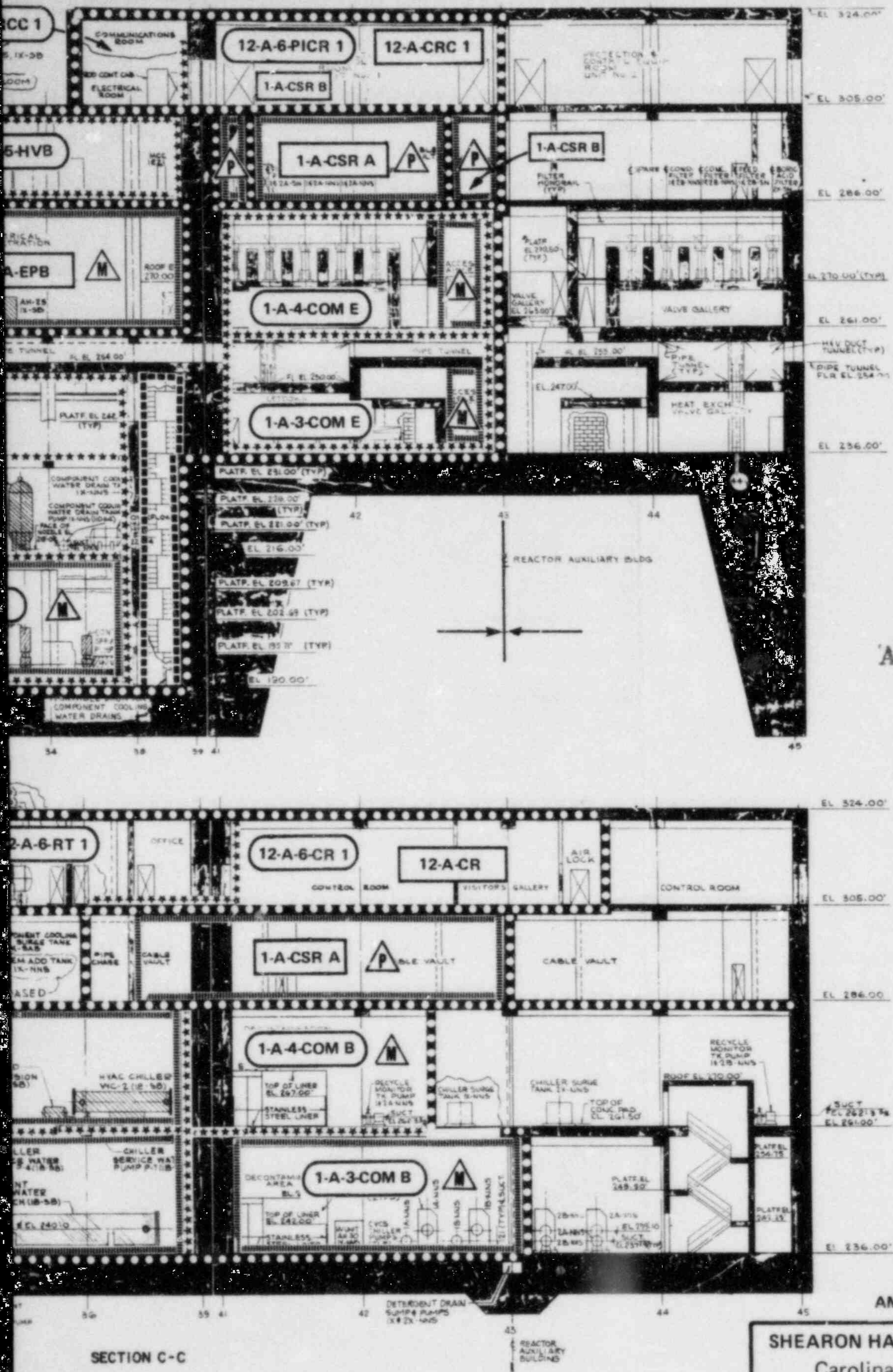
FIRE PROTECTION – TANK AREA
PLANS AND SECTIONS

FIGURE 9.5A-11

8408140036-22


1-A-4-TA
12-A-6-
1-A-5-HVA
1-A-45-ST
1-A-4-COR
1-A-EPA
1-A-3-COR
1-A-BAL
1-A-3-MP
1-A-2-COR
1-A-2-MP
1-A-1-PA
1-A-1-FD
1-A-1-ED
1-A-1-PB
1-A-3-TA
SECTION A-A
1-A-4-TA
1-A-5-HV3
1-A-SWGR A
1-A-SWGR B
1-A-BAL
1-A-4-CHLR
1-A-3-PB
1-A-3-PB
1-A-3-TA



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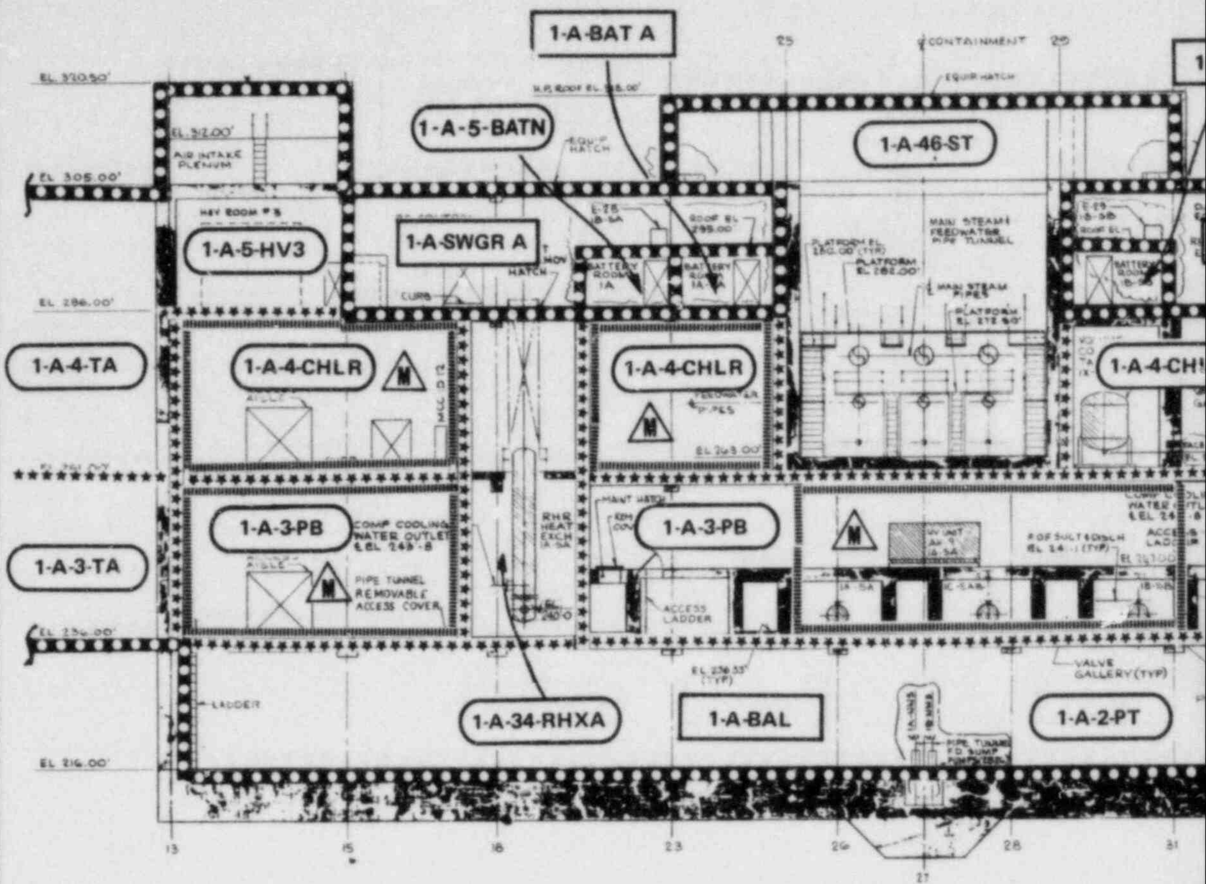
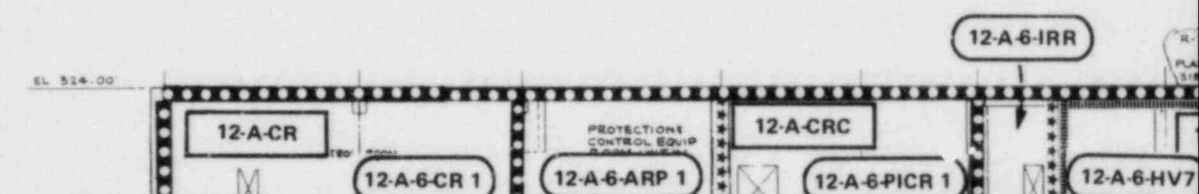
FIRE PROTECTION–REACTOR AUXILIARY BUILDING–SECTIONS–SHEET 1

FIGURE 9.5A-12

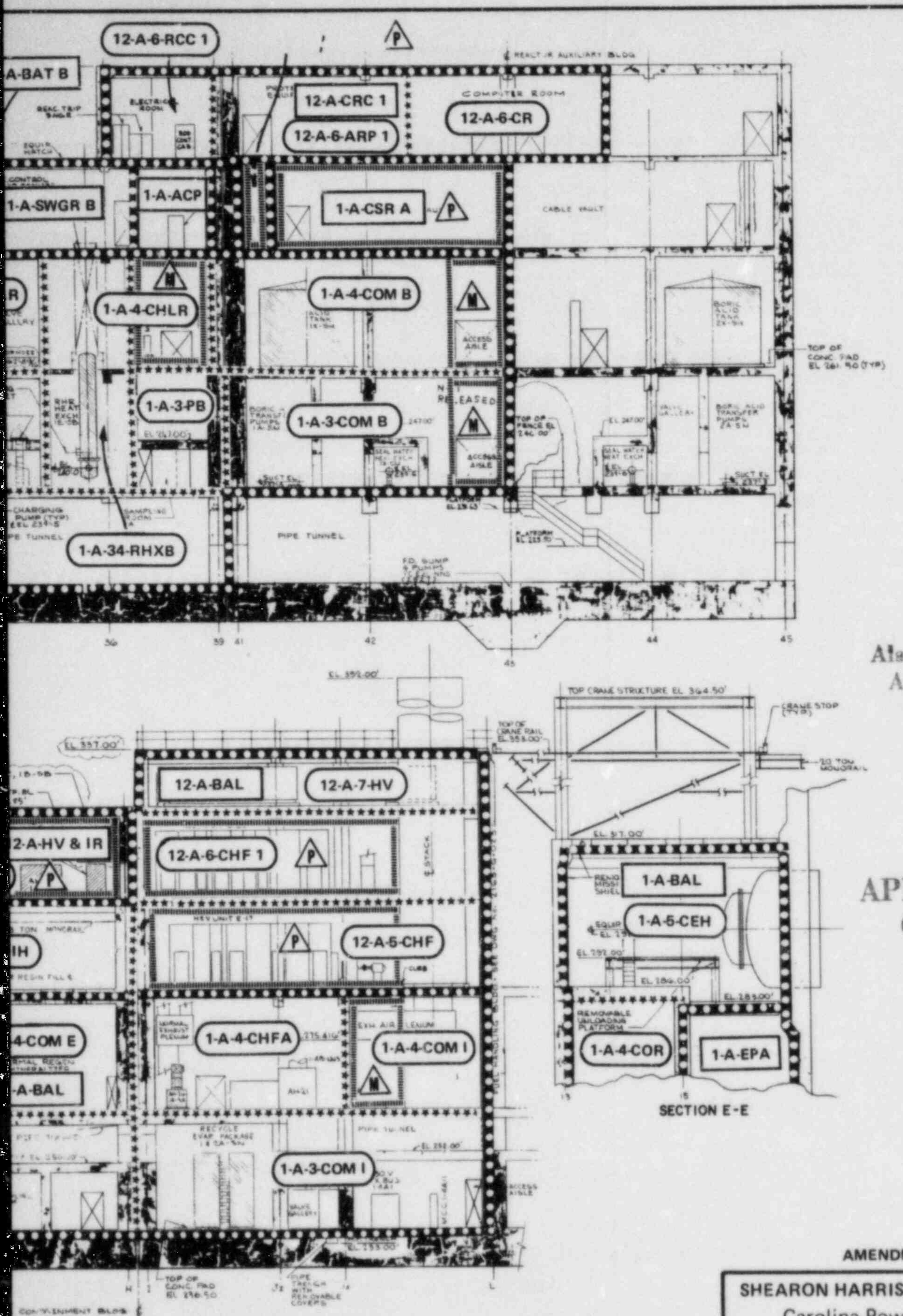
8408140036-23



SECTION B-B



SECTION D-D



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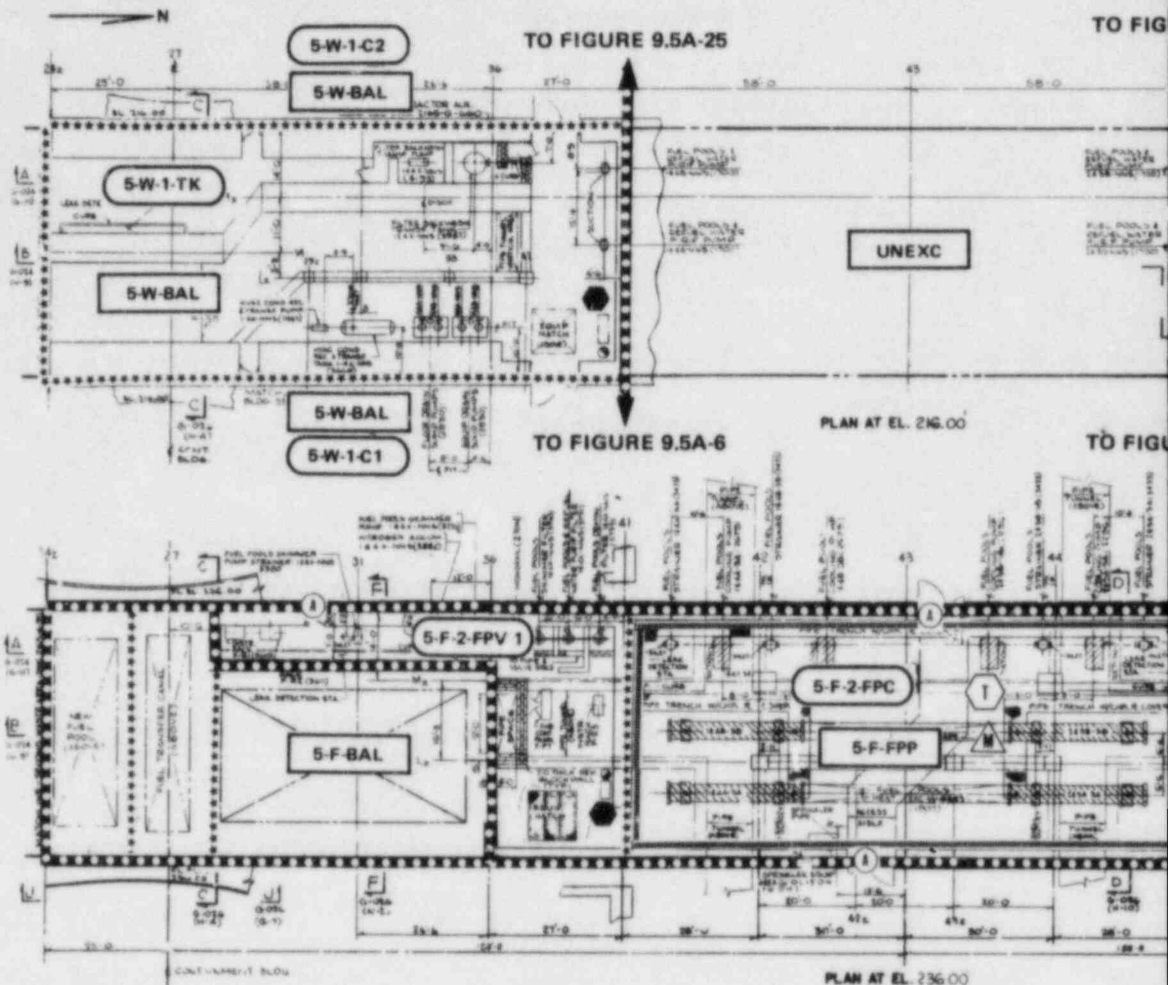
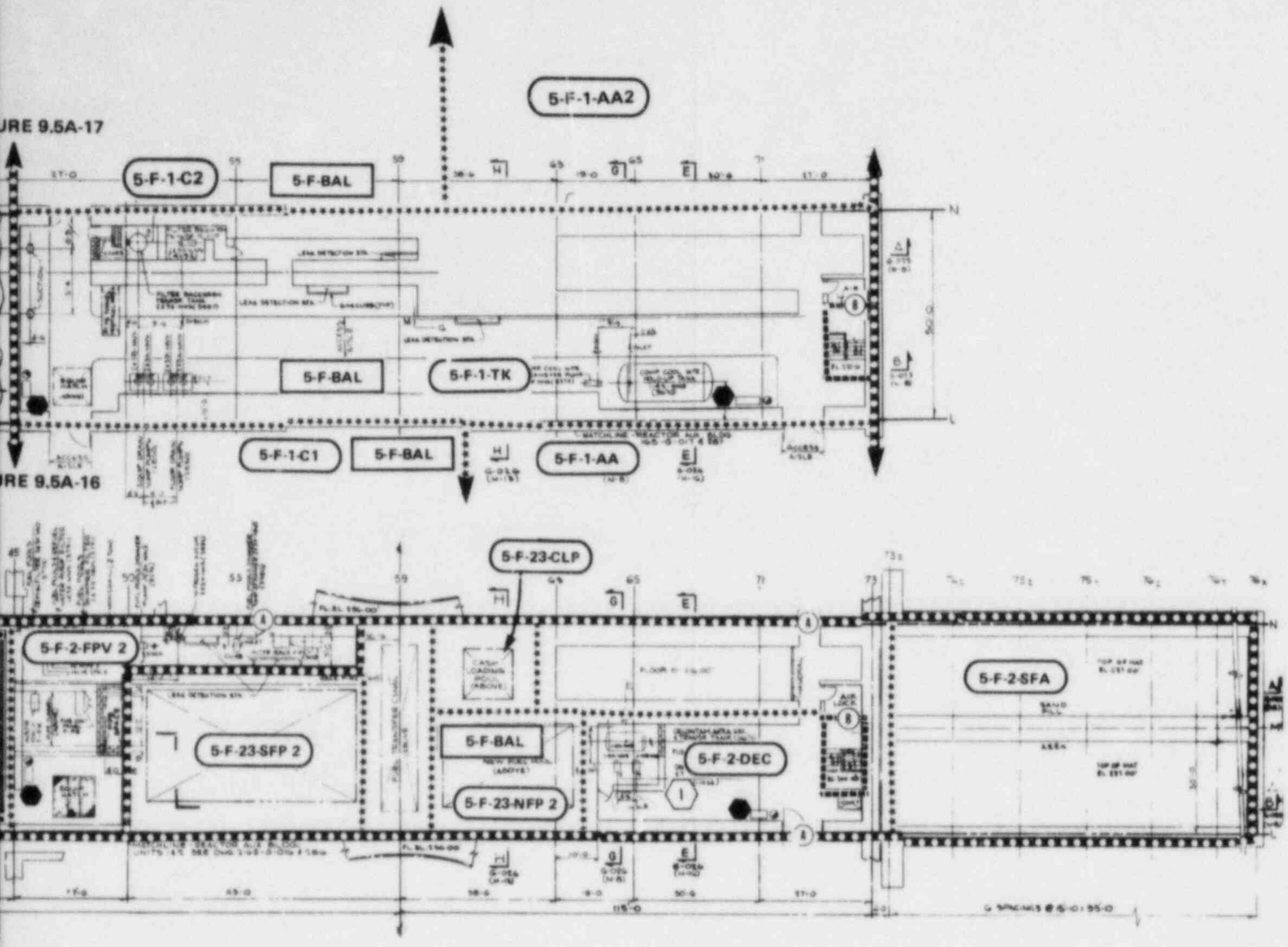
FIRE PROTECTION–REACTOR AUXILIARY BUILDING–SECTIONS–SHEET 2

FIGURE 9.5A-13

8408140036 -24



N
TO FIGURE 9.5A-25
TO FIG
5-W-1-C2
5-W-BAL
5-W-1-TK
5-W-BAL
UNEXC
5-W-BAL
5-W-1-C1
TO FIGURE 9.5A-6
PLAN AT EL. 216.00
TO FIGU
5-F-2-FPV 1
5-F-2-FPC
5-F-BAL
5-F-FPP
PLAN AT EL. 236.00



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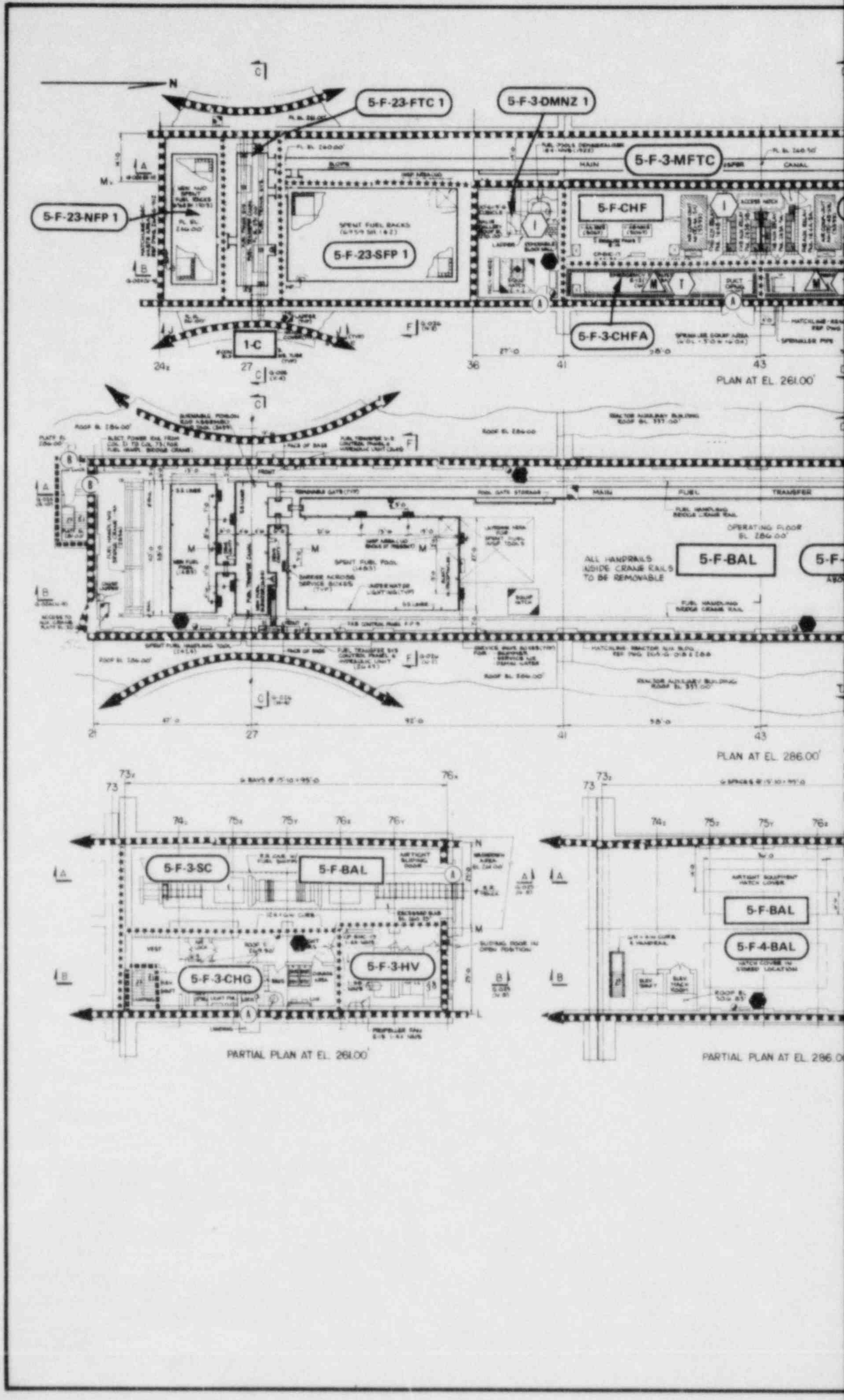
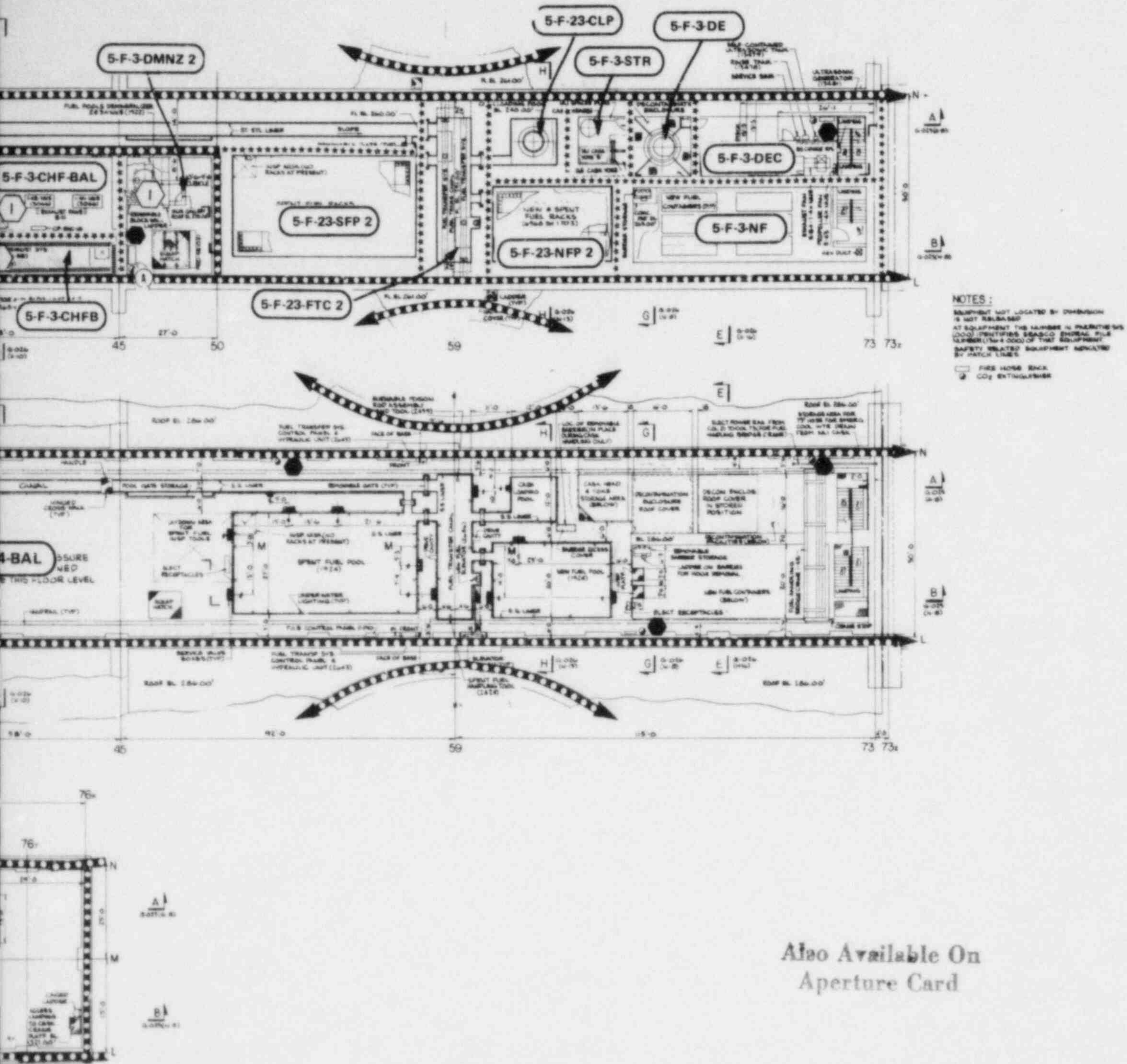
FIRE PROTECTION—FUEL HANDLING BUILDING—PLANS—SHEET 1

FIGURE 9.5A-14


5-F-23-FTC 1
5-F-3-DMNZ 1
5-F-3-MFTC
5-F-23-NFP 1
5-F-CHF
5-F-23-SFP 1
SPENT FUEL RACKS
5-F-3-CHFA
1-C
PLAN AT EL. 261.00'
ALL HANDRAILS INSIDE CRANE RAILS TO BE REMOVABLE
5-F-BAL
OPERATING FLOOR EL. 286.00'
SPENT FUEL POOL
PLAN AT EL. 286.00'
5-F-3-SC
5-F-BAL
5-F-3-CHG
5-F-3-HV
PARTIAL PLAN AT EL. 261.00'
5-F-BAL
5-F-4-BAL
PARTIAL PLAN AT EL. 286.00



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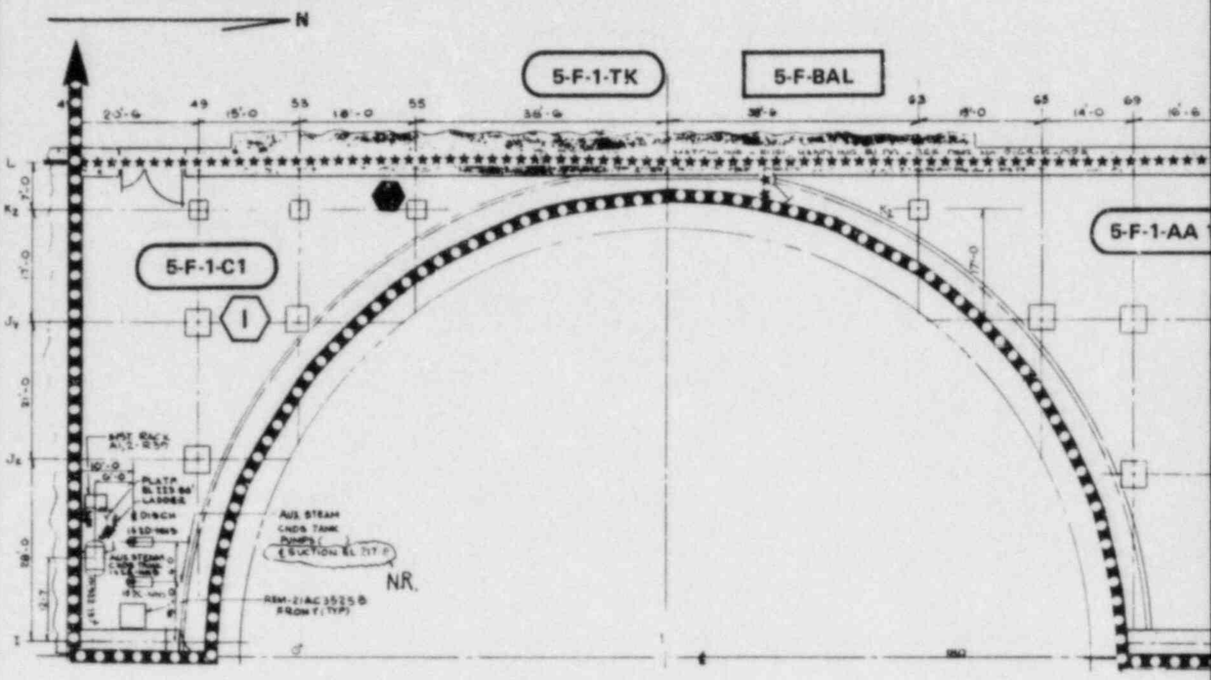
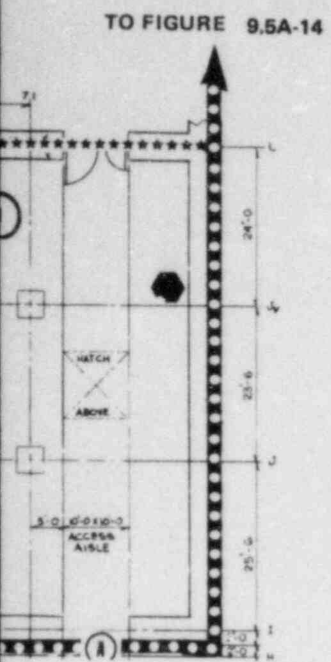
FIRE PROTECTION—FUEL HANDLING
BUILDING—PLANS—SHEET 2

FIGURE 9.5A-15



PLAN AT EL. 216.00'



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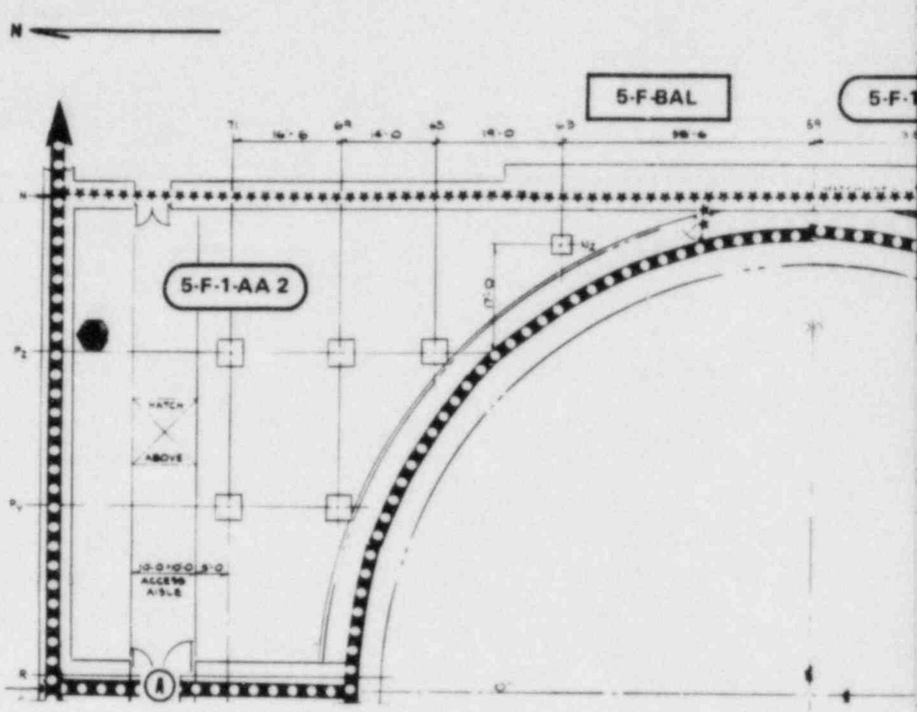
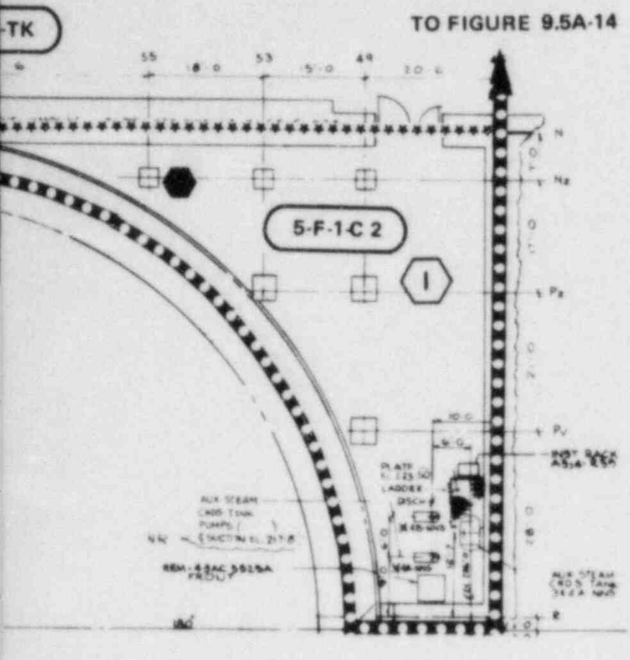
FIRE PROTECTION–REACTOR AUXILIARY BUILDING–PLAN EL 190.00' AND 216.00'

FIGURE 9.5A-16

8408140036-27



N
5-F-BAL
5-F-1
5-F-1-AA 2
HATCH
ABOVE
ACCESS
AISLE



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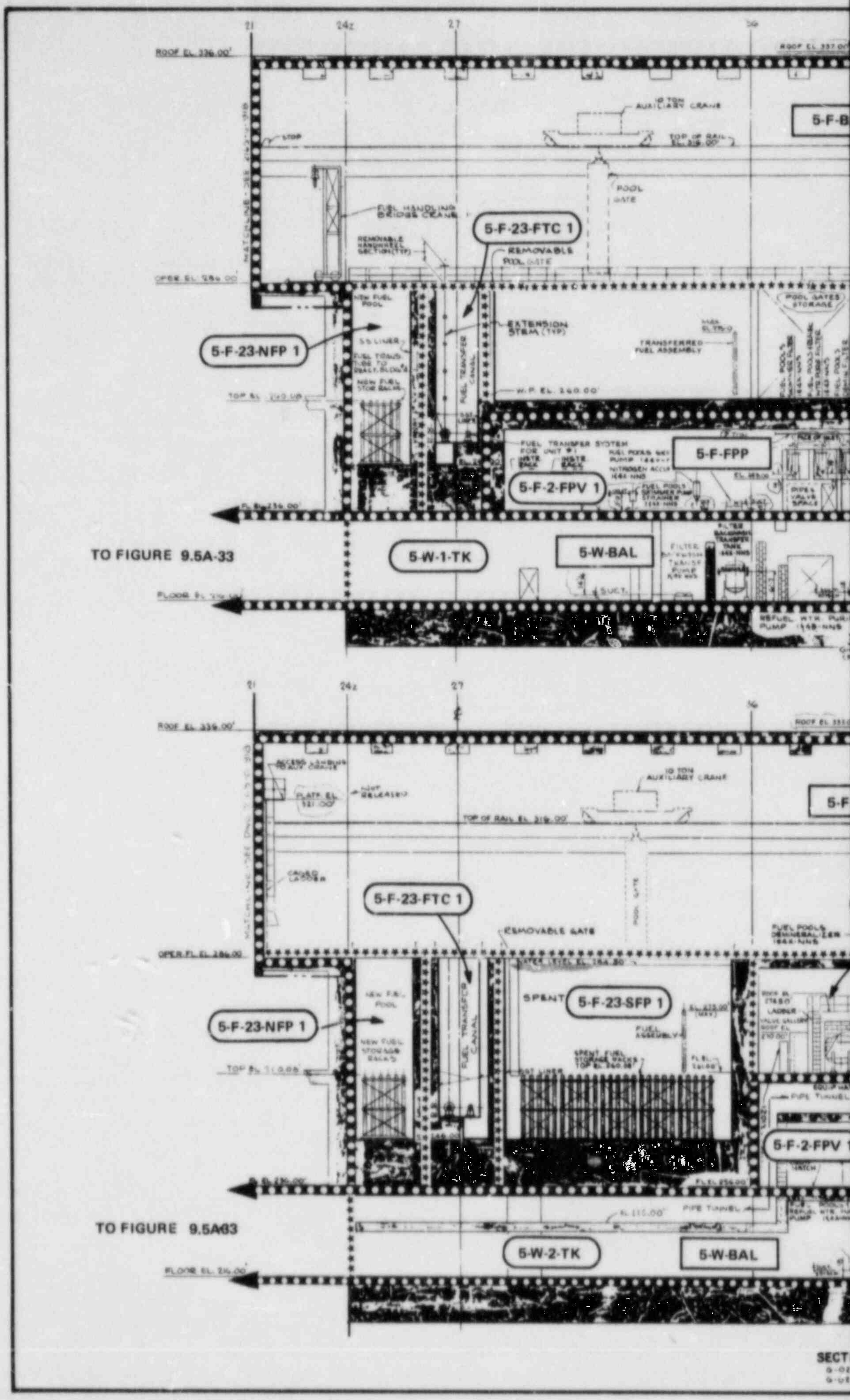
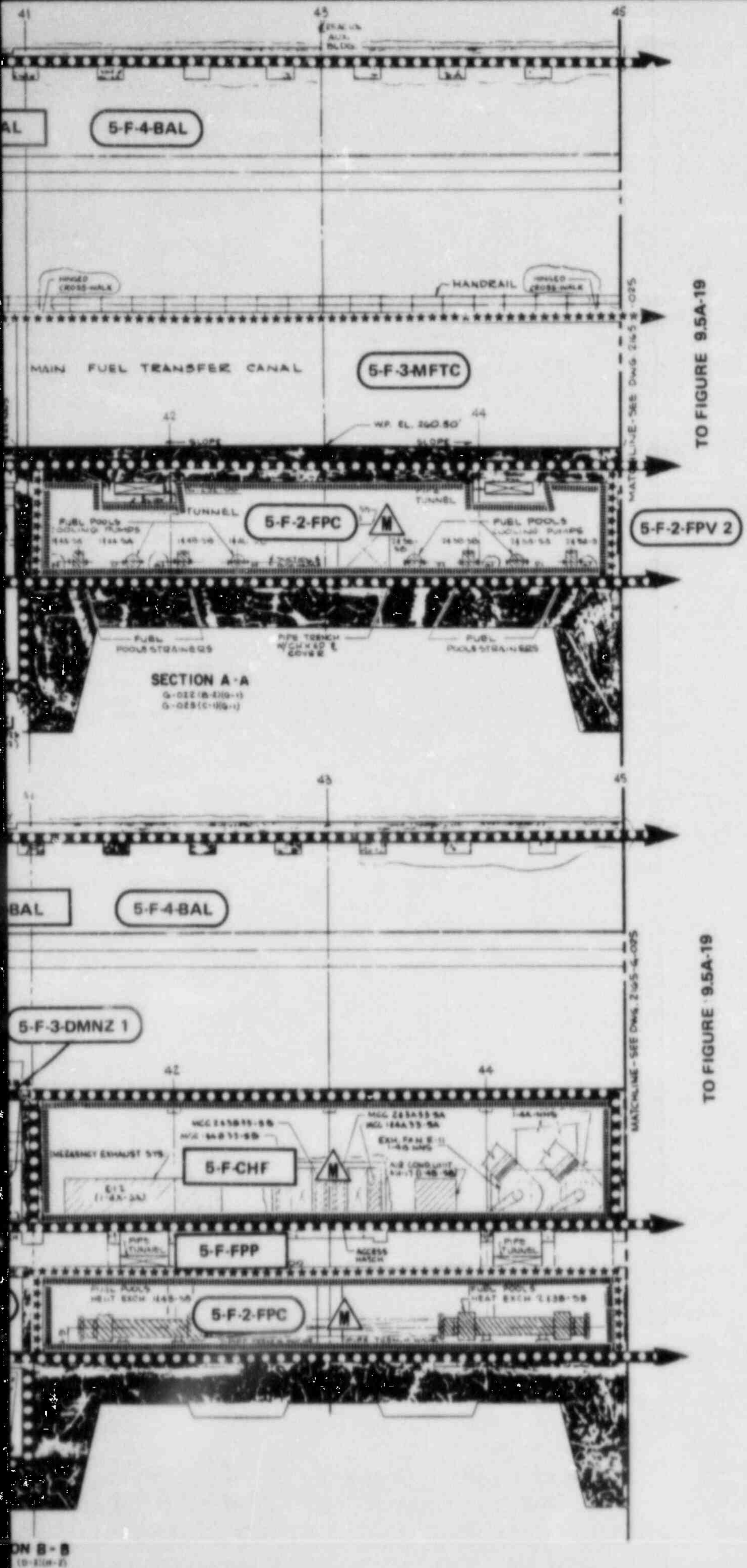
FIRE PROTECTION–REACTOR AUXILIARY BUILDING – PLAN EL 216.00'

FIGURE 9.5A-17

8408140036 -28


ROOF EL 336.00'
10 TON AUXILIARY CRANE
5-F-B
FUEL HANDLING BRIDGE CRANE
5-F-23-FTC 1
REMOVABLE POOL GATE
POOL GATE
OPER EL 286.00
5-F-23-NFP 1
EXTENSION STEM (TYP)
TRANSFERRED FUEL ASSEMBLY
POOL GATES STORAGE
FUEL TRANSFER CANAL
FUEL TRANSFER SYSTEM FOR UNIT #1
5-F-FPP
5-F-2-FPV 1
TO FIGURE 9.5A-33
5-W-1-TK
5-W-BAL
ROOF EL 336.00'
10 TON AUXILIARY CRANE
5-F
TOP OF RAIL EL 316.00'
5-F-23-FTC 1
REMOVABLE GATE
OPER FL EL 286.00
5-F-23-NFP 1
SPENT
5-F-23-SFP 1
5-F-2-FPV 1
PIPE TUNNEL
TO FIGURE 9.5A63
5-W-2-TK
5-W-BAL
FLOOR EL 216.00'
SECT



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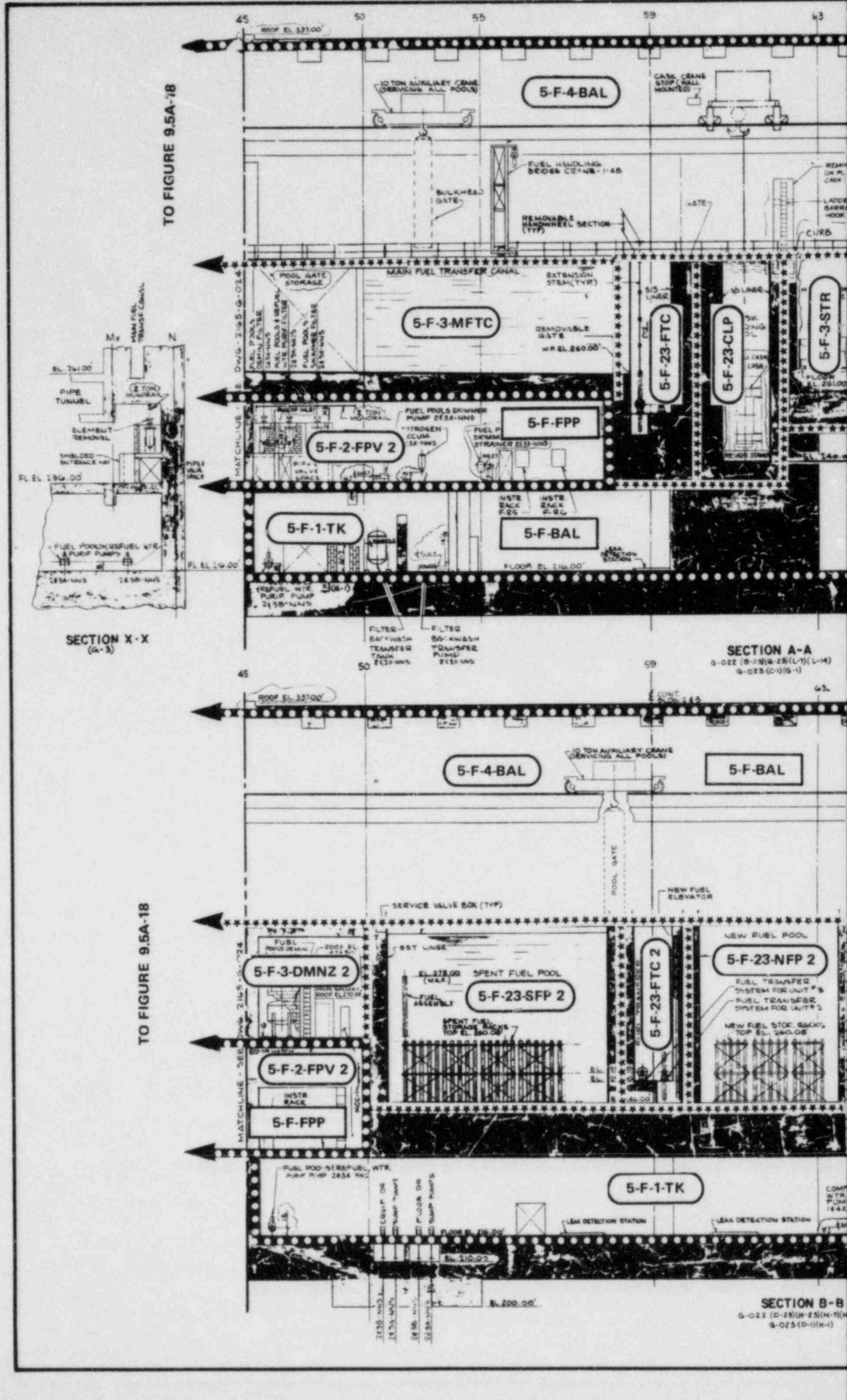
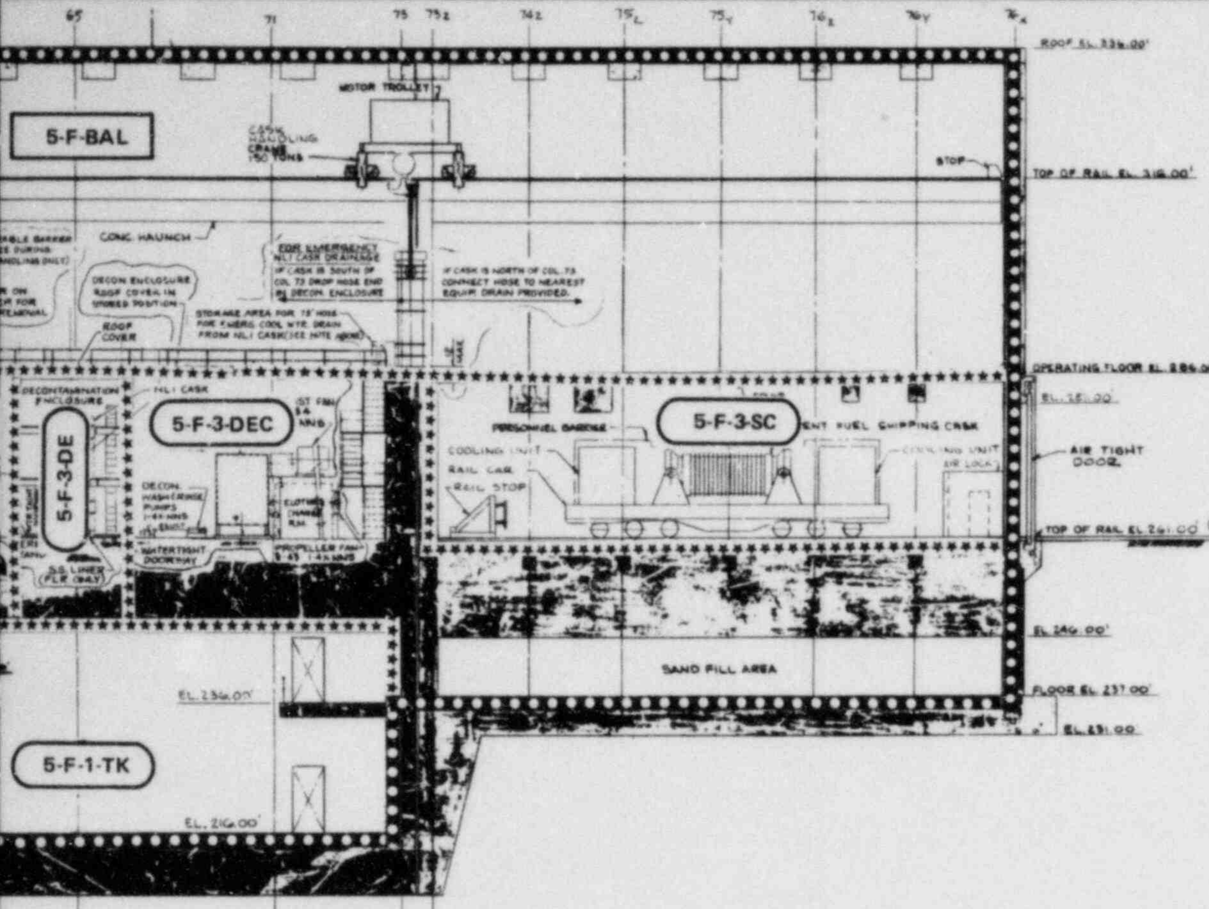
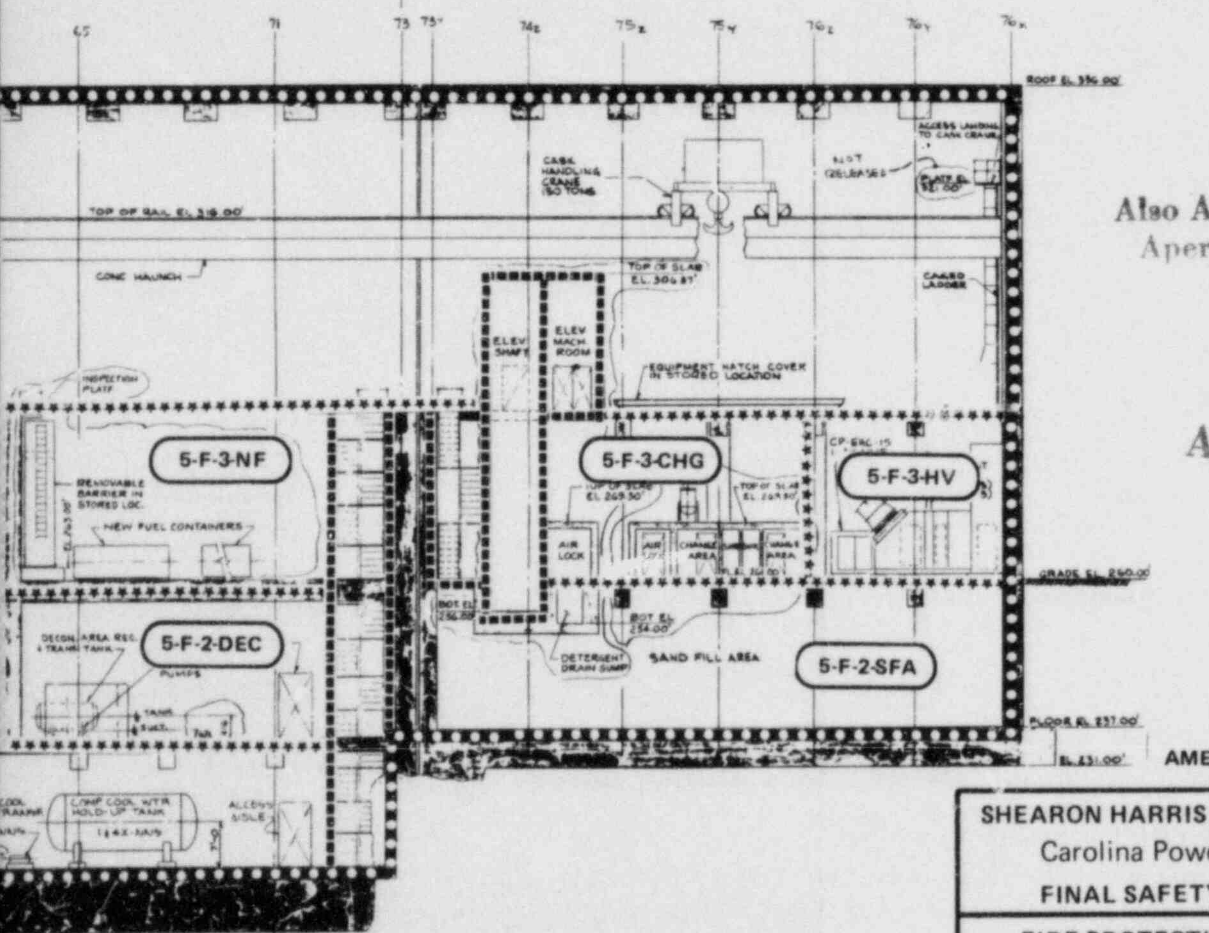
FIRE PROTECTION–FUEL HANDLING BUILDING–SECTIONS–SHEET 1

FIGURE 9.5A-18

8408140036-29


TO FIGURE 9.5A-18
5-F-4-BAL
5-F-3-MFTC
5-F-23-FTC
5-F-23-CLP
5-F-3-STR
5-F-FPP
5-F-2-FPV 2
5-F-1-TK
5-F-BAL
MAIN FUEL TRANSFER CANAL
FUEL HANDLING BRIDGE CRANE
BULKHEAD GATE
REMOVABLE GATE
SECTION X-X
SECTION A-A
TO FIGURE 9.5A-18
5-F-4-BAL
5-F-BAL
5-F-3-DMNZ 2
5-F-23-SFP 2
SPENT FUEL POOL
5-F-23-FTC 2
5-F-23-NFP 2
NEW FUEL POOL
NEW FUEL ELEVATOR
POOL GATE
SERVICE VALVE BOX (TYP)
5-F-2-FPV 2
5-F-FPP
5-F-1-TK
LEAK DETECTION STATION
SECTION B-B





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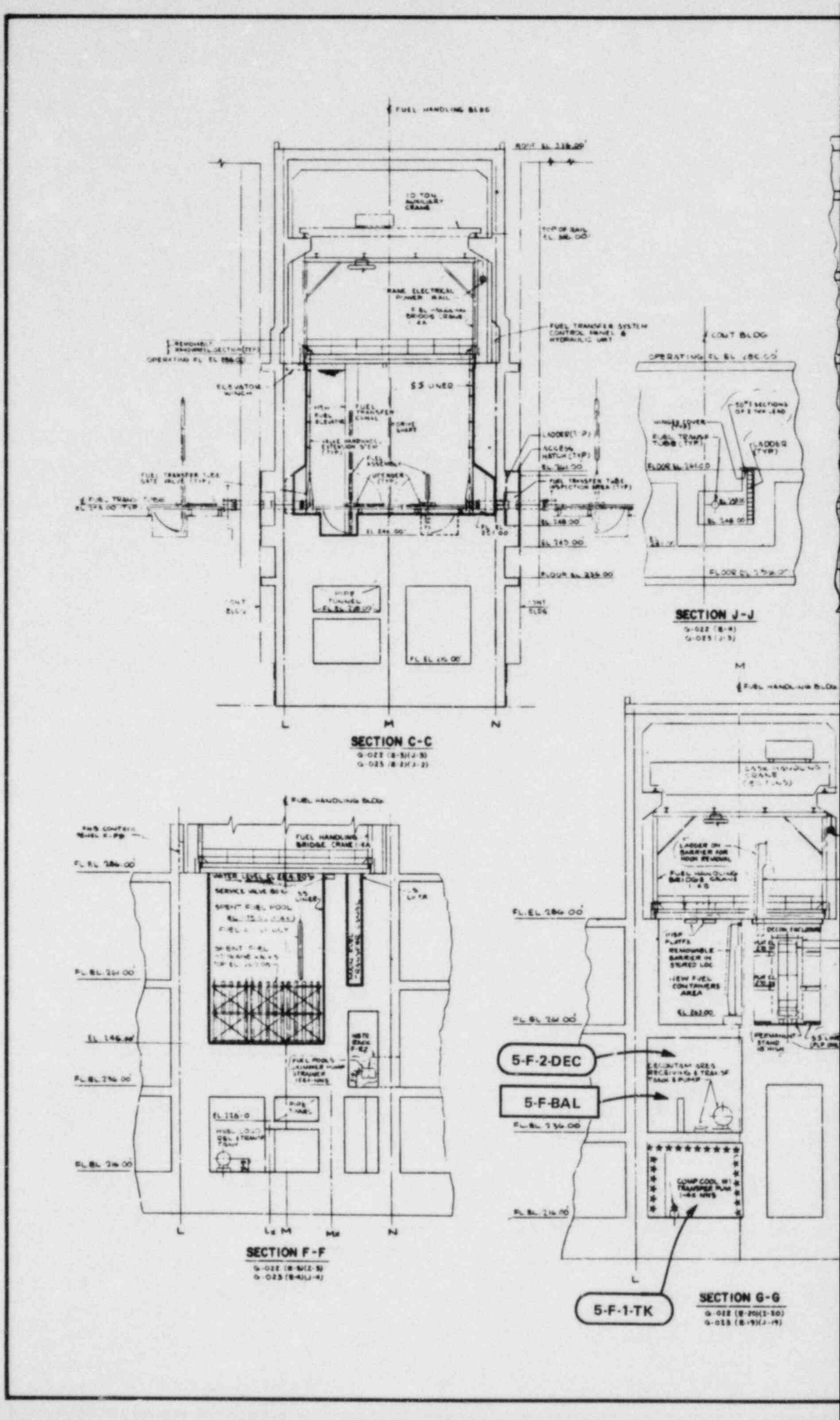
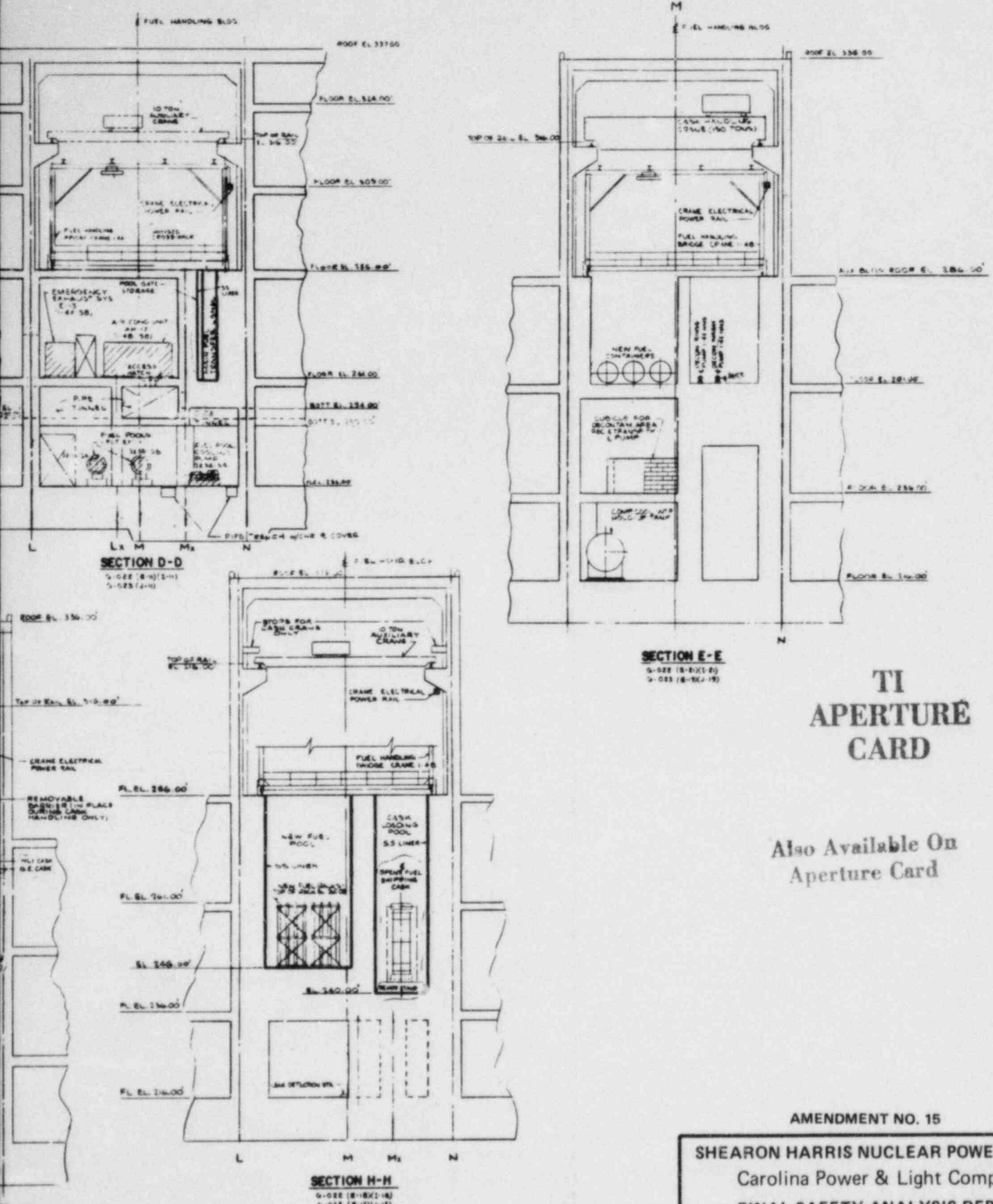
FIRE PROTECTION–FUEL HANDLING BUILDING–SECTIONS–SHEET 2

FIGURE 9.5A-19


SECTION C-C
SECTION J-J
SECTION F-F
SECTION G-G
5-F-2-DEC
5-F-BAL
5-F-1-TK
L
M
N



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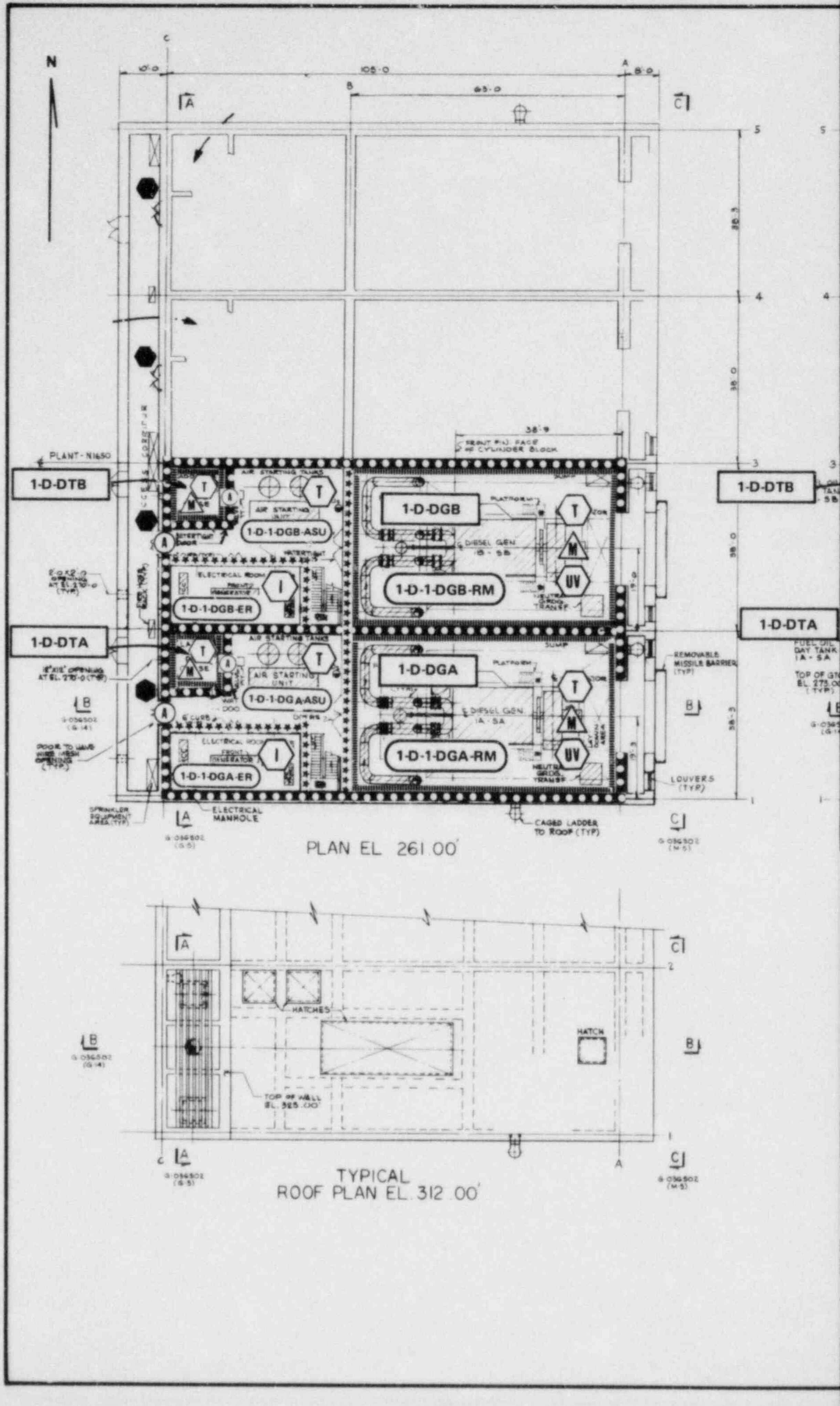
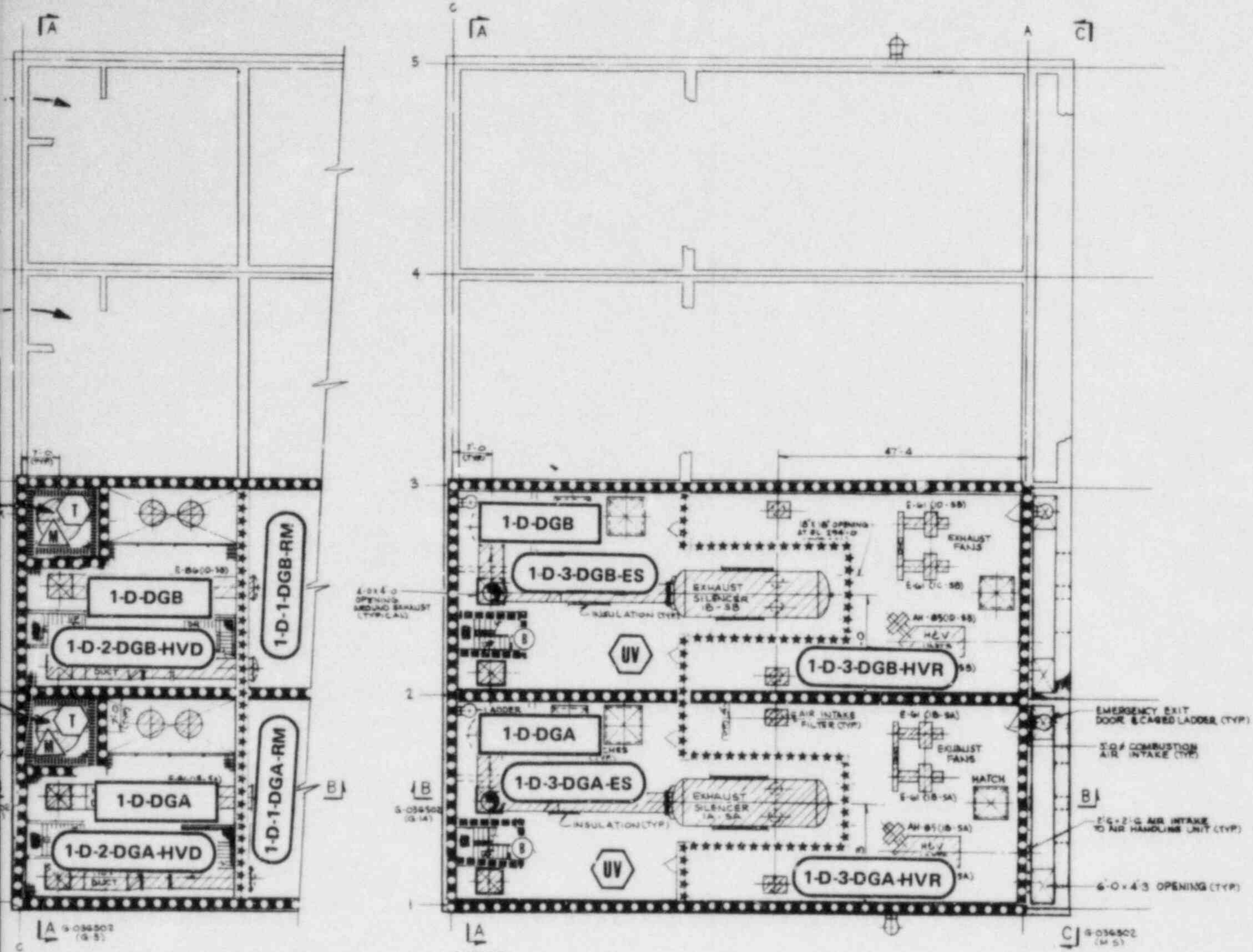
FIRE PROTECTION–FUEL HANDLING BUILDING–SECTIONS–SHEET 3

FIGURE 9.5A-20

8408140036-31



N
105'-0
65'-0
38'-9
1-D-DTB
1-D-DTA
1-D-DGB
1-D-1-DGB-ASU
1-D-1-DGB-ER
1-D-1-DGB-RM
1-D-DGA
1-D-1-DGA-ASU
1-D-1-DGA-ER
1-D-1-DGA-RM
AIR STARTING TANKS
ELECTRICAL ROOM
DIESEL GEN. 1B - SB
DIESEL GEN. 1A - SA
PLATFORM
REMOVABLE MISSILE BARRIER (TYP)
LOUVERS (TYP)
ELECTRICAL MANHOLE
CAGED LADDER TO ROOF (TYP)
PLANT - N1650
PLAN EL. 261.00'
HATCHES
HATCH
TOP OF WALL EL. 325.00'
TYPICAL ROOF PLAN EL. 312.00'



PART PLAN EL 280.00'

PLAN EL 292.00'

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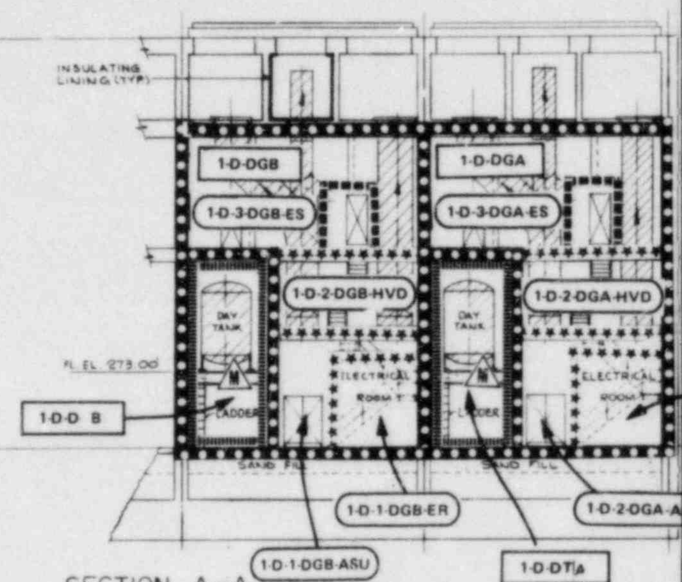
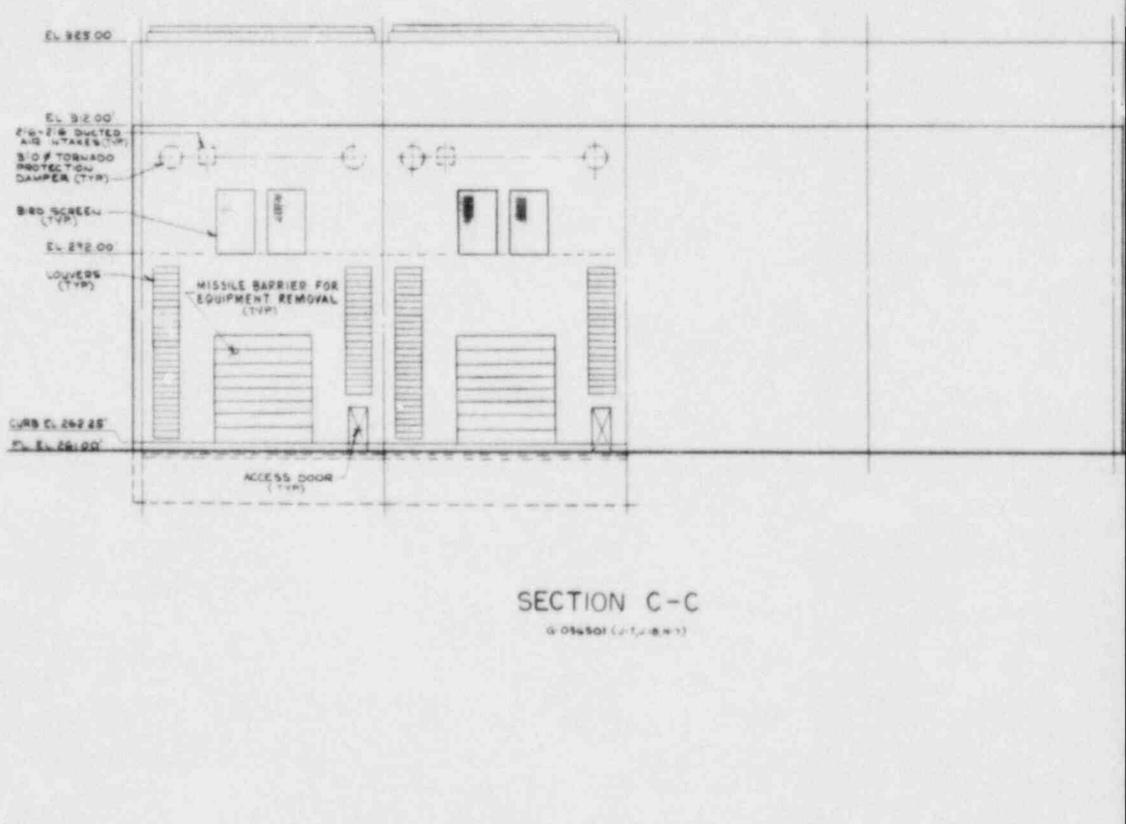
FIRE PROTECTION–DIESEL GENERATOR
BUILDING – PLANS

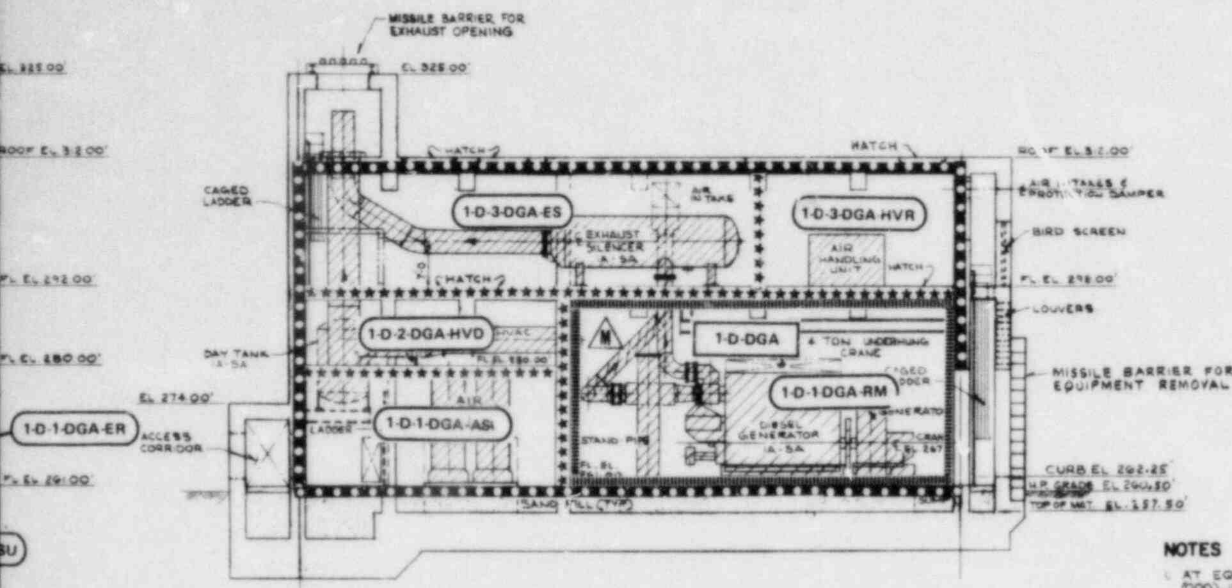
FIGURE 9.5A-21



SECTION A-A



SECTION C-C



SECTION B-B

NOTES

1. AT EQUIPMENT THE NUMBER IN PARENTHESIS (000) IDENTIFIES EBASCO EMDRAC FILE NUMBER (1364-000) OF THAT EQUIPMENT.
2. THIS BUILDING IS A SEISMIC CATEGORY I STRUCTURE.
3. INDICATES SAFETY RELATED EQUIPMENT

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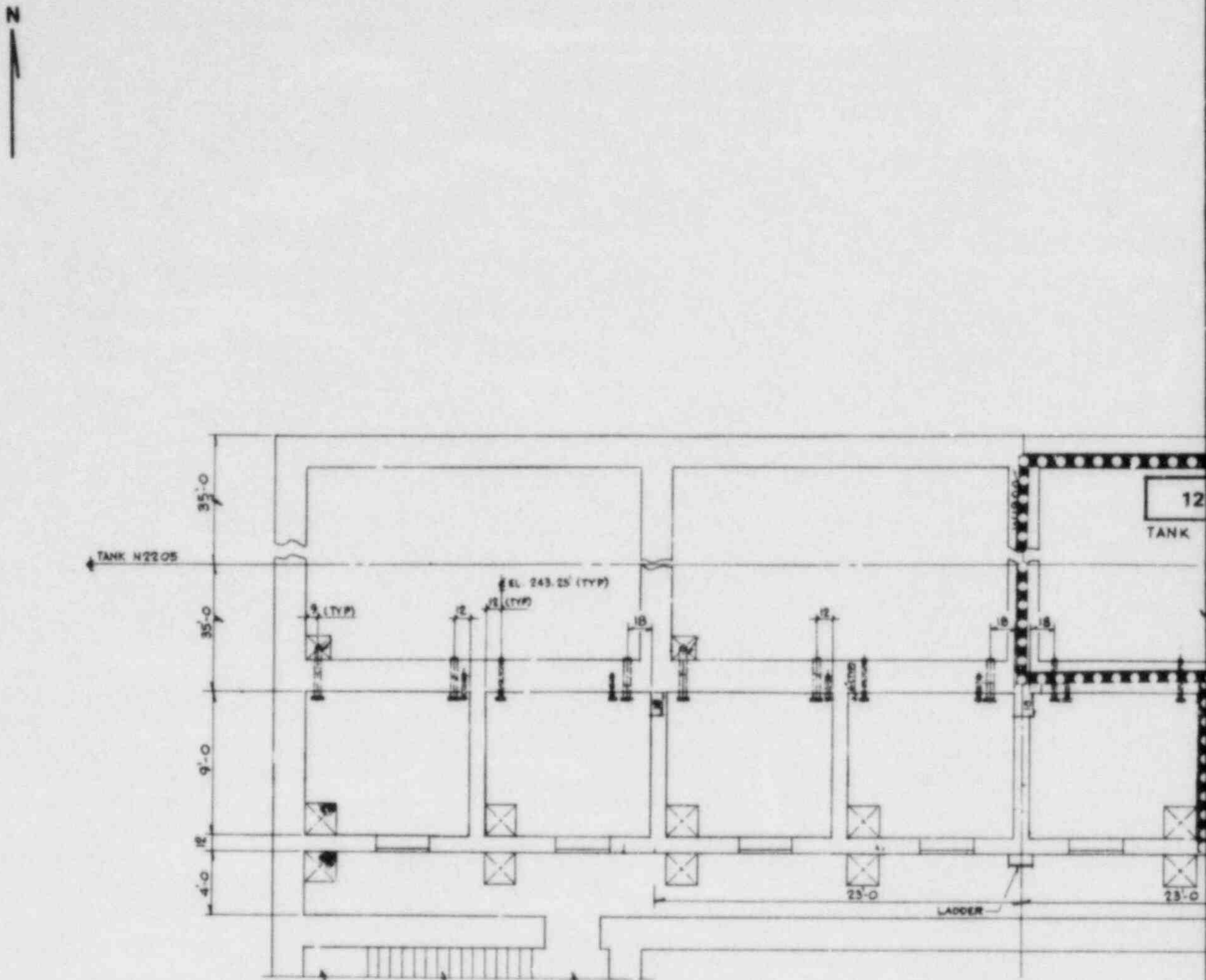
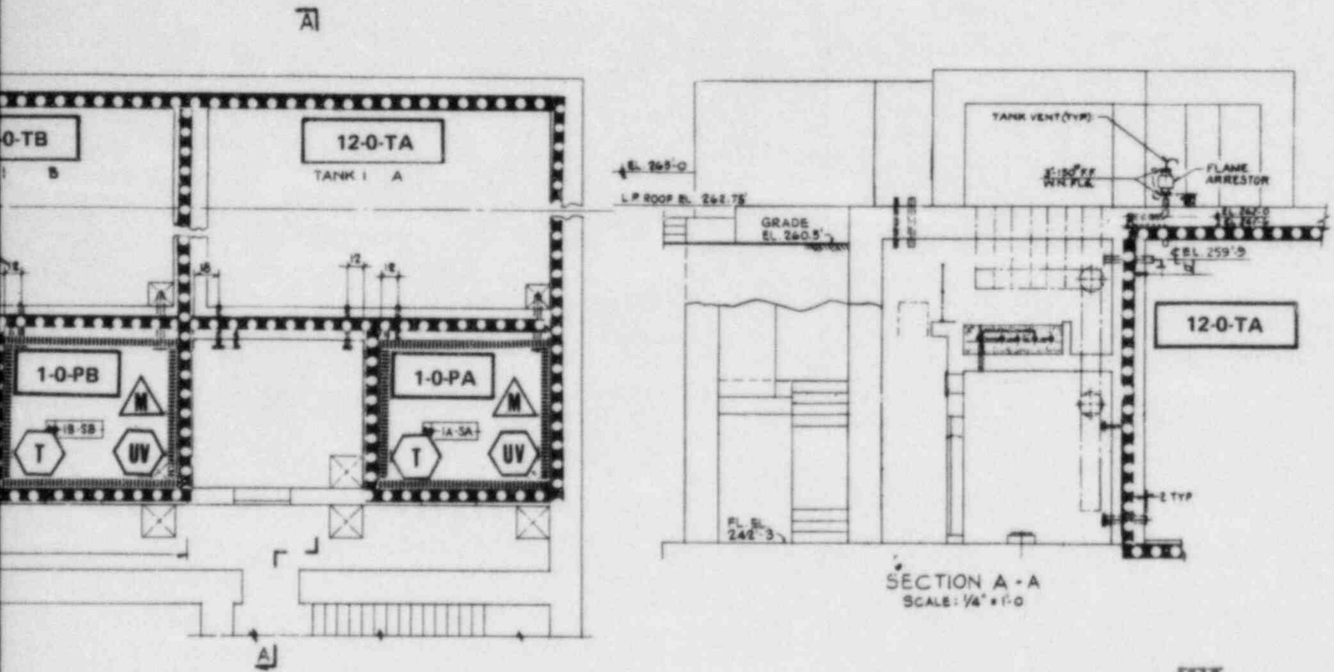
FIRE PROTECTION–DIESEL GENERATOR BUILDING – SECTIONS

FIGURE 9.5A-22

8408140036-33



PLAN AT EL. 242.25'
SCALE: 1/4"=1'-0



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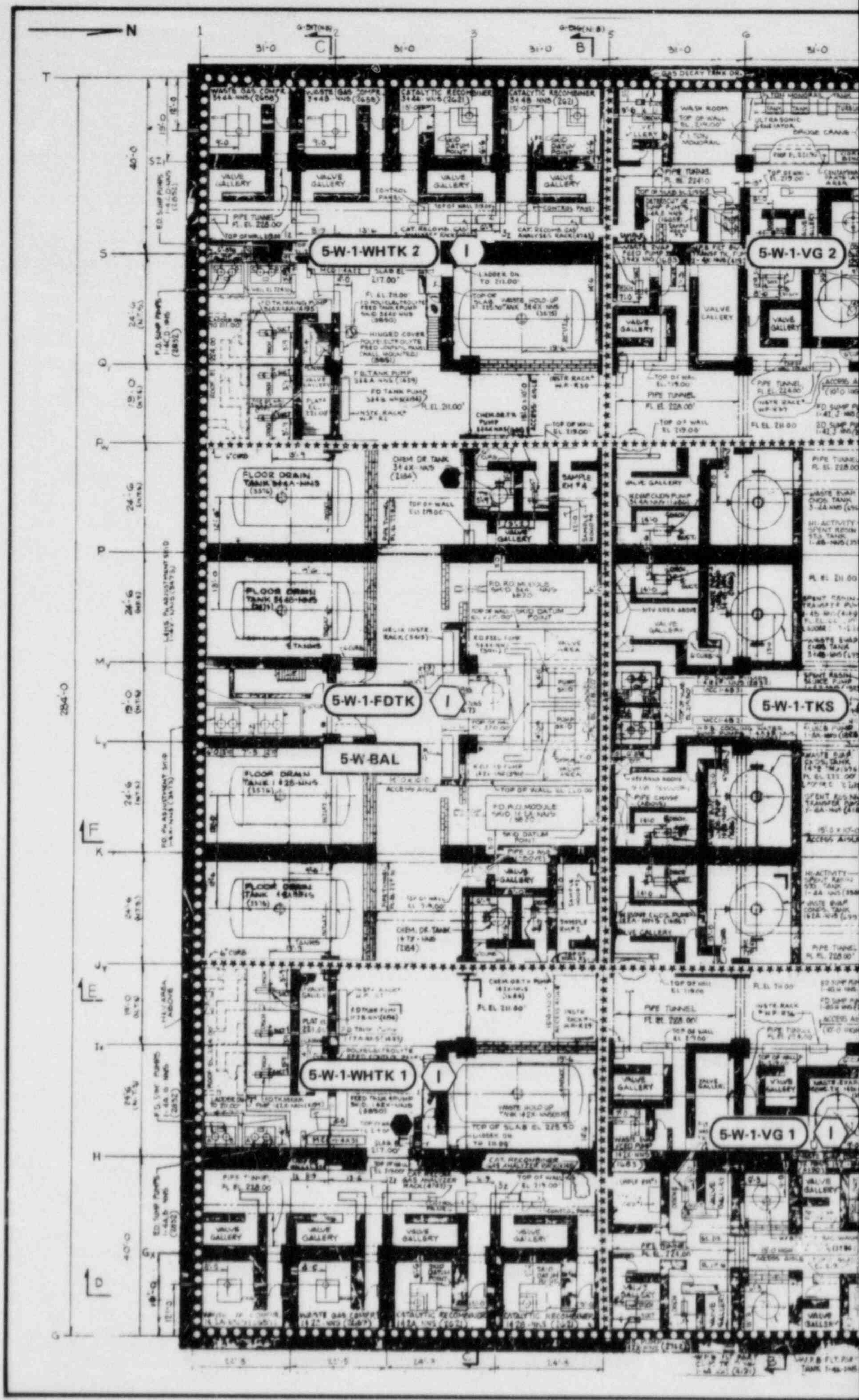
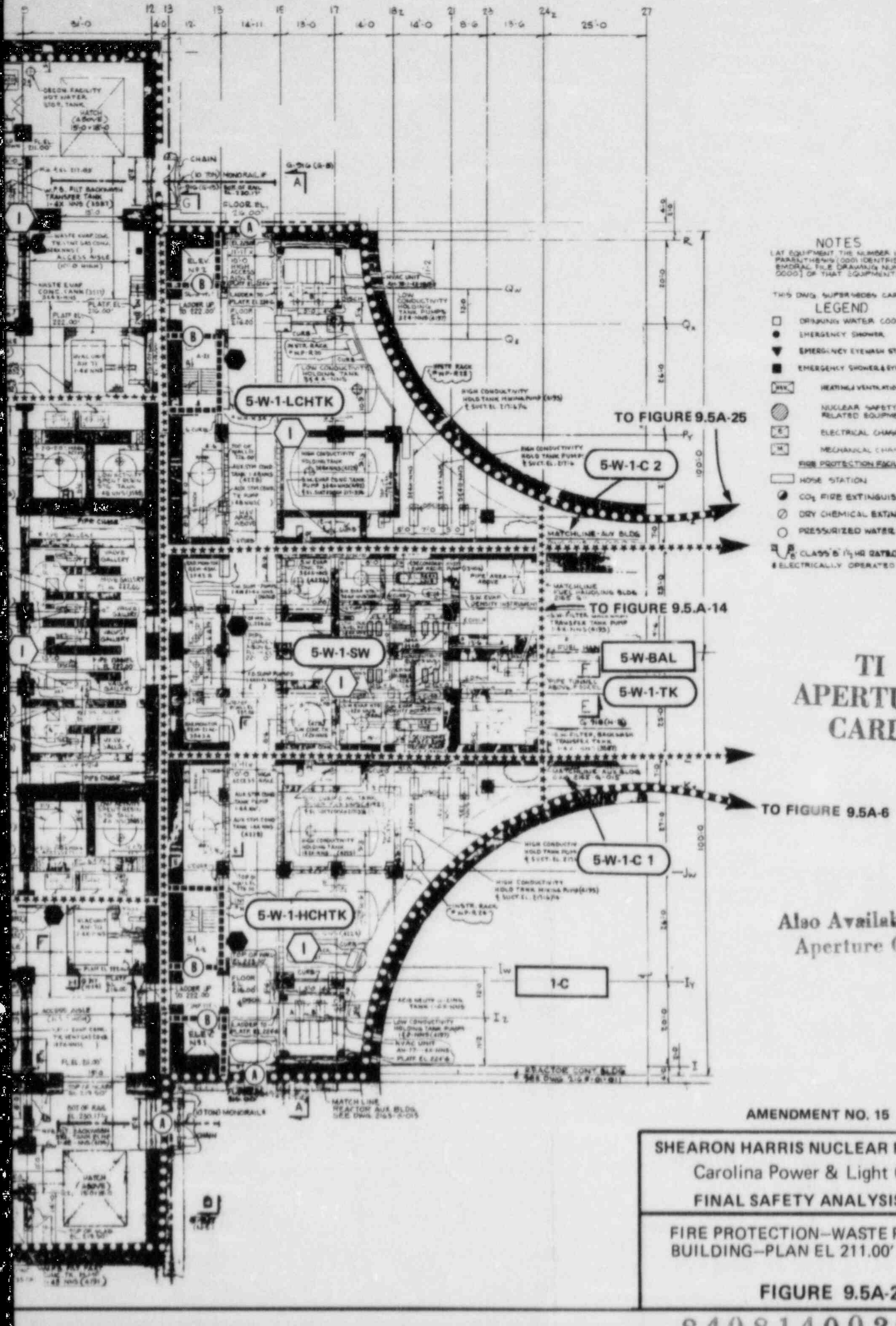
FIRE PROTECTION
DIESEL OIL STORAGE TANK AREA
PLAN AND SECTION –
FIGURE 9.5A-23

8408140036-34


N
5-W-1-WHTK 2
5-W-1-VG 2
5-W-1-FDTK
5-W-1-TKS
5-W-BAL
5-W-1-WHTK 1
5-W-1-VG 1
VALVE GALLERY
FLOOR DRAIN TANK
PIPE TUNNEL
WASH ROOM
284'-0



NOTES

LEGEND

- DRINKING WATER COOLER
- EMERGENCY SHOWER
- EMERGENCY EYEWASH STATION
- EMERGENCY SHOWER & EYEWASH STATION
- HEATING & VENTILATION CHASE
- NUCLEAR SAFETY RELATED EQUIPMENT
- ELECTRICAL CHASE
- MECHANICAL CHASE

FIRE PROTECTION FACILITIES

- HOSE STATION
- CO_2 FIRE EXTINGUISHER
- DRY CHEMICAL EXTINGUISHER
- PRESSURIZED WATER EXTINGUISHER
- ELECTRICALLY OPERATED HOIST

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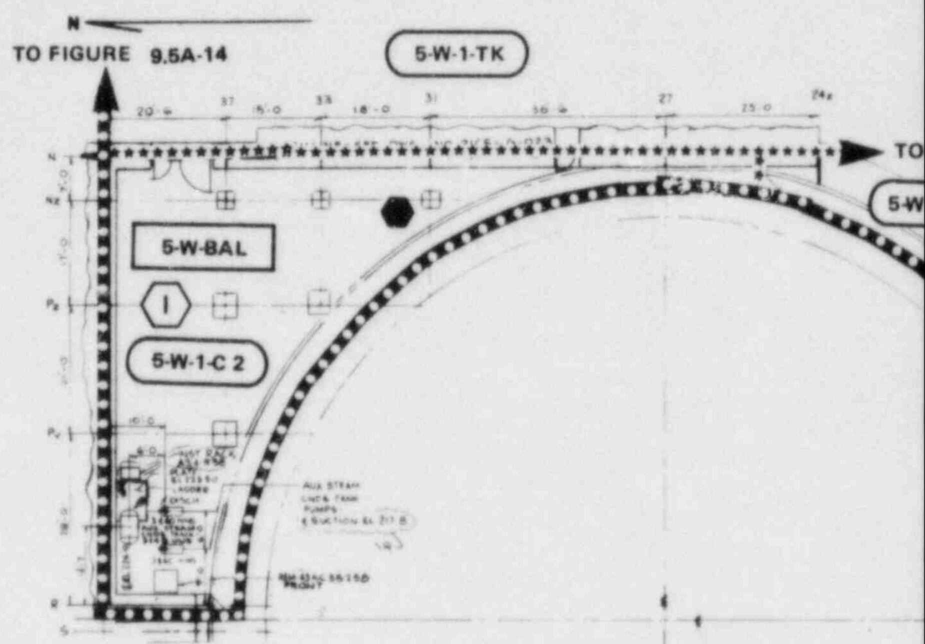
FINAL SAFETY ANALYSIS REPORT

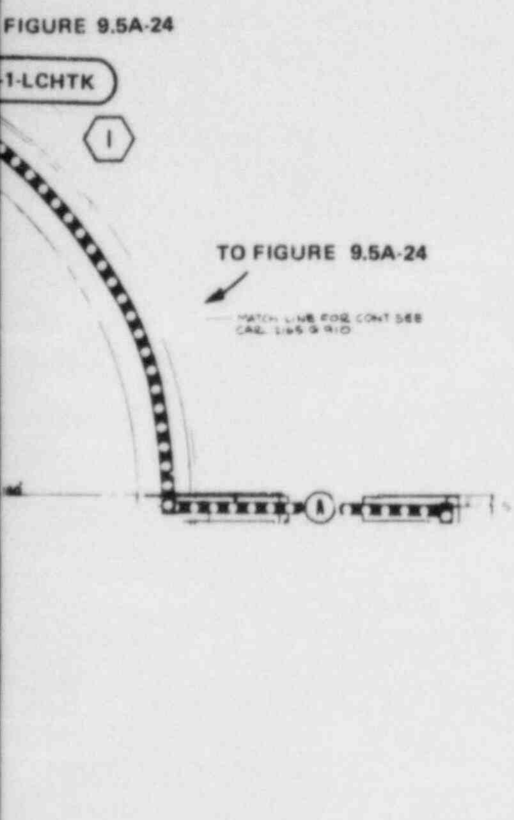
FIRE PROTECTION—WASTE PROCESSING BUILDING—PLAN EL 211.00' AND 216.00'

FIGURE 9.5A-24

8408140036-35



PLAN AT EL. 216.00



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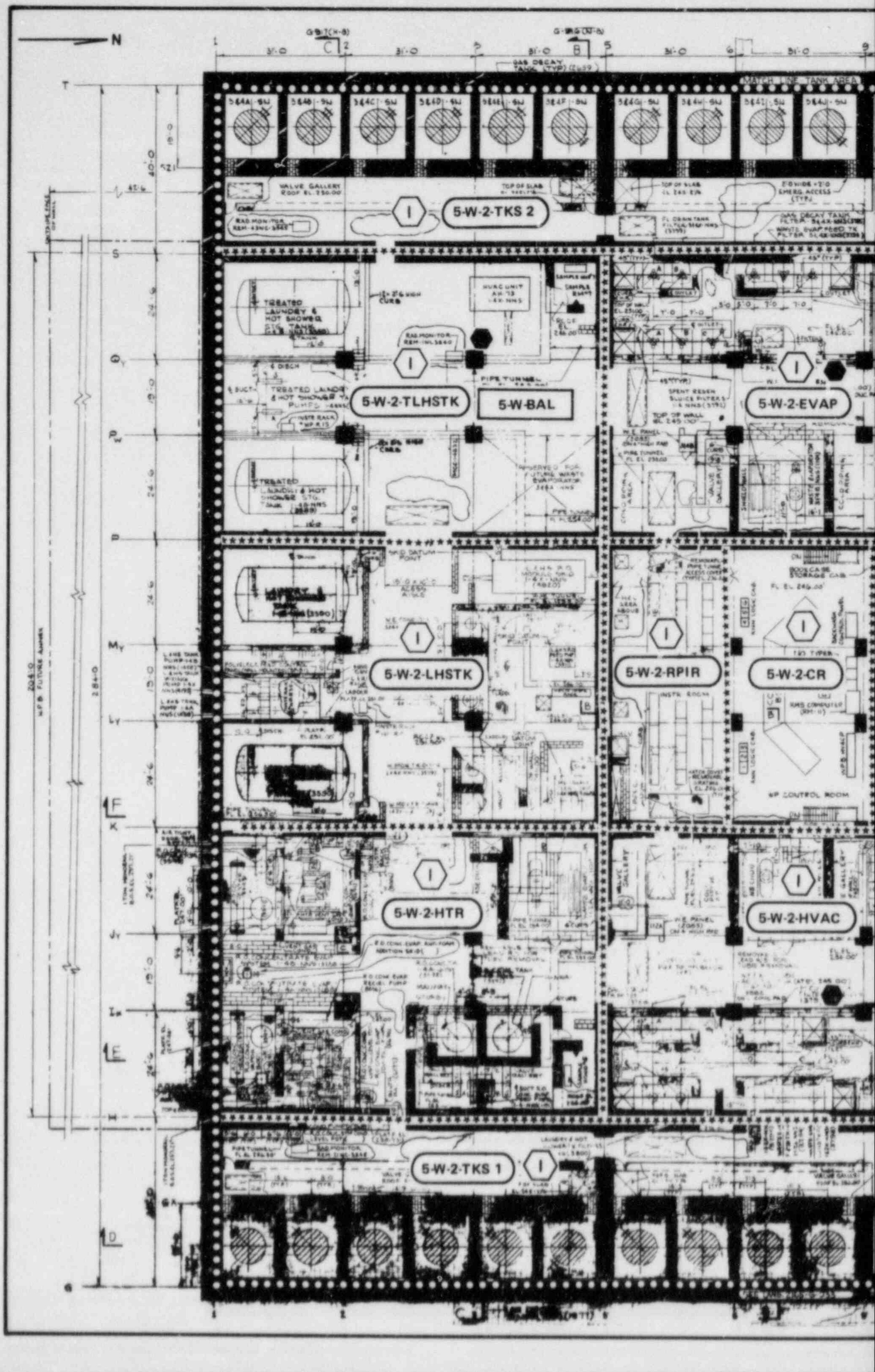
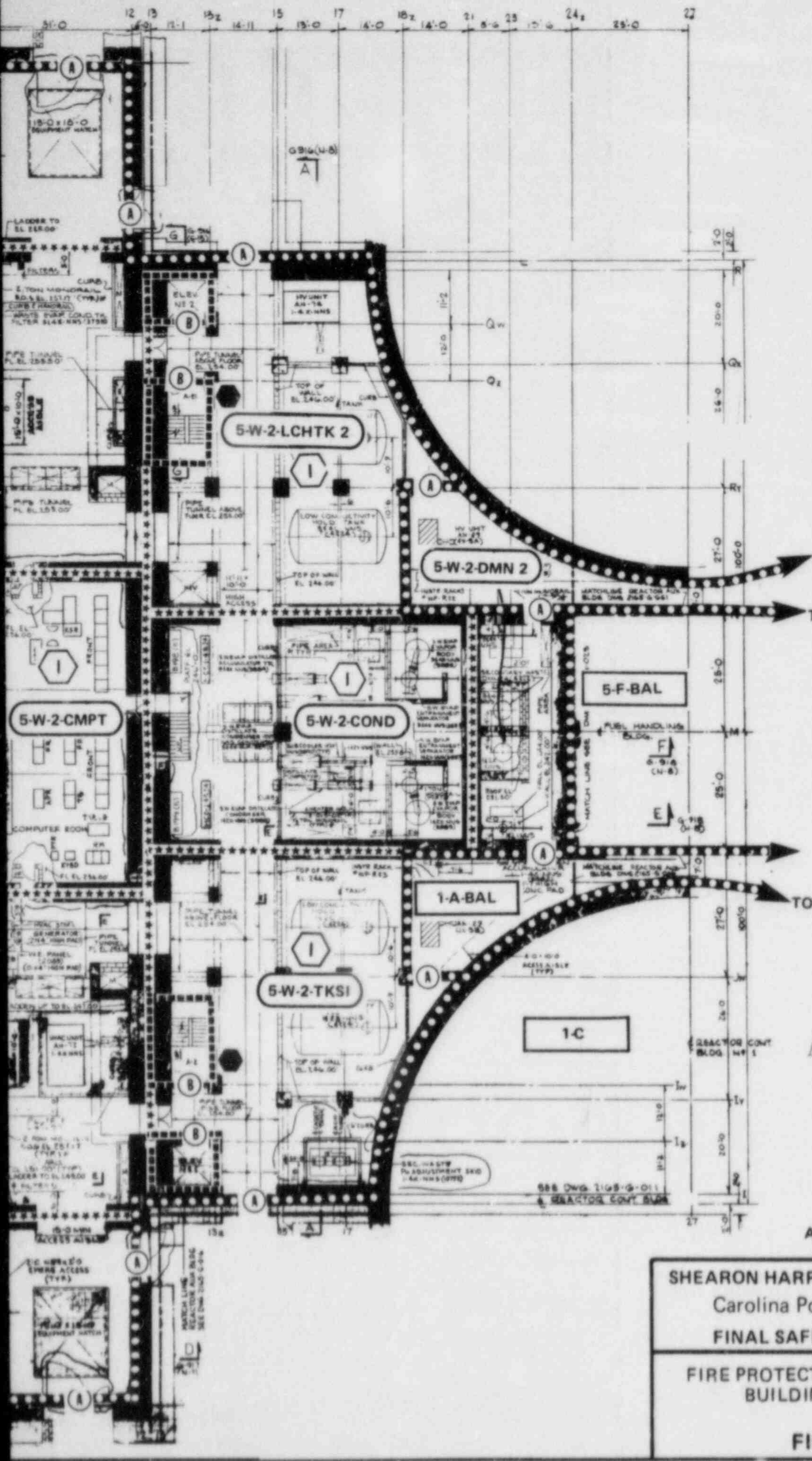
FIRE PROTECTION – REACTOR AUXILIARY BUILDING – PLAN EL 216.00'

FIGURE 9.5A-25

8408140036 -36


N
5-W-2-TKS 2
5-W-2-TLHSTK
5-W-BAL
5-W-2-EVAP
5-W-2-LHSTK
5-W-2-RPIR
5-W-2-CR
5-W-2-HTR
5-W-2-HVAC
5-W-2-TKS 1
VALVE GALLERY
TREATED LAUNDRY & HOT SHOWER STG. TANK
PIPE TUNNEL
INSTR. ROOM
HP CONTROL ROOM



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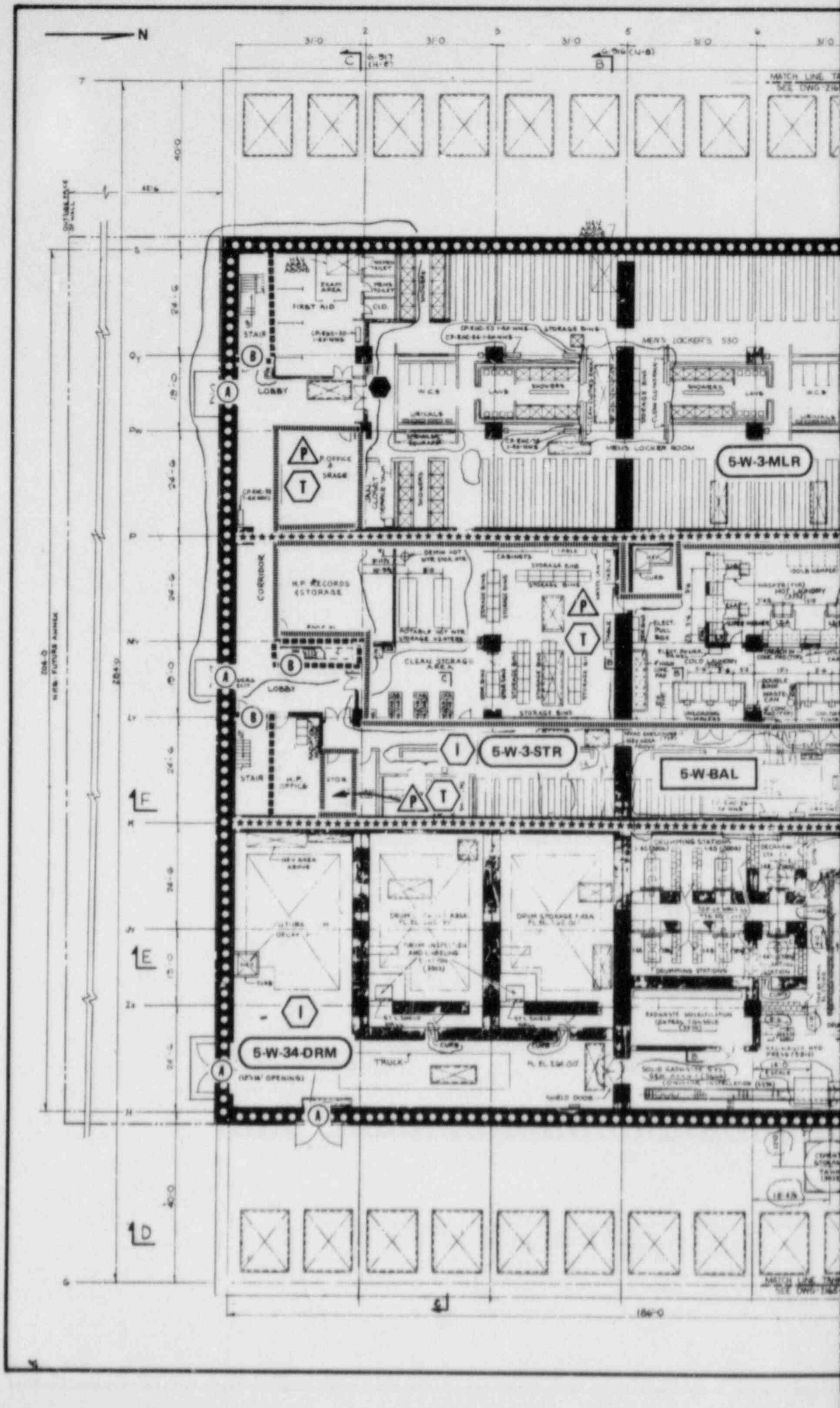
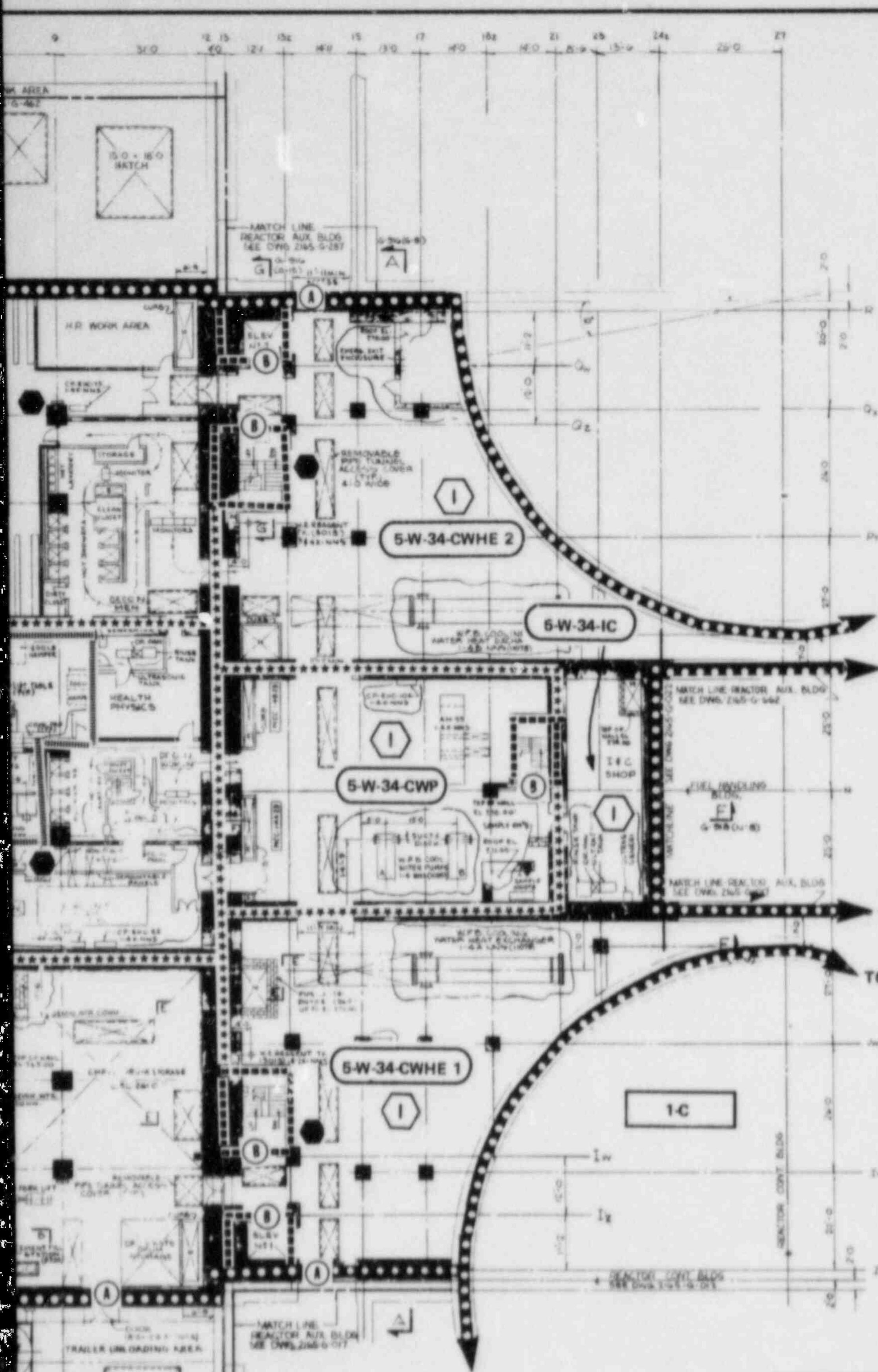
FINAL SAFETY ANALYSIS REPORT

FIRE PROTECTION–WASTE PROCESSING BUILDING–PLAN EL 236.00'

FIGURE 9.5A-26


N
5-W-3-MLR
5-W-3-STR
5-W-BAL
5-W-34-DRM
FIRST AID
EXAM AREA
STAIR
LOBBY
CORRIDOR
H.P. RECORDS & STORAGE
MEN'S LOCKER ROOM
MEN'S LOCKERS
SHOWERS
LAVS
URINALS
W.C.S
CLEAN STORAGE AREA
STORAGE BINS
CABINETS
H.P. OFFICE
DRUM STORAGE AREA
TRUCK
186'-0



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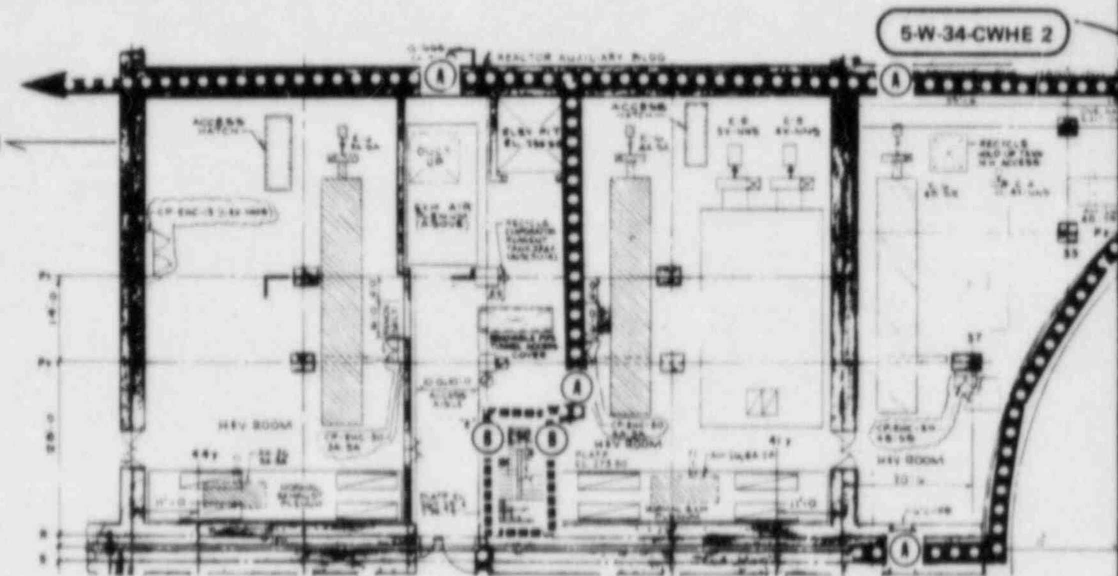
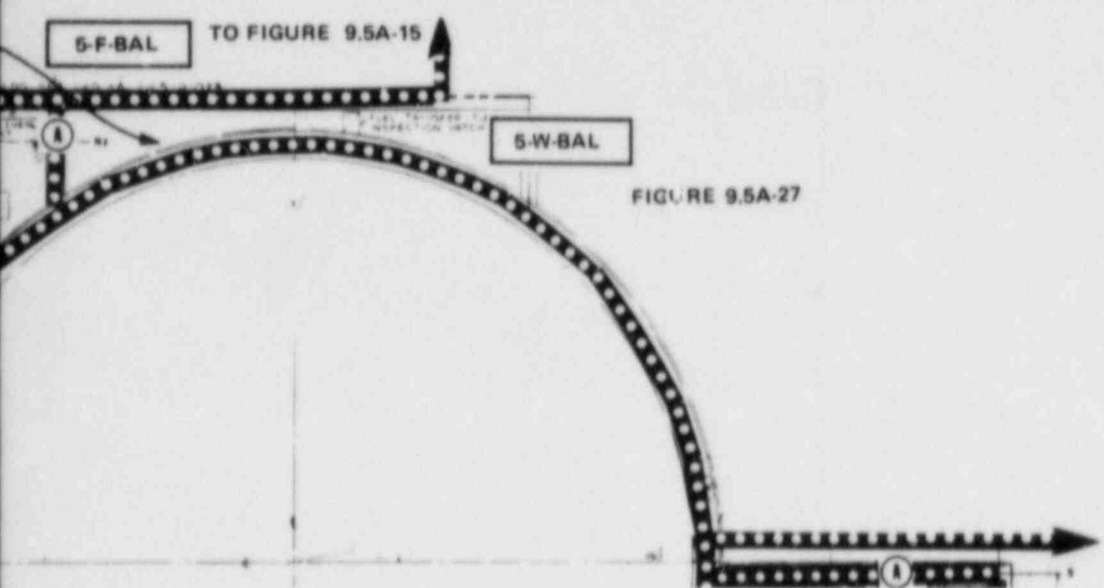
FIRE PROTECTION – WASTE PROCESSING BUILDING – PLAN EL. 261.00'

FIGURE 9.5A-27

8408140036 -38


5-W-34-CWHE 2
N



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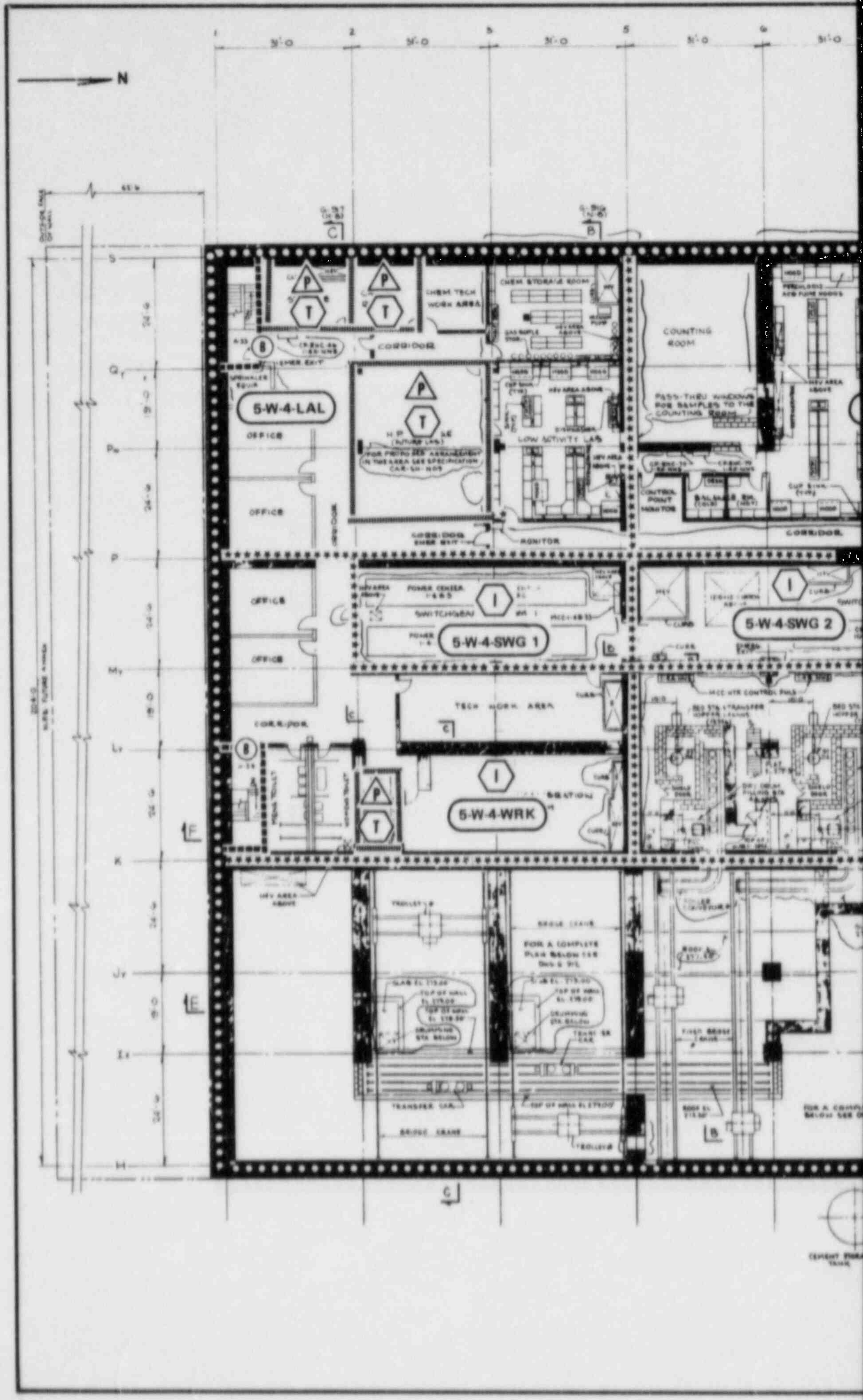
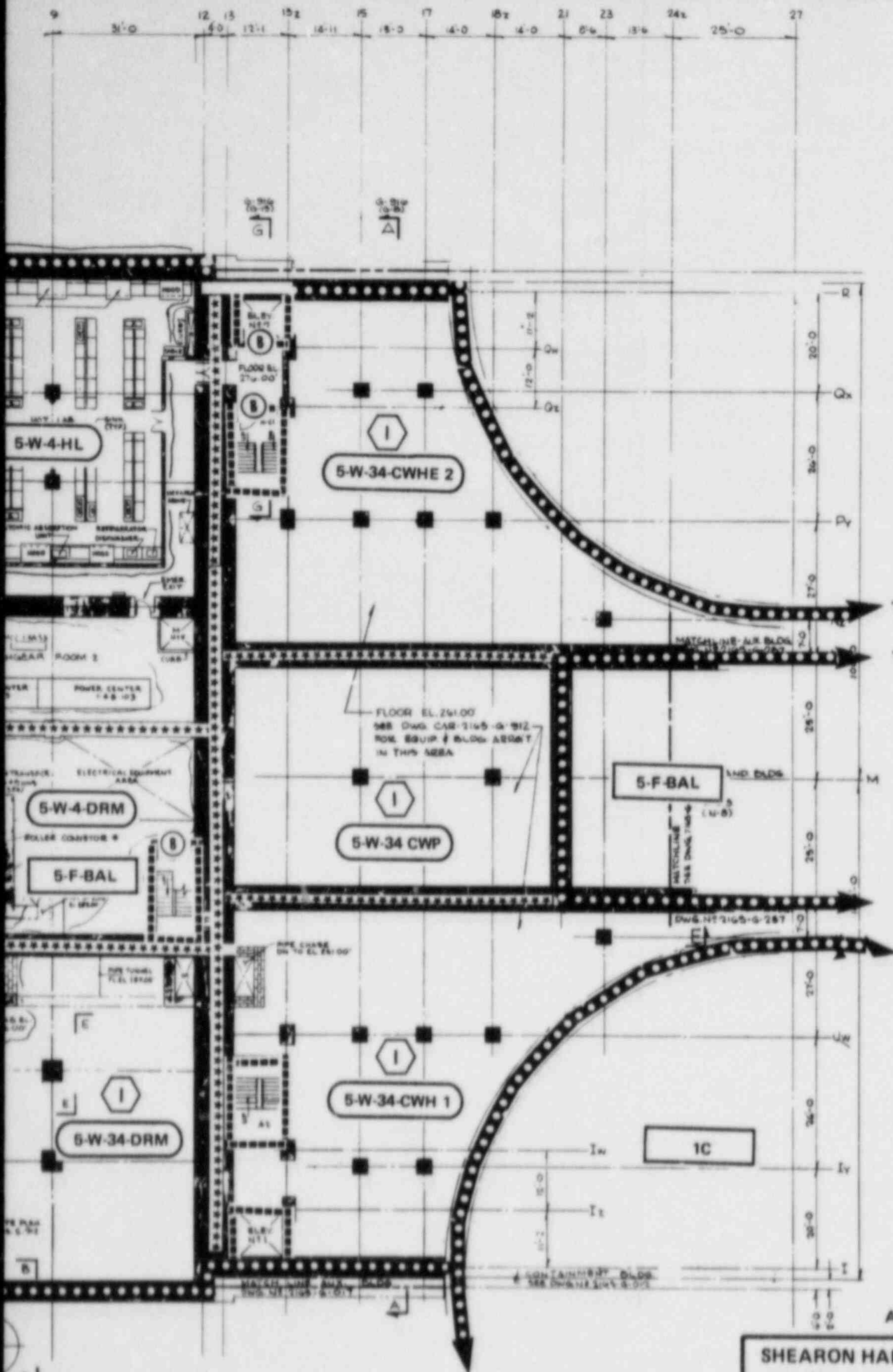
FIRE PROTECTION – REACTOR AUXILIARY BUILDING – PLAN EL 261.00'

FIGURE 9.5A-28


N
COUNTING ROOM
PASS-THRU WINDOWS FOR SAMPLES TO THE COUNTING ROOM
CHEM STORAGE ROOM
CHEM TECH WORK AREA
CORRIDOR
5-W-4-LAL
OFFICE
LOW ACTIVITY LAB
CONTROL POINT MONITOR
MONITOR
OFFICE
OFFICE
OFFICE
SWITCHGEAR
5-W-4-SWG 1
5-W-4-SWG 2
TECH WORK AREA
CORRIDOR
5-W-4-WRK
TRANSFER CAR
BRIDGE CRANE
FOR A COMPLETE PLAN BELOW



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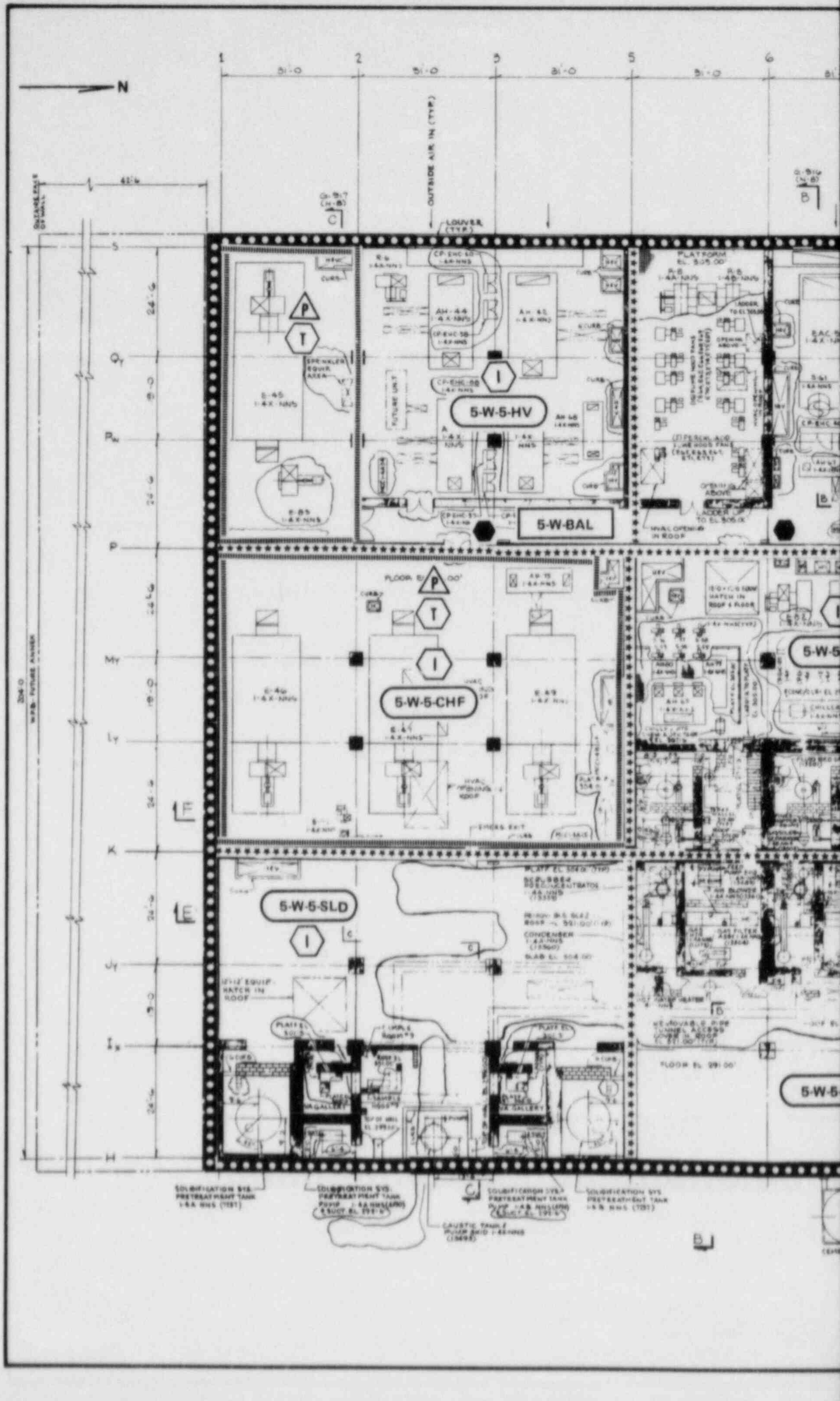
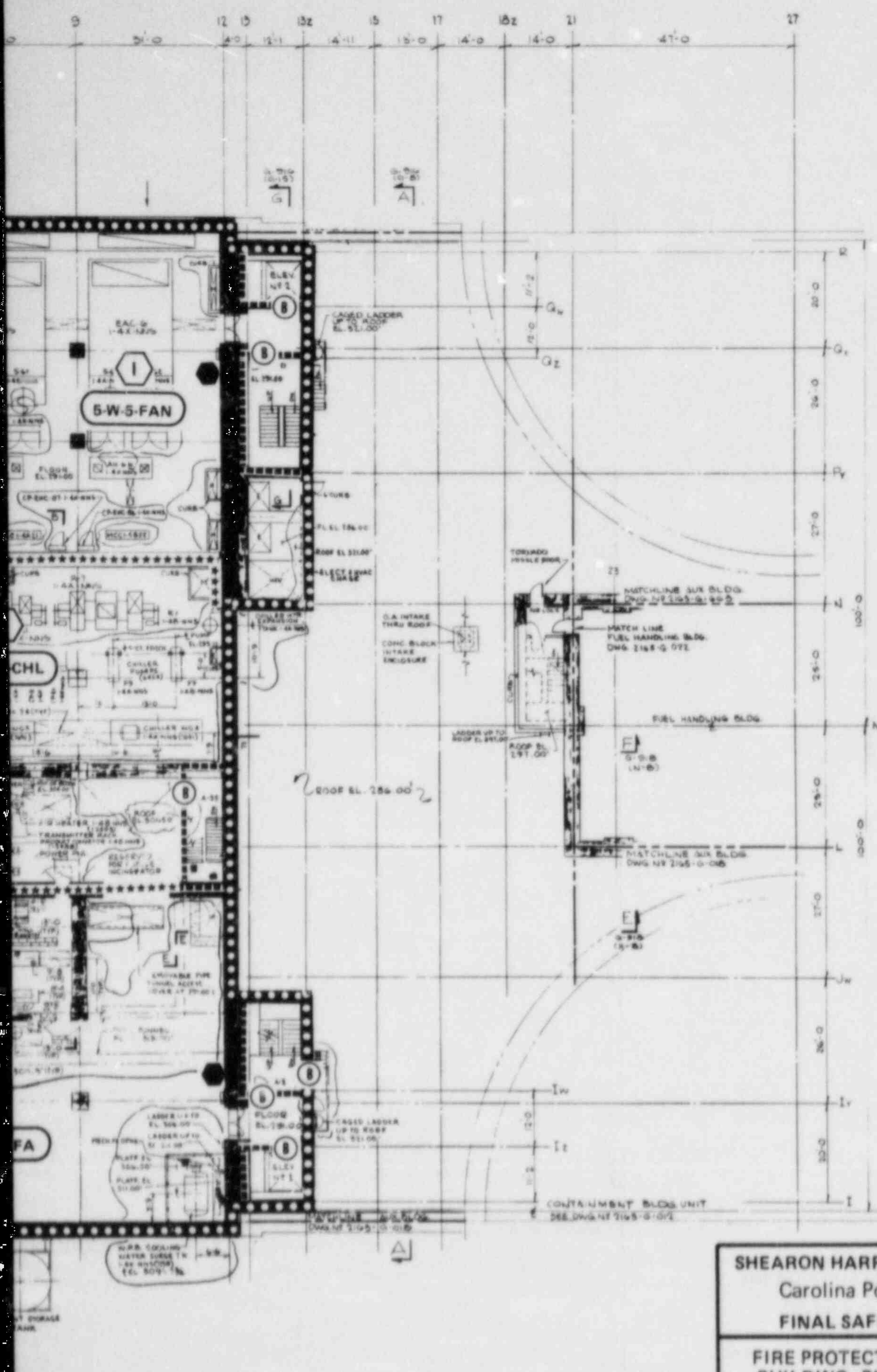
FIRE PROTECTION–WASTE PROCESSING
BUILDING–PLAN EL 276.00'

FIGURE 9.5A-29

8408140036-40


N
5-W-5-HV
5-W-BAL
5-W-5-CHF
5-W-5-SLD
OUTSIDE AIR IN (TYP)
LOUVER (TYP)
PLATFORM
FUTURE UNIT
FLOOR EL 291.00'
SOLIDIFICATION SYS. PRETREATMENT TANK
CAUSTIC TANK & PUMP SKID



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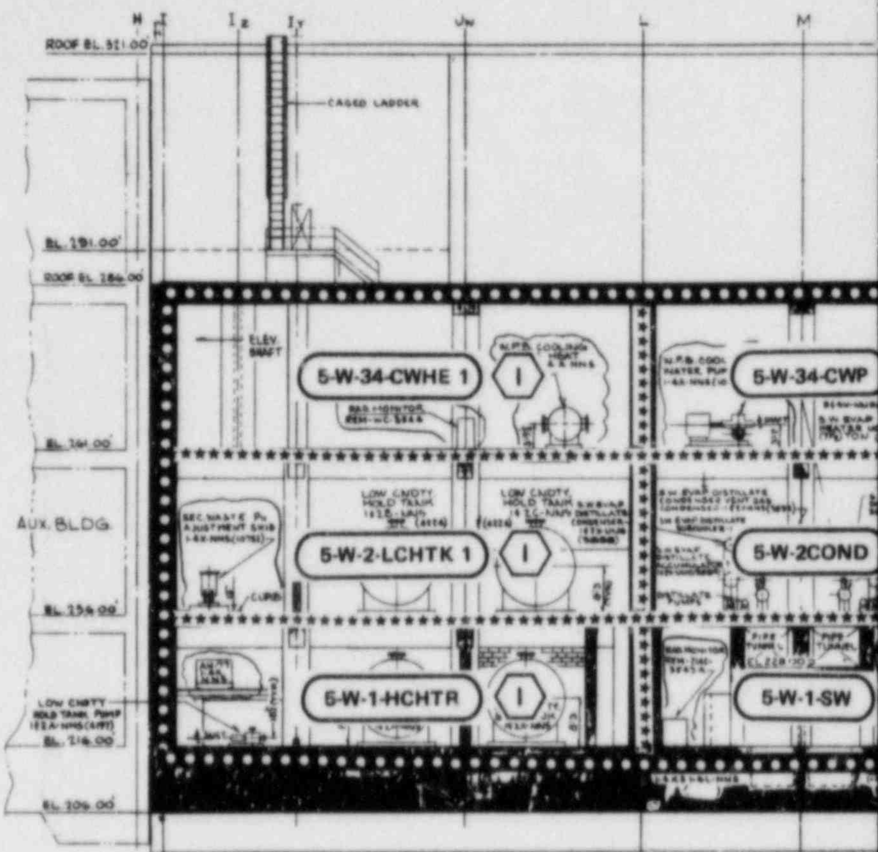
FINAL SAFETY ANALYSIS REPORT

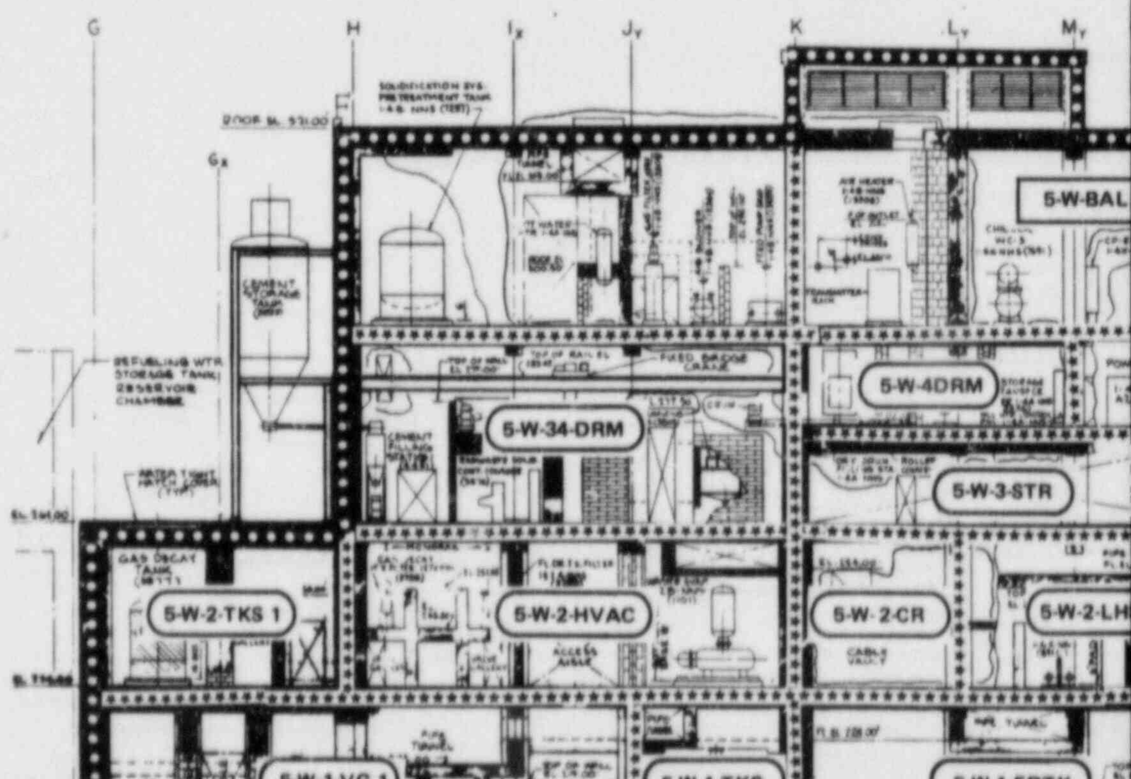
FIRE PROTECTION–WASTE PROCESSING
BUILDING–PLAN EL 286.00' AND 291.00'

FIGURE 9.5A-30

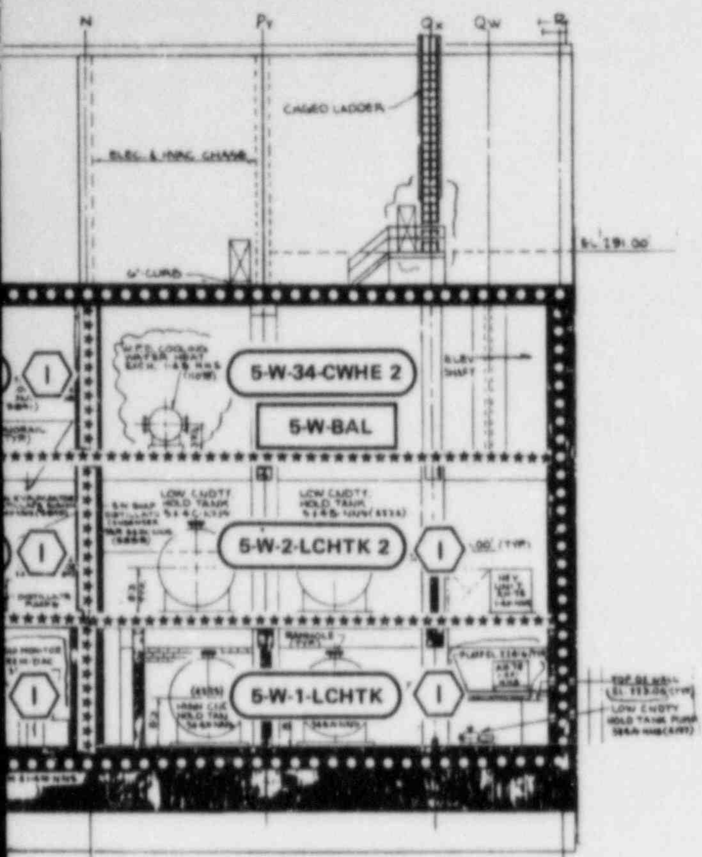
8408140036 -41

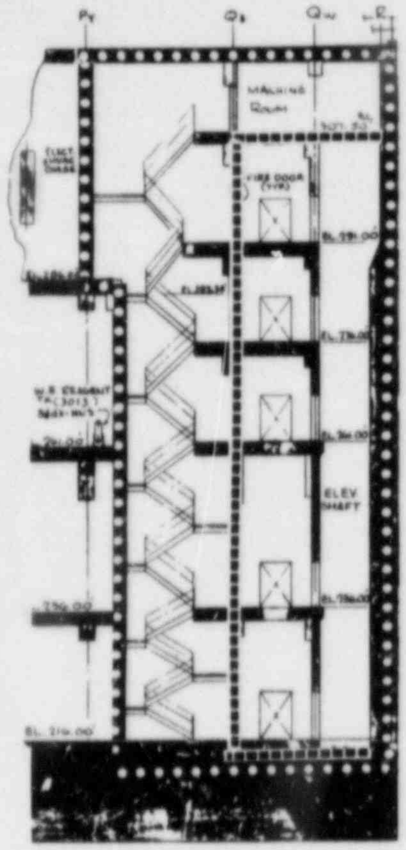


SECTION A-A
G-910-914 (B-13)

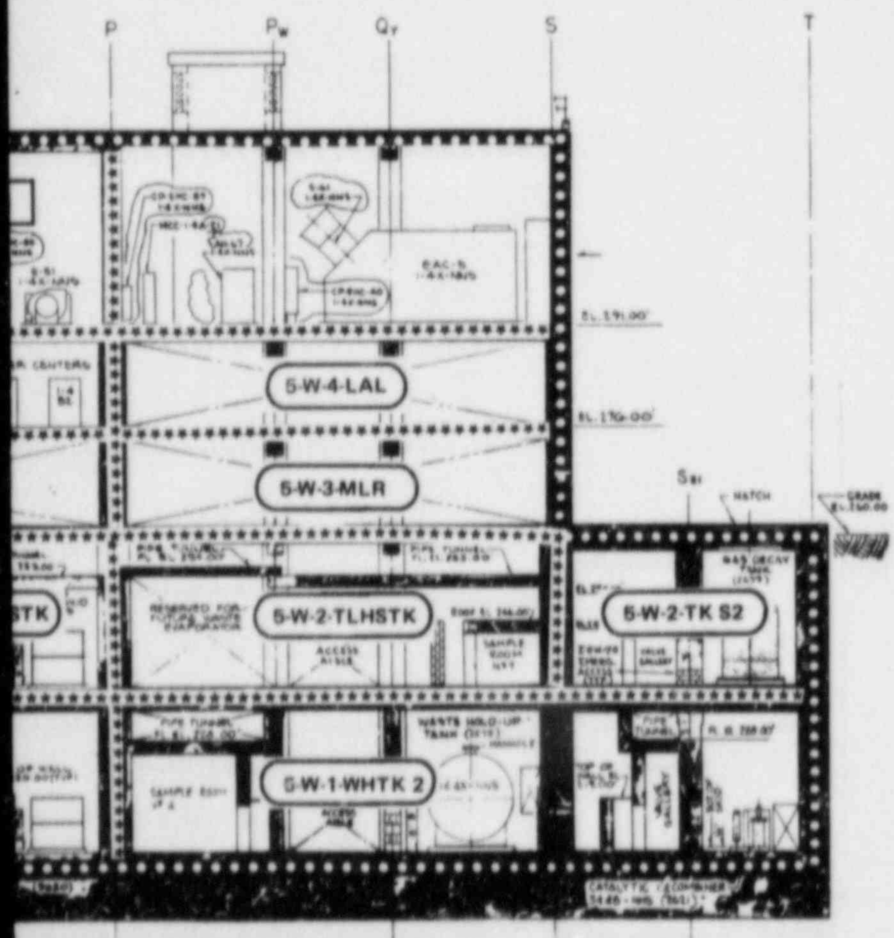


SECTION B-B
G-910-916 (A-6)





SECTION G-G



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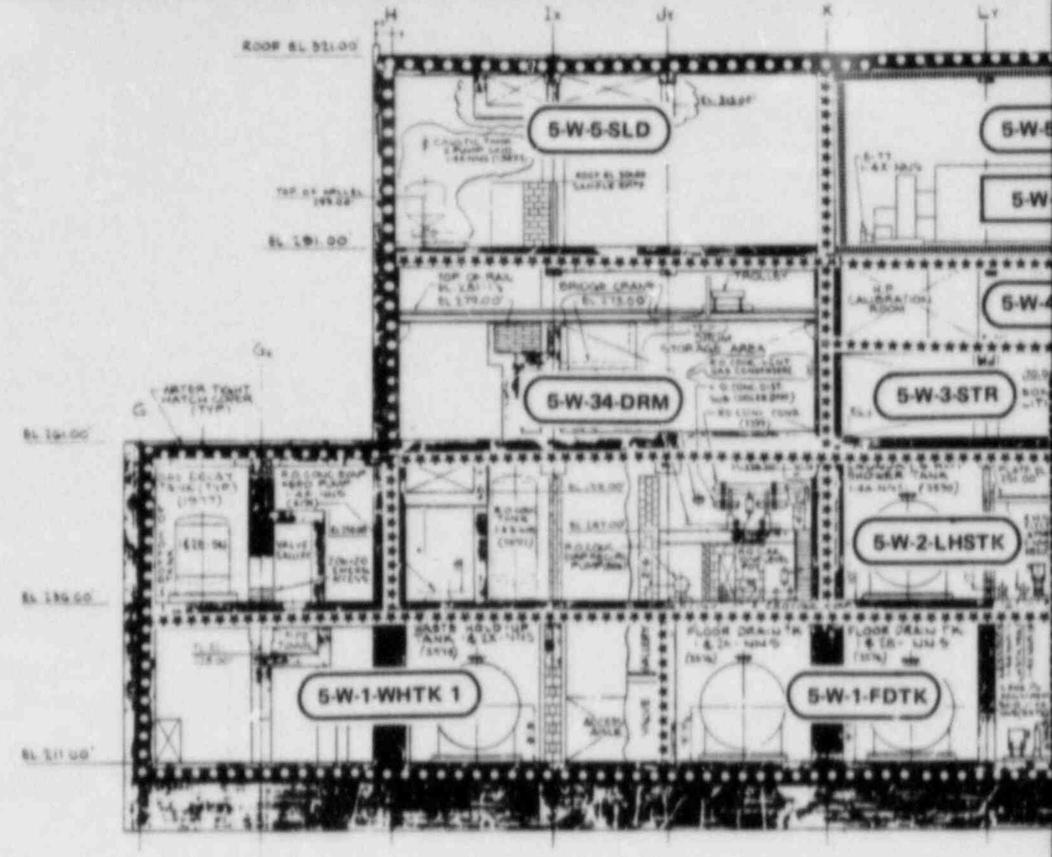
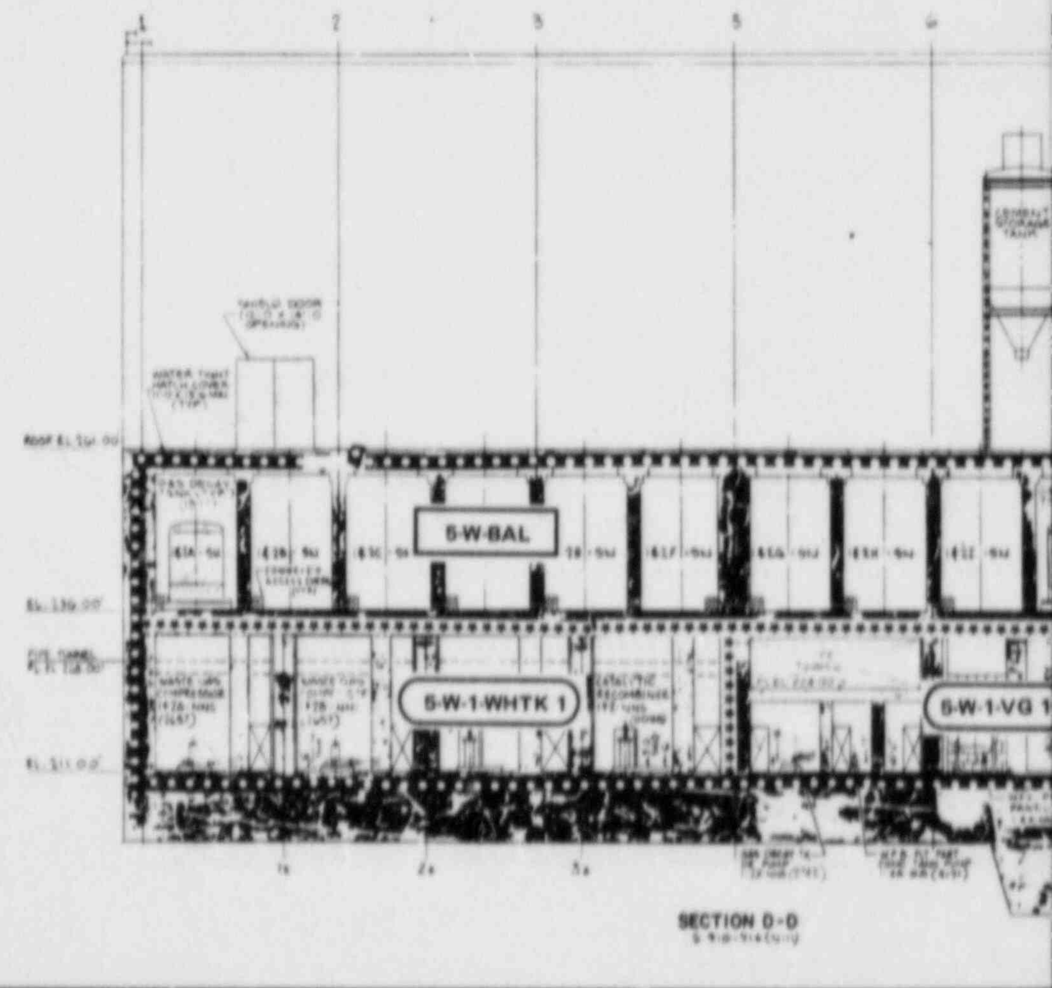
FIRE PROTECTION–WASTE PROCESSING BUILDING – SECTIONS – SHEET 1

FIGURE 9.5A-31

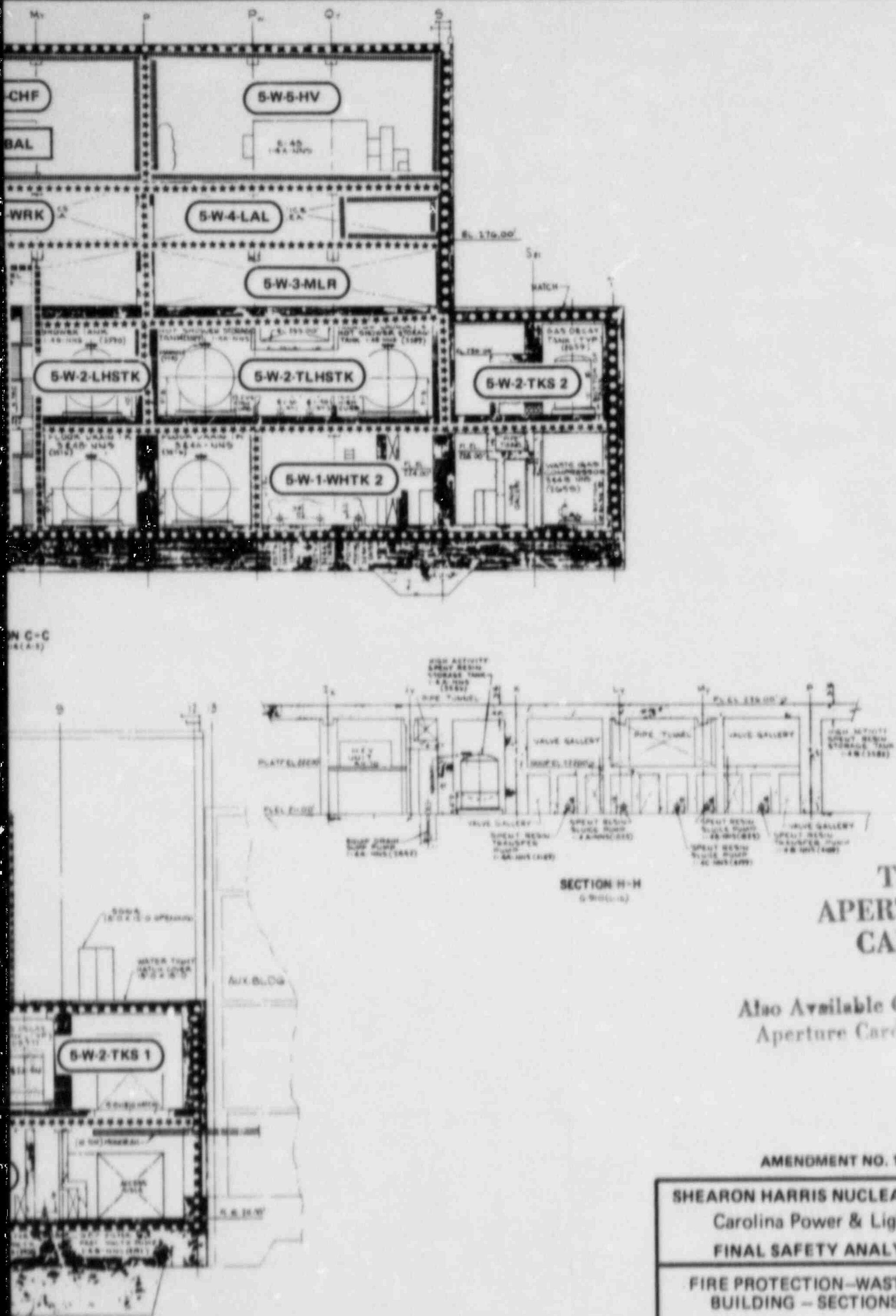
8408140036 -42



SECTI



SECTION D-D



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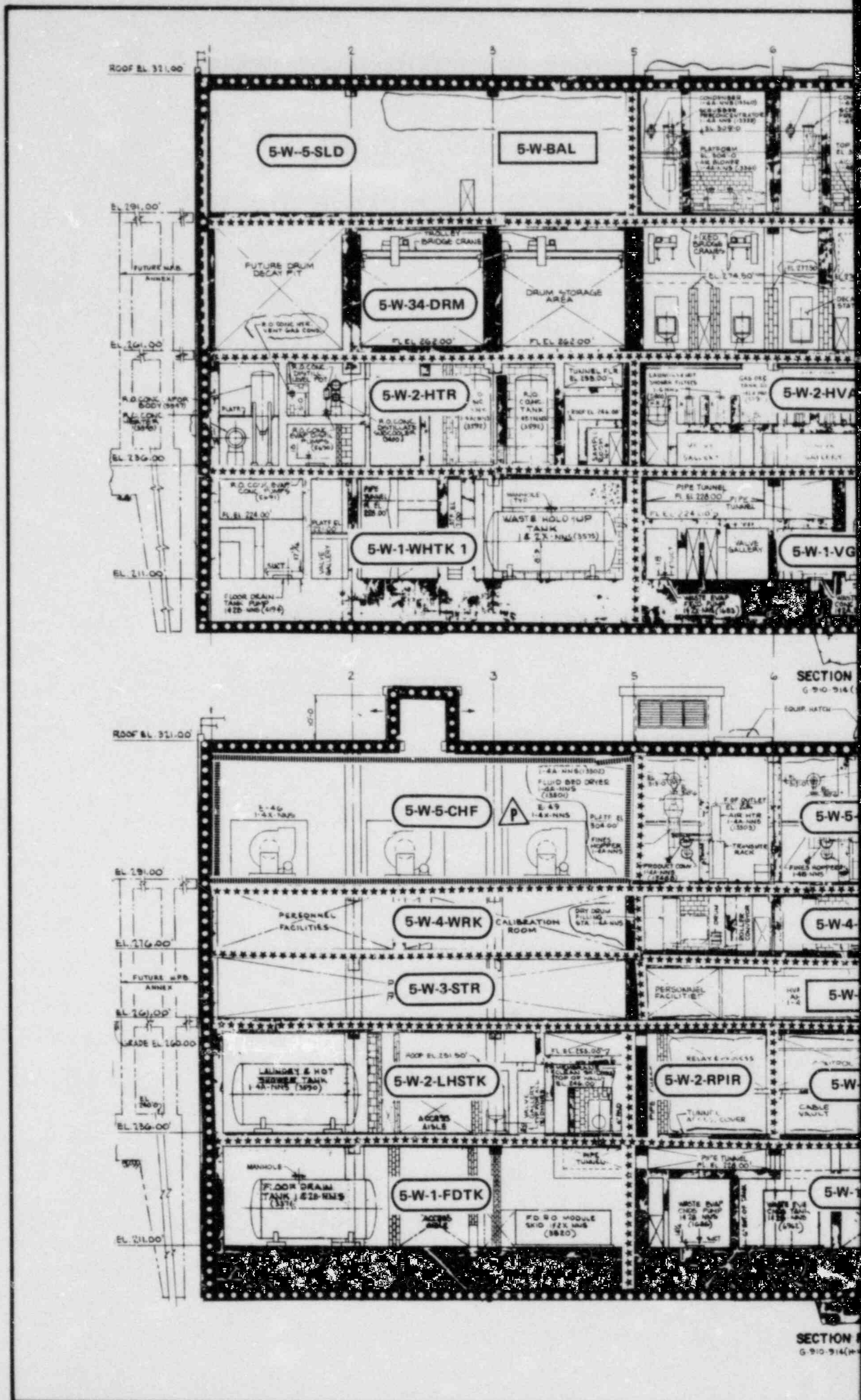
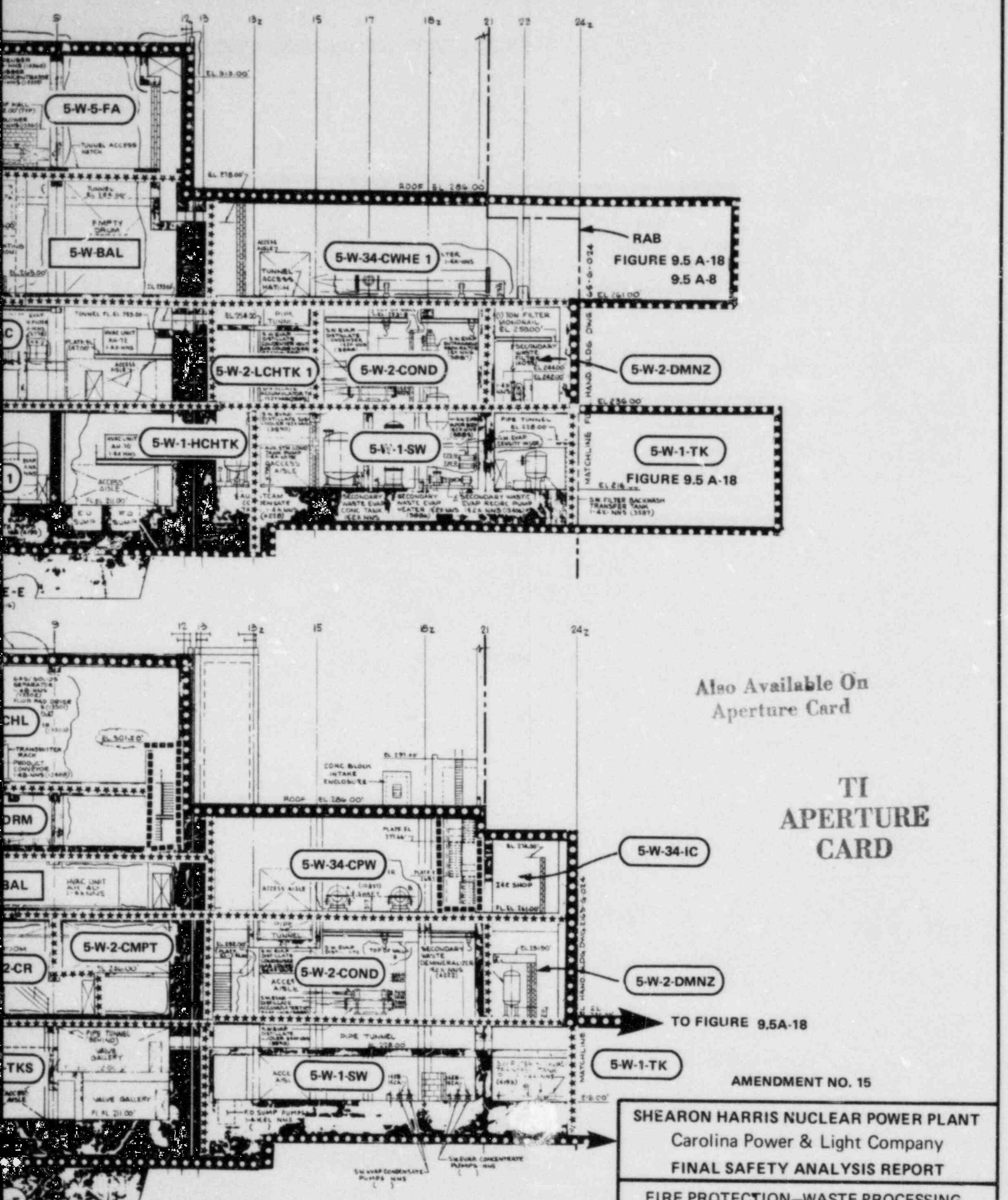
FIRE PROTECTION–WASTE PROCESSING BUILDING – SECTIONS – SHEET 2

FIGURE 9.5A-32

8408140036 -43


ROOF EL. 321.00'
EL. 291.00'
EL. 261.00'
EL. 236.00'
EL. 211.00'
5-W-5-SLD
5-W-BAL
FUTURE DRUM DECAY PIT
5-W-34-DRM
DRUM STORAGE AREA
FUTURE NPB ANNEX
5-W-2-HTR
5-W-2-HVA
WASTE HOLD-UP TANK
5-W-1-WHTK 1
5-W-1-VG
SECTION
ROOF EL. 321.00'
EL. 291.00'
EL. 276.00'
EL. 261.00'
GRADE EL. 260.00
EL. 236.00'
EL. 211.00'
5-W-5-CHF
FLUID BED DRYER
PERSONNEL FACILITIES
5-W-4-WRK
CALIBRATION ROOM
5-W-3-STR
PERSONNEL FACILITIES
LAUNDRY & HOT SHOWER TANK
5-W-2-LHSTK
5-W-2-RPIR
CABLE VAULT
FLOOR DRAIN TANK
5-W-1-FDTK
MANHOLE
SECTION



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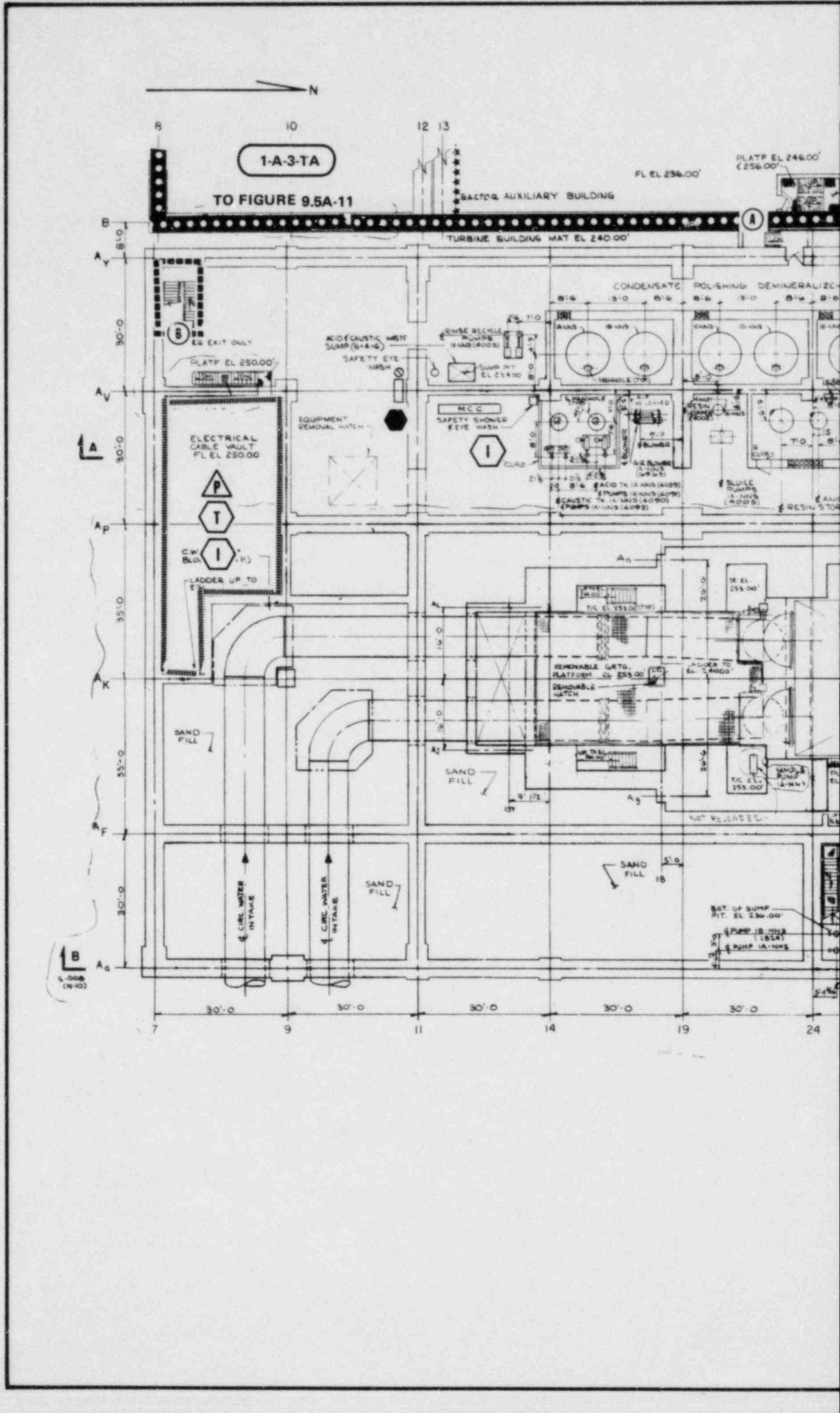
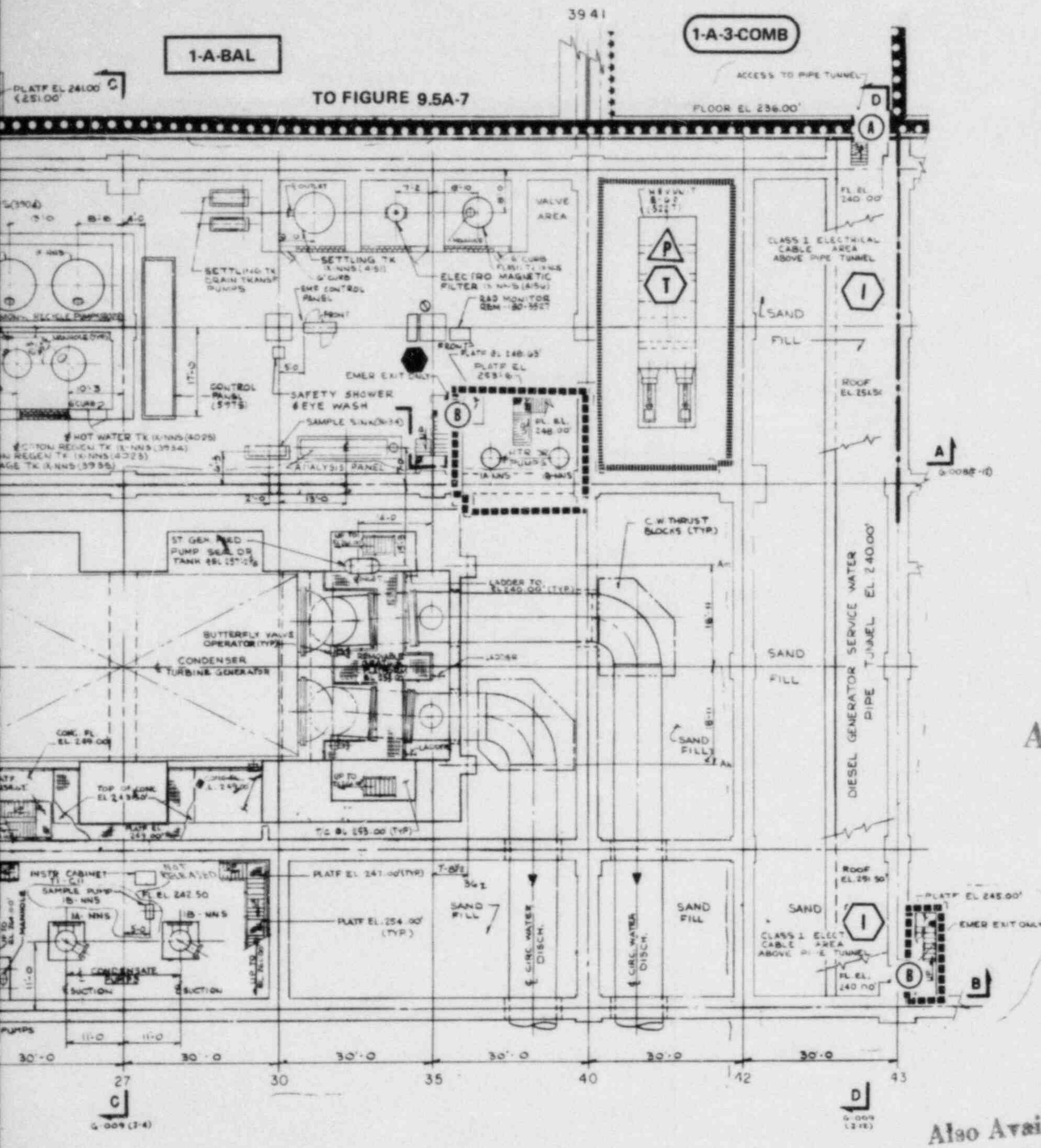
FIRE PROTECTION–WASTE PROCESSING
BUILDING – SECTIONS – SHEET 3

FIGURE 9.5A-33

8408140036 - 44



1-A-3-TA
TO FIGURE 9.5A-11
REACTOR AUXILIARY BUILDING
TURBINE BUILDING MAT EL 240.00'
FL EL 236.00'
CONDENSATE POLISHING DEMINERALIZER
ELECTRICAL CABLE VAULT FL EL 250.00
PLATF EL 250.00'
EQUIPMENT REMOVAL HATCH
SAFETY EYE WASH
SAFETY SHOWER & EYE WASH
MCC
RINSE RECYCLE PUMPS
ACID & CAUSTIC WASTE SUMP
LADDER UP TO
REMOVABLE GRTG. PLATFORM
REMOVABLE HATCH
SAND FILL
CIRC. WATER INTAKE
NOT RELEASED
30'-0
35'-0



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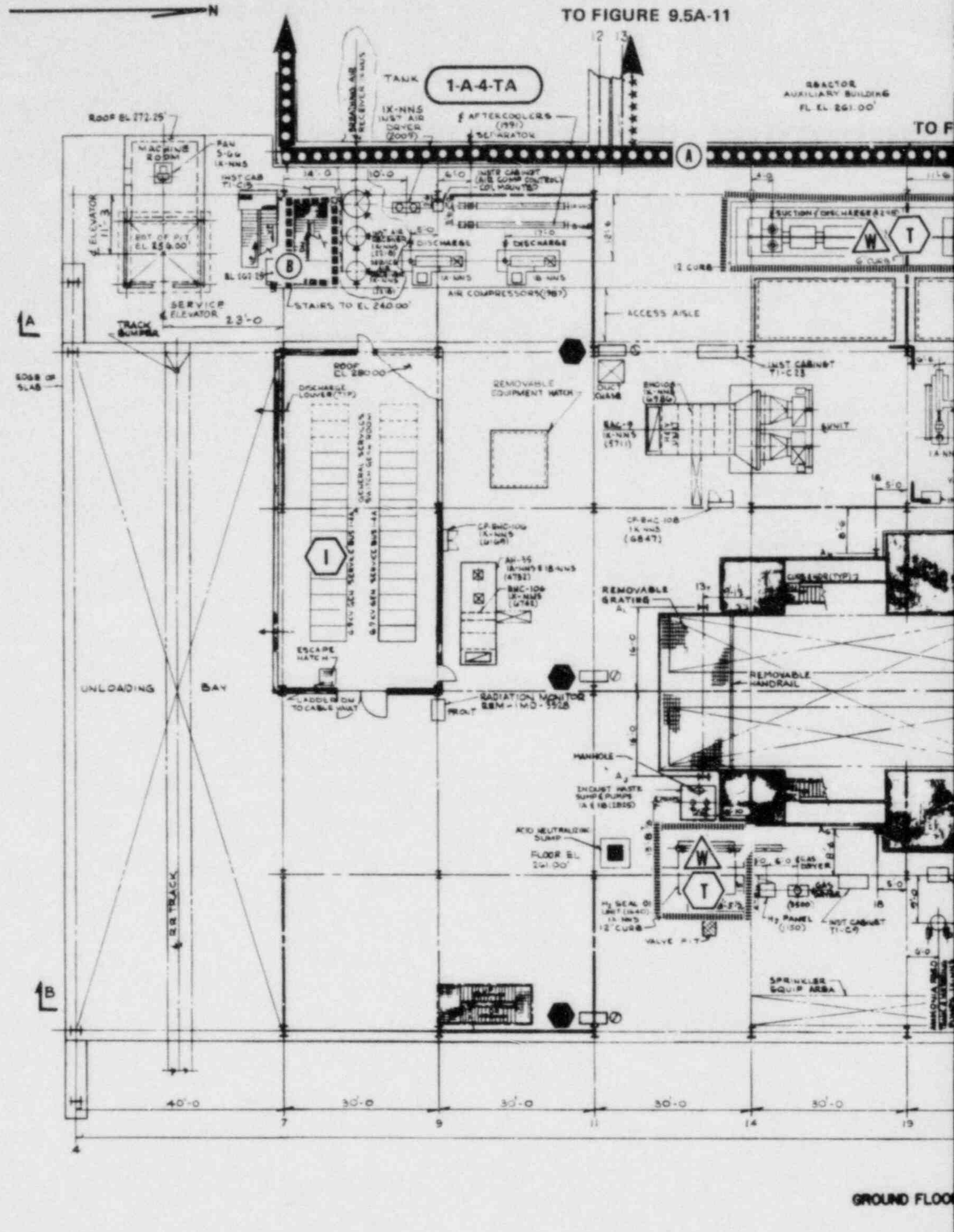
FIRE PROTECTION – TURBINE BUILDING PLAN EL 240.00'

FIGURE 9.5A-34

8408140036-45



NOTES

EQUIPMENT NOT LOCATED BY DIMENSION IS NOT RELEASED

AT EQUIPMENT THE NUMBER IN PARENTHESIS (000) IDENTIFIES EBASCO EMDRAC FILE NUMBER [364-000] OF THAT EQUIPMENT

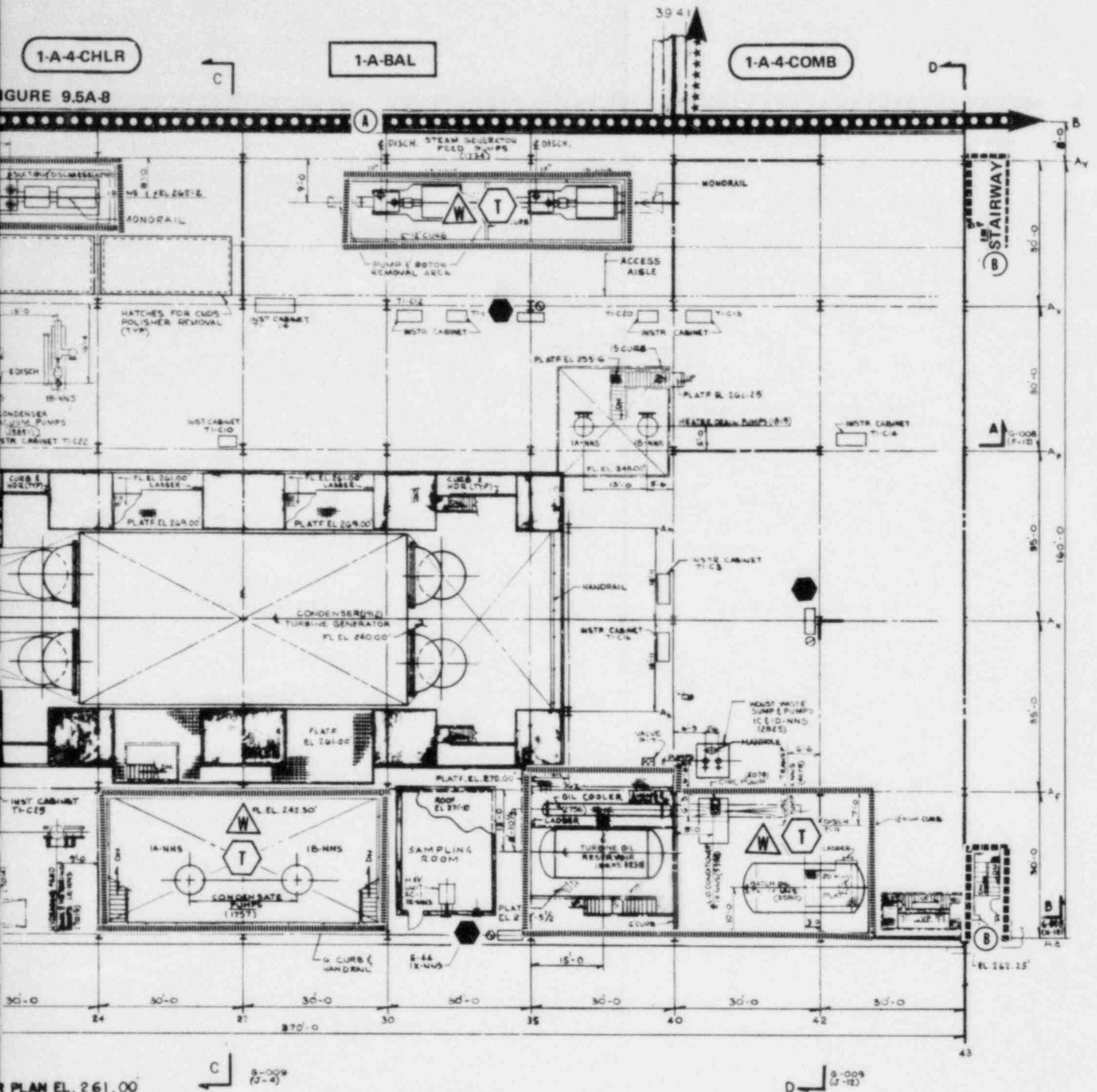
ALL TURBINE BUILDING EQUIPMENT IS NON NUCLEAR SAFETY (NNS)

——— HEAVY CENTER LINE INDICATES VERTICAL BRACING

FIRE PROTECTION FACILITIES

▭ – HOSE CONNECTION (1½)

⊘ – DRY CHEMICAL EXTINGUISHER



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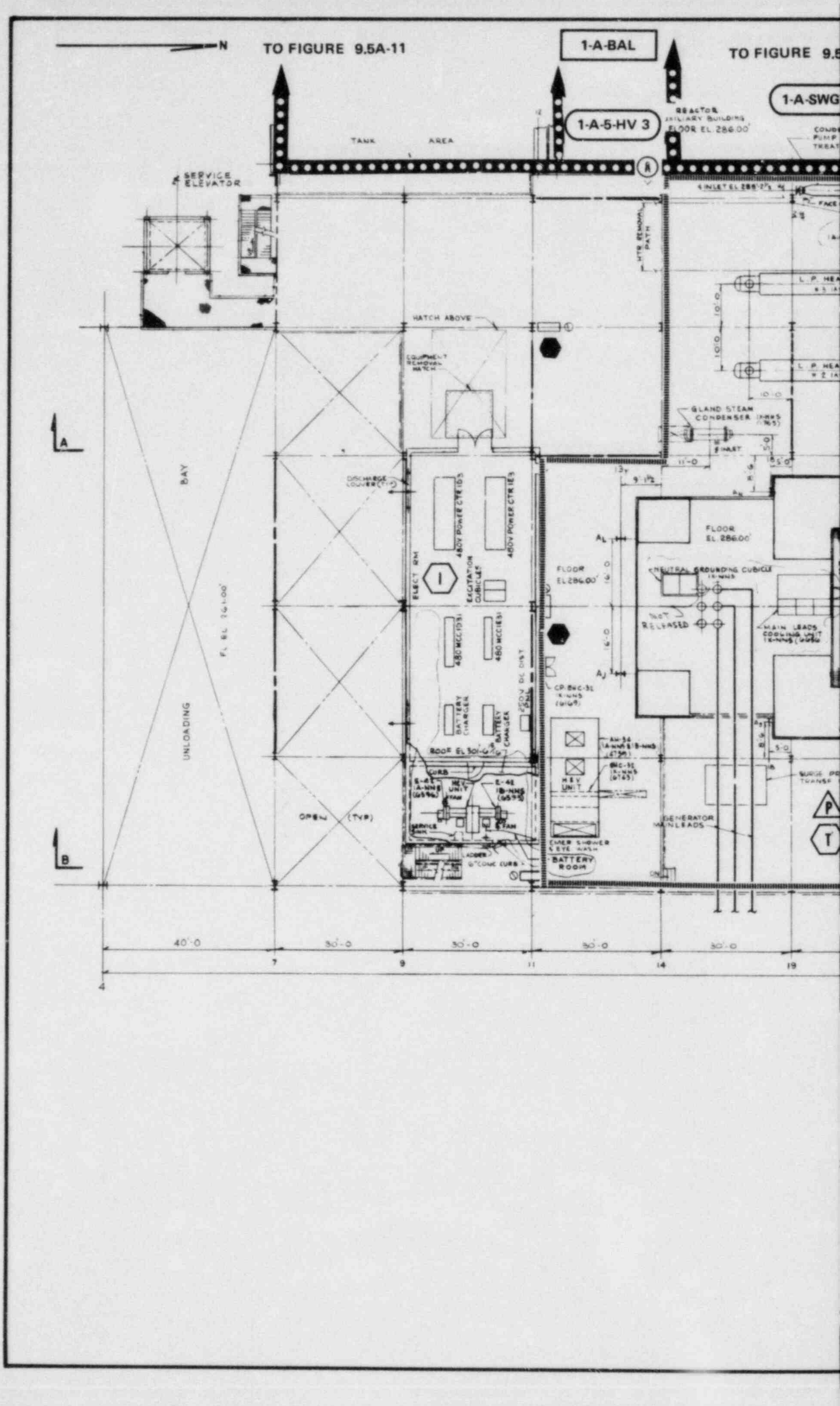
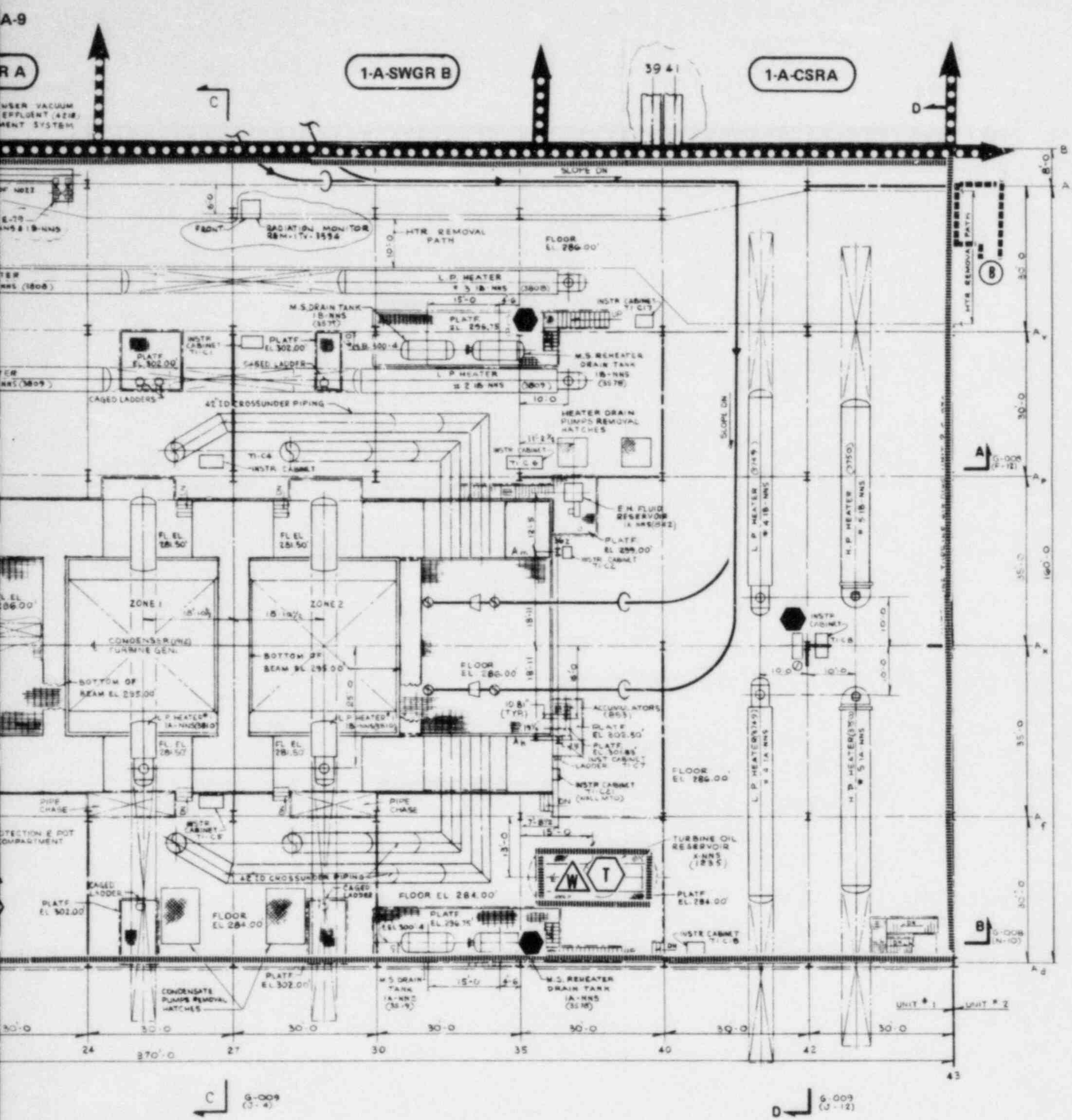
FIRE PROTECTION – TURBINE BUILDING GROUND FLOOR PLAN

FIGURE 9.5A-35

8408140036-46



N
TO FIGURE 9.5A-11
1-A-BAL
TO FIGURE 9.5
1-A-5-HV 3
1-A-SWG
REACTOR AUXILIARY BUILDING FLOOR EL. 286.00'
TANK AREA
SERVICE ELEVATOR
HATCH ABOVE
EQUIPMENT REMOVAL HATCH
HTR REMOVAL PATH
L.P. HEA
GLAND STEAM CONDENSER
A
B
BAY
UNLOADING
OPEN (TYP)
DISCHARGE LOUVER
ELECT RM
480V POWER CTR 1D5
480V POWER CTR 1E5
EXCITATION CUBICLE
480 MCC 1D51
480 MCC 1E51
BATTERY CHARGER
BATTERY CHARGER
ROOF EL 301-6
FLOOR EL 286.00'
FLOOR EL. 286.00'
NEUTRAL GROUNDING CUBICLE
NOT RELEASED
MAIN LEADS COOLING UNIT
H&V UNIT
BATTERY ROOM
EMER SHOWER & EYE WASH
GENERATOR MAIN LEADS
SURGE PR TRANSF
P
T
40'-0
30'-0
30'-0
30'-0
30'-0
4
7
9
11
14
19



MEZZANINE FLOOR PLAN EL. 286.00'

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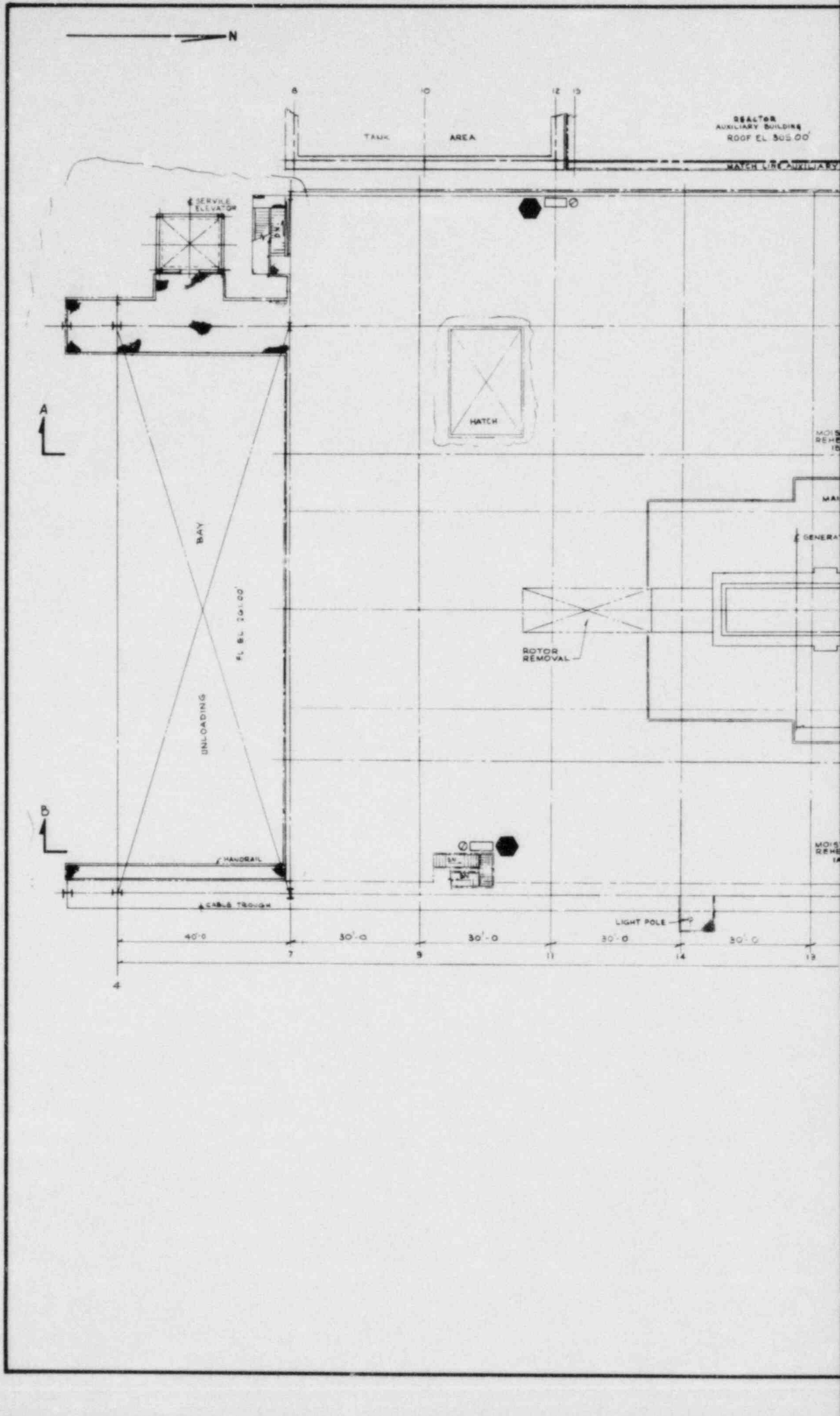
SHEARON HARRIS NUCLEAR POWER PLANT
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

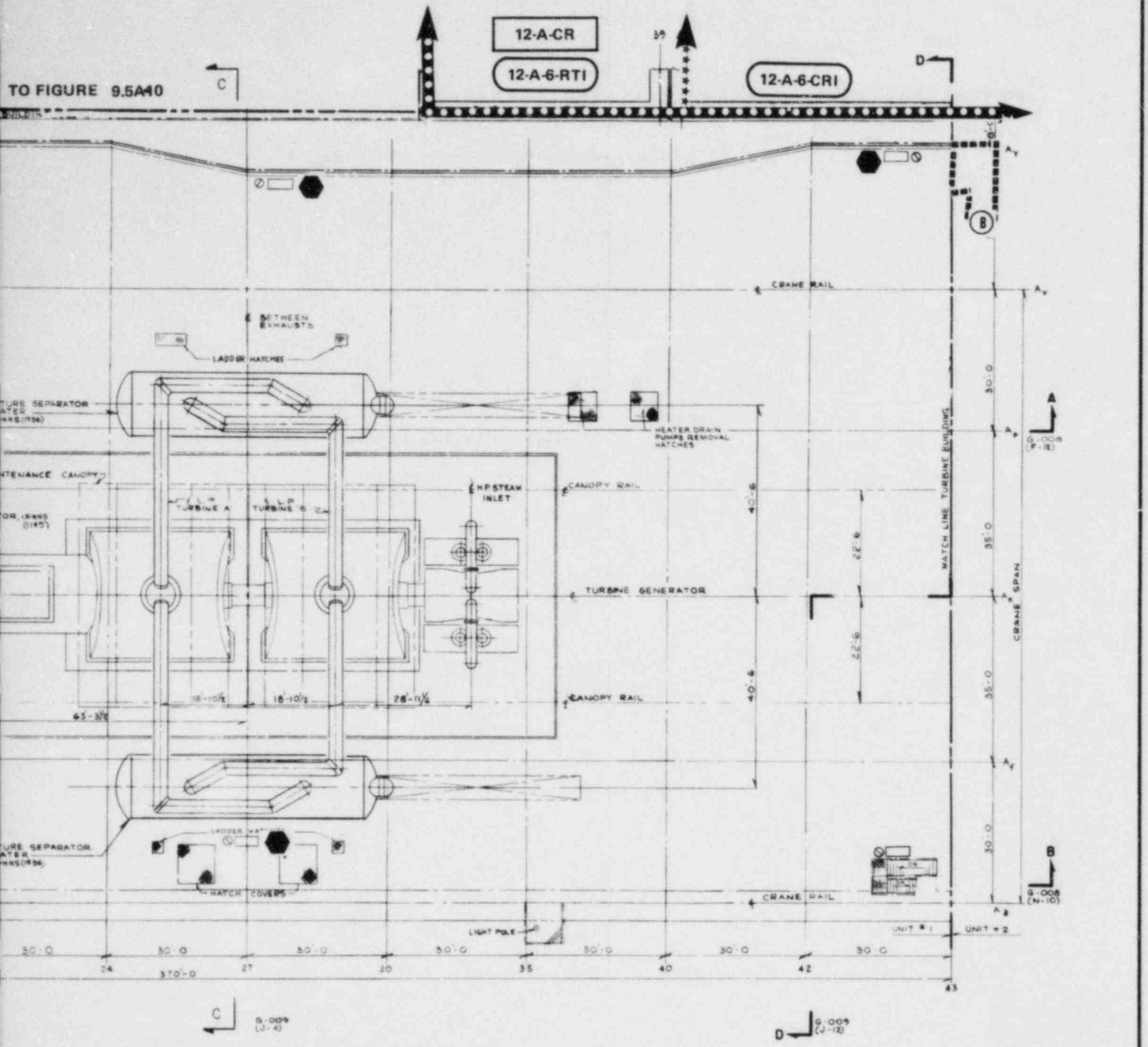
FIRE PROTECTION – TURBINE BUILDING
MEZZANINE FLOOR PLAN

FIGURE 9.5A-36

8408140036 -47



N
TANK AREA
AUXILIARY BUILDING
ROOF EL 305.00'
SERVICE ELEVATOR
HATCH
A
B
UNLOADING BAY
ROTOR REMOVAL
HANDRAIL
CABLE TROUGH
LIGHT POLE
40'-0
30'-0
30'-0
30'-0
30'-0



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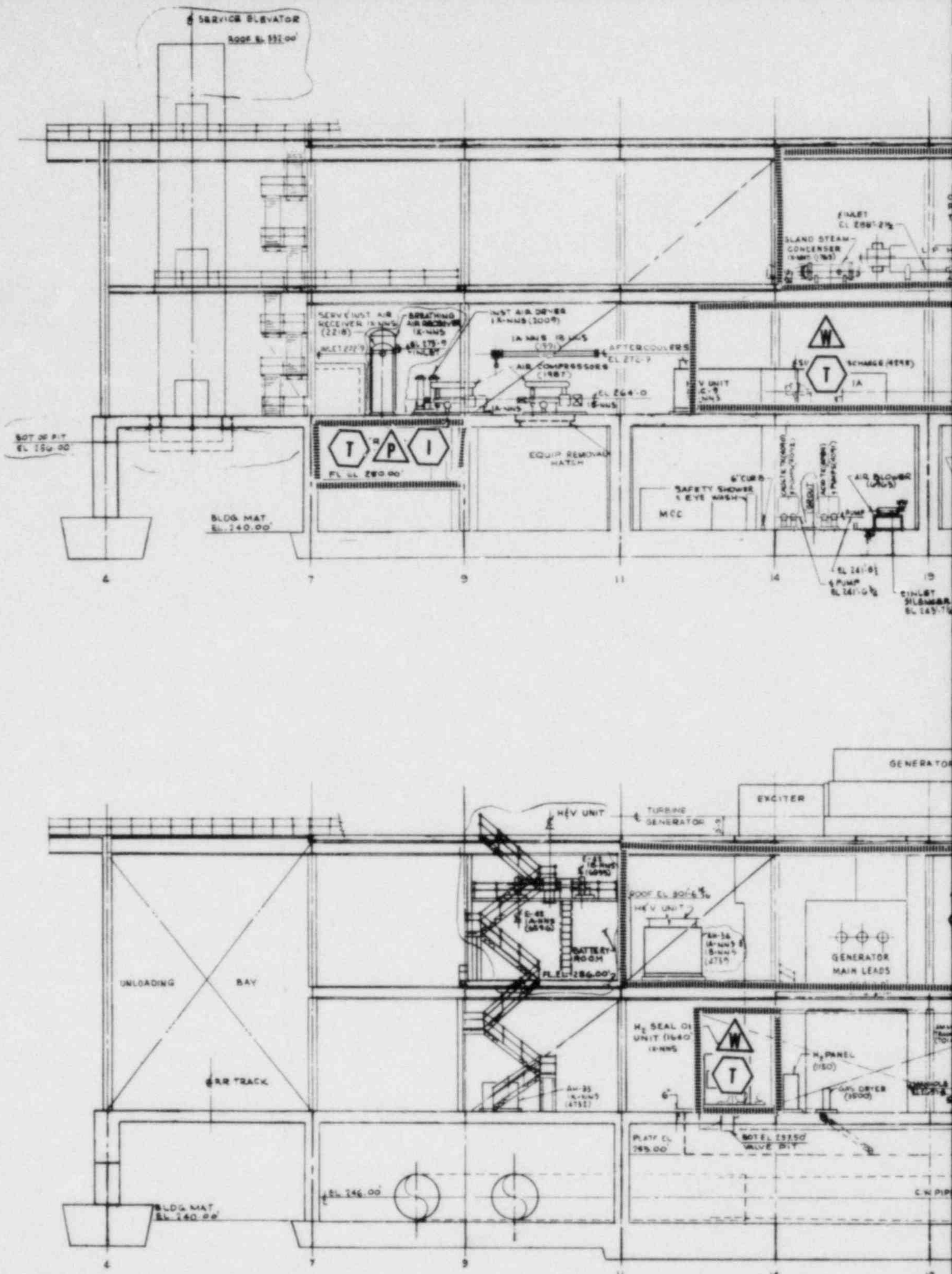
FIRE PROTECTION – TURBINE BUILDING OPERATING FLOOR PLAN

FIGURE 9.5A-37

8408140036 -48



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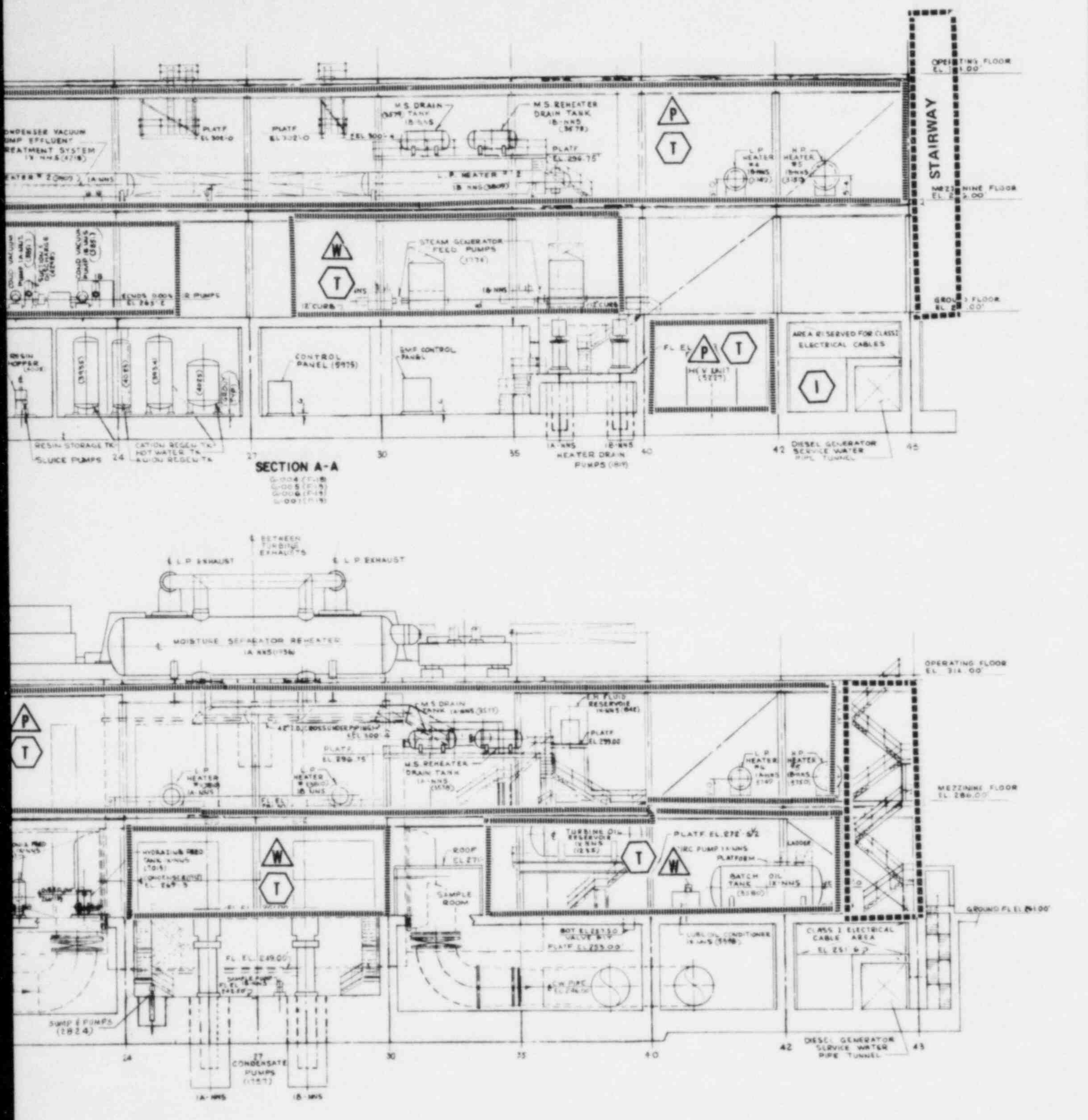

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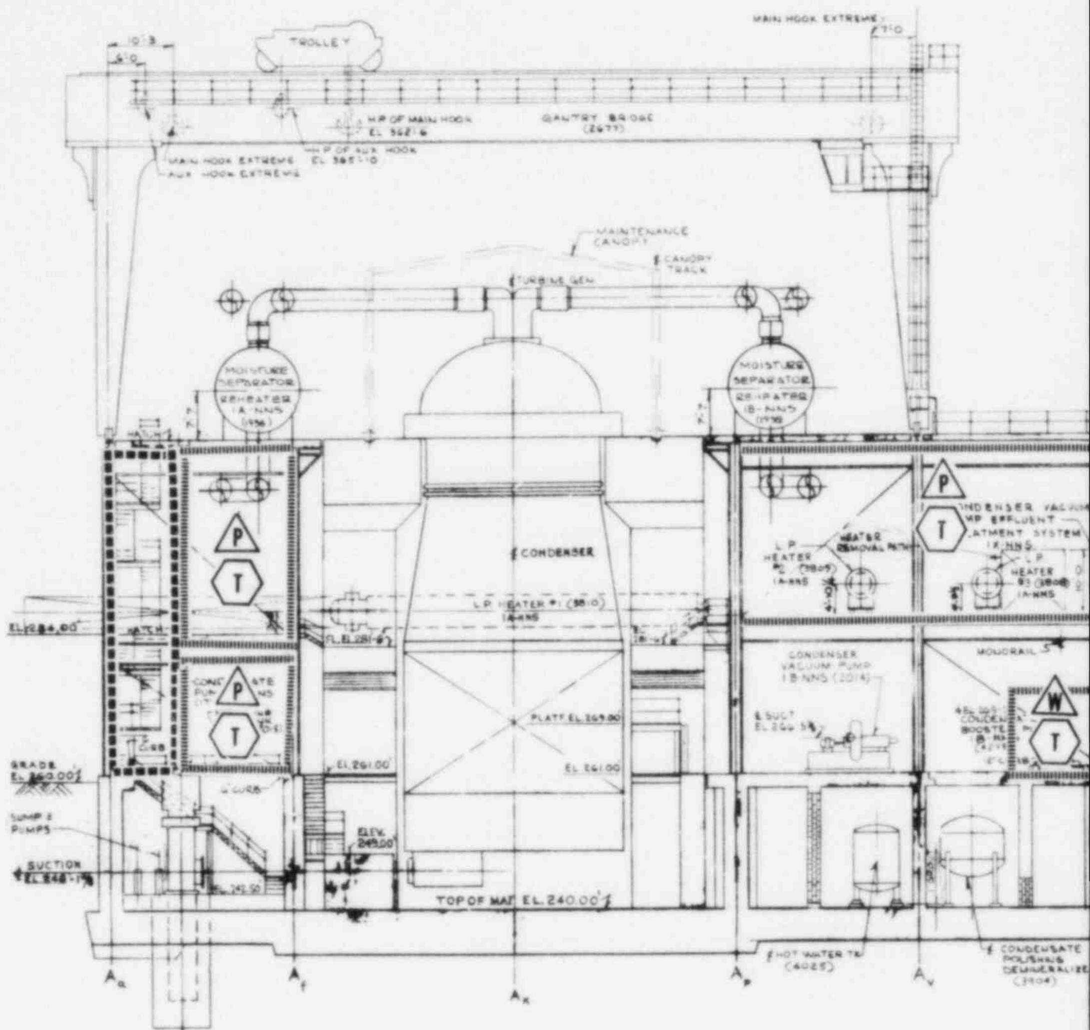
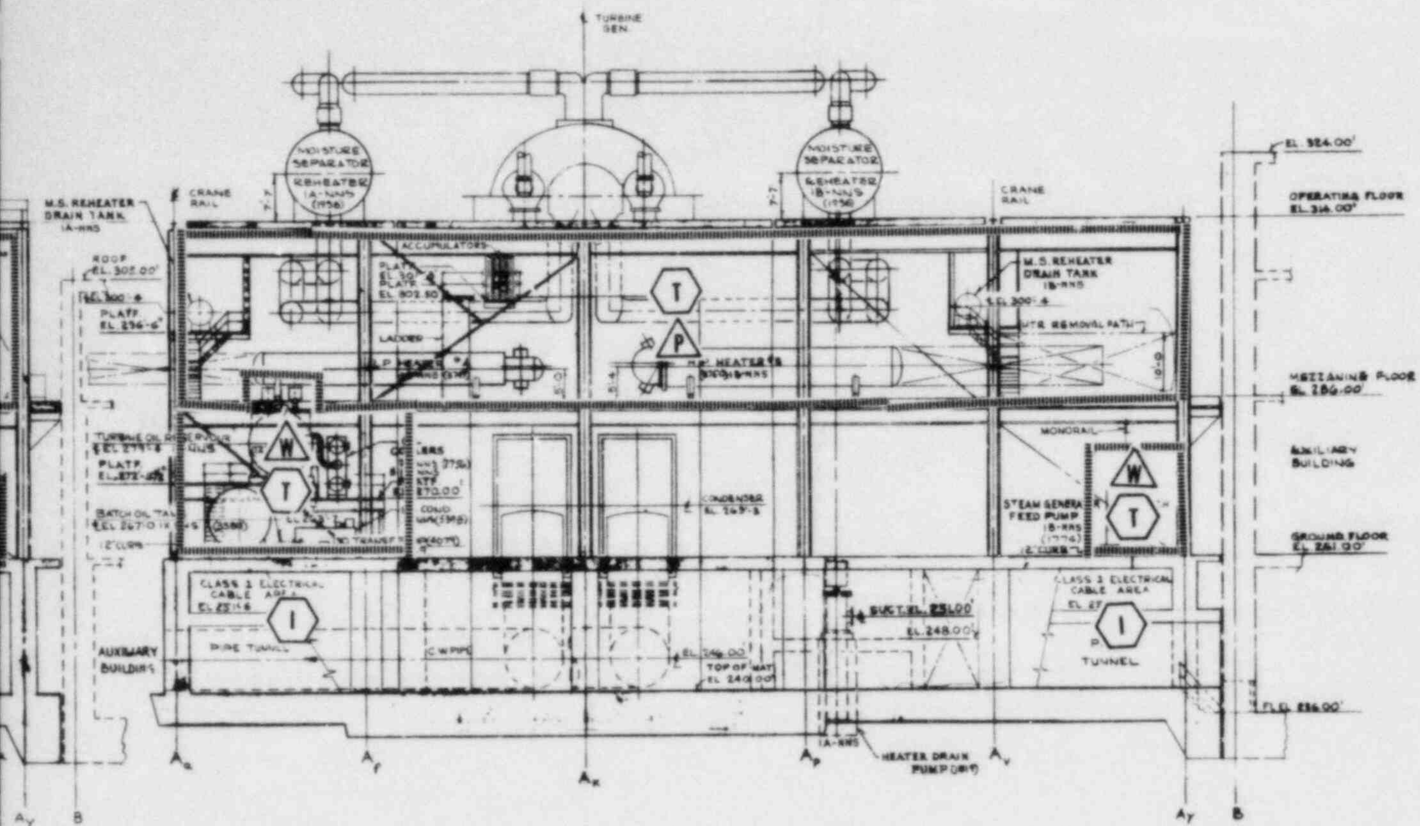
FIRE PROTECTION – TURBINE BUILDING SECTIONS – SHEET 1

FIGURE 9.5A-38

8408140036-49



SECTION C-C
G-004(L-10)
G-005(L-11)
G-006(L-11)
G-007(L-11)



SECTION D-D

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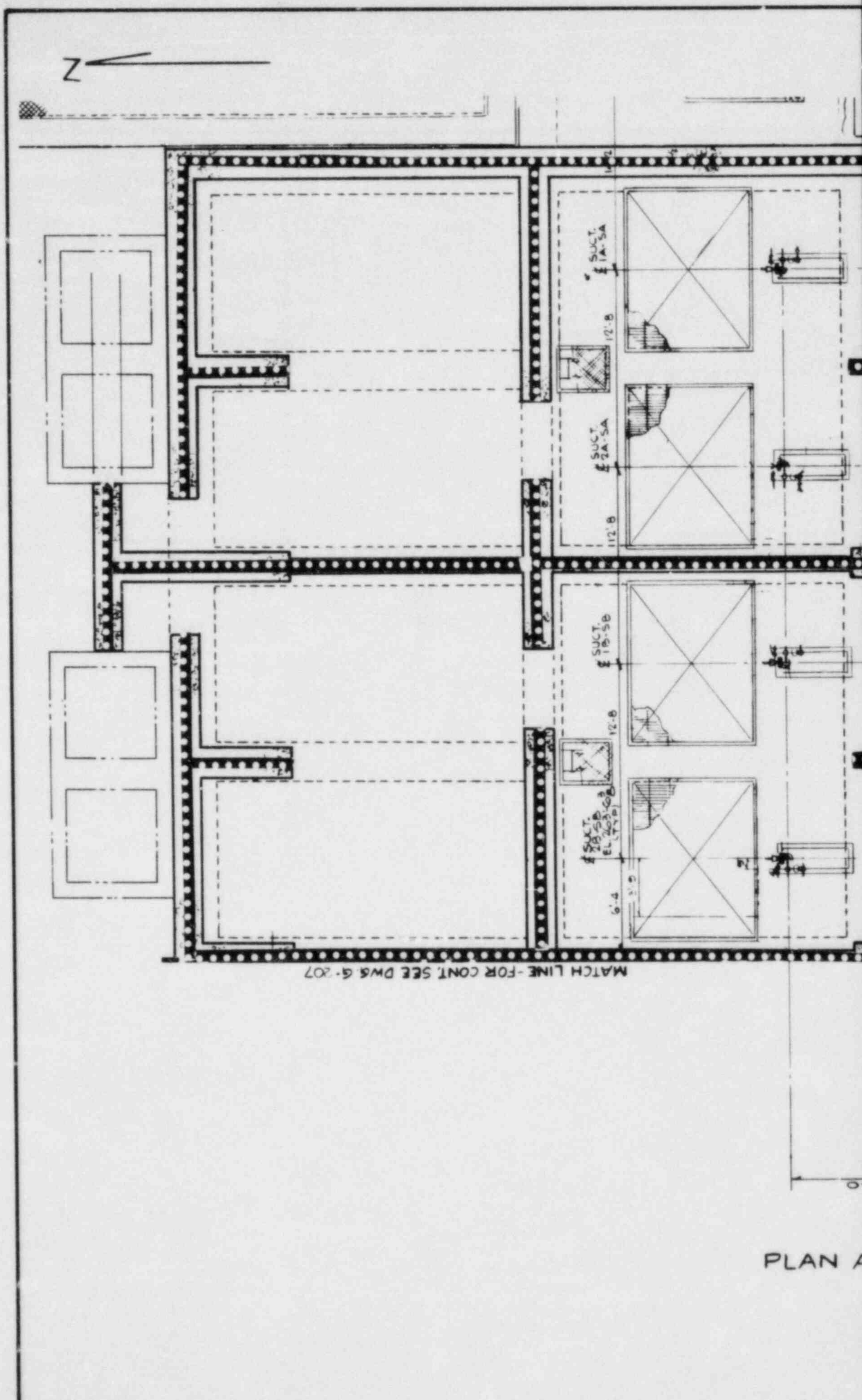
Carolina Power & Light Company
FINAL SAFETY ANALYSIS REPORT

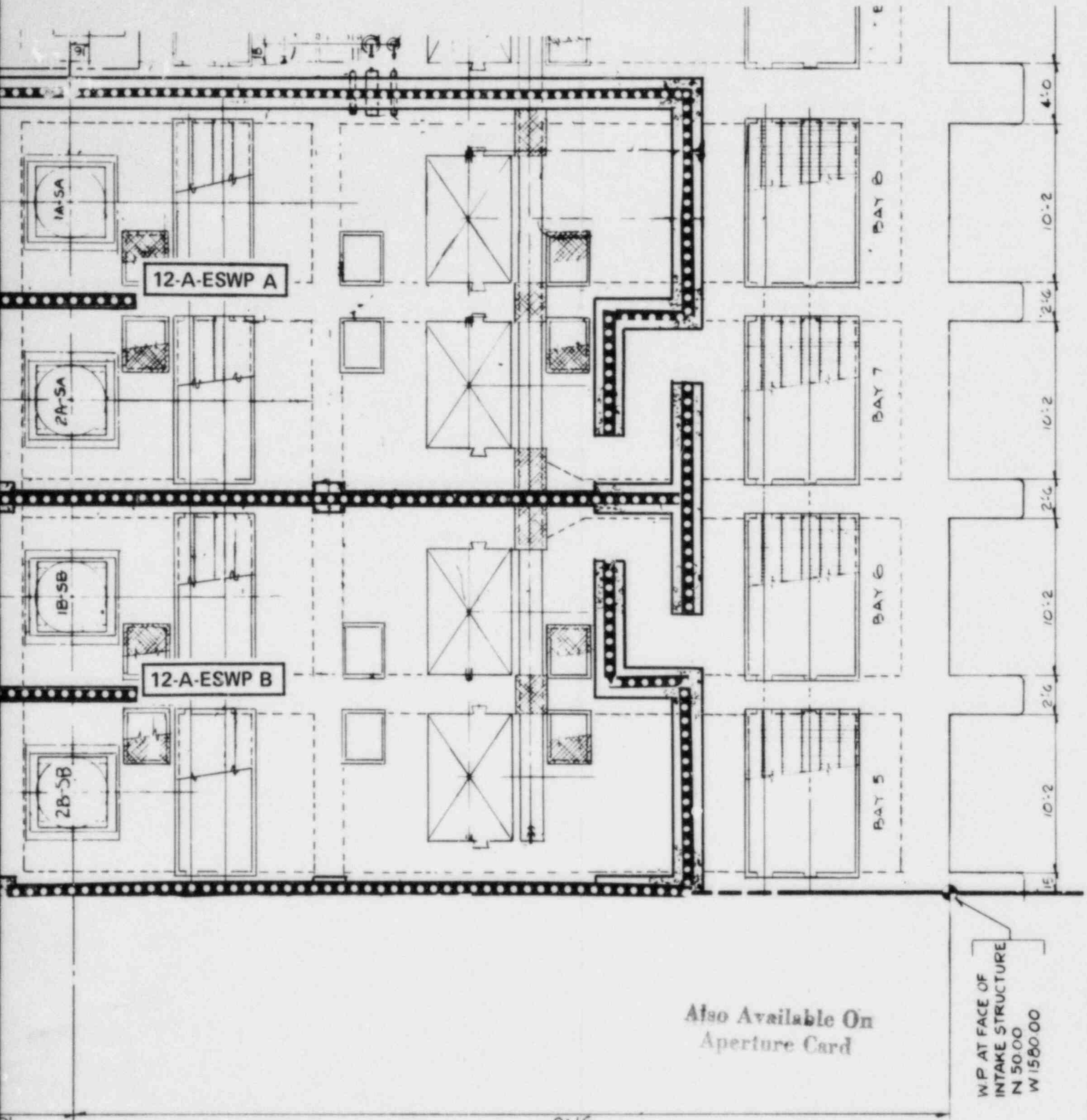
FIRE PROTECTION – TURBINE BUILDING
SECTIONS – SHEET 2

FIGURE 9.5A-39

8408140036 -50



SUCT. 1A-SA
12'-8
SUCT. 2A-SA
12'-8
SUCT. 1B-SB
12'-8
6'-4
MATCH LINE - FOR CONT. SEE DWG G-207
PLAN A



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T EL. 262.00'

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FIRE PROTECTION – EMERGENCY SERVICE WATER INTAKE STRUCTURE

FIGURE 9.5A-40

8408140036 -51