FIRE PROTECTION EVALUATION REPORT

Perry Nuclear Power Plant Units 1 & 2

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

Gilbert/Commonwealth
ENGINEERS/CONSULTANTS Reading,PA/Jackson,MI

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Rev. 1

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PERRY NUCLEAR POWER PLANT UNITS 1 AND 2

CLEVELAND ELECTRIC ILLUMINATING CO.

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THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

PERRY NUCLEAR POWER PLANT

UNITS 1 AND 2

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This issue of the report, dated January 1981, replaces the original document, dated September, 1977 in its entirety. Holders of the original report should discard it upon receipt of this revised version.

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1.0 INTRODUCTION

1.1 BACKGROUND AND PURPOSE

The Nuclear Regulatory Commission (NRC), in a letter dated May 3, 1976, transmitted to the Cleveland Electric Illuminating Company (CEI) a copy of revised Standard Review Plan (SRP) 9.5.1, "Fire Protection," dated May 1, 1976, which included Branch Technical Position APCSB 9.5-1. This revision of SRP 9.5.1 contained new guidelines for NRC staff evaluations of fire protection in their review of nuclear power plant construction permit applications docketed after July 1, 1976. The letter stated (1) that to the extent reasonable and practical the revised SRP will be used by the NRC staff in evaluating fire protection provisions of operating plants, applications currently under review for construction permits and operating licenses, and future applications for operating licenses for plants now under construction; and (2) that the NRC would provide more definitive criteria or acceptable alternatives for the application of SRP 9.5.1 when available.

In a subsequent letter dated September 30, 1976, the NRC transmitted Appendix A to APCSB 9.5-1 which provides for plants docketed prior to July 1, 1976 certain acceptable alternatives to the positions given in SRP 9.5.1. This letter also directed CEI to conduct an evaluation of the fire protection provisions for the Perry Nuclear Power Plant (PNPP), Units 1 and 2. The evaluation must include a fire hazards analysis conducted under the technical direction of a qualified fire protection engineer and performed to the level of detail indicated by Enclosure 2 to NRC's letter "Supplementary Guidance on Information Needed for Fire Protection Program Evaluation." In addition, the evaluation must provide a detailed comparison of the fire protection provisions proposed for PNPP Units 1 and 2 with the appropriate guidelines in Appendix A, which for PNPP are those designated as "Application Docketed But Construction Permit Not Received as of 7/1/76."

Therefore, the purpose of this report is to present the results of the fire protection evaluation for PNPP Units 1 and 2. The methodology employed and a description of the safe shutdown systems are presented in Sections 2.0 and 3.0, respectively. The fire hazards analysis is presented in Section 4.0, and a point-by-point comparison with Appendix A is provided in Section 5.0.

The evaluation was conducted by Gilbert Associates, Inc., Reading Pennsylvania, under the technical direction of J. D. Grier, who is qualified for member grade in the Society of Fire Protection Engineers. His qualifications include registration as a Professional Engineer in fire protection in the Commonwealth of Pennsylvania.

2.0 METHODOLOGY - FIRE HAZARDS ANALYSIS

2.1 INTRODUCTION

A major task within the fire protection evaluation program was the fire hazards analysis. PNPP Units 1 and 2 are currently in the final design phase and construction is partially completed. The fire hazards analysis was performed based on the plant design as it existed in December, 1979. The objective of the analysis was to determine the potential effects of a fire at any location within the plant which would adversely affect the ability to safely shut down the plant or would result in an uncontrolled release of radioactivity. Where it was determined that a single fire might jeopardize safe plant shutdown or cause uncontrolled release of radioactivity, a design change was implemented to prevent the loss of safe shutdown capability. This report is written based upon the premise that design changes, implemented as a result of the fire hazards analysis, have been fully incorporated into the design.

The detailed fire hazards analysis concentrated on those buildings which house safe shutdown equipment.

Buildings not containing equipment required for safe shutdown were evaluated to determine if, and to what extent, plant design changes need to be implemented in order for a fire in these buildings not to affect buildings containing safe shutdown equipment.

The fire hazards analysis was performed in two phases: the first was an information collection process; the second was the actual analysis and effects evaluation.

2.2 INFORMATION COLLECTION

Before the fire hazards analysis could be performed, information about PNPP had to be compiled. This effort involved determining equipment required for safe shutdown, preparing an inventory of combustibles, investigating fire barriers, reviewing existing fire detection/protection equipment, and then presenting this information on fire protection layout drawings.

2.2.1 Safe Shutdown Equipment

The shutdown operation, for purposes of this fire protection evaluation, is considered to start at full power and terminate with the plant at atmospheric pressure and refueling temperature with shutdown cooling in operation. Safe shutdown equipment is defined as mechanical, electrical and ventilation equipment, including instrumentation, controls and cables required for the shutdown operation. It was assumed that the shutdown procedure would be essentially a manual operation, conducted from either the control room or the remote shutdown panel in the control complex.

Additional information concerning the shutdown sequence is presented in Section 3.0.

2.2.2 Inventory of Combustibles*

The types of combustibles considered include petroleum products, electrical insulation, charcoal filters, and maintenance and operating supplies.

Petroleum products are defined, for the purposes of this report, as lubricants and fuel oil utilized at PNPP. Lubrication of

*"Combustible" is used to refer to any material or structure that can burn; (National Fire Protection Association Handbook, 14th Edition, page A-39).

equipment requiring small quantities (less than one gallon) of oil is normally accomplished through use of sealed bearings or oil/grease cup arrangements which require very small quantities of lubricant. These small quantities were not considered significant for the fire hazards analysis and were not included in specific fire area/zone fire loads. Fuel oil storage is discussed in the individual area analyses.

All transformers inside plant buildings are of dry type construction, except the main generator neutral grounding transformers (one in each Turbine Building) which are filled with nonflammable epoxy. No oil filled transformers are located inside the plant buildings.

Electrical insulation consists primarily of cable insulation. The types of cable insulation used are primarily ethylene propylene rubber or cross-linked polyethylene. Small quantities of other materials are used in switchgear and control panels. Cables have overall fire retardant jackets of chlorosulphonated polyethylene. For purposes of the fire hazards analysis, all cable insulation was assumed to be combustible and to have a heat content of 10,000 Btu/lb.(1) Cables have been type tested in accordance with the flame test specified in IEEE-383(2) and are certified to be of fire retardant construction. Cables are installed in steel trays (ladder type or solid bottom type) or in steel conduits. Control, instrument, and small power cables are randomly installed in trays and lay in multiple layers. Large power cables are installed in a single layer.

At the time this analysis was performed, the cable tray system layout had been established. However, routing of cables and the number and size of cables in each tray were not complete. Because cable routing is not complete, all safety related cable trays were considered to contain safe shutdown cabling.

Cable insulation weights were estimated using the following procedure:

a. An average cable size was established for each tray class, based upon tray classification (power, control, instrument, etc.)

b. The number of cables per tray was determined based on 50 percent cable tray fill criteria.

c. The insulation quantity was obtained by multiplying the number of cables, tray length and weight of insulation of an average cable size representative of the tray loading.

d. The total insulation weight was obtained through summation of all trays in the area.

Since most circuits do not run the full length of a tray and maximum allowable tray fill was assumed, item d, above, yielded a conservative (high) estimate of total insulation weight. The insulation of cables installed in conduit was accounted for by the conservative procedure used for estimating cable insulation weight in cable trays. In areas of the plant where no cable trays exist, a conservative amount of cable insulation was assumed to account for cable in conduit.

Insulation in motors less than 50 horsepower was a small quantity in comparison to the quantity of cable insulation and, therefore, was not considered.

Combustible materials inside instrumentation, control and relay cabinets consist of cable insulation, circuit card materials and bakelite in relay housings.

The Btu content of instrument cabinets was determined based upon a detailed investigation of combustibles within a representative cabinet. These combustibles consisted of cable insulation and printed circuit cards. The following procedure was used:

a. Cable length is estimated from physical wiring diagrams available at the time of this analysis.

b. The quantity, weight and dimensions of printed circuit cards was determined from design drawings.

c. The number of circuits contained in the control cabinets was calculated using elementary wiring diagrams.

d. The average wire length of a circuit was established and the total wire length was calculated.

e. The total weight of cable insulation was calculated, knowing the type of wire and its weight.

f. The total Btu content for the entire instrument cabinet was determined; the Btu per linear foot of cabinet width was obtained by dividing the width of the cabinet by the total Btu content of the cabinet.

g. The total footage of instrument cabinets was determined from layout drawings; the total Btu content for instrument cabinets in a given fire area/zone was then calculated.

Electrical insulation in motor control centers and switchgear was estimated using a procedure similar to that outlined above for cable insulation in cabinets.

Charcoal filter combustibles were determined from filter manufacturer data.

Maintenance and operating supplies consist of paper, cloth, plastic and other material items required for normal plant operations. In contrast to the first three categories of combustibles which are permanent and part of the plant design, these combustibles are transient, may vary with time, and can be moved throughout the plant. Because of these characteristics, they are subject to administrative controls. Certain areas of the plant, however, require a periodic supply of these combustibles. The controlled access dressing area, for example, will always contain clothing and associated supplies.

For the fire hazards analysis, it was assumed that plant housekeeping procedures would keep nonpermanent combustibles in general plant areas to low levels. In those areas where it is known that maintenance and operating supplies must be maintained, it was assumed that a reasonable quantity of such materials was present. The assumed Btu content of these materials was based upon knowledge of the kinds of materials required in an area and surveys of operating installations. These assumed Btu levels are presented in Section 4.0 for applicable areas/zones.

2.2.3 Review of Fire Barriers

The review of fire barriers consisted of examining the construction of existing fire barriers which separate fire areas, fire zones and redundant equipment within the plant. Included in this review was an evaluation of doors and other penetrations between fire areas.

Walls are assigned fire resistance ratings based upon their construction. Insulated steel deck roofing conforms to Factory Mutual Class I construction requirements. Door ratings are determined from Underwriters Laboratories, Inc., labels. Penetrations through rated fire walls, floors or ceilings are sealed to provide a barrier equal to that of the surrounding structure. All electrical penetrations through floors and fire walls are sealed to prevent fire propagation along the cables between floors or through walls. In addition, penetrations in fire barriers between redundant equipment within a given fire area are sealed to prevent fire propagation through the barrier. Fire dampers throughout the plant will have a fire rating consistent with the rating of the wall or floor being penetrated.

2.2.4 Existing Fire Detection/Protection Equipment

The following information was collected concerning existing fire detection and protection equipment:

a. Fire detector type and location.

b. Fire protection system configuration.

c. Valving type and location.

d. Fire pump type, capacity and location.

e. Hose station type and location.

f. Fire extinguisher type and location.

g. Location and configuration of permanently installed water sprinkler or deluge systems.

h. Location and configuration of permanently installed gaseous fire suppression systems.

i. Type of actuation for fire protection systems.

2.2.5 Fire Protection Layout Drawings

Fire protection layout drawings (E-023-001 through E-023-034) were developed to present much of the information gathered in the first phase of the fire hazards analysis. These drawings show: each building containing safe shutdown equipment, fire barriers within each building, required safe shutdown equipment found within each building, and existing fire suppression equipment. These drawings form the basic reference for the fire hazards analysis.

2.2.6 References

1. American National Standards Institute, 1976. Draft-Generic Requirements for Nuclear Power Plant Fire Protection, ANSI N18.10.

2. Institute of Electrical and Electronics Engineers, "Standard for Type Test of Class 1E Electric Cables, Field Splices, and Connections for Nuclear Power Generating Stations," IEEE-383, 1974.

2.3 FIRE HAZARDS ANALYSIS

Following the information collection and drawing preparation phase, the fire hazards analysis was performed. The steps used in this analysis and general considerations are discussed below. The detailed analysis, with results, is presented in Section 4.0.

2.3.1 Identification of Fire Areas/Zones

As part of the plant design, each building was designated as a major fire area. In some cases, buildings were further subdivided into individual fire areas. A fire area is defined as an area completely enclosed by rated fire barriers. These designated fire areas were then used in the fire hazards analysis. In some instances a single fire area consisting of several rooms or floors within a building was analyzed in its entirety while in other cases the fire area was further subdivided into fire zones to facilitate manageable and logical analysis. Divisions between zones do not necessarily occur at existing design features, such as floors or walls. Each fire area/zone is presented in Section 4.0 on a building by building basis.

The analysis for each fire area and fire zone within a building is treated similarly since differences between a fire area and a fire zone are often very slight. The location under consideration is identified in the analysis as a fire area or fire zone.

For purposes of this fire protection evaluation, stairtowers were not considered as part of the fire area/zone breakdown. The stairtowers have 3 hour rated enclosures.

2.3.2 Review of Safe Shutdown Equipment Within Fire Areas/Zones

Safe shutdown equipment located within each building is shown on the fire protection layout drawings, is listed in Table 3-1, and is discussed in Section 4.0. The fire protection layout drawings also show relative position of mechanical equipment, control and power centers, and trays carrying safety related cables.

An important aspect of this review was the consideration of equipment function and the location of other equipment capable of performing the same function. In some cases both sets of redundant equipment are located in the same fire area/zone. When this occurred, it was necessary to evaluate actual separation, combustibles in the immediate vicinity of the equipment, ignition sources, and fire detection and suppression equipment in the fire area/zone. In cases where other equipment capable of performing the same function is located in a different fire area/zone, it was determined that the equipment in the fire area/zone under consideration could be damaged by fire without adversely affecting safe plant shutdown.

Since equipment required for safe plant shutdown following a fire is also safety related equipment, existing separation of redundant safety related electrical systems provides protection against potential fires caused by internal cable failure. The separation required for cables and cable trays to provide this protection is set forth in the separation design criteria for PNPP. This criteria is in accordance with IEEE 384-1974.

Basically, two redundant channels of equipment for power and control exist throughout the plant. These are referred to as Division 1 and Division 2. For the reactor protection system (RPS), four channels of sensors and cable exist for the purpose of dual trip alarm and actuation of reactor scram. These are referred to as Division 1, 2, 3, and 4. Separation for each of these four divisions of sensors is maintained by routing the cables in separate raceways for each division. In accordance with the dual trip logic, Divisions 1 and 4 are redundant to Divisions 2 and 3. Divisions 1 and 4 RPS sensor cables are routed through the same areas as Division 1 power and control cables. Division 2 and 3 RPS sensor cables are routed through the same areas as Division 2 power and control cables.

2.3.3 Calculation of Fire Load

Combustible materials located within each fire area/zone were listed and the fire loading, in Btu/ft^2, was calculated. This number was then used to verify the adequacy of existing fire barriers (see Table 2-1). For fire areas/zones containing both sets of redundant equipment, the combustibles were further evaluated; their location, confinement, ignitability and fire spread were considered with respect to the redundant equipment.

2.3.4 Review of Ventilation Systems

Ventilation equipment required for safe plant shutdown, such as the residual heat removal pump room coolers, was treated as safe shutdown equipment.

Other ventilation systems were evaluated based upon the following considerations:

a. What effect might the ventilation scheme have on a fire within the affected fire area/zone?

b. To what locations would products of combustion be routed through the ventilation system?

c. Would the ventilation system help to spread a fire to another fire area/zone?

d. What would be the effect of shutting down the fire area/zone ventilation system in the event of a fire?

e. Are there fire or smoke dampers in the ventilation ducts?

f. Are there other vital aspects of the ventilation system?

g. Are there smoke (combustion products) exhaust systems?

2.3.5 Examination of Existing Fire Detection/Suppression/Containment

This examination consisted of determining how a fire within a fire area/zone would be extinguished, once detected. It was assumed that permanently installed equipment would function as designed. Manual backup fire suppression equipment is provided throughout the plant.

An additional consideration for fire zones was whether or not the fire would be confined to the zone until extinguished. If it could not be confidently determined that a fire would be confined within a fire zone, it was assumed that it would spread to adjacent fire zones through unprotected openings between zones.

2.3.6 Evaluation/Conclusions

Finally, an evaluation was made to determine whether or not the plant was adequately protected in the event of a fire within a fire area/zone. This evaluation was based upon all the previously noted information. The primary consideration was to determine if a fire would jeopardize safe plant shutdown.

The questions addressed in the evaluation of a fire area/zone were the following:

a. Is there equipment within the fire area/zone which is essential to safe plant shutdown, the function of which cannot be fulfilled by other equipment in other fire area/zones?

b. How would a fire in the fire area/zone be detected? What is the response time of the detection devices or scheme? Is this adequate?

c. How would a fire in the fire area/zone be extinguished? How quickly can the suppression equipment be placed into service and what is its effectiveness? Is this adequate?

d. Does the ventilation system contribute to the spread of the fire and/or products of combustion to other fire areas/zones which would be otherwise unaffected?

e. Will a fire cause equipment damage resulting in spillage or leakage of radioactivity?

f. Does this analysis show that the plant can be safely shut down and that radioactive releases to the environment are minimized despite any fire hazards identified within the fire area/zone?

If the answer to question f, above, was YES after all the other questions above had been addressed, then it was concluded that the individual fire area/zone was adequately protected against fire from the standpoint of safe plant shutdown.

If the answer to question f, above, based upon preceeding analyses, was NO, design changes were implemented to ensure that adequate protection would be available.

TABLE 2-1

REQUIRED BARRIER RATINGS FOR FIRE LOADINGS[1]

Fire Loading Btu/ft^2	Required Barrier Rating
40,000	30 minutes
80,000	1 hour
120,000	1-1/2 hours
160,000	2 hours
200,000	2-1/2 hours
240,000	3 hours

NOTE:

(1) From National Fire Protection Association Handbook, 14th Edition, page 6-81.

3.0 SAFE PLANT SHUTDOWN

The primary consideration of the fire hazard analysis was the evaluation of the ability to safely shut down the reactor in the event of a fire. The safe shutdown procedure was assumed to start at normal full power and to end with the reactor in the cold shutdown condition with long term cooling, using the residual heat removal (RHR) system, in progress.

Section 3.1 outlines the shutdown sequence upon which the fire hazards analysis was based. Section 3.2 lists the systems required to accomplish safe plant shutdown. Table 3-1 is a list of equipment required for safe plant shutdown.

3.1 SHUTDOWN SEQUENCE

For the fire hazards analysis, the shutdown sequence starts with the detection of a fire of such a magnitude that shutdown of the plant is required. Depending upon the location and magnitude of the fire, the plant may be quickly brought to hot shutdown or tripped by the plant operator. For the fire hazards analysis, it is assumed that plant shutdown is initiated with an automatic or manual scram of the reactor from the main control room or by tripping the reactor protection system breakers at the RPS distribution cabinets. Once initiated, no further control rod motion is required.

For each unit there is a normal offsite a-c power source available as well as two redundant Class 1E onsite power sources. It is not considered probable that a single fire would prevent the use of offsite power; however, for the purpose of this fire hazards analysis, only the Class 1E power sources have been analyzed.

It was assumed, for analytical purposes, that the function of the main turbine pressure regulators to control reactor pressure via the bypass valves to the main condenser was lost.

It was also determined that, although fire damage might cause the plant to trip, no fire could negate the ability to manually trip the reactor.

In the event that the reactor vessel is isolated, and feedwater supply is unavailable, relief valves are provided to automatically (or remote manually) maintain vessel pressure within desirable limits. The water level in the reactor will drop due to continued steam generation by decay heat. Upon reaching a predetermined low level, the reactor core isolation cooling (RCIC) system will be activated automatically. The RHR system will be placed in the steam condensing mode as soon as possible after isolation of the primary system from the main condenser. Reactor steam, at reduced pressure and temperature, will be directed to the RHR heat exchangers where the steam is condensed. In time the RHR heat exchangers will be switched to the suppression pool cooling mode. Reactor pressure is controlled and residual (decay and sensible) heat is rejected to the suppression pool by relieving steam pressure through the relief valves.

Manual operation of the relief valves reduce the reactor system pressure and temperature at a controlled rate until the RCIC system discontinues operation. This condition is reached at approximately 135 psig. The RHR system is then placed in the shutdown cooling mode at which time reactor water is pumped from one of the recirculation loops, through the RHR heat exchangers, and back to the reactor vessel by way of the feedwater system prior to reactor pressure vessel head removal. The safe shutdown procedure is completed when the shutdown cooling mode is maintaining the reactor system in a cold shutdown condition.

TABLE 3-1

LIST OF SAFE SHUTDOWN EQUIPMENT(1)

a. Diesel Generator Building

Equipment	Layout Drawing Location
Diesel Generator, A	1DG-1c
Diesel Generator, B	1DG-1a
Diesel Generator High Voltage Exciter Cabinet, A	1DG-1c
Diesel Generator High Voltage Exciter Cabinet, B	1DG-1a
Diesel Generator, Generator Control Panel, A	1DG-1c
Diesel Generator, Generator Control Panel, B	1DG-1a
Diesel Generator Engine Control Panel, A	1DG-1c
Diesel Generator Engine Control Panel, B	1DG-1a
Starting Air Receiver Tanks, 1A/2A	1DG-1c
Starting Air Receiver Tanks, 2B/2B	1DG-1a
Fuel Oil Day Tank, A	1DG-1c
Fuel Oil Day Tank, B	1DG-1a
Fuel Oil Transfer Pumps, 1A/2A	1DG-1c
Fuel Oil Transfer Pumps, 1B/2B	1DG-1a
Ventilation Fans, 1A/2A	1DG-1c
Ventilation Fans, 1B/2B	1DG-1a
Air Intake Filter, 2A/3A	1DG-1c
Air Intake Filter, 2B/3B	1DG-1a

b. Control Complex, Floor 1 (Elevation 574'-10")

Equipment	
Emergency Closed Cooling Pump, A	CC-1b
Emergency Closed Cooling Pump, B	CC-1a
Emergency Closed Cooling Heat Exchangers, A	CC-1b
Emergency Closed Cooling Heat Exchangers, B	CC-1a
Control Complex Chilled Water Chiller, A/C	CC-1c
Control Complex Chilled Water Chiller, B	CC-1c
Control Complex Chilled Water Pump, A/C	CC-1c
Control Complex Chilled Water Pump, B	CC-1c

(1) For clarity, reference is made to the equipment required for the safe shutdown of Perry Nuclear Power Plant, Unit 1. Identical or shared system equipment is available for the safe shutdown of Unit 2.

TABLE 3-1 (Continued)

b. Control Complex, Floor 1 (Continued)

Equipment	Layout Drawing Location
Emergency Closed Cooling Pump Area Air Handling Panel, 1A	CC-1b
Emergency Closed Cooling Pump Area Air Handling Panel, 1B	CC-1a
Emergency Closed Cooling/Chilled Water Inst. Rack, A/C	CC-1c
Emergency Closed Cooling/Chilled Water Inst. Rack, B	CC-1c
Control Complex Chilled Water Control Panel, A/C	CC-1c
Control Complex Chilled Water Control Panel, B	CC-1c
Emergency Pump Area Cooling System Air Handling Units, A	CC-1b
Emergency Pump Area Cooling System Air Handling Units, B	CC-1a

c. Control Complex, Floor 3 (Elevation 620'-6")

Equipment	
4.16 kV Switchgear Bus, Division 1	1CC-3c
4.16 kV Switchgear Bus, Division 2	1CC-3a
480 V Switchgear Bus, Division 1	1CC-3c
480 V Switchgear Bus, Division 2	1CC-3a
Motor Control Centers, Division 1	1CC-3c
Motor Control Centers, Division 2	1CC-3a
Remote Shutdown Panel	1CC-3d

d. Control Complex, Floor 4 (Elevation 638'-6")

Equipment	
Batteries, A	1CC-4h
Batteries, B	1CC-4d
Battery Chargers, A	1CC-4g
Battery Chargers, B	1CC-4c
125 VDC Switchgear Bus, Division 1	1CC-4g
125 VDC Switchgear Bus, Division 2	1CC-4c
125 VDC MCC, Division 1	1CC-4g

TABLE 3-1 (Continued)

d. Control Complex, Floor 4 (Elevation 638'-6") (Continued)

Equipment	Layout Drawing Location
125 VDC Distribution Panel, Division 1	1CC-4g
125 VDC Distribution Panel, Division 2	1CC-4c
Neutron Monitor Preamp Panels, SRM/IRM Cabinets, A/D	1CC-4f
Neutron Monitor Preamp Panels, SRM/IRM Cabinets, B/C	1CC-4b

e. Control Complex, Floor 5 (Elevation 654'-6")

Equipment	
ECCS Bench Board, P-601	1CC-5a
Auxiliary Relay Panels, P-618, 621, 622, 623, 628, 629, 631, 654, 655, 871, 872, 873	1CC-5a
Leak Detection Monitoring Panel, P-632, 642	1CC-5a
Control Rod Position Panel, P-651, 652	1CC-5a
Control Rod Drive Control Instrumentation Panel, P-653	1CC-5a
Neutron Power and Radiation Instrumentation Panel, P-669, 670, 671, 672	1CC-5a
Unit Control Console, P-680	1CC-5a
RPS Instrumentation and Auxiliary Relay Panel, P-691, 692, 693, 694	1CC-5a
HVAC Control Panel, P-800	1CC-5a
Analog Loop Instrument Panel, P-868, 869	1CC-5a
Diesel Generator Bench Board, P-877	1CC-5a
Containment/Drywell Isolation Valve Panel, P-881, 882	1CC-5a
Common Analog Loop Instrumentation and Auxiliary Relay Panel, P-969	1CC-5a
Common Long Response Panel, P-970	1CC-5a
Common HVAC Control Panel, P-904	1CC-5a

TABLE 3-1 (Continued)

f. Control Complex, Floor 6 (Elevation 679'-6")

Equipment	Layout Drawing Location
Control Room HVAC Supply Plenum, A	2CC-6
Control Room HVAC Supply Plenum, B	1CC-6
Control Room HVAC Supply Fan, A	2CC-6
Control Room HVAC Supply Fan, B	1CC-6
Control Room HVAC Return Fan, A	2CC-6
Control Room HVAC Return Fan, B	1CC-6
MCC, Switchgear & Misc. Electrical Equipment Area HVAC Plenum, A	2CC-6
MCC, Switchgear & Misc. Electrical Equipment Area HVAC Plenum, B	1CC-6
MCC, Switchgear & Misc. Electrical Equipment Area Supply Fan, A	2CC-6
MCC, Switchgear & Misc. Electrical Equipment Area Supply Fan, B	1CC-6
MCC, Switchgear & Misc. Electrical Equipment Area Return Fan, A	2CC-6
MCC, Switchgear & Misc. Electrical Equipment Area Return Fan, B	1CC-6
Battery Room Exhaust Fan, A	2CC-6
Battery Room Exhaust Fan, B	1CC-6
MCC, Switchgear, & Battery Room HVAC Instrument Rack, P-164, 166	2CC-6
MCC, Switchgear, & Battery Room HVAC Instrument Rack, P-165, 167	1CC-6
Control Room HVAC and Emergency Recirculation Instrument Rack, P-152	1CC-6
Control Room HVAC and Emergency Recirculation Instrument Rack, P-153	2CC-6
HVAC System Control Panel, A	1CC-6
HVAC System Control Panel, B	2CC-6

TABLE 3-1 (Continued)

g. Intermediate Building

Equipment	Layout Drawing Location
Instrument Air Receiver Tank, A	IB-2
Emergency Closed Cooling Surge Tanks, A	IB-4
Emergency Closed Cooling Surge Tanks, B	IB-4

h. Auxiliary Building

Equipment	
Residual Heat Removal Heat Exchangers, A/C	1AB-1b
Residual Heat Removal Heat Exchangers, B/D	1AB-1e
Residual Heat Removal Pump, A	1AB-1b
Residual Heat Removal Pump, B	1AB-1e
Residual Heat Removal Valves, A	1AB-1b
Residual Heat Removal Valves, B	1AB-1e
RHR Pump Room Cooling Air Handling Unit, A	1AB-1b
RHR Pump Room Cooling Air Handling Unit, B	1AB-1e
Reactor Core Isolation Cooling Lube Oil Cooler	1AB-1c
RCIC Turbine Drive	1AB-1c
RCIC Pump	1AB-1c
RCIC Valves	1AB-1b,c
RCIC Pump Room Cooling Air Handling Unit	1AB-1c
Instrument Air Receiver Tank, B	1AB-3a
RCIC Instrument Panel	1AB-1g
RHR Instrument Panel, A	1AB-1g
RHR Instrument Panel, B	1AB-1g
HVAC Pump Room Cooling Control Panel	1AB-2
Leakage Detection System Instrument Sensors (TE's)	1AB-1b,c,e
Suppression Pool Level Instrumentation Panels	1AB-1g

TABLE 3-1 (Continued)

i. Reactor Building

Equipment	Layout Drawing Location
Control Rod Drive Mechanisms	1RB-1d
Control Rod Drive Hydraulic Control Units	1RB-1b
Standby Liquid Control Storage Tank	1RB-1b
Standby Liquid Control Pumps and Valves	1RB-1b
Automatic Depressurization System (ADS) Valves	1RB-1c
Safety/Relief ADS Valve Air Accumulators	1RB-1c
Reactor Level & Pressure Instrumentation Rack, A	1RB-1b
Reactor Level & Pressure Instrumentation Rack, B	1RB-1b
Reactor Level & Pressure Instrumentation Rack, C	1RB-1b
Reactor Level & Pressure Instrumentation Rack, D	1RB-1b
Main Steam Flow Instrument Rack, A	1RB-1b
Main Steam Flow Instrument Rack, B	1RB-1b
Main Steam Flow Instrument Rack, C	1RB-1b
Main Steam Flow Instrument Rack, D	1RB-1b
Main Steam Line Isolation Valves	1RB-1c
RCIC Isolation Valves	1RB-1c
RHR Shutdown Valves	1RB-1b
RHR Shutdown Valves	1RB-1c
Neutron Monitoring Equipment	1RB-1d

j. Emergency Service Water Pumphouse

Equipment	
Emergency Service Water Pump, A	ESW-1a
Emergency Service Water Pump, B	ESW-1a
Emergency Service Water Pump Discharge Strainer, A	ESW-1a
Emergency Service Water Pump Discharge Strainer, B	ESW-1a
Emergency Service Water Screen Wash Pump, A	ESW-1a
Emergency Service Water Screen Wash Pump, B	ESW-1a

TABLE 3-1 (Continued)

j. <u>Emergency Service Water Pumphouse</u> (Continued)

Equipment	Layout Drawing Location
Emergency Service Water Pumphouse Intake Screen, A	ESW-1a
Emergency Service Water Pumphouse Intake Screen, B	ESW-1a
Emergency Service Water Screen Wash Pump Discharge Strainer, A	ESW-1a
Emergency Service Water Screen Wash Pump Discharge Strainer, B	ESW-1a
Emergency Service Water Ventilation Fan, A	ESW-1a
Emergency Service Water Ventilation Fan, B	ESW-1a
Motor Control Centers, Division 1	ESW-1a
Motor Control Centers, Division 2	ESW-1a
Instrument Racks, DW-1	ESW-1a
Instrument Racks, DW-2	ESW-1a
Control Panels for Intake Screens, A	ESW-1a
Control Panels for Intake Screens, B	ESW-1a

k. <u>Steam Tunnel</u>

Equipment	
Main Steam Line Isolation Valves	Steam Tunnel
RHR Shutdown Valve	Steam Tunnel
RCIC Valve	Steam Tunnel

l. <u>Yard Area</u>

Diesel Generator Fuel Oil Storage Tank, A	Yard
Diesel Generator Fuel Oil Storage Tank, B	Yard
Condensate Storage Tank	Yard

m. <u>Fuel Handling Building</u>

Equipment	
Instrument Air System Air Receiver Tank	FH-3

3.2 SYSTEMS FOR SAFE SHUTDOWN

The following is a list of systems required, or partially required, for safe plant shutdown:

1. Reactor System
2. Nuclear Boiler System
3. Control Rod Drive Hydraulic System
4. Standby Liquid Control System
5. Neutron Monitoring System
6. Reactor Protection System
7. Residual Heat Removal System
8. Reactor Core Isolation Cooling System
9. Automatic Depressurization System
10. Remote Shutdown System
11. Motor control centers, Switchgear, and Miscellaneous Electrical Equipment Area HVAC Systems
12. Battery Room Exhaust System
13. Control Room HVAC System
14. Emergency Closed Cooling Pump Area Cooling System

15. Emergency Service Water Pump House Ventilation System

16. Emergency Core Cooling System Pump Room Cooling System

17. Diesel Generator Building Ventilation System

18. Condensate Transfer and Storage System

19. Emergency Closed Cooling System

20. Emergency Service Water System

21. Control Complex Chilled Water System

22. Emergency Service Water Screen Wash System

23. Safety Related Instrument Air System

24. 125 V DC System

25. Standby Diesel Generator Power System

26. Standby Diesel Generator Starting Air System

27. Diesel Generator Fuel Oil System

28. Standby Diesel Generator Exhaust, Intake and Crankcase System

This listing is based upon the shutdown sequence and assumptions given in Section 3.1. Additional systems included in this list are used for normal reactor shutdown and, if available, would be put into service in the event of a fire.

4.0 FIRE HAZARDS ANALYSIS

4.1 REACTOR BUILDING

The reactor building is the structure that houses the reactor vessel. Separate structures are located on the Unit 1 and 2 sides of the plant for each reactor pressure vessel. The reactor building is comprised of the shield building and the primary steel containment vessel and extends from elevation 574'-10" to elevation 767'-5". In addition to containing the reactor vessel and associated support systems, the reactor building contains the control rod drive (CRD) hydraulic units, refueling auxiliaries, reactor water cleanup (RWCU) equipment, recirculation flow control hydraulic power units, and miscellaneous HVAC equipment, and also maintains the primary radiological boundary and pressure containment for the plant. The reactor building is adjacent to the auxiliary building, intermediate building and fuel handling building.

The reactor building ventilation system is comprised of two subsystems: drywell cooling and containment vessel cooling. The drywell cooling system consists of three fan cooler assemblies, each with one 100 percent capacity supply plenum and two 100 percent capacity supply fans. The containment vessel cooling system consists of six 25 percent capacity air handling units.

The reactor building purge system is comprised of two subsystems: purge supply and purge exhaust. The purge supply system consists of two 50 percent capacity plenums and supply fans to provide filtered and heated outside air to the containment vessel. The purge exhaust system consists of two 50 percent capacity exhaust fans and charcoal filter trains. This system exhausts air from the containment vessel and RWCU rooms through charcoal filters and to the plant vent. Supply air to and exhaust air from the drywell is purged by this system during refueling operations only.

Air handling for the annulus is accomplished by an exhaust gas treatment system consisting of two 100 percent capacity exhaust fans and charcoal filter trains. This system maintains a negative pressure relative to the outside so that exfiltration and ground level release of airborne radioactivity is minimized. All ventilation ducts penetrating the shield building wall are provided with 3 hour rated fire dampers with standard 160°F fusible links.

For purposes of this fire hazards analysis, the entire reactor building is considered a single fire area. This fire area is divided into four fire zones: Fire Zone RB-1a is the annulus outside of the steel containment vessel; Fire Zone RB-1b is the zone located inside the containment vessel and outside the drywell wall; Fire Zone RB-1c is the zone inside the drywell and includes the reactor vessel; Fire Zone RB-1d is the zone directly underneath the reactor vessel within the reactor pedestal wall.

4.1.1 <u>Unit 1 Reactor Building</u>

4.1.1.1 Fire Zone 1RB-1a

4.1.1.1.1 Description

Fire Zone 1RB-1a is shown on drawings E-023-002, E-023-005, E-023-010, E-023-014, E-023-018, E-023-022, E-023-025, E-023-027, E-023-028 and E-023-029. This zone, referred to as the annulus, is located between the shield building wall and the containment vessel wall. It serves as a secondary barrier for maintaining the radiation doses within the limits specified by 10CFR100.

The outside wall and ceiling (dome) of this fire zone are constructed of reinforced concrete. The inside wall and ceiling (dome) are the steel containment vessel. The outer wall has a 3 hour fire resistance rating. The floor is constructed of reinforced concrete. Wall and ceiling penetrations are sealed. Access to this zone is through Class A fire doors from the auxiliary building and intermediate building.

The ventilation system for this fire zone operates to maintain a negative pressure in the annulus relative to the outside to minimize exfiltration and ground level release of airborne activity. This system consists of two 100 percent capacity charcoal filter trains with exhaust fans located in the intermediate building. Smoke detectors are located in the discharge ducts of each fan to actuate an alarm in the control room if smoke is detected. Duct penetrations through the shield building wall are provided with 3 hour rated fire dampers with $160^{o}F$ fusible links.

Safe shutdown equipment in this fire zone consists of:

a. Reactor protection system (RPS) cables, Divisions 1, 2, 3 and 4

b. Neutron monitoring cables, Divisions 1, 2, 3 and 4.

c. Power and control cables, Divisions 1 and 2

4.1.1.1.2 Analysis

Electrical penetration assemblies for all divisions are located in the southwest portion (Quadrant 3) of the annulus. Penetrations are arranged in vertical and horizontal rows such that Division 1 and 4 penetrations are separated from Division 2 and 3 penetrations by a minimum of 12 feet.

Combustibles contained within this fire zone consist of 2,040 lbs of cable with a Btu content of 20,400,000 Btu. This total, contained in the 1,963 ft^2 floor area, yields a total fire loading of 10,400 Btu/ft^2 for this fire zone.

Since electrical penetration assemblies are located in a 35 foot segment of Quadrant 3, special consideration was given to the concentrated fire loading of 104,000 Btu/ft^2 in this region. The penetration cables are installed in tubular raceway assemblies. Each tubular raceway assembly will be encased with a calcium silicate coating to provide a 3 hour fire resistance rating between redundant cables.

4.1.1.1.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging redundant divisions of safe shutdown cable is achieved. This is accomplished by spatial separation and cable encasement.

4.1.1.2 Fire Zone 1RB-1b

4.1.1.2.1 Description

Fire Zone 1RB-1b is shown on drawings E-023-002, E-023-005, E-023-010, E-023-014, E-023-018, E-023-022, E- 023-025, E-023-027 and E-023-029. It comprises the region from the steel containment vessel to the concrete drywell wall.

The outside wall and ceiling (dome) of this fire zone are constructed of steel. The inside wall and floor are constructed of reinforced concrete. Wall doors consist of double-doored personnel access hatches and equipment hatches. Wall and ceiling penetrations are sealed, except for the suppression pool vents on the inside wall which are under water.

The cooling system for this zone operates primarily to provide cooling only for the containment vessel. This system uses six 25 percent capacity air handling units, located in the containment vessel, which supply cooled, recirculated air to various areas of the containment vessel through distribution ductwork. Temperature detectors mounted in the ducts, and area temperature detectors are provided to actuate alarms in the control room if the ambient temperature is too high.

The purge supply system provides filtered and heated outside air to the containment vessel. This system consists of two 50 percent capacity supply plenums and two 50 percent capacity supply fans. Smoke detectors are provided in the discharge duct of the supply fans to actuate an alarm in the control room and trip the fans if smoke is detected.

The purge exhaust system draws air from the containment vessel, drywell area (refueling operations only), and RWCU equipment rooms, exhausting it through the plant vent after it passes through the charcoal filters. Two 50 percent capacity charcoal filter trains with exhaust fans are provided for this system. A smoke detector is provided at the common discharge duct for the fan and will actuate an alarm in the control room if smoke is detected.

The above equipment, except drywell purge supply fans, is located in the intermediate building. The drywell purge supply fans are located in the containment vessel.

Safe shutdown equipment for this fire zone consists of:

a. Standby liquid control (SLC) tank pumps and valves

b. Control rod drive hydraulic control units (HCU)

c. Reactor vessel level and pressure instrument racks, A,B,C and D

d. Main steam flow instrument racks, A,B,C and D

e. RPS cables, Divisions 1, 2, 3 and 4

f. Neutron monitoring cables, Divisions 1, 2, 3 and 4

g. Power and control cables, Divisions 1 and 2

h. Residual heat removal (RHR) valves

Fire detection equipment in this zone consists of smoke detectors at elevation 620'-6" for the HCUs, and also at locations where Division 1 and 2 cable trays are in the vicinity of each other. Fire suppression equipment consists of manual water type hose stations.

4.1.1.2.2 Analysis

The SLC system is redundant to the control rods as a means of inserting negative reactivity into the reactor core. The control rod drive mechanisms are located in Fire Zone 1RB-1d (see Section 4.1.1.4). RPS sensors are located in this zone.

The two groups of the HCUs are physically separated at 90? and 270? azimuths. Redundant, safe shutdown related electrical penetration assemblies are spatially separated by more than 12 feet.

A special situation regarding the separation of redundant cable trays is as follows: Two Division 1 cable trays run horizontally along elevations 669'-8" and 671'-0". Three Division 2 cable trays run horizontally along elevation 669'-7", 670'-11" and 672'-3". The Division 2 trays run horizontally toward the Division 1 trays and then turn vertically downward. Just after this downward turn is made the Division 1 trays pass perpendicular to the Division 2 trays resulting in a spatial separation of less than 3 feet. At this point, a vertical fire barrier is installed between the redundant trays in accordance with IEEE-384.

The RPS sensors in this zone are located in a series of instrument panels. Each primary parameter is measured by a set of four independent RPS sensors. Sensors in a set are assigned different divisions and are located in different panels that are spatially separated from each other.

Combustibles contained within this fire zone consist of:

a. Control panels with a Btu content of 17,000,000 Btu

b. Cable insulation (32,700 lbs) with a Btu content of 327,000,000 Btu

c. HCUs with a Btu content of 25,000,000 Btu

d. Motor winding insulation (180 lbs) with a Btu content of 1,800,000 Btu

e. Polar crane lubricating oil (50 gallons) with a Btu content of 7,600,000 Btu

f. Fan insulation (45 lbs) with a Btu content of 450,000 Btu

g. Hydraulic fluid (180 gallons) with a Btu content of 27,360,000 Btu

The total Btu content of 406,210,000 Btu is contained in the 6,382 ft^2 floor area. Total fire loading for this fire zone is 63,700 Btu/ft^2.

4.1.1.2.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging redundant cables or equipment required for safe shutdown is achieved. This is accomplished by providing an early warning fire detection system at locations where fire could jeopardize redundant equipment. Also, redundant cable trays are separated by a fire barrier where they do not have proper spatial separation.

4.1.1.3 Fire Zone 1RB-1c

4.1.1.3.1 Description

Fire Zone 1RB-1c is shown on drawings E-023-002, E-023-005, E-023-010, E-023-014, E-023-018 and E-023-029. It comprises the region inside the drywell including the reactor vessel but excluding the area directly beneath the reactor. This zone serves as the structure that channels steam releases to the suppression pool, as well as housing the reactor vessel, reactor recirculation system and other auxiliary systems.

Walls, floor and ceiling of this fire zone are constructed of reinforced concrete. Wall doors consist of double-doored personnel access hatches and an equipment hatch. Wall penetrations are sealed, except for the suppression pool vents which are under water.

The drywell cooling system operates primarily to provide cooling only for the drywell area. This system uses three 100 percent capacity fan cooler assemblies, each with a supply plenum and two supply fans located in the drywell. The fan cooler units supply recirculated, cooled air to the drywell area through distribution ductwork. Temperature detectors mounted in the ducts, and area temperature detectors are provided to actuate alarms in the control room if the ambient temperature is too high.

During the drywell purge mode (refueling operations only), the two 50 percent capacity drywell purge supply fans direct supply air from the containment vessel into the drywell area. This supply air is then circulated by the drywell cooling system.

The purge exhaust system for this fire zone is the same as for Fire Zone 1RB-1b (see Section 4.2.1.2).

Safe shutdown equipment for this fire zone consists of:

a. Automatic depressurization system (ADS) valves (B21-F041, B21-F047, and B21-F051)

b. ADS valve air accumulators

c. Residual heat removal (RHR) valves

d. Reactor core isolation cooling valve

e. Main steam line isolation valves

f. Power and control cables, Divisions 1 and 2

g. RPS cables, Divisions 1, 2, 3 and 4

h. Neutron monitoring equipment

Cross-zoned fire detection, for early warning and suppression system activation, is provided at the reactor recirculation pumps. Fire suppression equipment for this zone consists of a local application type carbon dioxide system for the reactor recirculation pumps.

4.1.1.3.2 Analysis

The ADS valves provide a redundant means for transferring the reactor vessel water to the ultimate heat sink if the RHR shutdown suction valves become inoperative. The physical separation between the ADS valves and the RHR shutdown suction valves is at least 20 feet vertically and 10 feet horizontally.

Combustibles within this fire zone consist of:

a. Motor winding insulation (2,200 lbs) with a Btu content of 22,000,000 Btu

b. Motor lubricating oil/hydraulic fluid (150 gallons) with a Btu content of 22,800,000 Btu

c. Cable insulation (5,000 lbs) with a Btu content of 50,000,000 Btu

The total Btu content of 94,800,000 Btu is contained in the 2,603 ft^2 floor area. Total fire loading for this fire zone is 36,420 Btu/ft^2.

Since combustibles are concentrated in the area of the recirculation pump, special consideration was given to the potential for a fire in this region. It was determined that this fire would not spread in such a manner as to affect redundant safe shutdown equipment. However, fire detection and suppression systems are provided to minimize any damage in this fire zone.

4.1.1.3.3 Conclusions

The results of the analysis for this fire zone indicates that the objective of preventing a fire from damaging redundant equipment required for safe shutdown is achieved. This is accomplished by physical separation of redundant equipment, and fire detection and suppression systems provided for the reactor recirculation pumps.

4.1.1.4 Fire Zone 1RB-1d

4.1.1.4.1 Description

Fire Zone 1RB-1d is shown on drawings E-023-002, E-023-005 and E-023-029. It is the region directly below the reactor vessel and inside the vessel pedestal. This zone contains the control rod drives, neutron monitoring equipment and other under-vessel servicing equipment.

Walls and floor of this fire zone are constructed of reinforced concrete. Ventilation air is circulated through this zone by vents in the pedestal wall.

Safe shutdown equipment for this fire zone consists of:

a. Neutron monitoring equipment

b. Control rod drive mechanism

c. Control cables, Divisions 1 and 2

d. RPS cables, Divisions 1, 2, 3 and 4

Fire detection equipment is located beneath the reactor vessel to provide a fire signal to annunciate in the control room.

4.1.1.4.2 Analysis

The SLC system, located in Fire Zone 1RB-1b (see Section 4.1.1.2), provides a redundant means for taking the reactor to cold shutdown should the control rod drive mechanisms become inoperative. Divisional separation of cabling is maintained through the pedestal wall. Cables entering this zone are routed by separate raceway systems for Divisions 1, 2, 3 and 4.

The only combustible in this fire zone consists of 2,500 lbs of cable insulation with a Btu content of 25,000,000 Btu. This material, contained in the 301 ft^2 floor area, yields a fire loading of 83,300 Btu/ft^2 for this fire area.

4.1.1.4.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging redundant equipment required for safe shutdown is achieved. This is accomplished by separation of redundant equipment and an early warning fire detection system.

4.1.2 Unit 2 Reactor Building

4.1.2.1 Fire Zone 2RB-1a

4.1.2.1.1 Description

Fire Zone 2RB-1a is shown on drawings E-023-004, E-023-009, E-023-013, E-023-017, E-023-021, E-023-022, E-023-025, E-023-027, E-023-028 and E-023-030. This zone, referred to as the annulus, is located between the shield building wall and the containment vessel wall. It serves as a secondary barrier for maintaining the radiation doses within the limits specified by 10CFR100.

The outside wall and ceiling (dome) of this fire zone are constructed of reinforced concrete. The inside wall and ceiling (dome) are the steel containment vessel. The outer wall has a 3 hour fire resistance rating. The floor is constructed of reinforced concrete. Wall and ceiling penetrations are sealed. Access to this zone is through Class A fire doors from the auxiliary building and intermediate building.

The ventilation system for this fire zone operates to maintain a negative pressure in the annulus relative to the outside to minimize exfiltration and ground level release of airborne activity. This system consists of two 100 percent capacity charcoal filter trains with exhaust fans located in the intermediate building. Smoke detectors are located in the discharge ducts of each fan to actuate an alarm in the control room if smoke is detected. Duct penetrations through the shield building wall are provided with 3 hour rated fire dampers with 160°F fusible links.

Safe shutdown equipment in this fire zone consists of:

a. RPS cables, Divisions 1, 2, 3 and 4

b. Neutron monitoring cable, Divisions 1, 2, 3 and 4

c. Power and control cables, Divisions 1 and 2

4.1.2.1.2 Analysis

Electrical penetration assemblies for all divisions are located in the northwest portion (Quadrant 2) of the annulus. Penetrations are arranged in vertical and horizontal rows such that Division 1 and 4 penetrations are separated from Division 2 and 3 penetrations by a minimum of 12 feet.

Combustibles contained within this fire zone consist of 2,040 lbs of cable with a Btu content of 20,400,000 Btu. This total, contained in the 1,963 ft^2 floor area, yields a total fire loading of 10,400 Btu/ft^2 for this fire zone.

Since electrical penetration assemblies are located in a 35 foot segment of Quadrant 2, special consideration was given to the concentrated fire loading of 104,000 Btu/ft^2 in this region. The penetration cables are installed in tubular raceway assemblies. Each tubular raceway assembly will be encased with a calcium silicate coating to provide a 3 hour fire resistance rating between redundant cables.

4.1.2.1.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging redundant divisions of safe shutdown cable is achieved. This is accomplished by spatial separation and cable encasement.

4.1.2.2 Fire Zone 2RB-1b

4.1.2.2.1 Description

Fire Zone 2RB-1b is shown on drawings E-023-004, E-023-009, E-023-013, E-023-017, E-023-021, E-023-022, E-023-025, E-023-027, E-023-029 and E-023-030. It comprises the region from the steel containment vessel to the concrete drywell wall.

The outside wall and ceiling (dome) of this fire zone are constructed of steel. The inside wall and floor are constructed of reinforced concrete. Wall doors consist of double-doored personnel access hatches and equipment hatches. Wall and ceiling penetrations are sealed, except for the suppression pool vents on the inside wall which are under water.

The cooling system for this zone operates primarily to provide cooling only for the containment vessel. This system uses six 25 percent capacity air handling units, located in the containment vessel, which supply cooled, recirculated air to various areas of the containment vessel through distribution ductwork. Temperature detectors mounted in the ducts, and area temperature detectors are provided to actuate alarms in the control room if the ambient temperature is too high.

The purge supply system provides filtered and heated outside air to the containment vessel. This system consists of two 50 percent capacity supply plenums and two 50 percent capacity supply fans. Smoke detectors are provided in the discharge duct of the supply fans to actuate an alarm in the control room and trip the fans if smoke is detected.

The purge exhaust system draws air from the containment vessel, drywell area (refueling operations only), and RWCU equipment rooms, exhausting it through the plant vent after it passes through the charcoal filters. Two 50 percent capacity charcoal filter trains with exhaust fans are provided for this system. A smoke detector is provided at the common discharge duct for the fan and will actuate an alarm in the control room if smoke is detected.

The above equipment, except drywell purge supply fans, is located in the intermediate building. The drywell purge supply fans are located in the containment vessel.

Safe shutdown equipment for this fire zone consists of:

a. Standby liquid control (SLC) tank and pumps

b. Hydraulic control units (HCU)

c. Instrument transmitter racks

d. RPS cables, Divisions 1, 2, 3 and 4

e. Nuetron monitoring cable, Divisions 1, 2, 3 and 4

f. Power and control cables, Divisions 1 and 2

g. Residual heat removal (RHR) valves

Fire detection equipment in this zone consists of smoke detectors at elevation 620'-6" for the HCUs, and also at locations where Division 1 and 2 cable trays are in the vicinity of each other. Fire suppression equipment consists of manual water type hose stations.

4.1.2.2.2 Analysis

The SLC system is redundant to the control rods as a means of inserting negative reactivity into the reactor core. The control rod drive mechanisms are located in Fire Zone 2RB-1d (see Section 4.1.2.4). RPS sensors are located in this zone.

The two groups of the HCUs are physically separated at 90° and 270° azimuths. Redundant, safe shutdown related electrical penetration assemblies are spatially separated by more than 12 feet.

Two special situations regarding the separation of redundant cable trays are as follows:

a. One Division 1 cable tray at elevation 637-6" is located directly over top of, and parallel to, a Division 2 tray at elevation 634'-10" for a distance of approximately 50 feet in the northern region of this fire zone. A non-divisional tray at elevation 636'-2" is located in between, and parallel to these two divisional trays. Fire barriers are located directly above the non-divisional tray and directly below the non-divisional tray. Consequently, the Division 1 tray is separated from the Division 2 tray by two individual fire barriers. The barriers are in accordance with IEEE-384.

b. Three Division 2 cable trays at elevation 683'-1", 681'-9" and 680'-5" are located directly over top of, and parallel to, three Division 1 trays at elevations 676'-11", 675'-7" and 674'-3" for a distance of approximately 115 ft along southern, southeastern, and eastern regions of this fire zone. Two non-divisional trays at elevations 679'-4" and 678'-3" are located in between, and parallel to these Division 1 and Division 2 trays. Fire barriers are located directly above the top non-divisional tray, and directly below the bottom non-divisional tray, thus the Division 1 trays are separated from the Division 2 trays by two individual fire barriers.

The RPS sensors in this zone are located in a series of instrument panels. Each primary parameter is measured by a set of four independent RPS sensors. Sensors in a set are assigned different divisions and are located in different panels that are spatially separated from each other.

Combustibles contained within this fire zone consist of:

a. Control panels with a Btu content of 17,000,000 Btu

b. Cable insulation (46,500 lbs) with a Btu content of 465,000,000 Btu

c. HCUs with a Btu content of 25,000,000 Btu

d. Motor winding insulation (180 lbs) with a Btu content of 1,800,000 Btu

e. Polar crane lubricating oil (50 gallons) with a Btu content of 7,600,000 Btu

f. Fan insulation (45 lbs) with a Btu content of 450,000 Btu

g. Hydraulic fluid (180 gallons) with a Btu content of 27,360,000 Btu

The total Btu content of 544,260,000 Btu is contained in the 6,382 ft^2 floor area. Total fire loading for this zone is 85,300 Btu/ft^2.

4.1.2.2.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging redundant cables or equipment required for safe shutdown is achieved. This is accomplished by providing an early warning fire detection system at locations where fire could jeopardize redundant equipment. Also, redundant cable trays are separated by fire barriers where they do not have proper spatial separation.

4.1.2.3 Fire Zone 2RB-1c

4.1.2.3.1 Description

Fire Zone 2RB-1c is shown on drawings E-023-004, E-023-009, E-023-013, E-023-017, E-023-021, E-023-029 and E-023-030. It c[illegible]ses the region inside the drywell including the reactor vessel but excluding the area directly beneath the reactor. This zone serves as the structure that channels steam releases to the suppression pool, as well as housing the reactor vessel, reactor recirculation system and other auxiliary systems.

Walls, floor and ceiling of this fire zone are constructed of reinforced concrete. Wall doors consist of double-doored personnel access hatches and an equipment hatch. Wall penetrations are sealed, except for the suppression pool vents which are under water.

The drywell cooling system operates primarily to provide cooling only for the drywell area. This system uses three 100 percent capacity fan cooler assemblies, each with a supply plenum and two supply fans located in the drywell. The fan cooler units supply recirculated, cooled air to the drywell area through distribution ductwork. Temperature detectors mounted in the ducts, and area temperature detectors are provided to initiate alarms in the control room if the ambient temperature is too high.

[illegible]ing the drywell purge mode (refueling operations only), the two [illegible] percent capacity drywell purge supply fans direct supply air from the containment vessel into the drywell area. This supply air is then circulated by the drywell cooling system.

The purge exhaust system for this fire zone is the same as for Fire Zone 2RB-1b (see Section 4.2.2.2).

Safe shutdown equipment for this fire zone consists of:

a. Automatic depressurization system (ADS) valves

b. ADS valve air accumulators

c. Residual heat removal (RHR) valves

d. Reactor core isolation cooling valve

e. Main steam line isolation valves

f. Power and control cables, Divisions 1 and 2

g. RPS cables, Divisions 1, 2, 3 and 4

h. Neutron monitoring equipment

Cross-zoned fire detection for early warning and suppression system activation, is provided at the reactor recirculation pumps. Fire suppression equipment for this zone consists of a local application type carbon dioxide system for the reactor recirculation pumps.

4.1.2.3.2 Analysis

The ADS valves provide a redundant means for transferring the reactor vessel water to the ultimate heat sink if the RHR shutdown suction valves become inoperative. The physical separation between the ADS valves and the RHR shutdown suction valves is at least 20 feet vertically and 10 feet horizontally.

Combustibles within this fire zone consist of:

a. Motor winding insulation (2,200 lbs) with a Btu content of 22,000,000 Btu

b. Motor lubricating oil/hydraulic fluid (150 gallons) with a Btu content of 22,800,000

c. Cable insulation (5,000 lbs) with a Btu content of 50,000,000 Btu

The total Btu content of 94,800,000 Btu is contained in the 2,603 ft^2 floor area. Total fire loading for this fire zone is 36,420 Btu/ft^2.

Since combustibles are concentrated in this area of the recirculation pump, special consideration was given to the potential for a fire in this region. It was determined that a fire would not spread in such a manner as to affect redundant safe shutdown equipment. However, fire detection and suppression systems are provided to minimize any damage in this fire zone.

4.1.2.3.3 Conclusions

The results of the analysis for this fire zone indicates that the objective of preventing a fire from damaging redundant equipment required for safe shutdown is achieved. This is accomplished by physical separation of redundant equipment, and fire detection and suppression systems provided for the reactor recirculation pumps.

4.1.2.4 Fire Zone 2RB-1d

4.1.2.4.1 Description

Fire Zone 2RB-1d is shown on drawings E-023-004, E-023-009, E-023-029 and E-023-030. It is the region directly below the reactor vessel and inside the vessel pedestal. This zone contains the control rod drives, neutron monitoring equipment and other under-vessel servicing equipment.

Walls and floor of this fire zone are constructed of reinforced concrete. Ventilation air is circulated through this zone by vents in the pedestal wall.

Safe shutdown equipment for this fire zone consists of:

a. Neutron monitoring equipment

b. Control rod drive mechanism

c. Control cables, Divisions 1 and 2

d. RPS cables, Divisions 1, 2, 3 and 4

Fire detection equipment is located beneath the reactor vessel to provide a fire signal to annunciate in the control room.

4.1.2.4.2 Analysis

The SLC system, located in Fire Zone 2RB-1b (see Section 4.1.2.2), provides a redundant means for taking the reactor to cold shutdown should the control rod drive mechanism become inoperative. Divisional separation of cabling is maintained through the pedestal wall. Cables entering this zone are routed by separate raceway systems for Divisions 1, 2, 3 and 4.

The only combustible in this fire zone consists of 2,500 lbs of cable insulation with a Btu content of 25,000,000 Btu. This material, contained in the 301 ft^2 floor area, yields a fire loading of 83,300 Btu/ft^2 for this fire area.

4.1.2.4.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging redundant equipment required for safe shutdown is achieved. This is accomplished by separation of redundant equipment and an early warning fire detection system.

4.2 AUXILIARY BUILDING

The auxiliary building is a three story building constructed of reinforced concrete. Separate structures are located on the Unit 1 and 2 sides of the plant. Floor 1 is located at elevations 568'-4" and 574'-10", Floor 2 is at elevation 599'-0", and Floor 3 is at elevation 620'-6" (grade). This building houses auxiliary equipment for plant operation such as the residual heat removal (RHR) system, reactor core isolation cooling (RCIC) system, high and low pressure core spray (HPCS, and LPCS, respectively), reactor water cleanup (RWCU) system, instrument air systems, and ventilation systems. The third floor is divided by the portion of the steam tunnel that passes through the auxiliary building from the reactor building to the turbine power complex enroute to the turbine building. The auxiliary building is adjacent to the reactor building, intermediate building, the turbine power complex, and the radwaste building (Unit 1 side only); the remainder of the building is exposed.

The ventilation system for the auxiliary building consists of a 100 percent capacity supply plenum, two 100 percent capacity supply fans, a 100 percent capacity charcoal exhaust plenum, two 100 percent capacity exhaust fans, and distribution ductwork. Fans and plenums are at elevation 620'-6". The supply fans draw outside air through filters and heating coils and distribute the air as follows: to the corridors at elevations 574'-10", 599'-0" and 620'-6", and to each of the pump rooms (RHR "A", "B", "C"; RCIC, LPCS, HPCS; etc.). Air supplied to the corridor and pump rooms at elevation 574'-10" is exhausted through ductwork at that level. Part of the air is used to ventilate the room before being exhausted. Part of the air supplied to the equipment area at elevation 620'-6" is drawn into the RHR "A" and "B" pump rooms and then it is exhausted. Exhaust air passes through the charcoal exhaust plenum prior to discharge to the atmosphere through the unit vent. Air from the steam tunnel is partially exhausted by the auxiliary building exhaust. The rest of the air supplied to the steam tunnel (by a separate steam tunnel cooling system) is relieved to the turbine building.

All ventilation duct penetrations in the auxiliary building (except for pressure relief openings in the walls of RHR "A" and "B" pump rooms at elevation 620'-6" and the floor above the RCIC pump room) are provided with 3 hour rated fire dampers with standard 160°F fusible links.

Ionization type smoke detectors are provided in the common duct of the supply fans and on the common ductwork on the discharge of the exhaust fans. Upon detection of smoke, these detectors will actuate an alarm in the control room and illuminate the alarm light on the local HVAC control panel. In addition, if the smoke is in the supply ductwork, the smoke detector on the discharge side of the supply fans will send a signal to trip both supply fans, thereby cutting off the flow of supply air.

For purposes of this fire hazards analysis, the auxiliary building has been divided, by floors, into numerous fire areas and fire zones. These zones are shown on drawings E-023-002, E-023-005 and E-023-010 for Unit 1, and drawings E-023-004, E-023-009 and E-023-013 for Unit 2.

4.2.1 Unit 1 Auxiliary Building

4.2.1.1 Fire Area 1AB-1a

4.2.1.1.1 Description

Fire Area 1AB-1a, shown on drawing E-023-002, is located in the eastern section of Floor 1 of the auxiliary building (elevation 568'-4") and contains the process and auxiliary components for the LPCS system. It is bounded on the north and east by Fire Area 1AB-1g, on the south by the Unit 1 reactor building, and on the west by Fire Zone 1AB-1b.

Walls, floor, and ceiling for this fire area are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings. Wall and ceiling penetrations are sealed. Floor drains for this area are routed to a sump located within the area. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the area.

The ventilation system for this fire area is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the area when the LPCS pump is operating.

There is no safe shutdown equipment located in this fire area.

Fire suppression equipment for this area consists of manual water type hose stations and fire extinguishers.

4.2.1.1.2 Analysis

Functional redundancy for equipment in this fire area is not required since there is no safe shutdown equipment in this area.

Combustibles within this area consist of the following:

a. Motor winding insulation (510 lbs) with a Btu content of 5,100,000 Btu

b. Cable insulation (1,000 lbs) with a Btu content of 10,000,000 Btu

c. Lubricating oil (28 gallons) with a Btu content of 4,256,000 Btu

The total Btu content of 19,356,000 Btu is contained in the 1,588 ft^2 floor area. Total fire loading for this fire area is 12,200 Btu/ft^2.

4.2.1.1.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from spreading to adjacent areas or zones containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.1.2 Fire Zone 1AB-1b

4.2.1.2.1 Description

Fire Zone 1AB-1b is shown on drawings E-023-002, E-023-005 and E-023-010. It includes, in addition to the Floor 1 location, identical regions directly above on Floor 2 (elevation 599'-0") and Floor 3 (elevation 620'-6"). This composite zone contains the process and auxiliary components for the RHR "A" system on each respective floor. It is bounded on the north by Fire Area 1AB-1g (elevation 568'-4"), Fire Zone 1AB-2 (elevation 599'-0") and Fire Zone 1AB-3a (Elevation 620'-6"); on the east by Fire Area 1AB-1a, Fire Zone 1AB-2 (elevation 599'-0") and Fire Zone 1AB-3a (elevation 620'-6"); on the south by the Unit 1 reactor building; on the west by Fire Zone 1AB-1c, Fire Zone 1AB-2 (elevation 599'-0") and the steam tunnel (elevation 620'-6").

Walls, floor and ceiling (roof) for this fire zone are constructed of reinforced concrete. Doorways are equipped with a Class A fire door at elevation 568'-4", a Class A fire door at elevation 599'-0", and a Class A door at elevation 620'-6". Walls have 3 hour fire resistance ratings, except for the areas containing pressure relief openings from elevation 620'-6" to 652'-0" (roof). Wall penetrations are sealed, except for the pressure relief opening in the wall to Fire Zone 1AB-3a. Floor drains for this zone are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the zone.

The ventilation system for this fire zone is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the zone when the RHR "A" pump is operating.

Safe shutdown equipment in this fire zone consists of:

a. RHR heat exchangers

b. RHR pump, A

c. RHR pump room cooling air handling unit, A

d. Power and control cables, Division 1, Unit 1

e. Leak detection system instrument sensors

f. RHR valves

g. RCIC valves

Fire detection for this zone is accomplished by a leak detection system which monitors pump room cooling air inlet and outlet temperature and ambient room temperature. Fire suppression equipment consists of manual water type hose stations and fire extinguishers.

4.2.1.2.2 Analysis

Redundant RHR system equipment is located in Fire Zone 1AB-1e (see Section 4.2.1.5).

Combustibles within this zone consist of the following:

a. Motor winding insulation (360 lbs) with a Btu content of 3,600,000 Btu

b. Cable insulation (1,000 lbs) with a Btu content of 10,000,000 Btu

c. Lubricating oil (13 gallons) with a Btu content of 1,976,000 Btu

The total Btu content of 15,576,000 Btu is contained in the 1,298 ft^2 floor area. Total fire loading for this fire zone is 12,000 Btu/ft^2.

4.2.1.2.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to a zone containing redundant safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.1.3 Fire Zone 1AB-1c

4.2.1.3.1 Description

Fire Zone 1AB-1c, shown on drawing E-023-002, is located in the right center portion of Floor 1 of the auxiliary building. It contains process and auxiliary equipment for the RCIC system. This zone is bounded on the north by Fire Area 1AB-1g, on the east by Fire Zone 1AB-1b, on the south by the Unit 1 reactor building, and on the west by Fire Area 1AB-1d.

Walls, floor and ceiling for this fire zone are constructed of reinforced concrete. The doorway has a Class A fire door. Walls have 3 hour fire resistance ratings. Wall penetrations are sealed. A portion of the ceiling has grating for pressure relief. Floor drains for this zone are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the zone.

The ventilation system for this fire zone is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the zone when the RCIC pump is operating.

Safe shutdown equipment in this fire zone consists of:

a. RCIC pump room air handling unit

b. RCIC pump

c. RCIC turbine lubricating oil cooler

d. RCIC turbine drive

e. Power and control cables, Unit 1

f. Leak detection system instrument sensors

g. RCIC valves

Fire suppression equipment for this zone consists of an automatic sprinkler system, manual type water hose stations and fire extinguishers.

4.2.1.3.2 Analysis

Functional redundancy for the RCIC system is not provided by any other safe shutdown system. If the high pressure injection capabilities of the RCIC system become inoperative, the automatic depressurization system (ADS) can be used to decrease the reactor vessel pressure so the low pressure injection systems can be activated for reactor vessel water level control. Spatial separation of Division 1 and 2 instrument sensors and electrical circuits are in accordance with separation design criteria.

Special attention was given to the case of lubricating oil spillage. Should the lubricating oil system rupture, the oil will drain to a sump located within the room and not allow it to spread to adjacent zones. The sump is discharged through a line that is valve operated from outside the zone.

The motor operators on the RCIC valves will not be affected by an inadvertent actuation of the sprinkler system. These motor operators are enclosed to prevent water spray from rendering them inoperative. The motor associated with the water leg pump could be rendered inoperative, but this would have no impact on main process equipment operation.

Combustibles within this fire zone consist of the following:

a. Lubricating oil (8 gallons) with a Btu content of 1,216,000 Btu

b. Cable insulation (400 lbs) with a Btu content of 4,000,000 Btu

The total Btu content of 5,216,000 Btu is contained in the 560 ft^2 floor area. Total fire loading for this fire zone is 9,314 Btu/ft^2

4.2.1.3.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to adjacent zones or areas containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading. The automatic sprinkler system provided for this zone adds further depth in preventing a fire from spreading.

4.2.1.4 Fire Area 1AB-1d

4.2.1.4.1 Description

Fire Area 1AB-1d, shown on drawing E-023-002, is located in the left center portion of Floor 1 of the auxiliary building. It contains process and auxiliary equipment for the RHR "C" system. This area is bounded on the north by Fire Area 1AB-1g, on the east by Fire Zone 1AB-1c, on the south by the Unit 1 reactor building, and on the west by Fire Zone 1AB-1e.

Walls, floor and ceiling for this fire area are constructed of reinforced concrete. The doorway has a Class A fire door. Walls and ceiling have 3 hour fire resistance ratings. Wall and ceiling penetrations are sealed. Floor drains for this area are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the area.

The ventilation system for this fire area is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the area when the RHR "C" pump is operating.

There is no safe shutdown equipment located in this fire area.

Fire suppression equipment for this area consists of manual water type hose stations and fire extinguishers.

4.2.1.4.2 Analysis

Functional redundancy for the RHR "C" system is not required since the "C" loop is not required for safe shutdown of the reactor.

Combustibles within this area consist of:

a. Motor winding insulation (350 lbs) with a Btu content of 3,500,000 Btu

b. Cable insulation (800 lbs) with a Btu content of 8,000,000 Btu

c. Lubricating oil (13 gallons) with a Btu content of 1,976,000 Btu

The total Btu content of 13,476,000 Btu is contained in the 560 ft^2 floor area. Total fire loading for this fire area is 24,000 Btu/ft^2

4.2.1.4.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from spreading to adjacent zones or areas containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.1.5 Fire Zone 1AB-1e

4.2.1.5.1 Description

Fire Zone 1AB-1e is shown on drawings E-023-002, E-023-005 and E-023-010. It includes, in addition to the Floor 1 location, identical regions directly above on Floor 2 (elevation 599'-0") and Floor 3 (elevation 620'-6"). This composite zone contains the process and auxiliary components for the RHR "B" system on each respective floor. It is bounded on the north by Fire Area 1AB-1g (elevation 568'-4"), Fire Zone 1AB-2 (elevation 599'-0") and Fire Zone 1AB-3b (elevation 620'-6"); on the east by Fire Area 1AB-1d, Fire Zone 1AB-2 (elevation 599'-0") and the steam tunnel (elevation 620'-6"); on the south by the Unit 1 reactor building; on the west by Fire Area 1AB-1f, Fire Zone 1AB-2 (elevation 599'-0") and Fire Zone 1AB-3b (elevation 620'-6").

Walls, floor and ceiling (roof) for this fire zone are constructed of reinforced concrete. Doorways are equipped with a Class A fire door at elevation 568'-4", a Class A fire door at elevation 599'-0", and a Class A door at elevation 620'-6". Walls have 3 hour fire resistance ratings, except for the areas containing pressure relief openings from elevation 620'-6" to 652'-0" (roof). Wall penetrations are sealed, except for the pressure relief opening in the wall to Fire Zone 1AB-3b. Floor drains for this zone are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the zone.

The ventilation system for this fire zone is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the zone when the RHR "B" pump is operating.

Safe shutdown equipment in this fire zone consists of:

a. RHR heat exchangers

b. RHR pump

c. RHR pump room cooling air handling unit

d. RHR pump room cooling air handling unit

e. Power and control cables, Division 2, Unit 1

f. Leak detection system instrument sensors

g. RHR valves

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.2.1.5.2 Analysis

Redundant RHR system equipment is located in Fire Zone 1AB-1b (see Section 4.2.1.2).

Combustibles within this zone consist of the following:

a. Motor winding insulation (360 lbs) with a Btu content of 3,600,000 Btu

b. Cable insulation (3,570 lbs) with a Btu content of 35,700,000 Btu

c. Lubricating oil (13 gallons) with a Btu content of 1,976,000 Btu

The total Btu content of 41,276,000 Btu is contained in the 1,298 ft^2 floor area. Total fire loading for this fire zone is 31,800 Btu/ft^2.

4.2.1.5.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to a zone or area containing redundant safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.1.6 Fire Area 1AB-1f

4.2.1.6.1 Description

Fire Area 1AB-1f is shown on drawings E-023-002, E-023-005 and E-023-010. It is located in the western portion of Floor 1 of the auxiliary building. It has a vertical pipe chase extending to elevation 620'-6". This area contains the process and auxiliary components for the HPCS system. It is bounded on the north and west by Fire Area 1AB-1g, on the south by the Unit 1 reactor building, and on the east by Fire Zone 1AB-1e.

Walls, floor and ceiling for this fire area are constructed of reinforced concrete. Doorways are equipped with a Class A fire door at elevation 574'-10" and a Class A fire door at elevation 620'-6". Walls and ceiling have 3 hour fire resistance ratings. Wall and ceiling penetrations are sealed. Floor drains for this area are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the area.

The ventilation system for this fire area is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the area when the HPCS pump is operating.

There is no safe shutdown equipment located in this fire area.

Fire suppression equipment for this area consists of manual water type hose stations and fire extinguishers.

4.2.1.6.2 Analysis

Functional redundancy for equipment in this fire area is not required since this equipment is not required for safe shutdown.

Combustibles in this fire area consists of:

a. Motor winding insulation (693 lbs) with a Btu content of 6,930,000 Btu

b. Cable insulation (1,500 lbs) with a Btu content of 15,000,000 Btu

c. Lubricating oil (41 gallons) with a Btu content of 6,232,000 Btu

The total Btu content of 28,162,000 Btu is contained in the 1,588 ft^2 floor area. Total fire loading for this fire area is 17,735 Btu/ft^2.

4.2.1.6.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from spreading to adjacent zones or areas containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.1.7 Fire Area 1AB-1g

4.2.1.7.1 Description

Fire Area 1AB-1g, shown on drawing E-023-002, is the common corridor for Floor 1 of the auxiliary building. It provides access to Fire Areas and Zones 1AB-1a through 1AB-1f, and to the intermediate building. It also contains instrument and control panels required for safe shutdown. This area connects on the north to the turbine power complex, on the south to the intermediate building, and on the west to the radwaste building; the east side is an outside wall.

Walls, floor and ceiling for this fire area are constructed of reinforced concrete. The doorway to the intermediate building and the doorways to the other Floor 1 zones and fire areas are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings. Wall and ceiling penetrations are sealed.

The ventilation system for this fire area is described in Section 4.2.

Safe shutdown equipment in this fire area consists of:

a. RCIC instrument panel

b. RHR "A" instrument panel

c. RHR "B" instrument panel

d. Suppression pool level instrumentation

e. Power and control cables, Divisions 1 and 2, Unit 1

Fire detection equipment for this area consists of ionization detectors that actuate alarms in the control room. Fire suppression equipment consists of manual water type hose stations and fire extinguishers.

4.2.1.7.2 Analysis

Safe shutdown related panels of redundant divisions are spatially separated by a distance in excess of 65 feet. Adequate control cable separation is also maintained.

Combustibles within this area consist of the following:

a. Instrument panels with a Btu content of 16,000,000 Btu

b. Cable insulation (4,000 lbs) with a Btu content of 40,000,000 Btu

The total Btu content of 56,000,000 Btu is contained in the 4,856 ft^2 floor area. Total fire loading for this fire area is 11,540 Btu/ft^2.

4.2.1.7.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from damaging both divisions of redundant safe shutdown equipment is achieved. This is accomplished by spatial separation of redundant equipment within the area, low fire loading, an early warning fire detection system, and good separation from other zones and areas containing safe shutdown equipment.

4.2.1.8 Fire Zone 1AB-2

4.2.1.8.1 Description

Fire Zone 1AB-2, shown on drawing E-023-005, comprises the entire Floor 2 (elevation 599'-0") of the auxiliary building, with the exception of portions of Fire Zones and Areas 1AB-1b, 1AB-1e, and 1AB-1f which originate on Floor 1. This zone contains instrument and control panels, and process equipment for the RWCU system and turbine building cooling system. It is connected on the north to the turbine power complex, on the south to the Unit 1 reactor building and intermediate building, and on the west to the radwaste building; the east side is an outside wall.

Walls, floor and ceiling for this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings. Wall, floor and ceiling penetrations are sealed, except for the small floor area above the RCIC room on Floor 1 (Fire Zone 1AB-1c) which is provided with grating for pressure relief.

The ventilation system for this fire zone is described in Section 4.2.

Safe shutdown equipment in this fire zone consists of:

a. Control panel for HVAC pump room cooling units

b. Power and control cables, Division 1

Fire detection equipment for this zone consist of ionization detectors in the area of the HVAC pump room cooling unit control panel. Fire suppression equipment consists of manual water type hose stations and fire extinguishers.

4.2.1.8.2 Analysis

Functional redundancy for cables associated with Division 1 safe shutdown equipment in this zone is provided by Division 2 cables located in Fire Zone 1AB-3b (see Section 4.2.1.10). Since the HVAC pump room cooling unit control panel contains equipment associated with all three divisions, separation is accomplished by providing fire barriers within the panel.

Combustibles within this zone consist of the following:

a. Motor winding insulation (810 lbs) with a Btu content of 8,100,000 Btu

b. Lubricating oil/hydraulic fluid (30 gallons) with a Btu content of 4,560,000 Btu

c. Instrument panels with a Btu content of 4,800,000 Btu

d. Cable insulation (38,230 lbs) with a Btu content of 382,300,000 Btu

The total Btu content of 399,760,000 Btu is contained in a 9,685 ft^2 floor area. Total fire loading for this fire zone is 41,500 Btu/ft^2.

4.2.1.8.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging both divisions of redundant safe shutdown equipment or from spreading to an adjacent zone containing redundant safe shutdown equipment is achieved. This is accomplished by locating redundant cable trays in Fire Zone 1AB-3b. The HVAC pump room cooling unit panel is provided with internal barriers for divisional separation and has an ionization detector in the area for early warning fire detection.

4.2.1.9 Fire Zone 1AB-3a

4.2.1.9.1 Description

Fire Zone 1AB-3a, shown on drawing E-023-010, comprises the eastern half of Floor 3 (elevation 620'-6") of the auxiliary building, with the exception of the upper portion of Fire Zone 1AB-1b and the steam tunnel. This zone contains instrument air compressors and air receiving tanks, auxiliary building and steam tunnel ventilation equipment, and provides access to the portion of Fire Zone 1AB-1b on this floor. It is bounded on the south by the Unit 1 reactor building, and on the west by the steam tunnel and Fire Zone 1AB-1b; the north and east walls are exposed to grade.

Walls, floor and ceiling (roof) of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and floor have 3 hour fire resistance ratings. Wall and floor penetrations are sealed, except for pressure relief openings in the wall to Fire Zone 1AB-1b.

The ventilation system for this zone is described in Section 4.2.

Safe shutdown equipment for this zone consists of the instrument air receiver tank, valves, and cabling.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.2.1.9.2 Analysis

Functional redundancy to the safe shutdown equipment in this zone is provided by air receiver tanks, valves and cabling located in the intermediate building.

Combustibles within this zone consist of the following:

a. Motor winding insulation (90 lbs) with a Btu content of 900,000 Btu

b. Instrument panels with a Btu content of 800,000 Btu

c. Cable insulation (1,000 lbs) with a Btu content of 10,000,000 Btu

The total Btu content of 11,700,000 Btu is contained in a 3,334 ft^2 floor area. Total fire loading for this fire zone is 3,510 Btu/ft^2.

4.2.1.9.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to adjacent zones containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.1.10 Fire Zone 1AB-3b

4.2.1.10.1 Description

Fire Zone 1AB-3b, shown on drawing E-023-010, comprises the western half of Floor 3 (elevation 620'-6") of the auxiliary building, with the exception of the upper portions of Fire Zone 1AB-1e and Fire Area 1AB-1f, and the steam tunnel. This zone contains auxiliary vent exhaust system equipment and provides access to the portion of Fire Zone 1AB-1e on this floor. It is bounded on the south by the intermediate building and Fire Area 1AB-1f, on the east by the steam tunnel and Fire Zone 1AB-1e, on the north by the turbine power complex, and on the west by the radwaste building.

Walls, floor and ceiling (roof) of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and floor have 3 hour fire resistance ratings. Wall and floor penetrations are sealed, except for the pressure relief openings in the wall to Fire Zone 1AB-1e.

The ventilation system for this zone is described in Section 4.2.

Safe shutdown equipment for this zone consists of power and control cables.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers, also a manually operated deluge system for the charcoal filters.

4.2.1.10.2 Analysis

The cables associated with RHR "B" equipment are located in this zone. Cables associated with the redundant RHR "A" equipment are located in Fire Zone 1AB-2.

Combustibles within this zone consist of the following:

a. Motor winding insulation (90 lbs) with a Btu content of 900,000 Btu

b. Instrument panels with a Btu content of 2,600,000 Btu

c. Cable insulation (26,900 lbs) with a Btu content of 269,000,000 Btu

d. Charcoal (5,400 lbs) with a Btu content of 43,200,000 Btu

The total Btu content of 316,000,000 Btu is contained in the 4,555 ft^2 floor area. Total fire loading for this fire zone is 69,400 Btu/ft^2.

Special consideration was given to charcoal as a fire hazard. The current design includes heat sensors that initiate signals in the control room so that a water deluge system can be manually actuated, if required.

4.2.1.10.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to adjacent zones containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading for the zone.

4.2.2 Unit 2 Auxiliary Building

4.2.2.1 Fire Area 2AB-1a

4.2.2.1.1 Description

Fire Area 2AB-1a, shown on drawing E-023-004, is located in the western section of Floor 1 of the auxiliary building (elevation

568'-4") and contains the process and auxiliary components for the LPCS system. It is bounded on the south and west by Fire Area 2AB-1g, on the north by the Unit 2 reactor building, and on the east by Fire Zone 2AB-1b.

Walls, floor and ceiling for this fire area are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings. Walls and ceiling penetrations are sealed. Floor drains for this area are routed to a sump located within the area. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the area.

The ventilation system for this fire area is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the area when the LPCS pump is operating.

There is no safe shutdown equipment located in this fire area.

Fire suppression equipment for this area consists of manual water type hose stations and fire extinguishers.

4.2.2.1.2 Analysis

Functional redundancy for equipment in this fire area is not required since there is no safe shutdown equipment in this area.

Combustibles within this area consist of the following:

a. Motor winding insulation (510 lbs) with a Btu content of 5,100,000 Btu

b. Cable insulation (1,000 lbs) with a Btu content of 10,000,000 Btu

c. Lubricating oil (28 gallons) with a Btu content of 4,256,000 Btu

The total Btu content of 19,356,000 Btu is contained in the 1,588 ft^2 floor area. Total fire loading for this fire area is 12,200 Btu/ft^2.

4.2.2.1.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from spreading to adjacent areas or zones containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.2.2 Fire Zone 2AB-1b

4.2.2.2.1 Description

Fire Zone 2AB-1b is shown on drawings E-023-004, E-023-009, and E-023-013. It includes, in addition to the Floor 1 location, the identical regions directly above on Floor 2 (elevation 599'-0") and Floor 3 (elevation 620'-6"). This composite zone contains the process and auxiliary components for the RHR "A" system on each respective floor. It is bounded on the south by Fire Area 2AB-1g, (elevation 568'-4"), Fire Zone 2AB-2 (elevation 599'-0") and Fire Area 2AB-3a (elevation 620'-6"); on the west by Fire Zone 2AB-1a, Fire Area 2AB-2 (elevation 599'-0") and Fire Zone 2AB-3b (elevation 620'-6"), on the north by the Unit 2 reactor building; on the east by Fire Zone 2AB-1c, Fire Zone 2AB-2 (elevation 599'-0") and the steam tunnel (elevation 620'-6").

Walls, floor and ceiling (roof) for this fire zone are constructed of reinforced concrete. Doorways are equipped with a Class A fire door at elevation 568'-4", a Class A fire door at elevation 599'-0", and a Class A door at elevation 620'-6". Walls have a 3 hour resistance ratings except for the areas containing pressure relief openings from elevation 620'-6" to 652'-0" (roof). Wall penetrations are sealed, except for the pressure relief opening in the wall to Fire Zone 2AB-3b. Floor drains for this zone are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the zone.

The ventilation system for this fire zone is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the zone when the RHR "A" pump is operating.

Safe shutdown equipment in this fire zone consists of:

a. RHR heat exchangers

b. RHR pump

c. RHR pump cooler

d. Power and control cables, Division 1, Unit 2

e. Leak detection system instrument sensors

f. RHR valves

Fire detection for this zone is accomplished by a leak detection system which monitors pump cooling air inlet and outlet temperature and ambient room temperature. Fire suppression equipment consists of manual water type hose stations and fire extinguishers.

4.2.2.2.2 Analysis

Redundant RHR system equipment is located in Fire Zone 2AB-1e (see Section 4.2.2.5).

Combustibles within this zone consist of the following:

a. Motor winding insulation (360 lbs) with a Btu content of 3,600,000 Btu

b. Cable insulation (1,000 lbs) with a Btu content of 10,000,000 Btu

c. Lubricating oil (13 gallons) with a Btu content of 1,976,000 Btu

The total Btu content of 15,576,000 Btu is contained in the 1,298 ft^2 floor area. Total fire loading for this fire zone is 12,000 Btu/ft^2.

4.2.2.2.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to a zone containing redundant safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.2.3 Fire Zone 2AB-1c

4.2.2.3.1 Description

Fire Zone 2AB-1c, shown on drawing E-023-004, is located in the left center portion of Floor 1 of the auxiliary building. It contains process and auxiliary equipment for the RCIC system. This zone is housed on the south by Fire Area 2AB-1g, on the west by Fire Zone 2AB-1b, on the north by the Unit 2 reactor building, and on the east by Fire Area 2AB-1d.

Walls, floor and ceiling for this fire zone are constructed of reinforced concrete. The doorway has a Class A fire door. Walls have 3 hour fire resistance ratings. Wall penetrations are sealed. A ceiling opening has gratings for pressure relief. Floor drains for this zone are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the zone.

The ventilation system for this fire zone is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the zone when the RCIC pump is operating.

Safe shutdown equipment in this fire zone consists of:

a. RCIC pump air handling unit

b. RCIC pump

c. RCIC turbine lubricating oil cooler

d. RCIC turbine drive

e. Power and control cables, Unit 2

f. Leak detection system instrument sensors

g. RCIC valves

Fire suppression equipment for this zone consists of an automatic sprinkler system, manual water type hose stations and fire extinguishers.

4.2.2.3.2 Analysis

Functional redundancy for the RCIC system is not provided by any other safe shutdown system. If the high pressure injection capabilities of the RCIC system become inoperative, the automatic depressurization system (ADS) can be used to decrease the reactor vessel pressure so the low pressure injection systems can be activated for reactor vessel water level control. Spatial separation of Division 1 and 2 instrument sensors and electrical conduits are in accordance with separation design criteria.

Special attention was given to the case of lubricating oil spillage. Should the lubricating oil system rupture, the oil will drain to a sump located within the room and not allow it to spread to adjacent zones. The sump is discharged through a line that is valve operated from outside the zone.

The motor operators on the RCIC valves will not be effected by an inadvertent actuation of the sprinkler system. These motor operators are enclosed to prevent water spray from rendering them inoperative. The motor associated with the water leg pump could be rendered inoperative, but this would have no impact on main process equipment operation.

Combustibles within this fire zone consist of the following:

a. Lubricating oil (8 gallons) with a Btu content of 1,216,000 Btu

b. Cable insulation (400 lbs) with a Btu content of 4,000,000 Btu

The total Btu content of 5,216,000 Btu is contained in the 560 ft^2 floor area. Total fire loading for this fire zone is 9,314 Btu/ft^2.

4.2.2.3.3 Conclusions

The results of the analysis for this fire zo... dicate that the objective of preventing a fire from spreading to adjacent zones or areas containing safe shutdown equipment is achieved. This is accomplished by barrier design and the low fire loading. The automatic sprinkler system provided for this zone adds further depth in preventing a fire from spreading.

4.2.2.4 Fire Area 2AB-1d

4.2.2.4.1 Description

Fire Area 2AB-1d, shown on drawing E-023-004, is located in the right center portion of Floor 1 of the auxiliary building. It contains process and auxiliary equipment for RHR "C" system. This area is bounded on the south by Fire Area 2AB-1g, on the west by Fire Zone 2AB-1c, on the north by the Unit 2 reactor building, and on the east by Fire Zone 2AB-1e.

Walls, floor and ceiling for this fire area are constructed of reinforced concrete. The doorway has a Class A fire door. Walls and ceiling have 3 hour fire resistance ratings. Wall and ceiling penetrations are sealed. Floor drains for this area are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the area.

The ventilation system for this fire area is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the area when the RHR "C" pump is operating.

There is no safe shutdown equipment located in this fire area.

Fire suppression equipment for this area consists of manual water type hose stations and fire extinguishers.

4.2.2.4.2 Analysis

Functional redundancy for the RHR "C" system is not required since the "C" loop is not required for safe shutdown of the reactor.

Combustibles within this area consist of:

a. Motor insulation (350 lbs) with a Btu content of 3,500,000 Btu

b. Cable insulation (800 lbs) with a Btu content of 8,000,000 Btu

c. Lubricating oil (13 gallons) with a Btu content of 1,976,000 Btu

The total Btu content of 13,476,000 Btu is contained in the 560 ft^2 floor area. Total fire loading for this fire area is 24,000 Btu/ft^2.

4.2.2.4.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from spreading to adjacent zones or areas containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.2.5 Fire Zone 2AB-1e

4.2.2.5.1 Description

Fire Zone 2AB-1e is shown on drawings E-023-004, E-023-009, and E-023-013. It includes, in addition to the Floor 1 location, identical regions directly above on Floor 2 (elevation 599'-0") and Floor 3 (elevation 620'-6"). This composite zone contains the process and auxiliary components for the RHR "B" system on each respective floor. It is bounded on the south by Fire Area 2AB-1g (elevation 568'-4"), Fire Zone 2AB-2 (elevation 599'-9") and Fire Zone 2AB-3b (elevation 620'-6"); on the west by Fire Area 2AB-1d, Fire Zone 2AB-2 (elevation 599'-0") and the steam tunnel (elevation 620'-6"); on the north by the Unit 2 reactor building; on the east by Fire Area 2AB-1f, Fire Zone 2AB-2 (elevation 599'-0") and Fire Zone 2AB-3a (elevation 620'-6").

Walls, floor and ceiling (roof) for this fire zone are constructed of reinforced concrete. Doorways are equipped with a Class A fire door at elevation 568'-4", a Class A fire door at elevation 599'-0", and a Class A door at elevation 620'-6". Walls have 3 hour fire resistance ratings, except for the areas containing pressure relief openings from elevation 620'-6" to 652'-0" (roof). Wall penetrations are sealed, except for the pressure relief opening in the wall to Fire Zone 2AB-3a. Floor drains for this zone are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the zone.

The ventilation system for this fire zone is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the zone when the RHR "B" pump is operating.

Safe shutdown equipment in this fire zone consists of:

a. RHR heat exchangers

b. RHR pump

c. RHR pump cooler

d. RHR air handling unit

e. Power and control cables, Division 2, Unit 2

f. Leak detection system instrument sensors

g. RHR valves

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.2.2.5.2 Analysis

Redundant RHR system equipment is located in Fire Zone 2AB-1b (see Section 4.2.2.2).

Combustibles within this zone consist of the following:

a. Motor winding insulation (360 lbs) with a Btu content of 3,600,000 Btu

b. Cable insulation (3,570 lbs) with a Btu content of 35,700,000 Btu

c. Lubricating oil (13 gallons) with a Btu content of 1,976,000 Btu

The total Btu content of 41,276,000 Btu is contained in the 1,298 ft^2 floor area. Total fire loading for this fire zone is 31,800 Btu/ft^2.

4.2.2.5.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to a zone containing redundant safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.2.6 Fire Area 2AB-1f

4.2.2.6.1 Description

Fire Area 2AB-1f is shown on drawings E-023-004, E-023-009, and E-023-013. It is located in the eastern portion of Floor 1 of the auxiliary building. It has a vertical pipe chase extending to elevation 620'-6". This area contains the process and auxiliary components for the HPCS system. It is bounded on the east and south by Fire Area 2AB-1g, on the north by the Unit 2 reactor building, and on the west by Fire Zone 2AB-1e.

Walls, floor and ceiling for this fire area are constructed of reinforced concrete. Doorways are equipped with Class A fire doors at elevation 574'-10" and at elevation 620'-6". Walls and ceiling have 3 hour fire resistance ratings. Walls and ceiling penetrations are sealed. Floor drains for this area are routed to a sump located within the room. The sump is discharged to the auxiliary building sump through a line that is valve operated from outside the area.

The ventilation system for this fire area is described in Section 4.2. In addition, a fan coil unit is provided to cool and circulate air within the area when the HPCS pump is operating.

There is no safe shutdown equipment located in this fire area.

Fire suppression equipment for this area consists of manual water type hose stations and fire extinguishers.

4.2.2.6.2 Analysis

Functional redundancy for equipment in this fire area is not required since this equipment is not required for safe shutdown.

Combustibles in this fire area consist of:

a. Motor winding insulation (693 lbs) with a Btu content of 6,930,000 Btu

b. Cable insulation (1,500 lbs) with a Btu content of 15,000,000 Btu

c. Lubricating oil (41 gallons) with a Btu content of 6,232,000 Btu

The total Btu content of 28,162,000 Btu is contained in the 1,588 ft^2 floor area. Total fire loading for this fire area is 17,735 Btu/ft^2.

4.2.2.6.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from spreading to adjacent zones or areas containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.2.7 Fire Area 2AB-1g

4.2.2.7.1 Description

Fire Area 2AB-1g, shown on drawing E-023-004, is the common corridor for Floor 1 of the auxiliary building. It provides access to Fire Areas and Zones 2AB-1a through 2AB-1f, and to the intermediate building. It also contains instrument and control panels required for safe shutdown. This area connects on the south to the turbine power complex, and on the north to the intermediate building; the east and west are outside walls.

Walls, floor and ceiling for this fire area are constructed of reinforced concrete. The doorway to the intermediate building and the doorways to the other Floor 1 fire areas are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings. Wall and ceiling penetrations are sealed.

The ventilation system for this fire area is described in Section 4.2.

Safe shutdown equipment in this fire area consists of:

a. RCIC instrument panel

b. RHR "A" instrument panel

c. RHR "B" instrument panel

d. Suppression pool level instrumentation

e. Power and control cables, Divisions 1 and 2, Unit 2

Fire detection equipment for this area consists of ionization detectors that actuate alarms in the control room. Fire suppression equipment consists of manual water type hose stations and fire extinguishers.

4.2.2.7.2 Analysis

Safe shutdown related panels of redundant divisions are spatially separated by a distance in excess of 65 feet. Control cable separation is also maintained.

Combustibles within this area consist of the following:

a. Instrument panels with a Btu content of 16,000,000 Btu

b. Cable insulation (4,000 lbs) with a Btu content of 40,000,000 Btu

The total Btu content of 56,000,000 Btu is contained in the 4,856 ft^2 floor area. Total fire loading for this fire area is 11,540 Btu/ft^2.

4.2.2.7.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from damaging both divisions of redundant safe shutdown equipment is achieved. This is accomplished by the spatial separation of redundant equipment within the area, low zonal fire loading, an early warning fire detection system, and good separation from other zones and areas containing safe shutdown equipment.

4.2.2.8 Fire Zone 2AB-2

4.2.2.8.1 Description

Fire Zone 2AB-2, shown on drawing E-023-009, comprises the entire Floor 2 (elevation 599'-0") of the auxiliary building, with the exception of portions of Fire Zones and Areas 2AB-1b, 2AB-1e, and 2AB-1f which originate on Floor 1. This zone contains instrument and control panels, and process equipment for the RWCU system and turbine building cooling system. It is connected on the south to the turbine power complex, on the north to the Unit 2 reactor building, intermediate building, and Fire Area 2AB-1f; the east and west are outside walls.

Walls, floor and ceiling for this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings. Wall, floor and ceiling penetrations are sealed, except for the small floor area above the RCIC room on Floor 1 (Fire Zone 2AB-1c) which is provided with grating for pressure relief.

The ventilation system for this fire zone is described in Section 4.2.

Safe shutdown equipment in this fire zone consists of:

a. Control panel for HVAC pump room cooling units

b. Power and control cables, Division 2

Fire detection equipment for this zone consists of ionization detectors in the area of the HVAC pump room cooling unit control panel. Fire suppression equipment consists of manual water type hose stations and fire extinguishers.

4.2.2.8.2 Analysis

Functional redundancy for cables associated with Division 2 safe shutdown equipment in this zone is provided by Division 1 cables located in Fire Zone 2AB-3b (see Section 4.2.2.10). Since the HVAC pump room cooling unit control panel contains equipment associated with all three divisions, separation is accomplished by providing fire barriers within the panel.

Combustibles within this zone consist of the following:

a. Motor winding insulation (810 lbs) with a Btu content of 8,100,000 Btu

b. Lubricating oil/hydraulic fluid (30 gallons) with a Btu content of 4,560,000 Btu

c. Instrument panels with a Btu content of 4,800,000Btu

d. Cable insulation (38,230 lbs) with a Btu content of 382,300,000 Btu

The total Btu content of 399,760,000 Btu is contained in the 9,605 ft^2 floor area. Total fire loading for this fire zone is 41,500 Btu/ft^2.

4.2.2.8.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging both divisions of redundant safe shutdown equipment or from spreading to an adjacent zone containing redundant safe shutdown equipment is achieved. This is accomplished by locating redundant cable trays in Fire Zone 2AB-3b. The HVAC pump room cooling unit panel is provided with internal barriers for divisional separation and has an ionization detector in the area for early warning fire detection.

4.2.2.9 Fire Zone 2AB-3a

4.2.2.9.1 Description

Fire Zone 2AB-3a, shown on drawing E-023-013, comprises the eastern half of Floor 3 (elevation 620'-6") of the auxiliary building, with the exception of the upper portion of Fire Zones 2AB-1e and 2AB-1f and the steam tunnel. This zone contains auxiliary building and steam tunnel ventilation equipment, and provides access to the portion of Fire Zone 2AB-1e on this floor. It is bounded on the west by Fire Zone 2AB-1e and the steam tunnel, and connects on the north to the Unit 2 reactor building and Fire Zone 2AB-1f; the south and east walls are exposed to grade.

Walls, floor and ceiling (roof) of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and floor have 3 hour fire resistance ratings. Wall and floor penetrations are sealed, except for pressure relief openings in the wall to Fire Zone 2AB-1e.

The ventilation system for this zone is described in Section 4.2.

There is no safe shutdown equipment located in this fire zone.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.2.2.9.2 Analysis

Functional redundancy for equipment in this fire zone is not required since there is no safe shutdown equipment in this zone.

Combustibles within this zone consist of the following:

a. Motor winding insulation (90 lbs) with a Btu content of 900,000 Btu

b. Instrument panels with a Btu content of 800,000 Btu

c. Cable insulation (1,000 lbs) with a Btu content of 10,000,000 Btu

The total Btu content of 11,700,000 Btu is contained in the 3,334 ft^2 floor area. Total fire loading for this fire zone is 3,510 Btu/ft^2.

4.2.2.9.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to adjacent zones containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading.

4.2.2.10 Fire Zone 2AB-3b

4.2.2.10.1 Description

Fire Zone 2AB-3b, shown on drawing E-023-013, comprises the western half of Floor 3 (elevation 620'-6") of the auxiliary building, with the exception of the upper portion of Fire Zone 2AB-1b and the steam tunnel. This zone contains auxiliary vent exhaust system equipment and provide access to the portion of Fire Zone 2AB-1b on this floor. It is bounded on the north by the intermediate building and Unit 2 reactor building, on the east by Fire Zone 2AB-1b and the steam tunnel, and on the south by the turbine power complex; the west is exposed to grade.

Walls, floor and ceiling (roof) of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and floor have 3 hour fire resistance ratings. Wall and floor penetrations are sealed, except for the pressure relief opening in the wall to Fire Zone 2AB-1b.

The ventilation system for this zone is described in Section 4.2.

Safe shutdown equipment for this zone consists of power and control cables.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers, and a manually operated deluge system for the charcoal filters.

4.2.2.10.2 Analysis

The cables associated with RHR "A" equipment are located in this zone. Cables associated with the redundant RHR "B" equipment is located in Fire Zone 2AB-2.

Combustibles within this zone consist of the following:

a. Motor winding insulation (90 lbs) with a Btu content of 900,000 Btu

b. Instrument panels with a Btu content of 2,600,000 Btu

c. Cable insulation (26,900 lbs) with a Btu content of 269,000,000 Btu

d. Charcoal (5,400 lbs) with a Btu content of 43,200,000 Btu

The total Btu content of 316,000,000 Btu is contained in the 4,555 ft^2 floor area. Total fire loading for this fire zone is 69,400 Btu/ft^2.

Special consideration was given to charcoal as a fire hazard. The current design includes heat sensors that initiate signals in the control room so that a water deluge system can be manually actuated, if required.

4.2.2.10.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from spreading to adjacent zones containing safe shutdown equipment is achieved. This is accomplished by barrier design and low fire loading for the zone.

4.3 INTERMEDIATE BUILDING

The intermediate building is a five story building constructed of reinforced concrete. The building is located between the Unit 1 and 2 reactor buildings and houses safety related systems that service the fuel handling building and reactor building complexes. It is bounded on the north and south by the Unit 1 and 2 auxiliary and reactor buildings, on the east by the fuel handling building and Unit 1 and 2 reactor buildings, and on the west by the control complex and radwaste building.

The ventilation system for the intermediate building consists of one 100 percent capacity supply plenum, a supply fan, an exhaust fan, and distribution ductwork. The supply plenum, supply fan and exhaust fan are located at elevation 682'-6" of the intermediate building. The supply fan draws outside air through filters and heating coils and supplies it to various locations in the intermediate building. This supply air is drawn by the exhaust fan and discharged through the unit vent. Air from the spent fuel pool cooling and cleaning equipment rooms is exhausted by the fuel handling area exhaust system.

All ventilation ducts penetrating intermediate building floors, fire barriers, and walls of the walkway to the control complex, are provided with 3 hour rated fire dampers with standard 160° F fusible links.

Ionization smoke detectors are provided in the discharge ducts of the supply fans and exhaust fans. Upon detection of smoke, these detectors will signal in the control room and on the HVAC control panel. Also, if smoke is detected in the supply duct, the supply fan will trip.

For purposes of this fire hazards analysis, the entire five story intermediate building is considered a fire area since each floor communicates via a 3 inch rattle space at the reactor building. This fire area is divided into five fire zones: Fire Zone IB-1 is elevation 574'-10"; Fire Zone IB-2 is elevation 599'-0"; Fire Zone IB-3 is elevation 620'-6"; Fire Zone IB-4 is elevations 654'-6" and 665'-0"; Fire Zone IB-5 is elevation 682'-6".

4.3.1 Fire Zone IB-1

4.3.1.1 Description

Fire Zone IB-1 is shown on drawing E-023-003. It is at elevation 574'-10", comprising the entire first floor of the intermediate building. This zone contains equipment for the service air, liquid radwaste, fuel pool cooling and cleanup, and reactor building chilled water systems. It is bounded on the north by the Unit 1 auxiliary building, on the east by the fuel handling building and Unit 1 and 2 reactor buildings, on the south by the Unit 2 auxiliary building, and on the west by the control complex and radwaste building.

Walls, floor, and ceiling of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings. However, the 3 inch rattle space at each reactor building interface are unprotected openings. Penetrations are sealed, except for the rattle spaces.

Safe shutdown equipment in this zone consists of power and control cables for Divisions 1 and 2, Units 1 and 2.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.3.1.2 Analysis

Both divisions of power and control cables are located in this zone. However, Division 1 and 2 cable trays are spatially separated by more than 30 feet.

The combustibles contained within this fire zone consist of:

a. Cable insulation (3,400 lbs) with a Btu content of 34,000,000 Btu

b. Motor winding insulation (325 lbs) with a Btu content of 3,250,000 Btu

c. Pump lubricating oil (45 gallons) with a Btu content of 6,840,000 Btu

d. Control panels with a Btu content of 600,000 Btu

The total Btu content of 44,700,000 Btu is contained in the 12,778 ft^2 floor area. Total fire loading for this fire zone is 3,500 Btu/ft^2.

4.3.1.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging cables or equipment associated with both divisions of safe shutdown equipment is achieved. This is accomplished by the low fire loading and the spatial separation of cable trays and equipment.

4.3.2 Fire Zone IB-2

4.3.2.1 Description

Fire Zone IB-2 is shown on drawing E-023-008. It is at elevation 599'-0", comprising the entire second floor of the intermediate building. This zone contains equipment for the spent fuel pool cooling and cleanup system. It is bounded on the north by the Unit 1 auxiliary building, on the east by the fuel handling building and Unit 1 and 2 reactor buildings, on the south by the Unit 2 auxiliary building, and on the west by the control complex and radwaste building.

Walls, floor, and ceiling of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls, floor, and ceiling have 3 hour fire resistance ratings. However, the 3 inch rattle space at each reactor building interface is an unprotected opening. Penetrations are sealed, except for the rattle spaces. The rattle space where each of the electrical penetration areas (1CC-4b, 1CC-4f, 2CC-4b and 2CC-4f of drawing E-023-016) interface with the reactor building and the intermediate building is sealed to provide a 3 hour fire resistance rating.

Safe shutdown equipment in this zone consists of:

a. Power and control cables for Divisions 1 and 2, Units 1 and 2

b. Instrument air receiver tank

Fire detection equipment for this zone consists of ionization detectors located in the hot instrument and control machine shop, the electrical equipment room and in regions containing both divisions of redundant cables. Fire suppression equipment consists of manual water type hose stations and fire extinguishers.

4.3.2.2 Analysis

Air accumulator tank redundancy is provided by an identical tank located in Fire Zone 1AB-3a for Unit 1 and Fire Zone FH-3 for Unit 2. Both divisions of power and control cables for Units 1 and 2 are located in this fire zone. Redundant cable trays have adequate separation, except in one region where trays are within 3 feet of each other for a distance of approximately 12 feet. This region is provided with a vertical fire barrier, installed between the redundant trays in accordance with IEEE-384, and ionization detectors to provide early warning.

Combustibles contained within this fire zone consist of:

a. Cable insulation (62,200 lbs) with a Btu content of 622,000,000 Btu

b. Control panels with a Btu content of 6,400,000 Btu

The total Btu content of 628,400,000 is contained in the 12,778 ft^2 floor area. Total fire loading for this fire zone is 49,230 Btu/ft^2. However, in the region where cable trays are within 3 feet of each other, the fire loading is 82,000 Btu/ft^2.

4.3.2.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging cables or equipment associated with both divisions of safe shutdown equipment is achieved. This is accomplished by adequate spatial separation of redundant cable trays, or a combination of fire barriers, early warning detection and manual water type fire suppression.

4.3.3 Fire Zone IB-3

4.3.3.1 Description

Fire Zone IB-3 is shown on drawings E-023-012 and E-023-016. It is at elevation 620'-6", comprising the entire third floor of the intermediate building This zone contains equipment for the annulus exhaust gas treatment system. It is bounded on the north by the Unit 1 auxiliary building, on the east by the fuel handling building and Unit 1 and 2 reactor buildings, on the south by the Unit 2 auxiliary building, and on the west by the control complex.

Walls, floor, and ceiling of this fire zone are constructed of reinforced concrete. Doorways are protected by Class A fire doors. Walls, floor, and ceiling have 3 hour fire resistance ratings. However, the 3 inch rattle space at each reactor building interface is an unprotected opening. Penetrations are sealed except for the rattle spaces.

Safe shutdown equipment in this zone consists of power and control cables for Divisions 1 and 2, Units 1 and 2.

Fire suppression equipment for this zone consists of manually actuated water deluge systems in the charcoal filter plenums, water type hose stations and fire extinguishers.

4.3.3.2 Analysis

Both divisions of power and control cables are located in this zone. However, Division 1 and 2 cable trays are spatially separated by more than 20 feet.

Combustibles contained within this fire zone consist of:

a. Cable insulation (59,600 lbs) with a Btu content of 596,000,000 Btu

b. Charcoal (3,216 lbs) with a Btu content of 26,000,000 Btu

c. Control panels with a Btu content of 33,200,000 Btu

d. Switchgear (432 lbs) with a Btu content of 4,320,000 Btu

The total Btu content of 660,000,000 Btu is contained in the 10,778ft^2 floor area. Total fire loading for this fire zone is 61,200 Btu/ft^2.

Special consideration was given to charcoal as a fire hazard. The charcoal filter design includes heat sensors that actuate alarms in the control room so that the water deluge system can be manually actuated, if required.

4.3.3.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging cables or equipment associated with both divisions of safe shutdown equipment is achieved. This is accomplished by the spatial separation of cable trays.

4.3.4 <u>Fire Zone IB-4</u>

4.3.4.1 Description

Fire Zone IB-4 is shown on drawings E-023-016 and E-023-020. It is at elevations 654'-6" and 665'-0" and houses equipment for the reactor building and drywell purge system. This zone is bounded on the east by Unit 1 and 2 reactor buildings and the fuel handling building, and on the west by the control complex. The north and south sides have no building interfaces.

Walls, floor, and ceiling of this fire zone are constructed of reinforced concrete. Doorways are protected by Class A fire doors. Walls, floor, and ceiling have 3 hour fire resistance ratings. However, the 3 inch rattle space at each reactor building interface is an unprotected opening. Penetrations are sealed except for the rattle spaces. The rattle space where each of the electrical penetration areas (1CC-4b, 1CC-4f, 2CC-4b and 2CC-4f of drawing E-023-016) interface with the reactor building and the intermediate building is sealed to provide a 3 hour fire resistance rating.

Safe shutdown equipment in this zone consists of:

a. Power and control cables for Division 1, Units 1 and 2

b. Emergency closed cooling system surge tanks

Fire suppression equipment for this zone consists of manually actuated deluge systems in the charcoal filter plenums, water hose stations and fire extinguishers.

4.3.4.2 Analysis

Functional redundancy for the Division 1 cable trays in this fire zone is provided by Division 2 cable trays located in Fire Zone IB-5 (see Section 4.3.5). Both loops of the emergency closed cooling surge tanks are located in this fire zone.

Combustibles contained within this fire zone consist of:

a. Cable insulation (6,400 lbs) with a Btu content of 64,000,000 Btu

b. Charcoal (12,200 lbs) with a Btu content of 97,600,000 Btu

c. Control panels with a Btu content of 17,600,000 Btu

The total Btu content of 180,000,000 Btu is contained in the 12,778 ft^2 floor area. Total fire loading for this fire zone is 14,100 Btu/ft^2.

Special consideration was given to charcoal as a fire hazard. The present design includes heat sensors that actuate alarms in the control room so that the deluge system can be manually actuated, if required.

4.3.4.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging cables or equipment associated with both divisions of safe shutdown equipment is achieved. This is accomplished by the low fire loading, locating redundant cable trays in another zone, and spatial separation of redundant safe shutdown equipment.

4.3.5 <u>Fire Zone IB-5</u>

4.3.5.1 Description

Fire Zone IB-5 is shown on drawing E-023-02. It is at elevation 682'-6", comprising the entire top floor of the intermediate building. This zone contains the ventilation system equipment for the intermediate building and the fuel handling building. It is bounded on the east by Unit 1 and 2 reactor buildings and on the west by the control complex. The north and south sides have no building interfaces.

Walls, floor, and ceiling (roof) of this fire zone are constructed of reinforced concrete. Doorways are protected by Class A fire doors. Walls and floor have 3 hour fire resistance ratings. However, the 3 inch rattle space at the reactor building interface is an unprotected opening. Penetrations are sealed except for the rattle spaces.

Safe shutdown equipment in this fire zone consists of power and control cables for Division 2, Units 1 and 2.

Fire suppression equipment for this zone consists of manually actuated deluge systems in the charcoal filter plenums, water type hose stations and fire extinguishers.

4.3.5.2 Analysis

Functional redundancy for the Division 2 cable trays in this fire zone is provided by the Division 1 cable trays located in Fire Zone IB-4 (see Section 4.3.4).

Combustibles contained within this fire zone consist of:

a. Cable insulation (2,300 lbs) with a Btu content of 23,000,000 Btu

b. Charcoal (9,120 lbs) with a Btu content of 73,000,000 Btu

c. Control panels with a Btu content of 13,600,000 Btu

The total Btu content of 110,000,000 Btu is contained in the 12,778ft^2 floor area. Total fire loading for this fire zone is 8,610 Btu/ft^2.

Special consideration was given to charcoal as a fire hazard. The present design includes heat sensors that actuate alarms in the control room so that the deluge system can be manually actuated, if required.

4.3.5.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging cables or equipment associated with both divisions of safe shutdown equipment is achieved. This is accomplished by the low fire loading and locating redundant cable trays in another zone.

4.4 CONTROL COMPLEX

The control complex is a six story structure constructed of structural steel and reinforced concrete. Floors 1 and 2 are located below elevation 620'-0" (grade) and house mechanical and HVAC equipment, general offices, and meeting rooms common to both Units 1 and 2. Floors 3 through 6 are separated into two main sections, each housing equipment unique to the operation of one of Units 1 and 2. The control complex is bounded on the north by the radwaste building, on the east by the intermediate building, on the south by the service building, and on the west by the diesel generator building.

The ventilation systems that serve the various floors, areas, and zones of the control complex are as follows:

a. Controlled access and miscellaneous equipment area HVAC system

   This system consists of redundant 100 percent capacity supply and return fans, supply plenums, charcoal filter trains and exhaust fans. A common duct connects the redundant fans and the distribution ductwork to other areas through the vertical cable chases.

b. MCC, switchgear, and miscellaneous electrical equipment area HVAC system and battery room exhaust system

   This system consist of redundant 100 percent capacity supply fans, supply plenums and return fans. It serves Divisions 1 and 2 of the Unit 1 and 2 electrical areas that contain switchgear, motor control centers, battery rooms and the cable spreading rooms.

c. Control room HVAC system and control room emergency recirculation system

The control room HVAC system consists of redundant 100 percent capacity supply fans, supply plenums and return fans. The emergency recirculation system consists of two 100 percent capacity charcoal filter trains and two 100 percent capacity recirculating fans. These systems serve the control rooms for Units 1 and 2.

d. Computer room HVAC system

This system consists of two 100 percent capacity air handling units. During normal operation one air handling unit operates continuously to supply cooling air for the computer rooms.

e. Emergency pump area cooling system

This system consist of two 100 percent capacity air handling units that serve the equipment at elevation 574'-10". The system is interlocked with the emergency closed cooling water pumps so that it operates when these pumps start.

Ventilation system duct penetrations through fire rated walls and floors are provided with 3 hour rated fire dampers with standard 160°F fusible links. The ventilation systems listed above are discussed further in the applicable fire area/zone descriptions that follow.

For purposes of this fire hazards analysis the control complex has been divided, by floors, into numerous fire areas and fire zones. These areas and zones are shown on drawings E-023-006, E-023-007, E-023-011, E-023-015, E-023-016 and E-023-019. The floor at elevation 599'-0" (which is the ceiling of Fire Area

CC-1 and the floor of Fire Area CC-2) meets or exceeds the requirements of a three hour fire resistance rating with one exception: the bottom rebar concrete cover does not consistently maintain the mainimum 1-1/4" depth requirement. However, this cover is never less than a 1" depth. Therefore, although the appropriate zones will address this floor as having a two hour fire resistance rating, CC-1 and CC-2 will be identified as separate fire areas.

4.4.1 Unit 1 and 2 Fire Areas, Floor 1 (CC-1)

Fire Area CC-1 is shown on drawing E-023-006. It is at elevation 574'-10" and comprises the entire first floor of the control complex. This area houses mechanical and HVAC equipment common to Units 1 and 2.

This fire area is bounded on the north by the radwaste building, on the east by the intermediate building, and is below grade on the west and south with no building interfaces. Boundary walls are constructed of reinforced concrete.

This fire area is divided into three fire zones. Fire Zones CC-1a and CC-1b contain redundant safe shutdown equipment associated with the emergency closed cooling system. These zones are separated by a non-continuous 3 hour rated fire wall and are open to Zone CC-1c at the north. Fire Zone CC-1c comprises the remainder of this fire area and houses the control complex water chillers and non-safety related service and instrumentation air system components. Each redundant control complex chiller is separated by a non-continuous 3 hour rated fire wall. The only doorway to an adjacent building is to the intermediate building from Fire Zone CC-1a, and is equipped with a Class A fire door.

Ventilation air for this fire area is supplied by one of the redundant HVAC units serving the controlled access area located in the HVAC equipment room. The ducts supplying the air penetrate the ceiling of Fire Zone CC-1c and are provided with 3 hour rated fire dampers. During an emergency, or whenever the emergency closed cooling pumps are actuated, the corresponding air handling unit at elevation 587'-0" is automatically started and provides cooling by recirculating the air in the zone.

4.4.1.1 Fire Zone CC-1a

4.4.1.1.1 Description

Fire Zone CC-1a is located in the southeast corner of the first floor and contains the B loop components of the emergency closed cooling system. Emergency air handing equipment for this zone is located within this zone on a partial mezzanine floor at elevation 587'-0". This zone is bounded on the west by Fire Zone CC-1b, is open to Fire Zone CC-1c on the north, and is bounded on the east by the intermediate building, with an outside wall on the south.

The east and south walls of this fire zone are constructed of reinforced concrete. The west wall, which separates Fire Zones CC-1a and CC-1b, is non-continous and of drywall construction. The doorway in this wall is equipped with a Class A fire door. Floor construction is of reinforced concrete. Ceilings are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls and ceilings have 3 hour and 2 hour fire resistance rating, respectively. All penetrations are sealed. Floor drains in this fire zone are headered to a sump in Fire Zone CC-1c.

Safe shutdown equipment located in this zone is as follows:

a. Emergency closed cooling pump B, Unit 1

b. Emergency closed cooling pump B, Unit 2

c. Emergency closed cooling heat exchanger B, Unit 1

d. Emergency closed cooling heat exchanger B, Unit 2

e. Emergency pump area cooling system air handling unit B

f. Power and control cables for Divisions 1 and 2, Units 1 and 2

g. Emergency closed cooling pump area air handling panel, 1B

Fire detectors are provided where a cable fire could affect both divisions of safe shutdown equipment. Fire suppression equipment for this zone consists of water type hose stations and fire extinguishers.

4.4.1.1.2 Analysis

Functional redundancy for the mechanical equipment in this fire zone is provided by indentical equipment located in Fire Zone CC-1b (see Section 4.4.1.2). This equipment is separated by a non-continuous 3 hour rated fire wall. Both Division 1 and 2 electrical cable is routed through this zone. A vertical barrier installed in accordance with IEEE-384 is located between Division 1 and 2 cable trays.

Combustibles within this fire zone consist of the following:

a. Cable insulation (9,700 lbs) with a Btu content of 97,000,000 Btu

b. Emergency closed cooling pump motor winding insulation (90 lbs) with a Btu content of 900,000 Btu

The total Btu content of 97,900,000 Btu is contained in this 3,082 ft^2 floor area. Total fire loading for this fire zone is 31,800 Btu/ft^2.

Special consideration was given to the case of a fire in the region of the Division 2 emergency closed cooling pumps (1B) which could result in exposing Division 1 cable serving the emergency closed cooling pumps (1A). Furthermore, a cable fire in Division 1 cable trays in this region could affect the air handling units served by both Divisions 1 and 2. However, these situations are protected against by the provided detection and suppression systems.

4.4.1.1.3 Conclusions

The results of the analysis for this zone indicate that the objective of preventing a fire from damaging cables or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by the early warning fire detection, manual water type suppression equipment, and fire barriers located between cable trays where a fire could damage both divisions of redundant safe shutdown equipment.

4.4.1.2 Fire Zone CC-1b

4.4.1.2.1 Description

Fire Zone CC-1b is located in the south central portion of the first floor and contains the A loop components of the emergency closed cooling system. The emergency air handling equipment for this zone is located within this zone on a partial mezzanine floor at elevation 587'-0". It is bounded on the east by Fire Zone CC-1a, is open to Zone CC-1c on the north and west, with an outside wall on the south.

The south wall of this fire zone is constructed of reinforced concrete. The east wall, which separates Fire Zones CC-1a and CC-1b, is non-continuous and is constructed of drywall. The doorway in this wall is equipped with a Class A fire door. Floor construction is of reinforced concrete. Ceilings are constructed of reinforced concrete over steel form decks and 3 hour protected framing. Walls and ceilings have 3 hour and 2 hour fire resistance rating, respectively. All penetrations are sealed. Floor drains in this fire zone are headered to a sump in Fire Zone CC-1c.

Safe shutdown equipment located in this zone is as follows:

a. Emergency closed cooling pump A, Unit 1

b. Emergency closed cooling pump A, Unit 2

c. Emergency closed cooling heat exchanger A, Unit 1

d. Emergency closed cooling heat exchanger A, Unit 2

e. Emergency pump area cooling system air handling unit 1A

f. Power and control cables for Divisions 1 and 2, Units 1 and 2

g. Emergency closed cooling pump area air handling panel, 1A

Fire detection for this zone consists of ionization type detectors. Water type hose stations and fire extinguishers are provided for fire suppression.

4.4.1.2.2 Analysis

Functional redundancy for the mechanical equipment in this fire zone is provided by indentical equipment located in Fire Zone CC-1a (see Section 4.4.1.1). This equipment is separated by a non-continuous 3 hour rated fire wall. Both Division 1 and 2 electrical cables are routed through this zone. Where these redundant cable trays are in the vicinity of one another, they are separated by fire barriers in accordance with IEEE-384.

Combustibles within this fire zone consist of the following:

a. Cable insulation (4,626 lbs) with a Btu content of 46,260,000 Btu

b. Emergency closed cooling pump motor winding insulation (90 lbs) with a Btu content of 900,000 Btu

c. Panel combustible (460 lbs) with a Btu content of 4,600,000 Btu

The total Btu content of 51,760,000 Btu is contained in this 2,192 ft^2 floor area. Total fire loading for this fire zone is 23,620 Btu/ft^2.

Special consideration was given to one region within this fire zone that has both Division 1 and 2 cables within 4.5 feet of one another. Fire loading in this region has been calculated to be less than 40,000 Btu/ft^2. Therefore, because of this low fire loading, the presence of ionization detectors, and the installation of fire barriers, cable tray routing within this region is adequate as designed.

4.4.1.2.3 Conclusions

The results of the analysis for this zone indicate that the objective of preventing a fire from damaging cables or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by the low fire loading, separation of cable trays and equipment, and the presence of fire detection and suppression equipment.

4.4.1.3 Fire Zone CC-1c

4.4.1.3.1 Description

Fire Zone CC-1c is an L-shaped section in the west and north portions of the first floor. It contains the chilled water equipment for the control complex and the service and instrument air for use throughout the plant. This zone is open on the east to Fire Zone CC-1b, open on the south (internally) to Fire Zones CC-1a and CC-1b, and is bounded on the north by the radwaste building, with outside walls on the west and south.

Outer walls and the floor of this fire zone are construction of reinforced concrete. Doorways are equipped with Class A fire doors. Ceilings are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls and ceilings have 3 hour and 2 hour fire resistance ratings, respectively. All penetrations are sealed. Floor drains are headered to a sump in this fire zone. This zone is open to Fire Zones CC-1a and CC-1b, and is accessible by stairtowers and through a Class A fire door at the intermediate building.

Safe shutdown equipment located in this zone is as follows:

a. Control complex chilled water chillers

b. Control complex chilled water pumps

c. Power and control cables, Divisions 1 and 2, Unit 1 and Division 1, Unit 2

d. Control complex water chiller control panels

e. Emergency closed cooling/chilled water system instrumentation

Fire detection equipment for this zone consists of ionization type detectors. Water type hose stations and fire extinguishers are provided for fire suppression.

4.4.1.3.2 Analysis

Functionally redundant equipment is not provided in other fire zones since the three control complex chillers are contained within this zone. The chillers are spatially separated and non-continuous 3 hour rated fire walls are located between chiller cubicles. In addition to this separation, the drainage arrangement is such that a fire due to oil spillage from any of the 15 gallon capacity chillers will not spread from one cubicle to another. Cable trays for Divisions 1 and 2 are spatially separated by more than 30 feet and the noncontinuous 3 hour rated fire walls between cubicles.

Conbustibles within this zone consist of the following:

a. Equipment cable insulation (8,463 lbs) with a Btu content of 84,630,000 Btu

b. Chilled water pump motor winding insulation (135 lbs) with a Btu content of 1,350,000 Btu

c. Water chiller lubricating oil (45 gallons) with a Btu content of 6,840,000 Btu

d. Panel combustibles (480 lbs) with a Btu content of 4,800,000 Btu

The total Btu content of 97,620,000 Btu is contained in the 13,632 ft^2 floor area. Total fire loading for this fire zone is 7,160 Btu/ft^2.

4.4.1.3.3 Conclusions

The results of the analysis for this zone indicate that the objective of preventing a fire from damaging the cables or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by the low fire loading, spatial separation of cable trays and equipment, and the presence of fire detection and suppression equipment.

4.4.2 <u>Unit 1 and 2 Fire Areas, Floor 2 (CC-2)</u>

Fire Area CC-2 is shown on drawing E-023-007. It is at elevation 599'-0" and comprises the entire second floor of the control complex. This area houses offices, meeting rooms, and mechanical equipment common to Units 1 and 2.

This fire area is bounded on the north by the radwaste building, on the east by the intermediate building, and is below grade on the west and south with no building interfaces. All walls are constructed of reinforced concrete.

This fire area is divided into three fire zones. Fire Zone CC-2a consists of the entire eastern part of this floor from column lines CC-4 to CC-6. Fire Zone CC-2b includes the northern part of this floor from column lines CC-A to CC-C (north to south) and column lines CC-1 to CC-4 (west to east). Fire Zone CC-2c includes the southern part of this floor from column lines CC-C to CC-E (north to south) and column lines CC-1 to CC-4 (west to east). Zone partitions are 2 hour rated walls with Class B fire doors. The only doorways to an adjacent building are to the intermediate building from Fire Zone CC-2a and they are equipped with Class A fire doors.

The ventilation for this fire area is provided by the controlled access and miscellaneous equipment area HVAC system (Section 4.4, item a).

4.4.2.1 Fire Zone CC-2a

4.4.2.1.1 Description

Fire Zone CC-2a is located in the eastern portion of the floor and houses miscellaneous mechanical equipment common to Units 1 and 2 and Divisions 1 and 2 power and control cables for both units. It is bounded on the west by Fire Zones CC-2b and CC-2c, on the north by the radwaste building, on the east by the intermediate building, with an outside wall on the south.

The north, east and south walls of this fire zone are constructed of reinforced concrete. The west wall, which separates this zone from Fire Zones CC-2b and CC-2c, is constructed of drywall. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls and ceiling have a 3 hour fire resistance rating, except for the center corridor walls which are 2 hour rated. The floor has a 2 hour fire resistance rating. All penetrations are sealed. Floor drains are provided for this fire zone. Access to the zone is through Class A fire doors from the intermediate building and Class B fire doors from the center corridor.

Safe shutdown equipment in this zone consists of Division 1 and 2 power and control cables for Units 1 and 2.

Fire suppression equipment for this zone consists of an automatic sprinkler system, above and below the ceiling, water type hose stations and fire extinguishers

4.4.2.1.2 Analysis

Functionally redundant equipment is not provided in other fire zones since both divisions of power and control cables for Units 1 and 2 are located in this zone.

The combustibles in this zone consists of:

a. Cable insulation (25,653 lbs) with a Btu content of 256,530,000 Btu

b. Motor winding insulation (600 lbs) with a Btu content of 6,000,000 Btu

The total Btu content of 262,530,000 Btu is contained in the 6,072 ft^2 floor area. Total fire loading for this fire zone is 43,250 Btu/ft^2.

Special consideration was given to three cases where Division 1 and 2 power and control cable trays cross one another at a 90° angle. Fire barriers are installed at each of these crossover locations in accordance with IEEE-384 to provide separation between the redundant trays.

4.4.2.1.3 Conclusions

The results of the analysis for this zone indicate that the objective of preventing a fire from damaging the cables or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by spatial separation and the installation of fire barriers between cable trays where Division 1 and 2 cable trays cross over. This arrangement is supplemented by automatic and manual fire suppression equipment.

4.4.2.2 Fire Zone CC-2b

4.4.2.2.1 Description

Fire Zone CC-2b is located in the northwestern portion of the floor and houses general offices and laboratories common to Units 1 and 2. It is bounded on the east by Fire Zone CC-2a, on the south by Fire Zone CC-2c, on the north by the radwaste building, with an outside wall on the west.

The north and west walls of this fire zone are constructed of reinforced concrete. The south and east walls are of drywall construction. Doorways are equipped with Class B fire doors. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls and ceiling have a 3 hour fire resistance rating, except for the walls adjacent to Fire Zones CC-2a and CC-2c which are 2 hour rated. The floor has a 2 hour fire resistance rating. All penetrations are sealed. Floor drains are provided for this fire zone.

Safe shutdown equipment in this zone consists of Division 1 and 2 power and control cables for Unit 1.

Fire suppression equipment for this zone consists of an automatic sprinkler system (above and below the ceiling), water type hose stations and fire extinguishers.

4.4.2.2.2 Analysis

Functionally redundant equipment is not provided in other fire zones since both divisions of power and control cables for Unit 1 are located in this zone. Spatial separation of 14 feet is provided for these cable trays.

Combustibles within this zone consist of the following:

a. Equipment cable insulation (21,850 lbs) with a Btu content of 218,500,000 Btu

b. Transient materials (loose and stored clothing, plastic, etc.) weighing 5,708 lbs with a Btu content of 45,400,000 Btu

c. Shop facility lubricating oil (10 gallons) with a Btu content of 1,520,000 Btu

d. Panel combustibles (160 lbs) with a Btu content of 1,600,000 Btu

The total Btu content of 267,020,000 Btu is contained in this 6,370 ft^2 floor area. Total fire loading for this fire zone is 41,920 Btu/ft^2.

4.4.2.2.3 Conclusions

The results of the analysis for this zone indicate that the objective of preventing a fire from damaging the cables or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by the spatial separation of Division 1 and 2 cable trays. This arrangement is supplemented by the automatic sprinkler system and manual fire suppression equipment.

4.4.2.3 Fire Zone CC-2c

4.4.2.3.1 Description

Fire Zone CC-2c is located in the southwestern portion of the floor and houses general offices, radiological count rooms, conference rooms, etc., that are common to Units 1 and 2. It is bounded on the east by Fire Zone CC-2a, on the north by Fire Zone CC-2b, with outside walls on the south and west.

The west and south walls of this fire zone are constructed of reinforced concrete. The north and east walls are of drywall construction. Doorways are equipped with Class B fire doors. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls and ceiling have a 3 hour fire resistance rating, except for the walls adjacent to Fire Zones CC-2a and CC-2b which are 2 hour rated. The floor has a 2 hour fire resistance rating. All penetrations are sealed. Floor drains are provided for this fire zone. Access to this zone is through Class B fire doors from the center corridor.

Safe shutdown equipment in this zone consists of Division 1 and 2 power and control cables for Unit 2.

Fire suppression equipment for this zone consists of an automatic sprinkler system (above and below the ceiling), water type hose stations and fire extinguishers.

4.4.2.3.2 Analysis

Functionally redundant equipment is not provided in other fire zones since both divisions of power and control cables for Unit 2 are located in this zone. Spatial separation of 13 feet is provided for these cable trays.

Combustibles within this zone consist of the following:

a. Equipment cable insulation (25,440 lbs) with a Btu content of 254,500,000 Btu

b. Transient materials (paper, plastic, cloth etc.) weighing 4,080 lbs with a Btu content of 32,640,000 Btu

c. Charcoal (480 lbs) with a Btu content of 3,840,000 Btu

The total content of 290,880,000 Btu is contained in a 6,370 ft^2 floor area. Total fire loading for this area is 45,670 Btu/ft^2.

Consideration has been given to the case of inadvertent operation of the automatic sprinkler system. Water spray obstruction is provided where it is possible that water damage to computer and counting equipment could result if such an event occurred.

4.4.2.3.3 Conclusions

The results of the analysis for this zone indicate that the objective of preventing a fire from damaging the cables or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by the spatial separation of Division 1 and 2 cable trays. This arrangement is supplemented by the automatic sprinkler system and the manual fire suppression equipment.

4.4.3 Fire Areas, Floor 3

4.4.3.1 Unit 1 Fire Areas, Floor 3 (1CC-3)

4.4.3.1.1 Fire Area 1CC-3a

4.4.3.1.1.1 Description

Fire Area 1CC-3a is shown on drawing E-023-011. It houses the 4.16 kV and 480 V switchgear, and 480 V motor control centers for power distribution to Unit 1, Division 2 safety related equipment. This area consists of the switchgear room located at elevation 620'-6" along the north wall of the Unit 1 control complex, and the reactor protection system (RPS) motor generator set room. This area is bounded on the north by the radwaste building, on the east by Fire Area 1CC-4b (electrical cable chase), on the south by Fire Areas 1CC-3b and 1CC-3c, and on the west by the diesel generator building.

The north wall of this area is constructed of reinforced concrete. East, south and west walls are of drywall construction. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this fire area consists of two 100 percent capacity air handling units located in the HVAC equipment room. Air is supplied to this area by ductwork that is routed through the electrical cable chase (Fire Area 1CC-4b) and penetrates the chase wall at the Fire Area 1CC-4b interface. This supply air is relieved to the fourth floor (elevation 638'-6") cable spreading room (Fire

Area 1CC-4a) through ceiling openings located on the west end of this area. All ventilation penetrations through fire rated walls and ceiling openings are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area. If required, a manually activated smoke venting system is provided to purge smoke from this area.

Safe shutdown equipment within this area is as follows:

a. 4.16 kV switchgear bus

b. 480 V switchgear busses

c. 480 V motor control centers (MCCs)

d. Power and control cables for Unit 1, Division 2

Fire detection equipment for this area consists of ionization detectors. Manual carbon dioxide hose reels, water type hose stations and fire extinguishers are provided for fire suppression.

4.4.3.1.1.2 Analysis

Functional redundancy for the Division 2 switchgear, MCCs, and cabling in this area is provided by the Division 1 switchgear, MCCs, and cabling located in Fire Area 1CC-3c (see Section 4.4.3.1.3). Since only Division 2 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area consist of the following:

a. Cable insulation (11,630 lbs) with a Btu content of 116,300,000 Btu

b. Switchgear (3,126 lbs) with a Btu content of 31,260,000 Btu

c. MCCs (2,496 lbs) with a Btu content of 24,960,000 Btu

The total Btu content of 173,000,000 Btu, the majority of which is due to a high concentration of cable, is contained in this 3,655 ft^2 floor area. Total fire loading for this fire area is 47,340 Btu/ft^2.

4.4.3.1.1.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Also, the presence of the carbon dioxide hose reels, water type hose stations and fire extinguishers provides ample fire suppression.

4.4.3.1.2 Fire Area 1CC-3b

4.4.3.1.2.1 Description

Fire Area 1CC-3b is shown on drawing E-023-011. It houses power distribution equipment for the Division 3 high pressure core spray system (HPCS). It is at elevation 620'-6" and consists of the rectangular room located near the center of the Unit 1 control complex. This area is bounded on the north by Fire Area 1CC-3a, on the east and west by Fire Areas 1CC-3a and 1CC-3c, and on the south by Fire Area 1CC-3c.

The east wall of this area is constructed of reinforced concrete. North, south and west walls are of drywall construction. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage is provided for this area.

Ventilation air for this area is provided by two ducts branching off of the main duct that supplies air to Fire Areas 1CC-3a and 1CC-3c. Part of this supply air is relieved to these fire areas through wall openings. All penetrations through rated fire walls are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area.

There is no safe shutdown equipment located in this area.

Fire detection equipment for this area consists of ionization detectors. Manual carbon dioxide hose reels, water type hose stations and fire extinguishers are provided for fire suppression.

4.4.3.1.2.2 Analysis

Equipment functionally redundant to Division 3 equipment is not required.

Combustibles within this area consist of the following:

a. Switchgear (798 lbs) with a Btu content of 7,980,000 Btu

b. MCC (288 lbs) with a Btu content of 2,880,000 Btu

c. Battery cell cases (180 lbs) with a Btu content of 1,800,000 Btu

d. Battery chargers with a Btu content of 2,400,000 Btu

The total Btu content of 15,060,000 Btu is contained in a 713 ft^2 floor area. Total fire loading for this fire area is 21,130 Btu/ft^2.

Special consideration was given to the case of overcharging the batteries resulting in the production of hydrogen gas. The ventilation system for this area continuously exhausts air to the outside, ensuring that hydrogen gas concentration is maintained below 1 percent by volume.

4.4.3.1.2.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Also, the presence of the carbon dioxide and water hose stations and fire extinguishers provides sufficient fire suppression.

4.4.3.1.3 Fire Area 1CC-3c

4.4.3.1.3.1 Description

Fire area 1CC-3c is shown on drawing E-023-011. It houses the 4.16 kV and 480 V switchgear, and 480 V motor control centers for power distribution to Unit 1, Division 1, safety related equipment. This area consists of the switchgear room and access area at elevation 620'-6" and is located on the north side of the wall separating the Unit 1 and Unit 2 control complex and the reactor protection system (RPS) motor generator set room. This area is bounded on the north by Fire Areas 1CC-3a and 1CC-3b, on the east by Fire Area 1CC-4f (electrical cable chase), on the south by Fire Area 2CC-3a, and on the west by Fire Area 1CC-3d and the diesel generator building.

All walls of this area are constructed of drywall. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this area consists of two 100 percent capacity air handling units located in the HVAC equipment room. Air is supplied to this area by ductwork that is routed through the electrical cable chase (Fire Area 1CC-4f) and penetrates the chase wall at the Fire Area 1CC-4f interface. This supply air is relieved to the fourth floor (elevation 638'-0") cable spreading room (Fire Area 1CC-4e) through ceiling openings located at the west end of this area. All ventilation penetrations through rated fire walls and ceiling openings are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area. If required, a manually activated smoke venting system is provided to purge smoke from this area.

Safe shutdown equipment within this area is as follows:

a. 4.16 kV swichgear bus

b. 480 V switchgear busses

c. 480 V motor control centers (MCCs)

d. Power and control cables for Unit 1, Division 1

Fire detection equipment for this area consists of ionization detectors. Manual carbon dioxide hose reels, water type hose stations and fire extinguishers are provided for fire suppression.

4.4.3.1.3.2 Analysis

Functional redundancy for the Division 1 switchgear, MCCs, and cabling in this area is provided by the Division 2 switchgear, MCCs, and cabling located in Fire Area 1CC-3a (see Section 4.4.3.1.1). Since only Division 1 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area consist of the following:

a. Cable insulation (11,630 lbs) with a Btu content of 116,300,000 Btu

b. Switchgear (3,126 lbs) with a Btu content of 31,260,000 Btu

c. MCCs (2,784 lbs) with a Btu content of 27,840,000 Btu

The total Btu content of 176,000,000 Btu, the majority of which is due to a high concentration of cable, is contained in the 3,472 ft^2 floor area. Total fire loading for this fire area is 50,692 Btu/ft^2.

4.4.3.1.3.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Also, the presence of the carbon dioxide hose reels, water type hose stations, and fire extinguishers provides ample fire suppression.

4.4.3.1.4 Fire Area 1CC-3d

4.4.3.1.4.1 Description

Fire Area 1CC-3d is shown on drawing E-023-011. It is at elevation 620'-6" and consists of a small rectangular room located in the southwest corner of the Unit 1 control complex that houses the remote shutdown panel. This area is bounded on the north and east by Fire Area 1CC-3c, on the south by Fire Area 2CC-3a, and on the west by the control complex elevator shaft.

All walls of this area are constructed of drywall. The doorway is equipped with a Class A fire door.

The floor and ceiling are constructed of reinforced concrete over steel form deck and three hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

Ventilation air for this fire area is provided by a duct branching off of the main duct that supplies air to Fire Area 1CC-3c. The supply air to this area is relieved to Fire Area

1CC-3c through a transfer grille located in the wall. All penetrations and openings are provided with 3 hour rated fire dampers. Should a fire occur in this area, or in Fire Area 1CC-3c, the fire dampers will close, thereby isolating the fire areas from one another.

The safe shutdown equipment within this area is as follows:

a. Remote shutdown panel

b. Control cables, Division 1 and 2

Fire detection equipment for this area consists of ionization detectors. Manual carbon dioxide hose reels, water type hose stations and fire extinguishers are provided for fire suppression.

4.4.3.1.4.2 Analysis

Functional redundancy for the equipment in this area is provided since the control room has redundant component controls for all equipment which can be controlled from the remote shutdown panel. Separation is provided between Division 1 and 2 cabling and components on the panel in accordance with separation design criteria.

The only combustible in this area consists of the panel and cable insulation with a Btu content of 3,600,000 Btu. This is contained within a 165 ft^2 floor area which yields a fire loading of 21,800 Btu/ft^2 for this fire area.

4.4.3.1.4.3 Conclusions

The results of the analysis for this area indicate that with the fire loading calculated, the objective of preventing the spread of fire to adjacent areas is achieved. Although some

Division 1 and 2 valve controls are located on the remote shutdown panel, the safe shutdown of the reactor can be achieved by using appropriate valve controls in the control room if a fire should occur in this fire area.

4.4.3.2 Unit 2 Fire Areas, Floor 3 (2CC-3)

4.4.3.2.1 Fire Area 2CC-3a

4.4.3.2.1.1 Description

Fire Area 2 CC-3a is shown on drawing E-023-011. It houses the 4.16 kV and 480 V switchgear, and 480 V motor control center for power distribution to Unit 2, Division 2, safety related equipment. This area consists of the switchgear room located at elevation 620'-6" along the south side of the wall separating the Unit 1 and Unit 2 control complex and the reactor protection system (RPS) motor generator set room. This area is bounded on the north by Fire Area 1CC-3c, on the east by Fire Area 2CC-4b (electrical cable chase), on the south by Fire Areas 2CC-3b and 2CC-3c, and on the west by the diesel generator building.

All walls of this area are constructed of drywall. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this area consists of two 100 percent capacity air handling units located in the HVAC equipment room. Air is supplied to this area by ductwork that is routed through the electrical cable chase (Fire Area 2CC-4b) and penetrates the chase wall at the Fire

Area 2CC-4b interface. This supply air is relieved to the fourth floor (elevation 638'-6") cable spreading room (Fire Area 2CC-4a) through ceiling openings located at the west end of this area. All ventilation penetrations through rated fire walls and ceiling openings are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area. If required, a manually actuated smoke venting system is also provided to purge the smoke from this area.

Safe shutdown equipment within this is as follows:

a. 4.16 kV switchgear bus

b. 480 V switchgear busses

c. 480 V motor control centers (MCCs)

d. Power and control cables for Unit 2, Division 2

Fire detection equipment for this area consists of ionization detectors. Manual carbon dioxide hose reels, water type hose stations and fire extinguishers are provided for fire suppression.

4.4.3.2.1.2 Analysis

Functional redundancy for the Division 2 switchgear, MCCs and cabling in this area is provided by the Division 1 switchgear, MCCs, and cabling located in Fire Area 2CC-3c (see Section 4.4.3.2.3). Since only Division 2 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area consist of the following:

a. Cable insulation (11,630 lbs) with a Btu content of 116,300,000 Btu

b. Switchgear (3,12[illegible] lbs) with a Btu content of 31,260,000 Btu

c. MCCs (1,872 lbs) with a Btu content of 18,720,000 Btu

The total Btu content of 167,000,000 Btu, the majority due to a high concentration of cable, is contained in a 3,819 ft^2 floor area. Total fire loading for this fire area is 43,730 Btu/ft^2.

4.4.3.1.1.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Also, the presence of the carbon dioxide hose reels, water type hose stations and fire extinguishers provides ample fire suppression.

4.4.3.2.2 Fire Area 2CC-3b

4.4.3.2.2.1 Description

Fire Area 2CC-3b is shown on drawing E-023-011. It houses power distribution equipment for the Division 3 high pressure core spray system (HPCS). It is located at elevation 620'-6" and consists of the rectangular room located near the center of the Unit 2 control complex. This area is bounded on the north by Fire Area 2CC-3a, on the east and west by Fire Areas 2CC-3a and 2CC-3c, and on the south by Fire Area 2CC-3c.

The east wall of this area is constructed of reinforced concrete. North, south and west walls are of drywall construction. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. The walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed. Also, floor drainage is provided for this area.

Ventilation air for this area is provided by two ducts branching off of the main duct that supplies air to Fire Areas 2CC-3a and 2CC-3c. Part of this supply air is relieved to these fire areas through wall openings. All penetrations through fire rated walls are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area.

There is no safe shutdown equipment located in this area.

Fire detection equipment for this area consists of ionization detectors. Manual carbon dioxide and water hose stations and fire extinguishers are provided for fire suppression.

4.4.3.2.2.2 Analysis

Equipment functionally redundant to Division 3 equipment is not required.

Combustibles within this area consist of the following:

a. Switchgear (798 lbs) with a Btu content of 7,980,000 Btu

b. MCC (288 lbs) with a Btu content of 2,880,000 Btu

c. Battery cell cases (180 lbs) with a Btu content of 1,800,000 Btu

d. Battery charger with a Btu content of 1,200,000 Btu

The total Btu content of 13,860,000 Btu is contained in the 713 ft^2 floor area. Total fire loading for this fire area is 19,440 Btu/ft^2.

Special consideration was given to the case of overcharging the batteries resulting in the production of hydrogen gas. The ventilation system for this area continuously exhausts air to the outside, ensuring that hydrogen gas concentration is maintained below 1 percent by volume.

4.4.3.2.2.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Also, the presence of the carbon dioxide hose reels, water type hose stations and fire extinguishers provide sufficient fire suppression.

4.4.3.2.3 Fire Area 2CC-3c

4.4.3.2.3.1 Description

Fire Area 2CC-3c is shown on drawing E-023-011. It houses the 4.16 kV and 480 V switchgear, and 480 V motor control centers for power distribution to Unit 2, Division 1, safety related equipment. This area consists of the switchgear room at elevation 620'-6" located along the south wall of the control complex and the reactor protection system (RPS) motor generator set room. This area is bounded on the north by Fire Areas 2CC-3a and 2CC-3b, on the east by Fire Area 2CC-4f (electrical cable chase), on the south by the service building, and on the west by Fire Area 2CC-3d and the diesel generator building.

The south wall of this fire area is constructed of reinforced concrete. North, east and west walls are of drywall construction. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. The walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this area consists of two 100 percent capacity air handling units located in the HVAC equipment room. Air is supplied to this area by ductwork that is routed through the electrical cable chase (Fire Area 2CC-4f) and penetrates the chase wall at the Fire Area 2CC-4f interface. This supply air is relieved to the fourth floor (elevation 638'-0") cable spreading room (Fire Area 2CC-4e) through ceiling openings located at the west end of this area. All ventilation penetrations through rated fire walls and ceiling openings are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area. If required, a manually activated smoke venting system is also provided to purge the smoke from this area.

Safe shutdown equipment within this area is as follows:

a. 4.16 kV switchgear bus

b. 480 V switchgear busses

c. 480 V motor control centers (MCCs)

d. Power and control cables for Unit 2, Division 1

Fire detection equipment for this area consist of ionization detectors. Manual carbon dioxide hose reels, water type hose stations and fire extinguishers are provided for fire suppression.

4.4.3.2.3.2 Analysis

Functional redundancy for the Division 1 switchgear, MCCs and cabling in this area is provided by the Division 2 switchgear, MCCs, and cabling located in Fire Area 2CC-3a (see Section 4.4.3.2.1). Since only Division 1 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area, consist of the following:

a. Cable insulation (11,630 lbs) with a Btu content of 116,300,000 Btu

b. Switchgear (3,126 lbs) with a Btu content of 31,260,000 Btu

c. MCCs (2,354 lbs) with a Btu content of 23,540,000 Btu

The total Btu content of 172,000,000 Btu, the majority of which is due to a high concentration of cable, is contained in the 3,572 ft^2 floor area. Total fire loading for this fire area is 48,160 Btu/ft^2.

4.4.3.2.3.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Also, the presence of the carbon dioxide hose reels, water type hose stations and fire extinguishers provide sufficient fire suppression.

4.4.3.2.4 Fire Area 2CC-3d

4.4.3.2.4.1 Description

Fire Area 2CC-3d is shown on drawing E-023-011. It is at elevation 620'-6" and consists of a small rectangular room located in the southwest corner of the Unit 2 control complex that houses the remote shutdown panel This area is bounded on the north, east and west by Fire Area 2CC-3c, and on the south by the service building.

The south wall is constructed of reinforced concrete. The north, east and west walls are of drywall construction. The doorway is equipped with a Class A fire door. The floor and ceiling are constructed of reinforced concrete over steel form deck and three hour protected framing. The walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

Ventilation air for this area is provided by a duct branching off the main duct that supplies air to Fire Area 2CC-3c. The supply air to this area is relieved to Fire Area 2CC-3c through a transfer grille located in the wall. All penetrations and openings are provided with 3 hour rated fire dampers. Should a fire occur in this area, or Fire Area 2CC-3c, the fire dampers will close, thereby isolating the fire areas from one another.

The safe shutdown equipment within this area is as follows:

a. Remote shutdown panel

b. Control cables, Divisions 1 and 2

Fire detection equipment for this area consists of ionization detectors. Manual carbon dioxide hose reels, water type hose stations and fire extinguishers are provided for fire suppression.

4.4.3.2.4.2 Analysis

Functional redundancy for the equipment in this area is provided since the control room has redundant component controls for all equipment on the remote shutdown panel. Separation is provided between Division 1 and 2 cabling and components on the panel in accordance with separation design criteria.

The only combustible in this area consists of the panel and cable insulation with a Btu content of 3,600,000 Btu. This is contained within a 155 ft^2 floor area which yields a fire loading of 23,200 Btu/ft^2 for this fire area.

4.4.3.2.4.3 Conclusions

The results of the analysis for this area indicate that with the fire loading calculated, the objective of preventing the spread of fire to adjacent areas is achieved. Although some Division 1 and 2 valve controls are located on the remote shutdown panel, the safe shutdown of the reactor can be achieved by using appropriate valve controls in the control room if a fire should occur in this fire area.

4.4.4 Fire Areas, Floor 4

4.4.4.1 Unit 1 Fire Areas, Floor 4 (1CC-4)

4.4.4.1.1 Fire Area 1CC-4a

4.4.4.1.1.1 Description

Fire Area 1CC-4a is shown on drawing E-023-015. It is the cable spreading area for Unit 1, Division 2 and houses the Division 2 and non-safety related cables routed from the control room to other plant areas. This area is located at elevation 638'-6" along the north wall of the Unit 1 control complex. The floor area includes the computer room roof and the roof of the corridor around the Division 2 battery and DC equipment rooms. This area is bounded on the north by the radwaste building, on the east by Fire Area 1CC-4b, on the south by Fire Areas 1CC-4c, 1CC-4d, 1CC-4e, 1CC-4i and 1CC-4j, and on the west by the diesel generator building.

The north wall of this area is constructed of reinforced concrete. East, south and west walls are of drywall construction. Doorways are equipped with Class A fire doors The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. The walls, floors and ceilings have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage is provided throughout this area.

Ventilation air for this area is supplied through transfer grilles located in the walls and floor. Return air is removed by two 100 percent capacity fans and associated ductwork. All wall ventilation penetrations and floor openings for ventilation are provided with 3 hour rated fire dampers. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 1CC-3a, 1CC-4b, and 1CC-4i will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this area consists of:

a. Control cables for Unit 1, Division 2

b. RPS cables for Unit 1, Divisions 2 and 3

c. Neutron monitoring cables for Unit 1, Divisions 2 and 3

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Water type hose stations and fire extinguishers are also provided to supplement this system. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.1.1.2 Analysis

Functional redundancy for the Division 2 control cabling and Division 2 and 3 RPS cabling in this fire area is provided by Division 1 control cabling and Divisions 1 and 4 RPS cabling located in Fire Area 1CC-4e (see Section 4.4.4.1.5).

The only combustible material in this area consists of a concentration of cable insulation, totaling 31,000 lbs, with a Btu content of 310,000,000 Btu. This insulation, contained within the 3,159 ft^2 floor area, yields a fire loading of 98,140 Btu/ft^2 for this fire area.

4.4.4.1.1.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1-1/2 hours. Since this area is designed with 3 hour rated fire walls the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.1.2 Fire Area 1CC-4b

4.4.4.1.2.1 Description

Fire Area 1CC-4b is shown on drawings E-023-011, E-023-012, E-023-015, E-023-016 and E-023-019. It consists of a vertical cable chase along the east end of the Unit 1, Division 2 control complex extending from elevation 620'-6" to elevation 6?3'-2", and a horizontal cable chase extending from the vertical chase to the Unit 1 reactor building at elevation 639'-6" of the intermediate building. This fire area houses Divisions 2 and 3 and non-safety related cables routed from the Unit 1 reactor building to the cable spreading room and other plant areas. It is bounded on the north by the radwaste building and the interior of the intermediate building, on the east by the Unit 1 reactor building, on the south by Fire Area 1CC-4f and the interior of the intermediate building, and on the west by Fire Area 1CC-4a.

The north and east walls of this area within the control complex, and all walls within the intermediate building and Unit 1 reactor building, are constructed of reinforced concrete. The west and south walls of this area within the control complex are constructed of drywall. Doorways are equipped with Class A fire doors. Floor construction in the control complex is of reinforced concrete over steel form deck and 3 hour protected framing. The ceiling in the control complex (at elevation 693'-2") is constructed of drywall. Floor and ceiling construction within the intermediate building is of reinforced concrete. Walls, floors and ceilings have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage is provided in the control complex and intermediate building.

There is no ventilation system provided for this area during normal plant operation. However, in case of a fire in this area, a manually actuated smoke venting system is provided to purge the smoke. This system consists of a 100 percent capacity fan, isolation dampers and ductwork. Three hour rated fire dampers are provided where the ductwork penetrates fire rated walls. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 1CC-3a and 4a will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this fire area consists of:

a. Power and control cables for Unit 1, Division 2

b. RPS cables for Unit 1, Divisions 2 and 3

c. Neutron monitoring preamp panels (SRM/IRM)

d. Neutron monitoring cables for Unit 1, Divisions 2 and 3

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Closed directional spray nozzles are provided at each floor elevation to ensure protection of cable tray runs in the vertical chases. These nozzles are located as required for protection of multi-level cable tray configurations. Fire extinguishers are also provided. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.1.2.2 Analysis

Functional redundancy for the Division 2 power and control cabling and Division 2 and 3 RPS cabling in this fire area is provided by Division 1 power and control cabling and Divisions 1 and 4 RPS cabling located in Fire Area 1CC-4f (see Section 4.4.4.1.6).

The only combustible material in this area consists of a concentration of cable insulation, totaling 26,850 lbs, with a Btu content of 268,500,000 Btu. This insulation, contained within the 1,405 ft^2 floor area, yields a fire loading of 191,200 Btu/ft^2 for this fire area.

4.4.4.1.2.3 Conclusions

The results of the analysis for this fire area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 2-1/2 hours. Since this area is designed with 3 hour rated fire walls, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.1.3 Fire Area 1CC-4c

4.4.1.3.1 Description

Fire Area 1CC-4c is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a small square room within the Unit 1, Division 2 control complex that houses the 125V d-c distribution equipment for Division 2. This area is bounded on the north and east by Fire Area 1CC-4j, on the south by Fire Area 1CC-4g, and on the west by Fire Area 1CC-4d.

Walls are constructed of drywall. The floor and ceiling construction is of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this area consists of two 100 percent capacity air handling units that also supply air to other areas. During normal operation, one air handling unit operates continuously to supply air to this area. This air is then relieved to the adjacent battery room (Fire Area

1CC-4d) through transfer grilles located in the walls. All ventilation penetrations through the walls are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c distribution panels

b. Battery chargers

c. 125V d-c switchgear bus

d. Power and control cables for Unit 1, Division 2

Fire detection equipment for this area consists of ionization detectors. Manual fire extinguishers and carbon dioxide hose reels are provided for fire suppression.

4.4.4.1.3.2 Analysis

Functional redundancy for the Division 2 equipment in this area is provided by Division 1 equipment located in Fire Area 1CC-4g (see Section 4.4.4.1.7). Since only Division 2 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area consist of the following:

a. Cable insulation (220 lbs) with a Btu content of 2,200,000 Btu

b. Battery chargers with a Btu content of 3,200,000 Btu

c. Switchgear with a Btu content of 3,000,000 Btu

The total Btu content of 8,400,000 Btu is contained in the 256 ft^2 floor area. Total fire loading for this fire area is 32,900 Btu/ft^2.

4.4.4.1.3.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1/2 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

4.4.4.1.4 Fire Area 1CC-4d

4.4.4.1.4.1 Description

Fire Area 1CC-4d is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a rectangular room within the Unit 1, Division 2 control complex that houses the Division 2 batteries. This area is bounded on the north and west by Fire Area 1CC-4j, on the east by Fire Area 1CC-4c, and on the south by Fire Area 1CC-4h.

Walls are constructed of drywall. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed. Also, floor drainage is provided for this area.

Ventilation air supplied to the adjacent d-c switchgear room (Fire Area 1CC-4c) and the access corridor (Fire Area 1CC-4j) is routed to this area through transfer grilles located in the walls. This air is then exhausted to the atmosphere by two 100 percent capacity exhaust fans. All ventilation penetrations are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c batteries

b. Power and control cables for Unit 1, Division 2

Fire detection equipment for this area consists of ionization detectors. Manual fire extinguishers and carbon dioxide hose reels are provided for fire suppression.

4.4.4.1.4.2 Analysis

Functional redundancy for the Division 2 batteries in this fire area is provided by the Division 1 batteries located in Fire Area 1CC-4h (see Section 4.4.4.1.8). Since only Division 2 batteries and associated cabling are located in this area, equipment separation is not a factor.

The only combustible material in this area consists of battery cases, totaling 300 lbs. and having a Btu content of 3,000,000 Btu. This material, contained within a 416 ft^2 floor area, yields a fire loading of 7,211 Btu/ft^2 for this fire area.

Special consideration was given to the case of overcharging the batteries resulting in the production of hydrogen gas. The ventilation system for this area continuously exhuasts air to the outside, ensuring that hydrogen gas concentration is maintained below 1 percent by volume.

4.4.4.1.4.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

4.4.4.1.5 Fire Area 1CC-4e

4.4.4.1.5.1 Description

Fire Area 1CC-4e is shown on drawing E-023-015. It is the cable spreading area for Unit 1, Division 1, and houses the Division 1 and non-safety related cables routed from the control room to other plant areas. This area is located at elevation 638'-6" along the north side of the wall separating Unit 1 and Unit 2 control complex. The floor area includes the computer room roof and the roof of the corridor around the Division 1 battery and DC equipment rooms. This area is bounded on the north by Fire Areas 1CC-4a, 1CC-4g, 1CC-4h, 1CC-4i and 1CC-4j, on the east by Fire Area 1CC-4f, on the south by Fire Area 2CC-4a, and on the west by the diesel generator building.

The walls of this area are constructed of drywall. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage is provided throughout this area.

Ventilation air for this area is supplied through transfer grilles located in the walls and floor. Return air is removed by two 100 percent capacity fans. All wall ventilation penetrations and floor openings for ventilation are provided with 3 hour rated fire dampers. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 1CC-3c and 4f will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this area consists of:

a. Control cables for Unit 1, Division 1

b. RPS cables for Unit 1, Divisions 1 and 4

c. Neutron monitoring cables for Unit 1, Divisions 1 and 4

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Water type hose stations and fire extinguishers are also provided to supplement this system. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.1.5.2 Analysis

Functional redundancy for the Division 1 control cabling and Divisions 1 and 4 RPS cabling in this area is provided by the Division 2 control cabling and Divisions 2 and 3 RPS cabling located in Fire Area 1CC-4a (see Section 4.4.4.1.1).

The only combustible material in this area consists of a concentration of cable insulation, totaling 31,000 lbs, with a Btu content of 310,000,000 Btu. This material, contained within the 3,002 ft^2 floor area, yields a fire loading of 103,300 Btu/ft^2.

4.4.4.1.5.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1-1/2 hours. Since this area is designed with 3 hour rated fire walls, the objective of preventing the spread of a fire to adjacent areas containing redundant saf. shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.1.6 Fire Area 1CC-4f

4.4.4.1.6.1 Description

Fire Area 1CC-4f is shown on drawings E-023-011, E-023-015, E-023-016, and E-023-019. It consists of a vertical cable chase along the east end of the Unit 1, Division 1 control complex extending from elevation 620'-6" to elevation 693'-2", and a horizontal cable chase extending from the vertical chase to the Unit 1 reactor building at elevation 639'-6" of the intermediate building. This fire area houses Divisions 1 and 4, and non-safety related cables routed from the Unit 1 reactor building to the cable spreading room and other plant areas. It is bounded on the north by Fire Area 1CC-4b and the interior of the intermediate building, on the east by the Unit 1 reactor building and the interior of the intermediate building, on the south by Fire Area 2CC-4b and the interior of the intermediate, and on the west by Fire Area 1CC-4e.

The east wall of this area within the control complex, and all walls of this area within the intermediate building and the Unit 1 reactor building, are constructed of reinforced concrete. The north, south and west walls of this area within the control complex are constructed of drywall. Doorways are equipped with Class A fire doors. Floor construction in the control complex is of reinforced concrete over steel form deck and 3 hour protected framing. The ceiling in the control complex (at elevation 693'-2") is constructed of drywall. Floor and ceiling construction within the intermediate building is of reinforced concrete. Walls, floor and ceilings have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage is provided in both the control complex and intermediate building.

There is no ventilation system provided for this area during normal plant operation. However, in case of a fire in this area, a manually actuated smoke venting system is provided. This consists of a 100 percent capacity fan, isolation dampers and ductwork. Three hour rated fire dampers are provided where ductwork penetrates fire walls. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 1CC-3c and 1CC-4e will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this fire area consists of:

a. Power and control cables for Unit 1, Division 1

b. RPS cables for Unit 1, Divisions 1 and 4

c. Neutron monitoring preamp panels

d. Neutron monitoring cables for Unit 1, Divisions 1 and 4

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Closed directional spray nozzles are provided at each floor elevation to ensure protection of cable tray runs in the vertical chases. These nozzles are located as required for protection of multi-level cable tray configurations. Fire extinguishers are also provided. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.1.6.2 Analysis

Functional redundancy for the Division 1 power and control cabling and Divisions 1 and 4 RPS cabling in this fire area is provided by Division 2 power and control cabling and Divisions 2 and 3 RPS cabling located in Fire Area 1CC-4b (see Section 4.4.4.1.2).

The only combustible material in this area consists of a concentration of cable insulation, totaling 35,100 lbs, with a Btu content of 351,000,000 Btu. This insulation, contained within the 2,286 ft^2 floor area, yields a fire loading of 153,600 Btu/ft^2 for this fire area.

4.4.4.1.6.3 Conclusions

The results of the analysis for this fire area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 2 hours. Since this area is designed with 3 hour rated fire walls, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.1.7 Fire Area 1CC-4g

4.4.4.1.7.1 Description

Fire Area 1CC-4g is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a small square room within the Unit 1, Division 1 control complex that houses the 125V d-c distribution equipment for Division 1. This area is bounded on the north by Fire Area 1CC-4c, on the east and south by Fire Area 1CC-4j, and on the west by Fire Area 1CC-4h.

Walls are constructed of drywall. The floor and ceiling construction is of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this area consists of two 100 percent capacity air handling units that also supply air to other areas. During normal operation, one handling unit operates continuously to supply air to this area. This air is then relieved to the adjacent battery room (Fire Area 1CC-4h) through transfer grilles located in the walls. All ventilation penetrations through the walls are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c distribution panel

b. Battery chargers

c. 125V d-c switchgear bus

d. 125V d-c motor control center (MCC)

e. Power and control cables for Unit 1, Division 1

Fire detection equipment for this area consists of ionization detectors. Manual fire extinguishers and carbon dioxide hose reels are provided for fire suppression.

4.4.4.1.7.2 Analysis

Functional redundancy for the Division 1 equipment in this area is provided by Division 2 equipment located in Fire Area 1CC-4c (see Section 4.4.4.1.3), with the exception of the MCC for the reactor core isolation cooling system valves; the MCC has no redundancy. Since only Division 1 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area consist of the following:

a. Cable insulation (458 lbs) with a Btu content of 4,580,000 Btu

b. Battery chargers with a Btu content of 3,200,000 Btu

c. Switchgear with a Btu content of 3,000,000 Btu

d. Motor control center with a Btu content of 3,360,000 Btu

The total Btu content of 14,200,000 Btu is contained in the 256 ft^2 floor area. Total fire loading for this fire area is 55,500 Btu/ft^2.

4.4.4.1.7.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

4.4.4.1.8 Fire Area 1CC-4h

4.4.4.1.8.1 Description

Fire Area 1CC-4h is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a rectangular room within the Unit 1, Division 1 control complex that houses the Division 1 batteries. This area is bounded on the north by Fire Area 1CC-4d, on the east by Fire Area 1CC-4g, and on the west and south by Fire Area 1CC-4j.

Walls are constructed of drywall. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed. Also, floor drainage is provided for this area.

Ventilation air supplied to the adjacent d-c switchgear room (Fire Area 1CC-4g) and the access corridor (Fire Area 1CC-4j) is routed to this area through transfer grilles located in the walls. This air is then exhausted to the atmosphere by two 100 percent capacity exhaust fans. All ventilation penetrations are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c batteries

b. Power and control cables for Unit 1, Division 1

Fire detection equipment for this area consists of ionization detectors. Manual fire extinguishers and carbon dioxide hose reels are provided for fire suppression.

4.4.4.1.8.2 Analysis

Functional redundancy for the Division 1 batteries in this fire area is provided by the Division 2 batteries located in Fire Area 1CC-4d (see Section 4.4.4.1.4). Since only Division 1 batteries and associated cabling are located in this area, equipment separation is not a factor.

The only combustible material in this area consists of battery cases, totaling 300 lbs, and having a Btu content of 3,000,000 Btu. This material, contained within a 416 ft^2 floor area, yields a fire loading of 7,211 Btu/ft^2 for this fire area.

Special consideration was given to the case of overcharging the batteries resulting in the production of hydrogen gas. The ventilation system for this area continuously exhausts air to the outside, ensuring that hydrogen gas concentration is maintained below 1 percent by volume.

4.4.4 1.8.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

4.4.4.1.9 Fire Area 1CC-4i

4.4.4.1.9.1 Description

Fire Area 1CC-4i is shown on drawing E-023-015. It is located at the center of the Unit 1 control complex at elevation 638'-6" and consists of the computer room. This area is bounded on the north and east by Fire Area 1CC-4a, on the south and east by Fire Area 1CC-4e, and on the west by Fire Area 1CC-4j.

Walls and ceilings are constructed of drywall with doorways equipped with Class A fire doors. The computer room has a raised floor above the typical floor construction which is reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this fire area consists of two 100 percent capacity air handling units that also supply air to other areas. During normal operation, one air handling unit operates continuously to supply air to this area. This supply air is relieved to the adjacent cable spreading areas (1CC-4a and 1CC-4e) through transfer grilles located in the walls. All ventilation penetrations through the walls are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area.

No safe shutdown equipment is located in this fire area.

Fire detection equipment for this area consists of ionization detectors in the computer room and in the sub-floor. Fire suppression equipment includes an automatic total flooding carbon dioxide system in the sub-floor, manual fire extinguishers and carbon dioxide hose reels.

4.4.4.1.9.2 Analysis

Since there is no functionally redundant equipment in other fire areas, equipment separation is not required.

Combustibles in this area consist of the following:

a. Cable insulation (60 feet) with a Btu content of 24,000,000 Btu

b. Transient materials (paper, tapes, manuals, etc.) with a Btu content of 37,000,000 Btu

The total Btu content of 61,000,000 Btu is contained in the 672 ft^2 floor area. Total fire loading for this fire area is 91,000 Btu/ft^2.

4.4.4.1.9.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1-1/2 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing safe shutdown equipment is achieved. Also, the carbon dioxide system in the computer room sub-floor provides sufficient fire suppression capability.

4.4.4.1.10 Fire Area 1CC-4j

4.4.4.1.10.1 Description

Fire Area 1CC-4j is shown on drawing E-023-015. It is at elevation 638'-6" and is comprised of the corridor surrounding the Division 1 and 2 d-c equipment and battery rooms. This area provides access to these rooms and to the computer room and cable spreading areas for the Unit 1 control complex. The internal walls form the outer walls of the d-c equipment and battery rooms. The external walls of this area are bounded on the north by the radwaste building and Fire Area 1CC-4a, on the east by Fire Areas 1CC-4a, 1CC-4e and 1CC-4i, on the south by Fire Areas 2CC-j and 1CC-4e, and on the west by the diesel generator building.

The walls and ceiling in this area are constructed of drywall. Doorways are equipped with Class A fire doors. The floor is constructed of reinforced concrete and 3 hour fireproofed steel form deck and framing. The walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

Ventilation for this area is accomplished by supplying air from fans in the HVAC equipment area. These fans also supply air to Fire Areas 1CC-4c, 1CC-4g, 2CC-4c and 2CC-4g. The supply air is relieved to the battery rooms (Fire Areas 1CC-4d and 1CC-4h) through transfer grilles in the wall. Ventilation penetrations in the walls are provided with 3 hour rated fire dampers that close to isolate this area in the event of a fire.

No safe shutdown equipment is located in this fire area.

Fire suppression equipment consists of manual fire extinguishers, water hose stations and carbon dioxide hose reels.

4.4.4.1.10.2 Analysis

There are no combustibles in this 1655 ft^2 area, hence no fire loading.

4.4.4.1.10.3 Conclusions

This fire area contains no safe shutdown equipment or combustible materials.

4.4.4.2 Unit 2 Fire Areas, Floor 4 (2CC-4)

4.4.4.2.1 Fire Area 2CC-4a

4.4.4.2.1.1 Description

Fire Area 2CC-4a is shown on drawing E-023-015. It is the cable spreading area for Unit 2, Division 2 and houses the Division 2 and non-safety related cables routed from the control room to other plant areas. This area is located at elevation 638'-6" along the south side of the wall separating the Unit 1 and Unit 2 control complex. The floor area includes the computer room roof and the roof of the corridor around the Division 2 battery and DC equipment rooms. This area is bounded on the north by Fire Area 1CC-4e, on the east by Fire Area 2CC-4b, on the south by Fire Areas 2CC-4c, 2CC-4d, 2CC-4e, 2CC-4i and 2CC-4j, and on the west by the diesel generator building.

The walls of this area are constructed of drywall with doorways equipped with Class A doors. Floor and ceiling construction is of reinforced concrete over steel form deck and 3 hour protected framing. The walls, floors and ceilings have a 3 hour fire resistance rating. All penetrations are sealed. Also, floor drainage is provided throughout this area.

Ventilation air for this area is supplied through transfer grilles located in the walls and floor. Return air is removed by two 100 percent capacity fans and associated ductwork. All wall ventilation penetrations and floor openings for ventilation are provided with 3 hour rated fire dampers. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 2CC-3a, 4b, and 4i will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this area consists of:

a. Control cables for Unit 2, Division 2 equipment

b. RPS cables for Unit 2, Divisions 2 and 3

c. Neutron monitoring cables for Unit 2, Divisions 2 and 3

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Water type hose stations and fire extinguishers are also provided to supplement this system. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.2.1.2 Analysis

Functional redundancy for the Division 2 control cabling and Division 2 and 3 RPS cabling in this fire area is provided by Division 1 cabling and Division 1 and 4 RPS cabling located in Fire Area 2CC-4e (see Section 4.4.4.2.5).

The only combustible material in this area consists of a concentration of cable insulation, totaling 31,000 lbs, with a Btu content of 310,000,000 Btu. This insulation, contained within the 2,991 ft^2 floor area, yields a fire loading of 103,700 Btu/ft^2 for this fire area.

4.4.4.2.1.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1-1/2 hours. Since this area is designed with 3 hour rated fire walls, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.2.2 Fire Area 2CC-4b

4.4.4.2.2.1 Description

Fire Area 2CC-4b is shown on drawings E-023-011, E-023-015, E-023-016 and E-023-019. It consists of a vertical cable chase along the east end of the Unit 2, Division 2 control complex extending from elevation 620'-6" to elevation 693'-2", and a horizontal cable chase extending from the vertical chase to the Unit 2 reactor building at elevation 639'-6" of the intermediate building. This fire area houses Divisions 2 and 3 and non-safety related cables routed from the Unit 2 reactor building to the cable spreading room and other plant areas. It is bounded on the north by Fire Area 1CC-4f and the interior of the intermediate building, on the east by the Unit 2 reactor building and the interior of the intermediate building, on the south by Fire Area 2CC-4f, and on the west by Fire Area 2CC-4a.

The east wall of this area within the control complex, and all walls within the intermediate building and the Unit 2 reactor building, are constructed of reinforced concrete. The north, south and west walls of this area within the control complex are constructed of drywall. Doorways are equipped with Class A fire doors in the intermediate building, and Class B access hatches in the control complex. Floor construction in the control complex is of reinforced concrete over steel form deck and 3 hour protected framing. The ceiling in the control complex (at elevation 693'-2") is constructed of drywall. Floor and ceiling construction within the intermediate building is of reinforced concrete. Walls, floors and ceilings have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage in the control complex and intermediate building.

There is no ventilation system provided for this area during normal plant operation. However, in case of a fire in this area, a manually actuated smoke venting system is provided to purge the smoke. This system consists of a 100 percent capacity fan, isolation dampers and ductwork. Three hour rated fire dampers are provided where the ductwork penetrates fire rated walls. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 2CC-3a, 4a will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this fire area consists of:

a. Power and control cables for Unit 2, Division 2

b. RPS cables for Unit 2, Divisions 2 and 3

c. Neutron monitoring preamp panels

d. Neutron monitoring cables for Unit 2, Divisions 2 and 3

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Closed directional spray nozzles are provided at each floor elevation to ensure protection of cable tray runs in the vertical chases. These nozzles are located as required for protection of multi-level cable tray configurations. Fire extinguishers are also provided. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.2.2.2 Analysis

Functional redundancy for the Division 2 power and control cabling and Division 2 and 3 RPS cabling in this fire area is provided by Division 1 power and control cabling and Divisions 1 and 4 RPS cabling located in Fire Area 2CC-4f (see Section 4.4.4.2.[illegible]).

The only combustible material in this area consists of a concentration of cable insulation, totaling 35,100 lbs with a Btu content of 351,000,000 Btu. This insulation, contained within the 2,285 ft^2 floor area, yields a fire loading of 153,700 Btu/ft^2 for this fire area.

4.4.4.2.2.3 Conclusions

The results of the analysis for this fire area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 2 hours. Since this area is designed with 3 hour rated fire walls, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.2.3 Fire Area 2CC-4c

4.4.4.2.3.1 Description

Fire Area 2CC-4c is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a small square room within the Unit 2, Division 2 control complex that houses the 125V d-c distribution equipment for Division 2. This area is bounded on the north and east by Fire Area 2CC-4j, on the south by Fire Area 2CC-4g, and on the west by Fire Area 2CC-4d.

Walls are constructed of drywall. The floor and ceiling construction is of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this area consists of two 100 percent capacity air handling units that also supply air to other areas. During normal operation, one air handling unit operates continuously to supply air to this area. This air is then relieved to the adjacent battery room (Fire Area 2CC-4d) through transfer grilles located in the walls. All ventilation penetrations through the walls are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c distribution panels

b. Battery charger

c. 125V d-c switchgear bus

d. Power and control cables for Unit 2, Division 2

Fire detection equipment for this area consist of ionization detectors. Manual fire extinguishers and carbon dioxide hose reels are provided for fire suppression.

4.4.4.2.3.2 Analysis

Functional redundancy for the Division 2 equipment in this area is provided by Division 1 equipment located in Fire Area 2CC-4g (see Section 4.4.4.2.7). Since only Division 2 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area consist of the following:

a. Equipment cable insulation (220 lbs) with a Btu content of 2,200,000 Btu

b. Battery charger with a Btu content of 1,600,000 Btu

c. Switchgear with a Btu content of 3,000,000 Btu

The total Btu content of 6,800,000 Btu is contained in the 256 ft^2 floor area. Total fire loading for this fire area is 26,600 Btu/ft^2.

4.4.4.2.3.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1/2 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

4.4.4.2.4 Fire Area 2CC-4d

4.4.4.2.4.1 Description

Fire Area 2CC-4d is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a rectangular room within the Unit 2, Division 2 control complex that houses the Division 2 batteries. This area is bounded on the north and west by Fire Area 2CC-4j, on the east by Fire Area 2CC-4c, and on the south by Fire Area 2CC-4h.

Walls are constructed of drywall. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed. Also, floor drainage is provided for this area.

Ventilation air supplied to the adjacent d-c switchgear room (Fire Area 2CC-4c) and the access corridor (Fire Area 2CC-4j) is routed to this area through transfer grilles located in the walls. This air is then exhausted to the atmosphere by two 100 percent capacity exhaust fans. All wall penetrations for ventilation are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c batteries

b. Power and control cables for Unit 2, Division 2

Fire detection equipment for this area consists of ionization detectors. Manual fire extinguishers and carbon dioxide hose reels are provided for fire suppression.

4.4.4.2.4.2 Analysis

Functional redundancy for the Division 2 batteries in this fire area is provided by the Division 1 batteries located in Fire Area 2CC-4h (see Section 4.4.4.2.8). Since only Division 2 batteries and associated cabling are located in this area, equipment separation is not a factor.

The only combustible material in this area consists of battery cases, totaling 300 lbs, with a Btu content of 3,000,000 Btu. This material, contained within a 416 ft^2 floor area, yields a fire loading of 7,211 Btu/ft^2 for this fire area.

Special consideration was given to the case of overcharging the batteries resulting in the production of hydrogen gas. The ventilation system for this area continuously exhausts air to the outside, ensuring that hydrogen gas concentration is maintained below 1 percent by volume.

4.4.4.2.4.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spreading of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

4.4.4.2.5 Fire Area 2CC-4e

4.4.3.2.5.1 Description

Fire Area 2CC-4e is shown on drawing E-023-015. It is the cable spreading area for Unit 2, Division 1 and houses the Division 1 and non-safety related cables routed from the control room to other plant areas. This area is located at elevation 638'-6" along the north side of the south wall of the Unit 2 control complex. The floor area includes the computer room roof and the roof of the corridor around the Division 1 battery and DC equipment rooms. This area is bounded on the north by Fire Areas 2CC-4a, 2CC-4g, 2CC-4h, 2CC-4i and 2CC-4j, on the east by Fire Area 2CC-4f, on the south by the service building, and on the west by the diesel generator building.

The south wall of this area is constructed of reinforced concrete, with the north, east and west walls of drywall construction. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floors and ceilings have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage is provided throughout this area.

Ventilation air for this area is supplied through transfer grilles located in the walls and floor. Return air is removed by two 100 percent capacity fans. All wall ventilation penetrations and floor openings for ventilation are provided with 3 hour rated fire dampers. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 2CC-3c and 2CC-4f will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this area consists of:

a. Control cables for Unit 2, Division 1

b. RPS cables for Unit 2, Divisions 1 and 4

c. Neutron monitoring cables for Unit 2, Divisions 1 and 4

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Fire extinguishers are also provided. Water type hose stations and fire extinguishers are also provided to supplement this system. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.2.5.2 Analysis

Functional redundancy for the Division 1 control cabling and Divisions 1 and 4 RPS cabling in this area is provided by the Division 2 control cabling and Divisions 2 and 3 RPS cabling located in Fire Area 2CC-4a (see Section 4.4.4.2.1).

The only combustible material in this area consists of a concentration of cable insulation, totaling 31,000 lbs, with a Btu content of 310,000,000 Btu. This material, contained within the 3,158 ft^2 floor area, yields a fire loading of 98,200 Btu/ft^2 for this fire area.

4.4.4.2.5.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1-1/2 hours. Since this area is designed with 3 hour rated fire walls, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.2.6 Fire Area 2CC-4f

4.4.4.2.6.1 Description

Fire Area 2CC-4f is shown on drawings E-023-011, E-023-015, E-023-016 and E-023-019. It consists of a vertical cable chase along the east end of the Unit 2, Division 1 control complex extending from elevation 620'-6" to elevation 693'-2", and a horizontal cable chase extending from the vertical chase to the Unit 2 reactor building at elevation 639'-6" of the intermediate building. This fire area houses Divisions 1 and 4 and non-safety related cables routed from the Unit 2 reactor building to the cable spreading room and other plant areas. It is bounded on the north by Fire Area 2CC-4b and the interior of the intermediate building, on the east by the Unit 2 reactor building, on the south by the service building and the interior of the intermediate building, and on the west by Fire Area 2CC-4e.

The east and south walls of this area within the control complex, and all walls within the intermediate building and the Unit 2 reactor building, are constructed of reinforced concrete. The north and west walls of this area within the control complex are constructed of drywall. Doorways are equipped with Class A fire doors in the intermediate building and Class B access hatches in the control complex. Floor construction in the control complex is of reinforced concrete over steel form deck and 3 hour protected framing. The ceiling in the control complex (at elevation 693'-2") is constructed of drywall. Floor and ceiling construction within the intermediate building is of reinforced concrete. Walls, floors and ceilings have a 3 hour fire resistance rating. All penetrations are sealed. Floor drainage is provided in both the control complex and intermediate building.

There is no ventilation system provided for this area during normal plant operation. However, in case of a fire in this area, a manually actuated smoke venting system is provided. This system consists of a 100 percent capacity fan, isolation dampers and ductwork. Three hour rated dampers are provided where the ductwork penetrates fire walls. In addition to operation (closing) of these dampers by melting of fusible links, the dampers to Fire Areas 2CC-3c and 4e will also operate upon a signal from the smoke detection system for this area.

Safe shutdown equipment in this fire area consists of:

a. Power and control cables for Unit 2, Division 1

b. RPS cables for Unit 2, Divisions 1 and 4

c. Neutron monitoring preamp panels

d. Neutron monitoring cables for Unit 2, Divisions 1 and 4

Fire protection for this area consists of a preaction type sprinkler system equipped with heat detectors for system actuation. Closed directional spray nozzles are provided at each floor elevation to ensure protection of cable tray runs in the vertical chases. These nozzles are located as required for protection of multi-level cable tray configurations. Fire extinguishers are also provided. Additional fire detection equipment is also provided for this area by ionization detectors.

4.4.4.2.6.2 Analysis

Functional redundancy for the Division 1 power and control cabling and Division 1 and 4 RPS cabling in this fire area is provided by Division 2 power and control cabling and Divisions 2 and 3 RPS cabling located in Fire Area 2CC-4b (see Section 4.4.4.2.2).

The only combustible material in this area consists of a concentration of cable insulation, totaling 26,850 lbs, with a Btu content of 268,500,000 Btu. This insulation, contained within a 1,404 ft^2 floor area, yields a fire loading of 192,000 Btu/ft^2 for this fire area.

4.4.4.2.6.3 Conclusions

The results of the analysis for this fire area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 2-1/2 hours. Since this area is designed with 3 hour rated fire walls, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved. Further assurance of limiting fire spread is achieved since the area is equipped with a preaction type sprinkler system for fire protection.

4.4.4.2.7 Fire Area 2CC-4g

4.4.4.2.7.1 Description

Fire Area 2CC-4g is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a small square room within the Unit 2, Division 1 control complex that houses the 125V d-c distribution equipment for Division 1. This area is bounded on the north by Fire Area 2CC-4c, on the east and south by Fire Area 2CC-4j, and on the west by Fire Area 2CC-4h.

Walls are constructed of drywall. The floor and ceiling construction is of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this area consists of two 100 percent capacity air handling units that also supply air to other areas. During normal operation, one air handling unit operates continuously to supply air to this area. This air is then relieved to the adjacent battery room (Fire Area 2CC-4h) through transfer grilles located in the walls. All ventilation penetrations through the walls are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c distribution panel

b. Battery charger

c. 125V d-c switchgear bus

d. 125V d-c motor control center (MCC)

e. Power and control cables for Unit 2, Division 1

Fire detection equipment for this area consists of ionization detectors. Manual fire extinguishers and carbon dioxide hosereels are provided for fire suppression.

4.4.4.2.7.2 Analysis

Functional redundancy for the Division 1 equipment in this area is provided by Division 2 equipment located in Fire Area 2CC-4C (see Section 4.4.4.2.3), with the exception of the MCC for the reactor isolation cooling system valves; the MCC has no redundancy. Since only Division 1 equipment is located in this area, equipment separation is not a factor.

Combustibles within this area consist of the following:

a. Equipment cable insulation (458 lbs) with a Btu content of 4,580,000 Btu

b. Battery charger with a Btu content of 1,600,000 Btu

c. Switchgear with a Btu content of 3,000,000 Btu

d. Motor control center with a Btu content of 3,360,000 Btu

The total Btu content of 12,600,000 is contained in the 256 ft^2 area. Total fire loading for this fire area is 49,000 Btu/ft^2.

4.4.4.2.7.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

4.4.4.2.8 Fire Area 2CC-4h

4.4.4.2.8.1 Description

Fire Area 2CC-4h is shown on drawing E-023-015. It is at elevation 638'-6" and consists of a rectangular room within the Unit 2, Division 1 control complex that houses the Division 1 batteries. This area is bounded on the north by Fire Area 2CC-4d, on the east by Fire Area 2CC-4g, and on the west and south by Fire Area 2CC-4j.

Walls are constructed of drywall. The floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed. Also, floor drainage is provided for this area.

Ventilation air supplied to the adjacent d-c switchgear room (Fire Area 2CC-4g) and the access corridor (Fire Area 2CC-4j) is routed to this area through transfer grilles located in the walls. This air is then exhausted to the atmosphere by two 100 percent capacity exhaust fans. All ventilation penetrations are provided with 3 hour rated fire dampers.

Safe shutdown equipment located within this area is as follows:

a. 125V d-c batteries

b. Power and control cables for Unit 2, Division 1

Fire detection equipment for this area consists of ionization detectors. Manual fire extinguishers and carbon dioxide hose reels are provided for fire suppression.

4.4.4.2.8.2 Analysis

Functional redundancy for the Division 1 batteries in this fire area is provided by the Division 2 batteries located in Fire Area 2CC-4d (see Section 4.4.4.2.4). Since only Division 1 batteries and associated cabling are located in this area, equipment separation is not a factor.

The only combustible material in this area consists of battery cases, totaling 300 lbs, and having a Btu content of 3,000,000 Btu. This material, contained within a 416 ft^2 floor area, yields a fire loading of 7,211 Btu/ft^2 for this fire area.

Special consideration was given to the case of overcharging the batteries resulting in the production of hydrogen gas. The ventilation system for this area continuously exhausts air to the outside, ensuring that hydrogen gas concentration is maintained below 1 percent by volume.

4.4.4.2.8.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing redundant safe shutdown equipment is achieved.

For this reason, no modifications are recommended for this fire area.

4.4.4.2.9 Fire Area 2CC-4i

4.4.4.2.9.1 Description

Fire Area 2CC-4i is shown on drawing E-023-015. It is located at the center of the Unit 2 control complex at elevation 638'-6" and consists of the computer room. This area is bounded on the north and east by Fire Area 2CC-4a, on the south and east by Fire Area 2CC-4e, and on the west by Fire Area 2CC-4j.

Walls and ceilings are constructed of drywall with doorways equipped with A fire doors. The computer room has a raised floor above the typical floor construction which is reinforced concrete over form deck and 3 hour protected framing. Walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

The ventilation system for this fire area consists of two 100 percent capacity air handling units that also supply air to other areas. During normal operation, one air handling unit operates continuously to supply air to this area. This supply air is relieved to the adjacent cable spreading areas (2CC-4a and 2CC-4e) through transfer grilles located in the walls. All ventilation penetrations through the walls are provided with 3 hour rated fire dampers. The operation (closing) of all these dampers is initiated either by heat melting a fusible element or by a signal from the smoke detection system for this area.

No safe shutdown equipment is located in this fire area.

Fire detection equipment for this area consists of ionization detectors in the computer room and in the sub-floor. Fire suppression equipment includes an automatic total flooding carbon dioxide system in the sub-floor, manual fire extinguishers and carbon dioxide hose reels.

4.4.4.2.9.2 Analysis

Since there is no functionally redundant equipment in other fire areas, equipment separation is not required.

Combustibles in this area consist of the following:

a. Equipment cable insulation (60 feet) with a Btu content of 3,300,000 Btu

b. Transient materials (paper, tapes, manuals, etc.) with a Btu content of 37,000,000 Btu

The total Btu content of 61,000,000 Btu is contained in the 672 ft^2 floor area. Total fire loading for this fire area is 91,000 Btu/ft^2.

4.4.4.2.9.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 1-1/2 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to adjacent areas containing safe shutdown equipment is achieved. Also, the carbon dioxide system in the computer room sub-floor provides sufficient fire suppression capability.

4.4.4.2.10 Fire A ea 2CC-4j

4.4.4.2.10.1 Description

Fire Area 2CC-4j is shown on drawing E-023-015. It is at elevation 638'-6" and is comprised of the corridor surrounding the Division 1 and 2 d-c equipment and battery rooms. This area provides access to these rooms and to the computer room and cable spreading areas for the Unit 1 control complex. The internal walls form the outer walls of the d-c equipment and battery rooms. The external walls of this area are bounded on the north by Fire Area 1CC-4j and 2CC-4a, on the east by Fire Areas 2CC-4a, 2CC-4e and 2CC-4i, on the south by Fire Area 2CC-4e and the service building, and on the west by the diesel generator building.

The walls and ceiling in this area are constructed of drywall. Doorways are equipped with Class A fire doors. The floor is constructed of reinforced concrete over steel form deck and 3 hour protected framing. The walls, floor and ceiling have a 3 hour fire resistance rating. All penetrations are sealed.

Ventilation for this area is accomplished by supplying air from fans in the HVAC equipment area. These fans also supply air to Fire Areas 1CC-4c, 1CC-4g, 2CC-4c and 2CC-4g. The supply air is relieved to the battery rooms (Fire Areas 2CC-4d and 2CC-4h) through transfer grilles in the wall. Ventilation penetrations in the walls are provided with fire dampers that close to isolate this area in the event of a fire.

No safe shutdown equipment is located in this fire area.

Fire suppression equipment consists of manual fire extinguishers water hose stations, and carbon dioxide hose reels.

4.4.4.2.10.2 Analysis

There are no combustibles in this 1644 ft^2 area, hence no fire loading.

4.4.4.2.10.3 Conclusions

This fire area contains safe shutdown equipment or combustible materials.

4.4.5 <u>Fire Areas, Floor 5</u>

4.4.5.1 Unit 1 Fire Areas, Floor 5 (1CC-5)

4.4.5.1.1 Fire Area 1CC-5a

4.4.5.1.1.1 Description

Fire Area 1CC-5a is shown on drawing E-023-019. It contains the control equipment required for operation of Unit 1. The equipment consists primarily of prefabricated floor section modules. Each of these modules which consists of floor sections, termination cabinets, and panels or console assemblies, has wireways in the floor section for routing cable from the various panels (consoles) to the termination cabinets. This fire area is at elevation 654'-6" and is bounded on the north by the outside wall, on the east by Fire Areas 1CC-4b and 1CC-4f, on the south by Fire Area 2CC-5a, and on the west by Fire Areas 1CC-5b and 1CC-5c.

The north wall of this area is constructed of reinforced concrete. East, south and west walls are constructed of drywall. Doorways are equipped with Class A fire doors. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. The control room floor configuration is steel plate raised 12 inches above the reinforced concrete. Walls, floor and ceiling have 3 hour fire resistance ratings. All penetrations are sealed.

The control room HVAC system consists of two 100 percent capacity supply fans, plenums, and return fans. The emergency recirculation systems consists of two 100 percent capacity charcoal filter trains and recirculating fans. In the event of a fire, a smoke venting system can be manually initiated to purge smoke from the control room and allow outside air to be supplied.

Safe shutdown equipment located within this fire area consists of termination cabinets, floor section modules, consoles and control panels associated with the equipment identified in Section 3.0.

Fire detection equipment for this area consists of both ionization detectors and heat detectors covering the floor section modules. This coverage includes the wireways in the modules and the cabinets and panels on top of the modules. Fire suppression equipment consists of a manually activated carbon dioxide total flooding system for the wireways in the floor section modules. The floor area is divided into three sections. Should a fire occur in one of these three main sections, the wireways in the entire section are flooded simultaneously. Manual water type hose stations and fire extinguishers are also provided for backup fire suppression.

4.4.5.1.1.2 Analysis

Functional redundancy is provided for equipment in this area since diesel generator control, reactor trip, and long term shutdown can be accomplished from outside of the control room. Redundant divisions of cabling are not located in common wireways within the floor sections. Separation is in accordance with separation design criteria. Tests performed to determine fire spreading capability within a floor section have shown that a fire in one wireway will not affect cabling in adjacent wireways.

Combustibles within this area consist of the following:

a. Instrument console and cabinet cable (400 linear feet) with a Btu content of 171,000,000 Btu

b. Termination cabinets (21,400 lbs) with a Btu content of 214,000,000 Btu

c. Floor section modules (78,888 lbs) with a Btu content of 788,888,000 Btu

d. Transient materials (paper, magnetic tapes etc.) weighing 1,000 lbs with a Btu content of 8,000,000 Btu

The total Btu content of 1,182,000,000 Btu is contained in a 7,124 ft^2 floor area. Total fire loading for this fire area is 166,000 Btu/ft^2.

4.4.5.1.1.3 Conclusions

The results of the analysis indicate that the objective of preventing a fire from damaging cable or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by the spatial separation and/or provision of fire barriers in accordance with separation design criteria, and the remote shutdown panel that provides alternate control for safe shutdown of the reactor. Also, an early warning detection system and a manually activated carbon dioxide suppression system are provided.

4.4.5.1.2 Fire Area 1CC-5b

4.4.5.1.2.1 Description

Fire Area 1CC-5b is shown on drawing E-023-019. It is a small rectangular room in the northwest corner of the elevation 654'-6" floor that serves as a chart storage room. This area is bounded on the north by the outside wall, on the east by Fire Area 1CC-5a, on the south by Fire Area 1CC-5c, and on the west by the stairtower.

The north wall of this area is constructed of reinforced concrete. East, south and west walls are constructed of drywall. The doorway is equipped with a Class A fire door. The floor and ceiling are constructed of reinforced concrete over steel form deck with 3 hour protected framing. Walls, floor and ceiling have 3 hour fire resistance ratings. All penetrations are sealed.

This fire area contains no safe shutdown equipment.

Fire detection equipment for this area consists of ionization detectors. An automatic carbon dioxide flooding system, manual water type hose stations and fire extinguishers are provided for fire suppression.

4.4.5.1.2.2 Analysis

The combustible materials in this fire area consist of charts stored on shelves and weighing approximately 9,000 lbs, with a Btu content of 72,000,000 Btu. This material, contained within a 127 ft^2 floor area, yields a fire loading of 567,600 Btu/ft^2 for this fire area.

4.4.5.1.2.3 Conclusions

The objective of preventing the spread of a fire to any area containing safe shutdown equipment is achieved. This is accomplished by 3 hour rated fire barriers design, and by providing an early warning detection system and an automatic fire suppression system.

4.4.5.1.3 Fire Area 1CC-5c

4.4.5.1.3.1 Description

Fire Area 1CC-5c is shown on drawing E-023-019. It is at elevation 654'-6" in the northwest corner of the floor and consist of the corridor that provides access to the Unit 1 fire areas on this floor. This area is bounded on the north by Fire Area 1CC-5b and the stairwell, on the east by Fire Area 1CC-5a, on the south by Fire Area 2CC-5b, and on the west by the outside wall.

The west wall is constructed of reinforced concrete. North, east and south walls are constructed of drywall. Doorways are equipped with Class A fire doors. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have 3 hour fire resistance ratings. All penetrations are sealed.

This fire area contains no safe shutdown equipment.

Fire suppression equipment for this area consists of manual water type hose stations and fire extinguishers.

4.4.5.1.3.2 Analysis

Combustibles contained in this 1,242 ft^2 area are insignificant, hence the fire loading is negligible.

4.4.5.1.3.3 Conclusions

To contain a fire within this area, fire area boundaries must have a fire resistance rating of 1/2 ho[illegible] Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to any area containing safe shutdown equipment is easily achieved.

4.4.5.2 Unit 2 Fire Areas, Floor 5 (2CC-5)

4.4.5.2.1 Fire Area 2CC-5a

4.4.5.2.1.1 Description

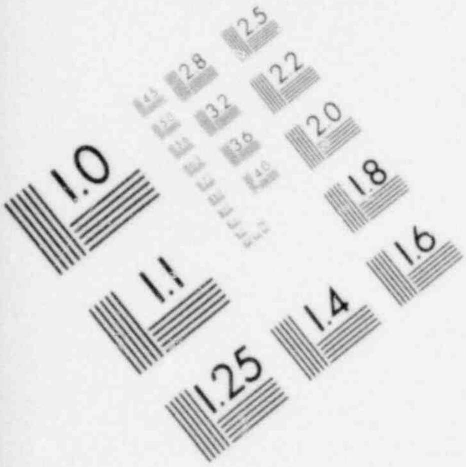
Fire Area 2CC-5a is shown on drawing E-023-019. It contains all the control equipment for operation of Unit 2. This equipment consists primarily of prefabricated floor section modules. Each of these modules consists of floor sections, termination cabinets, and panels or console assemblies has wireways in the floor section for routing cable from the various panels (consoles) to the termination cabinets. This fire area is at elevation 654'-6" and is bounded on the north by Fire Area 1CC-5a, on the east by Fire Zones 2CC-4b and 2CC-4f, on the south by the service building, and on the west by Fire Area 2CC-5b.

The south wall of this area is constructed of reinforced concrete. North, east and west walls are constructed of drywall. Doorways are equipped with Class A fire doors. Floor and ceiling are constructed of reinforced concrete over steel form deck and 3 hour protected framing. The control room floor consists of steel plate raised 12 inches above the reinforced concrete. Walls, floor and ceiling have 3 hour fire resistance ratings. All penetrations are sealed.

The control room HVAC system consists of two 100 percent capacity supply fans, plenums, and return fans. The emergency recirculation system consists of two 100 percent capacity charcoal filter trains and recirculating fans. In the event of a fire, a smoke venting system can be manually initiated to purge smoke from the control room and allow outside air to be supplied.

Safe shutdown located within this fire area consists of termination cabinets, floor section modules, consoles, and control panels associated with the equipment identified in Section 3.0.

Fire detection equipment for this area consists of both ionization detectors and heat detectors covering the floor section modules. This coverage includes the wireways in the modules and the cabinets and panels on top of the modules. Fire suppression equipment consists of a manually activated carbon dioxide total flooding system for the wireways in the floor section modules. The floor area is divided into three sections. Should a fire occur in one of these three main sections, the wireways in the entire section are flooded simultaneously. Manual water type hose stations and fire extinguishers are also provided for backup fire suppression.



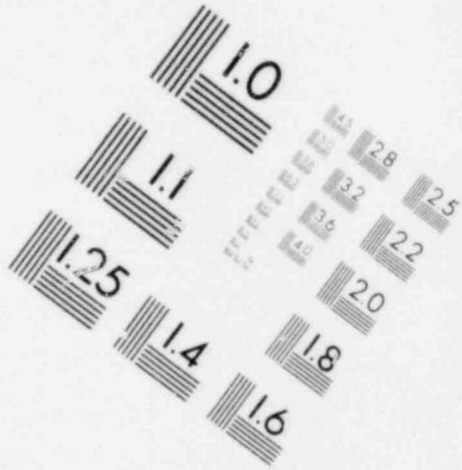
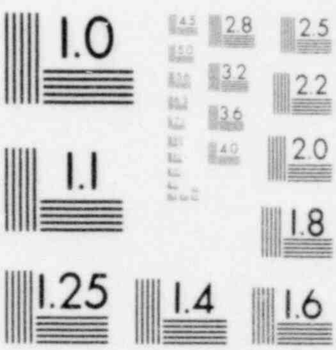


IMAGE EVALUATION TEST TARGET (MT-3)



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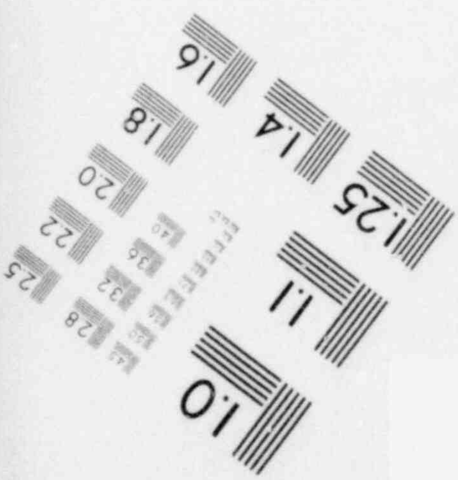


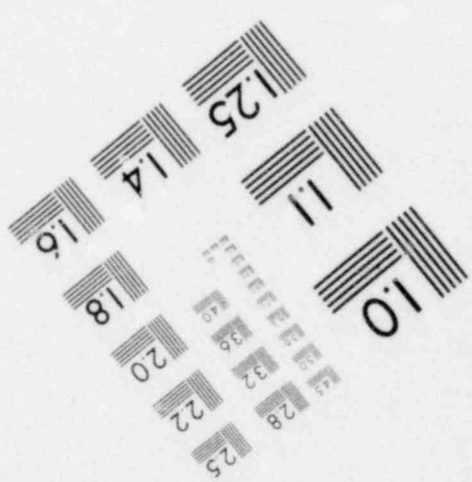
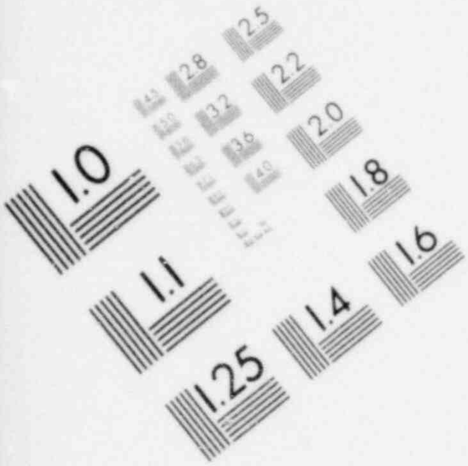
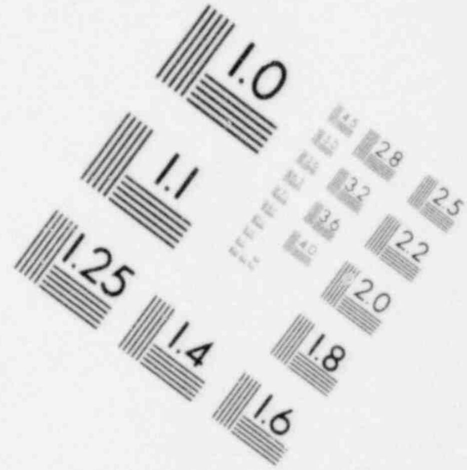
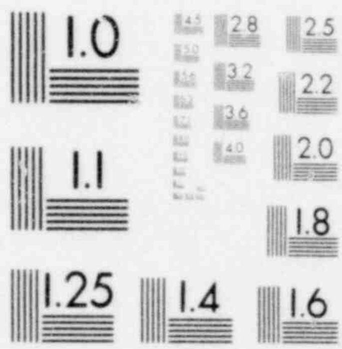
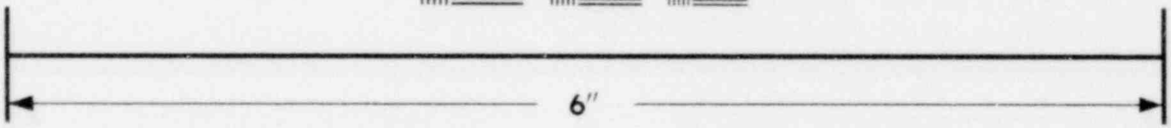


IMAGE EVALUATION TEST TARGET (MT-3)









4.4.5.2.1.2 Analysis

Functional redundancy is provided for this area since diesel generator control, reactor trip, and long term shutdown can be accomplished from outside of the control room. Redundant divisions of cabling are not located in common wireways within the floor sections. Separation is in accordance with separation design criteria. Tests performed to determine fire spreading capability within a floor section have shown that a fire in one wireway will not affect cabling in adjacent wireways.

Combustibles within this area consist of the following:

a. Instrument console and cabinet cable (400 linear feet) with a Btu content of 171,000,000 Btu

b. Termination cabinets (21,400 lbs) with a Btu content of 214,000,000 Btu

c. Floor section modules (78,888 lbs) with a Btu content of 788,880,000 Btu

d. Transient materials (paper, magnetic tapes, etc.) weighing 1,000 lbs with a Btu content of 8,000,000 Btu

The total Btu content of 1,182,000,000 Btu is contained in a 7,124 ft^2 floor area. Total fire loading for this fire area is 166,000 Btu/ft^2.

4.4.5.2.1.3 Conclusions

The results of the analysis indicate that the objective of preventing a fire from damaging cable or equipment associated with more than one division of safe shutdown equipment is achieved. This is accomplished by spatial separation and/or provision of fire barriers in accordance with separation design criteria, and the remote shutdown panel that provides alternate control for safe shutdown of the reactor. Also, an early warning detection system and a manually activated carbon dioxide suppression system are provided.

4.4.5.2.2 Fire Area 2CC-5b

4.4.5.2.2.1 Description

Fire Area 2CC-5b is shown on drawing E-023-019. It is at elevation 654'-6" in the southwest corner of the floor and consists of the kitchen, conference room, stairwell and the corridor that provides access to the Unit 2 fire areas on this floor. This area is bounded on the north by Fire Area 1CC-5c, on the east by Fire Area 2CC-5a, on the south by the service building, and on the west by the outside wall.

The west and south walls are constructed of reinforced concrete. North, and east walls are constructed of drywall. Doorways are equipped with Class A fire doors. The floor and ceiling are constructed of reinforced concrete over steel form deck and with 3 hour protected framing. Walls, floor and ceiling have 3 hour fire resistance ratings. All penetrations are sealed.

This fire area contains no safe shutdown equipment.

Fire detection equipment for this area consists of ionization detectors in the conference room and kitchen. Manual water type hose stations and fire extinguishers are provided for fire suppression.

4.4.5.2.2.2 Analysis

The combustible materials in this fire area consist of paper and furniture, weighing approximately 2,000 lbs, with a Btu content of 16,000,000 Btu. This material, contained within a 1,242 ft^2 floor area, yields a fire loading of 13,000 Btu/ft^2 for this fire area.

4.4.5.2.2.3 Conclusions

The results of the analysis for this area indicate that, to contain a fire of the loading calculated, the fire area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to any area containing safe shutdown equipment is achieved. Also, manual water type hose stations and fire extinguishers are provided for fire suppression.

4.4.6 <u>Fire Areas, Floor 6</u>

4.4.6.1 Unit 1 Fire Areas, Floor 6

4.4.6.1.1 Fire Area 1CC-6

4.4.6.1.1.1 Description

Fire Area 1CC-6 is shown on drawing E-023-019. It is located at elevation 679'-6" above the Unit 1 control room. The ceiling is at the control complex roof elevation of 719'-2". This area houses the ventilation equipment required to maintain the habitability of the control room and to cool the electrical equipment required to control the operation and safe shutdown of Unit 1. It is bounded on the north and west by outside walls, on the south by Fire Area 2CC-6, and on the east by Fire Areas 1CC-4b, 1CC-4f (cable chases), and CC-6.

The north and west walls of this area are constructed of reinforced concrete. East and south walls are constructed of drywall. Doorways are equipped with Class A fire doors. Floor and ceiling (roof) are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have 3 hour fire resistance ratings. Wall and floor penetrations are sealed. Floor drains are provided for this fire area.

The ventilation for this fire area, and corresponding Fire Area 2CC-6, is accomplished as follows: The return fans for the controlled access and miscellaneous equipment area HVAC system and the MCC, switchgear and miscellaneous electrical equipment area HVAC system (refer to Section 4.4, items a, b) flow directly into this area. Excess air used for pressurization of the Unit 1 and 2 control rooms (Fire Areas 1CC-5a and 2CC-5a, respectively) is relieved to this fire area as well as Fire Area 2CC-6. The supply branch of these two ventilation systems provides air to Fire Area 2CC-6, which is returned to this fire area through transfer grilles in the wall separating these areas. Duct penetration for both fire areas are provided with 3 hour fire dampers.

Safe shutdown equipment located within this fire area is as follows:

a. Control room HVAC supply plenum

b. Control room HVAC supply fan

c. Control room HVAC exhaust fan

d. MCC, switchgear, and misc. electrical area HVAC plenum

e. MCC, switchgear, and misc. electrical area supply fan

f. MCC, switchgear, and misc. electrical area exhaust fan

g. Battery room exhaust fan

h. Power and control cables for Unit 1, Divisions 1 and 2

i. HVAC system control panel

j. MCC switchgear, and misc. electrical equipment area HVAC, and battery room instrument rack

Fire suppression equipment for this area consists of a manually activated deluge system in the charcoal filter plenums, water type hose stations and fire extinguishers.

4.4.6.1.1.2 Analysis

Functional redundancy for the equipment in this fire area is provided by the equipment located in Fire Area 2CC-6 (see Section 4.4.6.2). Also, divisional separation of mechanical equipment is provided by Fire Area 2CC-6. Division 1 and 2 power and control cables are separated by at least 20 feet.

Combustibles within this area consist of the following:

a. Cable insulation (5,500 lbs) with a Btu content of 55,000,000 Btu

b. Charcoal (8,740 lbs) with a Btu content of 69,920,000 Btu

c. Motor winding insulation (270 lbs) with a Btu content of 2,700,000 Btu

The total Btu content of 128,000,000 Btu is contained in 8,251 ft^2 floor area. Total fire loading for this fire area is 15,500 Btu/ft^2.

Special consideration was given to the charcoal filter as a fire hazard. The filter has heat sensors incorporated in the design to initiate signals in the control room so that the water deluge system can be actuated, if required.

4.4.6.1.1.3 Conclusions

The results of this analysis indicate that to contain a fire of the loading calculated, the fire area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to any area containing safe shutdown equipment is achieved. The water deluge system in the charcoal filter plenums provides additional fire suppression capability.

4.4.6.2 Unit 2 Fire Areas, Floor 6

4.4.6.2.1 Fire Area 2CC-6

4.4.6.2.1.1 Description

Fire Area 2CC-6 is shown on drawing E-023-019. It is located at elevation 679'-6" above the Unit 2 control room. The ceiling is at the control complex roof elevation of 719'-2". This area houses the ventilation equipment required to maintain the habitability of the Unit 2 control room and to cool the electrical equipment required to control the operation and safe shutdown of Unit 2. It is bounded on the south and west by outside walls, on the north by Fire Area 1CC-6, and on the east by Fire Areas 2CC-4b, 2CC-4f (cable chases), and CC-6.

The south and west walls of this area are constructed of reinforced concrete. North and east walls are constructed of drywall. Doorways are equipped with Class A fire doors. Floor and ceiling (roof) are constructed of reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have 3 hour fire resistance ratings. Wall and floor penetrations are sealed. Floor drains are provided for this fire area.

The ventilation system for this fire area is described in Section 4.4.6.1.1.

Safe shutdown equipment located within this fire area is as follows:

a. Control room HVAC supply plenum

b. Control room HVAC supply fan

c. Control room HVAC return fan

d. MCC, switchgear, and misc. electrical area HVAC plenum

e. MCC, switchgear, and misc. electrical area supply fan

f. MCC, switchgear and misc. electrical area return fan

g. Battery room exhaust fan

h. Power and control cables for Unit 2, Divisions 1 and 2

i. HVAC system control panel

j. MCC, switchgear, and misc. electrical equipment area HVAC and battery room instrument racks

Fire suppression equipment for this area consists of a manually activated water deluge system in the charcoal filter plenums, water type hose stations and fire extinguishers.

4.4.6.2.1.2 Analysis

Functional redundancy for the equipment in this fire area is provided by the equipment located in Fire Area 1CC-6 (see Section 4.4.6.1). Also, divisional separation of mechancial equipment is provided by Fire Area 1CC-6. Division 1 and 2 power and control cables are separated by at least 20 feet.

Combustibles within this area consist of the following:

a. Cable insulation (4,300 lbs) with a Btu content of 43,000,000 Btu

b. Charcoal (8,740 lbs) with a Btu content of 69,920,000 Btu

c. Motor winding insulation (270 lbs) with a Btu content of 2,700,000 Btu

The total Btu content of 116,000,000 Btu is contained in a 8,531 ft^2 floor area. Total fire loading for this fire area is 13,600 Btu/ft^2.

Special consideration was given to the charcoal filter as a fire hazard. The filter has heat sensors incorporated in the design to initiate signals in the control room so that the water deluge system can be actuated, if required.

4.4.6.2.1.3 Conclusions

The results of this analysis indicate that to contain a fire of the loading calculated, the fire area boundaries must have a fire resistance rating of 1/2 hour. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to any area containing safe shutdown equipment is achieved. The water deluge system in the charcoal filter plenums provides additional fire suppression capability.

4.4.6.3 Fire Areas Common to Units 1 and 2, Floor 6

4.4.6.3.1 Fire Area CC-6

4.4.6.3.1.1 Description

Fire Area CC-6 is shown on drawing E-023-019. It houses Unit 1 and Unit 2 ventilation ducts and comprises the horizontal chase in the upper, east section of the control complex at elevation 693'-2". The ceiling is at the control complex roof elevation 719'-2". This area is bounded on the north and south by the outside wall, on the west by Fire Areas 1CC-6 and 2CC-6, and on the east by the intermediate building.

The north, east and south walls of this area are constructed of reinforced concrete. The west wall is constructed of drywall. The floor is constructed of gypsum plank and drywall. Ceiling (roof) construction is reinforced concrete over steel form deck and 3 hour protected framing. Walls, floor and ceiling have 3 hour fire resistance ratings. Wall and floor penetrations are sealed. Access to this area is through access panels from Fire Areas 1CC-6 and 2CC-6.

Safe shutdown equipment for this fire area consists of HVAC ductwork for the systems identified in Section 4.4.

Fire suppression equipment for this area consists of manual fire extinguishers.

4.4.6.3.1.2 Analysis

Both redundant divisions of the ventilation ductwork are contained in this fire area. Each division of redundant ductwork entering into this common area is provided with 3 hour rated fire dampers.

The combustibles contained in this 3,836 ft^2 floor area are insignificant; hence, the fire loading is negligible.

4.4.6.3.1.3 Conclusions

Due to the negligible fire loading, and the presence of 3 hour rated fire dampers, the objective of preventing the spread of a fire to any area containing safe shutdown equipment is easily achieved.

4.5 DIESEL GENERATOR BUILDING

The diesel generator building is a two story structure constructed of reinforced concrete. The six diesel generator rooms, three for each unit, are located at elevation 620'-0". Above the diesel generator rooms, at elevation 646'-6", are the diesel generator air intake room and the exhaust silencer.

The diesel generator building is bounded on the east by the control complex, the north by the radwaste building, and the south by the service building. The west wall is exposed to grade.

The diesel generator building houses the emergency diesel generators, fuel oil day tanks, and other equipment necessary to supply standby electric power to operate safe shutdown equipment should normal power be lost.

Each of the diesel generator rooms is provided with a separate and independent ventilation system. Ventilation system details are provided in Section 9.4 of the FSAR.

For purposes of this fire hazards analysis, the diesel generator building is divided into seven fire areas. Each of the six diesel generator rooms and its associated penthouse containing the air intake equipment comprise a fire area, while the common corridor is considered as the seventh fire area.

4.5.1 <u>Unit 1 Fire Areas</u>

4.5.1.1 Fire Area 1DG-1a

4.5.1.1.1 Description

Fire Area 1DG-1a is shown on drawing E-023-011. It is located in the northernmost portion of the diesel generator building. The main floor, at elevation 620'-6", houses the diesel generator and auxiliary equipment; the air intake penthouse structure is at elevation 646'-6". This area is bounded on the north and east by the radwaste building, on the south by Fire Area 1DG-1b, and on the west by the outside wall which is exposed to grade. The diesel generator housed in this area provides Division 2 onsite a-c power in case of an emergency.

Wall, floor and ceiling construction for this area is of reinforced concrete. The walls have a 3 hour fire resistance rating. Doorways are equipped with Class A fire doors. Wall penetrations are sealed to provide a 3 hour rating. Floor drain piping is configured to form traps between each fire area. Access to this area is through a Class A fire door from Fire Area 1DG-1b.

Ventilation for this area is accomplished by taking in outside air that enters the penthouse through the fixed outside air louvers. Two 100 percent capacity fans are provided. Ventilating air is vented to the atmosphere through electric motor operated discharge louvers. During summer operation all of the intake air is relieved to the atmosphere. During winter operation room air is partially recirculated to maintain a minimum supply air mixture temperature of 60° F.

Safe shutdown equipment located within this area is as follows:

a. Diesel generator, Division 2

b. Fuel oil day tank

c. Starting air receiver tanks

d. Fuel oil transfer pumps

e. Diesel generator, generator control panel

f. Diesel generator, engine control panel

g. Diesel generator, high voltage exciter cabinet

h. Ventilation fans

i. Power and control cables for Unit 1, Division 2

j. Air intake filter

Fire detection for this area is provided by rate-of-rise fixed temperature detectors located on the main floor only. Fire suppression equipment consists of a manually activated total flooding carbon dioxide system on the main floor. Actuation of the carbon dioxide system will trip the ventilation fans and close all ventilation dampers. Also, manual fire extinguishers are provided for fire suppression.

4.5.1.1.2 Analysis

Functional redundancy for the diesel generator and associated equipment in this fire area is provided by the Division 1 diesel generator and associated equipment located in Fire Area 1DG-1c (see Section 4.5.1.3). Only Division 2 equipment or cables are located in this area.

Combustibles within this area consist of the following:

a. Diesel fuel oil (600 gallons) with a Btu content of 87,000,000 Btu

b. Diesel lubricating oil (1500 gallons) with a Btu content of 228,000,000 Btu

c. Cable insulation (1320 lbs) with a Btu content of 13,200,000 Btu

d. Instrument panel combustibles (450 lbs) with a Btu content of 4,500,000 Btu

The total Btu content is 333,000,000 Btu which is contained in the 1,530 ft^2 floor area. Total fire loading for this fire area is 217,600 Btu/ft^2.

The diesel fuel oil day tank and supports are protected to obtain a 3 hour fire resistance rating. Should lubricating oil leak from the diesel generator, the leakage would be collected by the floor drains and be piped to an oil interceptor tank.

4.5.1.1.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 3 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to an adjacent area is achieved. Also, the main floor is protected by a total flooding carbon dioxide system for fire suppression.

4.5.1.2 Fire Area 1DG-1b

4.5.1.2.1 Description

Fire Area 1DG-1b is shown on drawing E-023-011. It is located in the northern portion of the diesel generator building. The main floor at elevation 620'-6" houses the diesel generator and auxiliary equipment; the air intake penthouse structure is at elevation 646'-6". This area is bounded on the north by Fire Area 1DG-1a, on the south by Fire Area 1DG-1c, on the east by Fire Area DG-1d, and on the west by the outside wall which is exposed to grade. The diesel generator housed in this area provides Division 3 onsite a-c power in case of an emergency.

Wall, floor and ceiling construction for this area is of reinforced concrete. The walls have a 3 hour fire resistance rating. Doorways are equipped with Class A fire doors. Wall penetrations are sealed to provide a 3 hour rating. Floor drain piping is configured to form traps between each fire area. Access to this area is through a Class A fire door from the common corridor (Fire Area DG-1d).

Ventilation for this area is accomplished by taking in outside air that enters the penthouse through the fixed outside air louvers. Two 100 percent capacity fans are provided. Ventilating air is vented to the atmosphere through electric motor operated discharge louvers. During summer operation all of the intake air is relieved to the atmosphere. During winter operation room air is partially recirculated to maintain a minimum supply air mixture temperature of 60° F.

There is no safe shutdown equipment located within this area.

Fire detection for this area is provided by rate-of-rise fixed temperature detectors located on the main floor only. Fire suppression equipment consists of a manually activated total flooding carbon dioxide system on the main floor. Actuation of the carbon dioxide system will trip the ventilation fans and close all ventilation dampers. Also, manual fire extinguishers are provided for fire suppression.

4.5.1.2.2 Analysis

Combustibles within this area consist of the following:

a. Diesel fuel oil (600 gallons) with a Btu content of 87,000,000 Btu

b. Diesel lubricating oil (1,000 gallons) with a Btu content of 152,000,000 Btu

c. Cable insulation (1,300 lbs) with a Btu content of 13,000,000 Btu

d. Instrument panel combustibles (450 lbs) with a Btu content of 4,500,000 Btu

The total Btu content is 256,500,000 Btu which is contained in the 1,470 ft^2 floor area. Total fire loading for this fire area is 175,000 Btu/ft^2.

The diesel fuel oil day tank and supports are protected to obtain a 3 hour fire resistance rating. Should lubricating oil leak from the diesel generator, the leakage would be collected by the floor drains and be piped to an oil interceptor tank.

4.5.1.2.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 2-1/2 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to an adjacent area is achieved. Also, the main floor is protected by a total flooding carbon dioxide system for fire suppression.

4.5.1.3 Fire Area 1DG-1c

4.5.1.3.1 Description

Fire Area 1DG-1c is shown on drawing E-023-011. It is located in the northern portion of the diesel generator building. The main floor, at elevation 620'-6", houses the diesel generator and auxiliary equipment: the air intake penthouse structure is at elevation 646'-6". This area is bounded on the north by Fire Area 1DG-1b, on the south by Fire Area 2DG-1a, on the east by Fire Area DG-1d, and on the west by the outside wall which is exposed to grade. The diesel generator housed in this area provides Division 1 onsite a-c power in case of an emergency.

Wall, floor and ceiling construction for this area is of reinforced concrete. The walls have a 3 hour fire resistance rating. Doorways are equipped with Class A fire doors. Wall penetrations are sealed to provide a 3 hour rating. Floor drain piping is configured to form traps between each fire area. Access to this area is through a Class A fire door from the common corridor (Fire Area DG-1d).

Ventilation for this area is accomplished by taking in outside air that enters the penthouse through the fixed outside air louvers. Two 100 percent capacity fans are provided. Ventilating air is vented to the atmosphere through electric motor operated discharge louvers. During summer operation all of the intake air is relieved to the atmosphere. During winter operation room air is partially recirculated to maintain a minimum supply air mixture temperature of 60° F.

Safe shutdown equipment located within this area is as follows:

a. Diesel generator, Division 1

b. Fuel oil day tank

c. Starting air receiver tanks

d. Fuel oil transfer pumps

e. Diesel generator, generator control panel

d. Instrument panel combustibles with a Btu content of 4,500,000 Btu

The total Btu content is 333,000,000 Btu which is contained in the 1,530 ft^2 floor area. Total fire loading for this fire area is 217,600 Btu/ft^2.

The diesel fuel oil day tank and supports are protected to obtain a 3 hour fire resistance rating. Should lubricating oil leak from the diesel generator, the leakage would be collected by the floor drains and be piped to an oil interceptor tank.

4.5.1.3.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 3 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to an adjacent area is achieved. Also, the main floor is protected by a total flooding carbon dioxide system for fire suppression.

4.5.2 Unit 2 Fire Areas

4.5.2.1 Fire Area 2DG-1a

4.5.2.1.1 Description

Fire Area 2DG-1a is shown on drawing E-023-011. It is located in the southern portion of the diesel generator building. The main floor, at elevation 620'-6", houses the diesel generator and auxiliary equipment; the air intake penthouse structure is at elevation 646'-6". This area is bounded on the north by Fire Area 1DG-1c, on the south by Fire Area 2DG-1b, on the east by Fire

Area DG-1d, and on the west by the outside wall which is exposed to grade. The diesel generator housed in this area provides Division 2 onsite a-c power in case of an emergency.

Wall, floor and ceiling construction for this area is of reinforced concrete. The walls have a 3 hour fire resistance rating. Doorways are equipped with Class A fire doors. Wall penetrations are sealed to provide a 3 hour rating. Floor drain piping is configured to form traps between each fire area. Access to this area is through a Class A fire door from the common corridor (Fire Area DG-1d).

Ventilation for this area is accomplished by taking in outside air that enters the penthouse through the fixed outside air louvers. Two 100 percent capacity fans are provided. Ventilating air is vented to the atmosphere through electric motor operated discharge louvers. During summer operation all of the intake air is relieved to the atmosphere. During winter operation room air is partially recirculated to maintain a minimum supply air mixture temperature of 60° F.

Safe shutdown equipment located within this area is as follows:

a. Diesel generator, Division 2

b. Fuel oil day tank

c. Starting air receiver tanks

d. Fuel oil transfer pumps

e. Diesel generator control panel

f. Engine control panel

g. Exciter cabinet

h. Ventilation fans

i. Power and control cables for Unit 2, Division 2

Fire detection for this area is provided by a rate-of-rise fixed temperature detectors located on the main floor only. Fire suppression equipment consists of a manually activated total flooding carbon dioxide system on the main floor. Actuation of the carbon dioxide system will trip the ventilation fans and close all ventilation dampers. Also, manual fire extinguishers are provided for fire suppression.

4.5.2.1.2 Analysis

Functional redundancy for the diesel generator and associated equipment in this fire area is provided by the Division 1 diesel generator and equipment located in Fire Area 2DG-1c (see Section 4.5.2.3). Only Division 2 equipment or cables are located in this area.

Combustibles within this area consist of the following:

a. Diesel fuel oil (600 gallons) with a Btu content of 87,000,000 Btu

b. Diesel lubricating oil (1,500 gallons) with a Btu content of 228,000,000 Btu

c. Cable insulation (1,320 lbs) with a Btu content of 13,200,000 Btu

d. Instrument panel combustibles (450 lbs) with a Btu content of 4,500,000 Btu

The total Btu content is 333,000,000 Btu which is contained in the 1,530 ft^2 floor area. Total fire loading for this fire area is 217,600 Btu/ft^2.

The diesel fuel oil day tank and supports are protected to obtain a 3 hour fire resistance rating. Should lubricating oil leak from the diesel generator, the leakage would be collected by the floor drains and be piped to an oil interceptor tank.

4.5.2.1.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 3 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to an adjacent area is achieved. Also, the main floor is protected by a total flooding carbon dioxide system for fire suppression.

4.5.2.2 Fire Area 2DG-1b

4.5.2.2.1 Description

Fire Area 2DG-1b is shown on drawing E-023-011. It is located in the southern portion of the diesel generator building. Main floor, at elevation 620'-6", houses the diesel generator and auxiliary equipment; and the air intake penthouse structure is at elevation 646'-6". This area is bounded on the north by Fire Area 2DG-1a, on the south by Fire Area 2DG-1c, on the east by Fire Area DG-1d, and on the west by the outside wall which is exposed to grade. The diesel generator housed in this area provides Division 3 onsite a-c power in case of an emergency.

Wall, floor and ceiling construction for this area is of reinforced concrete. The walls have a 3 hour fire resistance rating. Doorways are equipped with Class A fire doors. Wall penetrations are sealed to provide a 3 hour rating. Floor drain piping is configured to form traps between each fire area. Access to this area is through a Class A fire door from the corridor (Fire Area DG-1d).

Ventilation for this area is accomplished by taking in outside air that enters the penthouse through the fixed outside air louvers. Two 100 percent capacity fans are provided. Ventilating air is vented to the atmosphere through electric motor operated discharge louvers. During summer operation all of the intake air is relieved to the atmosphere. During winter operation room air is partially recirculated to maintain a minimum supply air mixture temperature of 60° F.

There is no safe shutdown equipment located within this area.

Fire detection for this area is provided by rate-of-rise fixed temperature detectors located on the main floor only. Fire suppression equipment consists of a manually activated total flooding carbon dioxide system on the main floor. Actuation of the carbon dioxide system will trip the ventilation fans and close all ventilation dampers. Also, manual fire extinguishers are provided for fire suppression.

4.5.2.2.2 Analysis

Combustibles within this area consist of the following:

a. Diesel fuel oil (600 gallons) with a Btu content of 87,000,000 Btu

b. Diesel lubricating oil (1,000 gallons) with a Btu content of 152,000,000 Btu

c. Cable insulation (1,300 lbs) with a Btu content of 13,000,000 Btu

d. Instrument panel combustibles (450 lbs) with a Btu content of 4,500,000 Btu

The total Btu content is 256,500,000 Btu which is contained in the 1,470 ft^2 floor area. Total fire loading for this fire area is 175,000 Btu/ft^2.

The diesel fuel oil day tank and supports are protected to btain a 3 hour fire resistance rating. Should lubricating oil leak from the diesel generator, the leakage would be collected by the floor drains and be piped to an oil interceptor tank.

4.5.2.2.3 Conclusions

The results of the analy is for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 2-1/2 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of a fire to an adjacent area is achieved. Also, the entire main floor is protected by a total flooding carbon dioxide system, thereby providing additional fire suppression.

4.5.2.3 Fire Area 2DG-1c

4.5.2.3.1 Description

Fire Area 2DG-1c is shown on drawing E-023-011. It is located in the southernmost portion of the diesel generator building. The main floor, at elevation 620'-6", houses the diesel generator and auxiliary equipment; the air intake penthouse structure is at elevation 646'-6". This area is bounded on the north by Fire Area 2DG-1b, on the south by the service building, on the east by

Fire Area DG-1d, and on the west by the outside wall which is exposed to grade. The diesel generator housed in this area provides Division 1 onsite a-c power in case of an emergency.

Wall, floor and ceiling construction for this area is of reinforced concrete. The walls have a 3 hour fire resistance rating. Doorways are equipped with Class A fire doors. Wall penetrations are sealed to provide a 3 hour rating. Floor drain piping is configured to form traps between each fire area. Access to this area is through a Class A fire door from the common corridor (Fire Area DG-1d).

Ventilation for this area is accomplished by taking in outside air that enters the penthouse through the fixed outside air louvers. Two 100 percent capacity fans are provided. Ventilating air is vented to the atmosphere through electric motor operated discharge louvers. During summer operation all of the intake air is relieved to the atmosphere. During winter operation room air is partially recirculated to maintain a minimum supply air mixture temperature of 60° F.

Safe shutdown equipment located within this area is as follows:

a. Diesel generator, Division 1

b. Fuel oil day tank

c. Starting air receiver tanks

d. Fuel oil transfer pumps

e. Diesel generator control panel

f. Engine control panel

g. Exciter cabinet

h. Ventilation fans

i. Power and control cables for Unit 2, Division 1

Fire detection for this area is provided by rate-of-rise fixed temperature detectors located on the main floor only. Fire suppression equipment consists of a manually activated total flooding carbon dioxide system on the main floor. Actuation of the carbon dioxide system will trip the ventilation fans and close all ventilation dampers. Also, manual fire extinguishers are provided for fire suppression.

4.5.2.3.2 Analysis

Functional redundancy for the diesel generator and associated equipment in this fire area is provided by the Division 2 diesel generator and equipment located in Fire Area 2DG-1a (see Section 4.5.2.1). Only Division 1 equipment or cables are located in this area.

Combustibles within this area consist of the following:

a. Diesel fuel oil (600 gallons) with a Btu content of 87,000,000 Btu

b. Diesel lubricating oil (1,500 gallons) with a Btu content of 228,000,000 Btu

c. Cable insulation (1,320 lbs) with a Btu content of 13,200,000 Btu

d. Instrument panel combustibles (450 lbs) with a Btu content of 4,500,000 Btu

The total Btu content is 333,000,000 Btu which is contained in the 1,530 ft^2 floor area. Total fire loading for this fire area is 217,600 Btu/ft^2.

The diesel fuel oil day tank and supports are protected to obtain a 3 hour fire resistance rating. Should lubricating oil leak from the diesel generator, the leakage would be collected by the floor drains and be piped to an oil interceptor tank.

4.5.2.3.3 Conclusions

The results of the analysis for this area indicate that to contain a fire of the loading calculated, the area boundaries must have a 3 hour fire resistance rating. Since this area is designed with 3 hour rated fire barriers, the objective of preventing the spread of fire to an adjacent area is achieved. Also, the main floor is protected by a total flooding carbon dioxide system for fire suppression.

4.5.3 Fire Areas Common to Units 1 & 2

4.5.3.1 Fire Area DG-1d

4.5.3.1.1 Description

Fire Area DG-1d is shown on drawing E-023-011. It is at elevation 620'-6" and serves as a common connecting corridor between the control complex, service building and diesel generator areas thereby providing access to the diesel generator rooms. This area is bounded on the north by the radwaste building, on the east by Fire Areas 1CC-3 and 2CC-3 of the control complex, on the south by the service building, and on the west by Fire Areas 1DG-1b, 1DG-1c and 2DG-1a, 2DG-1b, 2DG-1c.

Wall, floor and ceiling construction for this area is of reinforced concrete. The walls have a 3 hour fire resistance rating. Doorways are equipped with Class A fire doors. Wall penetrations are sealed to provide a 3 hour rating. Access to this area is through Class A fire doors from the control complex, service building and the diesel generator rooms.

Safe shutdown equipment located within this area is as follows:

a. Power and control cables for Unit 1, Divisions 1 and 2

b. Power and control cables for Unit 2, Divisions 1 and 2

Fire suppression equipment for this area consists of manual fire extinguishers.

4.5.3.1.2 Analysis

Since Divisions 1 and 2 power and control cables for Unit 1 and Unit 2 are contained in this area, spatial separation is maintained by separating redundant diesel generator power and control cables serving a unit by more than 7 feet. Moreover, cabling for Units 1 and 2 diesel generators is routed so that spatial separation in excess of 11 feet is maintained between cables serving different units.

The only combustible material in this area is 5,600 lbs of cable insulation with a Btu content of 56,000,000 Btu. This insulation, contained within the 1,968 ft^2 floor area, yields a fire loading of 28,500 Btu/ft^2 for this fire area.

4.5.3.1.3 Conclusions

The results of the analysis indicate that because of the spatial separation of cables and the low fire loading, the objective of preventing a fire from damaging cables associated with more than one division of safe shutdown equipment or spreading to another fire area is achieved.

4.6 EMERGENCY SERVICE WATER PUMPHOUSE

The emergency service water pumphouse is a single story, rectangular building constructed of reinforced concrete shown on the drawing E-023-034. It is an isolated structure located north of the main plant area with the service water pumphouse as the closest building. This building houses pumps and associated equipment required to supply cooling water for safe shutdown systems.

The ventilation system for the emergency service water pumphouse consists of intake louvers, two 100 percent capacity supply fans and two 100 percent capacity motor operated exhaust louvers for each reactor unit. Each fan is sized to dissipate heat generated by the emergency service water (ESW) pump motors along with miscellaneous equipment. The supply fan draws outside air through the intake louvers and supplies it to the pump area. This supply air is relieved to the atmosphere through the motor operated exhaust louvers which automatically open when the corresponding fan is energized. During winter operations, some room air is recirculated to maintain room temperature. The supply fans operate only when the emergency pumps are operated.

Two 100 percent capacity supply fans are provided for ventilation of the diesel driven fire pump room. These fans operate only when the diesel driven fire pump operates. The supply fan draws ambient air from the emergency service pumphouse and supplies it to the fire pump room. This air is then relieved through exhaust louvers to the atmosphere. Penetrations through the roof of the diesel driven fire pump room are provided with 3 hour rated fire dampers.

For purposes of this fire hazards analysis, the emergency service water pumphouse is divided into two fire areas: Fire Area ESW-1a contains ESW pumps, associated equipment and the electric motor driven fire pump; Fire Area ESW-1b contains the diesel driven fire pump, associated control panel, batteries, and diesel fuel oil storage tank.

4.6.1 Fire Area ESW-1a

4.6.1.1 Description

Fire Area ESW-1a is shown on drawing E-023-034. It comprises the entire emergency service water pumphouse, except for the diesel fire pump room located in the northeast corner of the main floor (elevation 586'-6"). This area houses equipment for the ESW system including screen wash pumps, ESW pumps, discharge strainers and associated control equipment.

Walls, floor and ceiling are constructed of reinforced concrete. Walls have 3 hour fire resistance ratings. The doorway to Fire Area ESW-1b is equipped with Class A fire doors. Wall penetrations are sealed. Floor drains are configured with a header on the east side and another on the west side of the floor which carry drainage to the sump. Access to the area is provided from the outside by doors at grade.

The safe shutdown equipment in this fire area consists of:

a. ESW pumps for Divisions 1 and 2, Units 1 and 2

b. Screen wash pumps for Divisions 1 and 2, Units 1 and 2

c. ESW pump discharge strainers for Divisions 1 and 2, Units 1 and 2

d. Screen wash pump discharge strainers for Divisions 1 and 2, Units 1 and 2

e. Motor control centers (MCC) for Divisions 1 and 2, Units 1 and 2

f. Control panels for pumphouse intake screens for Divisions 1 and 2, Units 1 and 2

g. Power and control cables for Divisions 1 and 2, Units 1 and 2

h. Emergency service water pumphouse intake screens for Divisions 1 and 2

i. Emergency service water pumphouse ventilation for Divisions 1 and 2, Units 1 and 2

j. Instrument racks

Fire detection equipment for this area consists of ionization detectors. Manual water type hose stations and fire extinguishers are provided for fire suppression.

4.6.1.2 Analysis

Redundant cable trays are spatially separated by a minimum of 9 feet. Division 2 pumps and equipment for both units, are located in the western portion of the building. Division 1 pumps and equipment are located in the eastern portion. An exception is the Division 1 MCC's for both units, which are located in the center of the building near the south wall and are adequately separated from the redundant Division 2 MCC's and associated equipment located in the northwest part of this fire area.

The combustibles contained within this fire area consist of:

a. Control panels with a Btu content of 3,200,000 Btu

b. Cable insulation (11,240 lbs) with a Btu content of 112,400,000 Btu

c. Motor winding insulation (1,565 lbs) with a Btu content of 15,600,000 Btu

d. MCC (768 lbs) with a Btu content of 7,680,000 Btu

The total Btu content of 138,800,000 Btu is contained in the 5,244 ft^2 floor area. Total fire loading for this fire area is 26,700 Btu/ft^2.

4.6.1.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from damaging cables or equipment associated with both divisions of safe shutdown equipment is achieved. This is accomplished by adequate spatial separation between redundant safe shutdown equipment and low fire loading.

4.6.2 Fire Area ESW-1b

4.6.2.1 Description

Fire Area ESW-1b is shown on drawing E-023-034. It is a room located in the northeast corner of the emergency service water pumphouse at elevation 586'-6". This area houses the diesel driven fire pump, control panel, diesel engine, and diesel fuel oil tank.

Walls, floor and ceiling are constructed of reinforced concrete. Walls have 3 hour fire resistance ratings. The doorways to Fire Area ESW-1a are equipped with Class A fire doors. Floor drains for this area are trapped and trenched to a sump.

There is no safe shutdown equipment contained within this fire area.

Fire detection equipment for this area consists of ionization detectors. An automatic sprinkler system, manual water type hose stations and fire extinguishers are provided for fire suppression.

4.6.2.2 Analysis

Combustibles within this fire area consist of:

a. Diesel fuel oil (300 gallons) with a Btu content of 45,600,000 Btu

b. Control panels with a Btu content of 1,200,000 Btu

c. Cable insulation (200 lbs) with a Btu content of 2,000,000 Btu

d. Battery cases (50 lbs) with a Btu content of 500,000 Btu

The total Btu content of 49,300,000 Btu is contained in a 440 ft^2 floor area. Total fire loading for this fire area is 112,000 Btu/ft^2.

Special consideration was given to the case of a rupture of the 300 gallon diesel fuel oil tank or failure of a connection to the tank. This fire area has trenches to collect any spillage, and thus prohibit an oil leak from flowing across the floor and into Fire Area ESW-1a. Each trench is connected to a 4 inch drain line with a trap. The drain lines are interconnected and empty into the 480 gallon capacity sump in Fire Area ESW-1a.

4.6.2.3 Conclusions

The results of the analysis for this fire area indicate that the objective of preventing a fire from spreading to Fire Area ESW-1a, which contains safe shutdown equipment, is achieved. This is accomplished by barrier design, and by the provision of trenches and drains to collect oil spillage. Also the automatic sprinkler system provides added assurance of containing a fire to this area.

4.7 FUEL HANDLING BUILDING

The fuel handling building is a three story building constructed of reinforced concrete. The building is located between the Unit 1 and 2 reactor buildings and serves as a preparation and storage area for new fuel, and a storage area for spent fuel from the Unit 1 and 2 reactors. This building also houses miscellaneous mechanical and electrical equipment. It is bounded on the north by the Unit 1 reactor building, on the south by the Unit 2 reactor building, on the west by the intermediate building, and has no building interface on the east.

The ventilation system for the fuel handling building consists of one 100 percent capacity supply plenum, two 100 percent capacity supply fans, three 50 percent capacity charcoal filter trains with exhaust fans, and distribution ductwork. The supply plenum and supply fans are located at elevation 599'-0" of the fuel handling building, and the charcoal filter trains and exhaust fans are at elevation 682'-0" of the intermediate building. The supply fan draws outside air through filters and heating coils and supplies it to locations in the fuel handling building such as the operating floor, CRD pump area, and the railway and overhead crane area. This supply air is drawn through the charcoal filter train by the exhaust fans prior to discharge through the unit vent. Air from the fuel pool cooling and cleaning equipment rooms in the intermediate building is also exhausted through these filter trains.

All duct penetrations in the fuel handling building floors, and in the walls that interface with the intermediate building, are provided with 3 hour rated fire dampers with 160? F fusible links.

Ionization smoke detectors are provided in the common discharge ducts of the supply fans and exhaust fans. Upon detection of smoke, these detectors will initiate an alarm in the control room and also light an alarm light on the HVAC panel.

The rattle space provided between the fuel handling and the reactor building constitutes an unprotected opening; therefore, the entire three story fuel handling building is one fire area. This fire area is divided into four fire zones: Fire Zone FH-1 is elevation 574'-10"; Fire Zone FH-2a is elevation 599'-0", north side; Fire Zone FH-2b is elevation 599'-0", south side; Fire Zone FH-3 is at elevation 620'-6".

4.7.1 Fire Zone FH-1

4.7.1.1 Description

Fire Zone FH-1 is shown on drawing E-023-003. It is at elevation 574'-10", comprising the entire first level of the fuel handling building. This zone contains equipment for the control rod drive hydraulic system and the fuel pool cooling and cleanup system. It is bounded on the north by Unit 1 reactor building, on the south by Unit 2 reactor building, on the west by the intermediate building, and has no building interface on the east.

Walls, floor and ceiling of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls and ceiling have 3 hour fire resistance ratings, except for the 3 inch rattle space at the reactor building interface. Penetrations are sealed, except for this rattle space.

There is no safe shutdown equipment located within this fire zone.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.7.1.2 Analysis

Functional redundancy with equipment in other fire zones is not required since there is no safe shutdown equipment in this zone.

Combustibles within this zone consist of the following:

a. Motor winding insulation (600 lbs) with a Btu content of 6,000,000 Btu

b. Pump lubricating oil (120 gallons) with a Btu content of 18,300,000 Btu

c. Cable insulation (1,000 lbs) with a Btu content of 10,000,000 Btu

The total Btu content of 34,300,000 Btu is contained in a 5,142 ft^2 floor area. Total fire loading for this fire zone is 6,670 Btu/ft^2.

4.7.1.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging safe shutdown equipment in other zones is achieved. This is accomplished because of the low fire loading.

4.7.2 <u>Fire Zone FH-2a</u>

4.7.2.1 Description

Fire Zone FH-2a is shown on drawing E-023-008. It is at elevation 599'-0", comprising the north half of the second level of the fuel handling building. This zone contains equipment required for control rod drive maintenance. It is bounded on the north by the Unit 1 reactor building, on the south by Fire Zone FH-3, on the west by the intermediate building, and has no building interface on the east.

Walls, floor and ceiling of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have 3 hour fire resistance ratings, except for the 3 inch rattle space at the Unit 1 reactor building interface. Penetrations are sealed, except for this rattle space.

Safe shutdown equipment in this zone consists of Division 1 power and control cables.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.7.2.2 Analysis

Functional redundancy for the Division 1 cables in this fire zone is provided by redundant Division 2 cables routed through the control complex.

The only combustible material in this fire zone is comprised of 4,350 lbs of cable insulation having a Btu content of 43,500,000 Btu. This material, contained in a 2,359 ft^2 floor area, yields a fire loading of 1,845 Btu/ft^2 for this fire zone.

4.7.2.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging cables or equipment associated with one or more divisions of safe shutdown equipment is achieved. This is accomplished because of the low fire loading and the presence of only one division of cable trays in this zone.

4.7.3 Fire Zone FH-2b

4.7.3.1 Description

Fire Zone FH-2b is shown on drawing E-023-008. It is at elevation 599'-0", comprising the south half of the second level of the fuel handling building. This zone contains equipment required for refueling activities. It is bounded on the south by the Unit 2 reactor building, on the north by Fire Zone FH-3, on the west by the intermediate building, and has no building interface on the east.

Walls, floor and ceiling of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. Walls, floor and ceiling have 3 hour fire resistance ratings, except for the 3 inch rattle space at the Unit 2 reactor building interface. Penetrations are sealed, except for this rattle space.

There is no safe shutdown equipment located in this fire zone.

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.7.3.2 Analysis

Functional redundancy with equipment in other fire zones is not required since there is no safe shutdown equipment in this zone.

The only combustible material in this fire zone is comprised of 547 lbs of cable insulation having a Btu content of 5,470,000 Btu. This material, contained in a 2,359 ft^2 floor area, yields a fire loading of 2,320 Btu/ft^2 for this fire zone.

4.7.3.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging safe shutdown equipment in other zones is achieved. This is accomplished because of the low fire loading.

4.7.4 Fire Zone FH-3

4.7.4.1 Description

Fire Zone FH-3 is shown on drawing E-023-012. It is at elevation 620'-6", comprising the entire third floor of the fuel handling building. This zone contains equipment required for refueling activities. It is bounded on the north by the Unit 1 reactor building, on the south by the Unit 2 reactor building, on the west by the intermediate building, and has no building interface on the east.

Walls, floor and ceiling (roof) of this fire zone are constructed of reinforced concrete. Doorways are equipped with Class A fire doors. The walls, floor and ceiling have 3 hour fire resistance ratings, except for the 3 inch rattle space at the reactor building interface. Wall and ceiling penetrations are sealed, except for this rattle space.

The safe shutdown equipment in this zone consists of:

a. Power and control cables, Division 1, Units 1 and 2

b. Instrument air system air receiver tank

Fire suppression equipment for this zone consists of manual water type hose stations and fire extinguishers.

4.7.4.2 Analysis

Functional redundancy for the Division 1 cables in this fire zone is provided by redundant Division 2 cables routed through the control complex. Functional redundancy for the air accumulator tank is provided by an identical accumulator tank located in Fire Zone IB-2.

Combustibles within this zone consist of the following:

a. Cable insulation (6,100 lbs) with a Btu content of 61,000,000 Btu

b. Fuel handling crane motor winding insulation (45 lbs) with a Btu content of 450,000 Btu

c. Panel combustibles (1,040 lbs) with a Btu content of 10,400,000 Btu

The total Btu content of 71,850,000 Btu is contained in the 15,014 ft^2 floor area. Total fire loading for this fire zone is 4,800 Btu/ft^2.

4.7.4.3 Conclusions

The results of the analysis for this fire zone indicate that the objective of preventing a fire from damaging cables or equipment associated with one or more divisions of safe shutdown equipment is achieved. This is accomplished because of the low fire loading and the presence of only one division of cable trays in this zone.

4.8 STEAM TUNNEL

The steam tunnel is a structure located between elevations 614'-6" and 620'-6" that houses main steam, feedwater and other major pipes extending from the reactor building. Separate tunnels are located on the Unit 1 and 2 sides of the plant and extend in the north-south direction (0? azimuth) from the reactor building through the auxiliary building at elevation 620'-6", connect to the east end of the turbine power complex, and continue to the turbine building. The portion of this structure from the reactor building to the end of the auxiliary building is safety related. The steam tunnel also serves to maintain radiological shielding around the main steam lines.

For purposes of this fire hazards analysis, the steam tunnel is considered one fire area.

4.8.1 Description

The steam tunnel is shown on drawings E-023-010 and E-023-013 for Units 1 and 2, respectively. Walls, floor and ceiling are constructed of reinforced concrete. Access to the steam tunnel is through hatches at elevation 652'-0" from the auxiliary building or from the turbine building.

The ventilation air for the steam tunnel is supplied by two 100 percent capacity supply fans that provide cooled air to the area. The supply fans draw ambient air from the south half of the auxiliary building at elevation 620'-6" through filters and cooling coils and distributes it to the steam tunnel area. This supply air is partially exhausted by the auxiliary building exhaust fans and partially relieved to the turbine building. The duct penetrations on the steam tunnel walls have 3 hour rated fire dampers with 160?F fusible links.

Safe shutdown equipment within the steam tunnel consists of:

a. Main steam line isolation valves

b. RHR shutdow valve

c. RCIC valve

4.8.2 Analysis

Functional redundancy for the containment isolation valves located in the steam tunnel is provided by isolation valves inside containment that are powered by a separate division. The ADS valves provide a redundant means of transferring the reactor vessel water to the RHR system should the RHR shutdown suction valve become inoperative.

Combustibles within the steam tunnel are insignificant, hence, the fire loading is negligible.

4.8.3 Conclusions

The objective of preventing a fire in the steam tunnel from affecting safe shutdown equipment in this structure or spreading to adjacent buildings contai..ing safe shutdown equipment is achieved. This is accomplished by absence of combustible material and barrier design.

Only one of the two larger tanks for each unit is required for safe shutdown; the smaller tank is not required for safe shutdown.

Fire suppression equipment located in this region of the yard area consists of fire hydrants (supplied from the fire service water system) and hydrant houses with the necessary equipment (hose, nozzles, etc.) for fire fighting operations.

4.9.1.2 Analysis

The two 89,900 gallon tanks for each unit are functionally redundant since each tank supplies one diesel generator. Vent pipes from the tanks are equipped with flame arrestors.

4.9.1.3 Conclusions

The objective of preventing a fire in this region of the yard area from spreading to buildings or locations containing safe shutdown equipment is achieved. This is accomplished because of the underground location and spatial separation of the tanks.

4.9.2 <u>Condensate Storage Tanks, Units 1 and 2</u>

4.9.2.1 Description

The condensate storage tanks are located approximately 340 feet north and south, respectively, of the Unit 1 and 2 reactor buildings. These tanks provide a source of supply water for the reactor core isolation cooling (RCIC) system, which is used during safe shutdown of the reactor when normal feedwater is not available.

Fire suppression equipment located in this region of the yard area consists of fire hydrants (supplied from the fire service water system) and hydrant houses with the necessary equipment (hose, nozzles, etc.) for fire fighting operations.

4.9.2.2 Analysis

The condensate storage tank are located within a Seismic Category I concrete structure designed to accommodate the total liquid capacity of the condensate storage tank with at least one foot freeboard. This concrete structure also serves as a fire barrier should a fire occur in the adjacent buildings.

4.9.2.3 Conclusions

The objective for this portion of the yard area is to prevent damage to a condensate storage tank as a result of a fire in nearby equipment or buildings. This is achieved since the tanks are protected with surrounding fire barriers.

4.9.3 Auxiliary Boiler Fuel Oil Storage Tank

4.9.3.1 Description

The auxiliary boiler fuel oil storage tank is located approximately 240 feet east of the Unit 1 auxiliary boiler and turbine buildings. It is above ground and is surrounded by a dike to contain potential spillage.

Fire suppression equipment located in this region of the yard area consists of a fire hydrant (with a hydrant house and fire fighting equipment) supplied by the fire service water system. The oil storage tank is equipped with a fixed foam suppression system. Foam hose stations are also provided for spills within the dike and for the oil tank unloading area.

4.9.3.2 Analysis

Functional redundancy is not a consideration since this tank is not required for safe shutdown. A separation of 350 feet exists between this tank and buildings containing safe shutdown equipment.

4.9.3.3 Conclusions

The objective of preventing a fire in this region of the yard area from spreading to buildings or locations containing safe shutdown equipment is achieved. This is accomplished by providing a dike to surround the tank, the remote location of the tank, and availability of fire suppression equipment.

4.9.4 Hydrogen Storage Tanks, Units 1 and 2

4.9.4.1 Description

The hydrogen storage tanks are located approximately 45 feet north, and 100 feet south of the Unit 1 and 2 heater bays, respectively.

Fire suppression equipment located in this region of the yard area consists of fire hydrants (supplied from the fire service water system) and hydrant houses with the necessary equipment (hose, nozzles, etc.) for fire fighting operations.

4.9.4.2 Analysis

Spatial separation between the hydrogen storage tanks and buildings that contain safe shutdown equipment is adequate. Also, these tanks are oriented to minimize the probability of missiles striking a building should a tank explosion occur.

4.9.4.3 Conclusions

The objective of preventing a fire in this region of the yard area from spreading to buildings or locations containing safe shutdown equipment is achieved. This is accomplished by adequate spatial separation between the hydrogen storage tanks and buildings containing safe shutdown equipment.

4.9.5 Transformers

4.9.5.1 Description

The Unit 1 startup transformer, unit auxiliary transformer, and main transformer (which consists of three single phase transformers), are located in the Unit 1 portion of the yard area just north of the turbine building and west of the heater bay and hydrogen storage tanks. Three Unit 1 interbus transformers are located along the outside of the south wall of the Unit 1 turbine power complex.

The Unit 2 unit auxiliary transformer and main transformer (which consists of three single phase transformers), are located in the portion of the yard area just south of the Unit 2 turbine building and west of the heater bay. The Unit 2 startup transformer is located just outside of the west wall of the Unit 2 turbine building. Three Unit 2 interbus transformers are located along the outside of the north wall of the Unit 2 turbine power complex. A spare main transformer is located adjacent to the south wall of the Unit 2 turbine building.

Fire suppression for each of these transformers consists of a deluge water spray system, activated manually or automatically by a signal from the heat detectors located at each transformer. In addition, since the spare main transformer is located such that portions of the turbine building wall with fire rating of less than two hours is located within 50 feet of the transformer, these portions are also protected by a deluge water spray system.

4.9.5.2 Analysis

These transformers are not required for safe shutdown operations since electrical power can be supplied by the emergency diesel generators. Fire barriers are provided between phases of the main transformer and on the east and west sides of the unit auxiliary transformer. Each transformer is surrounded by a curb to contain any oil leakage. Interbus transformers are separated from each other by fire barriers and are surrounded by a curb to contain any oil leakage. All building walls located within 50 feet of any of these transformers has a minimum fire resistance rating of 2 hours.

4.9.5.3 Conclusions

The objective of preventing a fire in this region of the yard area from spreading to buildings or locations containing safe shutdown equipment is achieved. This is accomplished because of the separation provided by the fire barriers, the absence of safe shutdown equipment in this area, and the automatic fire suppression systems.

4.10 WATER TREATING BUILDING

The water treating building is a two story structure. The building is ˙ cated on the Unit 1 side of the plant. It is bounded by the turbine building on the east; the north, south and west walls are exposed.

The water treating building houses process equipment required to covert raw water into the various grades of water used in the plant.

For the purpose of this fire hazards analysis, this entire two story building is considered a fire area.

4.10.1 Description

The water treating building is shown on drawing E-023-001. The east wall, shared with the turbine building, is constructed of drywall and has a 3 hour fire resistance rating. The north, south, and west walls are exterior walls constructed of metal siding. The roof is of steel frame and metal deck construction with roofing that meets Factory Mutual (FM) Class I requirements. Doorways in the west and south walls are equipped with Class A fire doors. Other penetrations in these walls are sealed to provide a 3 hour fire resistance rating.

The ventilation system for the water treating building consist of roof exhausters, intake louvers and a supply fan that provides ambient air to the laboratory enclosure. No fire dampers are provided in this system.

No safe shutdown equipment is located in the water treating building.

Fire suppression equipment for this building consists of portable fire extinguishers and water type hose stations inside the building.

4.10.2 Analysis

No safe shutdown equipment is located in the water treating building. Also, the building fire loading is low.

4.10.3 Conclusions

The objective for this fire area is to prevent fire within the water treating building from endangering the ability to safely shut down the plant. This objective is achieved since this building has a low fire loading and is remote from safe shutdown equipment in other buildings.

4.11 TURBINE POWER COMPLEX

The turbine power complex is a four story structure. Separate buildings are located on the Unit 1 and 2 sides of the plant. The Urit 1 turbine power complex is bounded by the turbine building on the north, the steam tunnel on the east, and the off-gas building on the west; the south wall is partially bounded by the auxiliary building with the remainder of the wall exposed. The Unit 2 turbine power complex is bounded by the turbine building on the south, the steam tunnel on the east, and the off-gas building on the west; the north wall is partially bounded by the auxiliary building with the remainder of the wall exposed.

This building contains equipment for the condensate demineralizer system, condensate filtration system, motor control centers, DC distribution equipment, and metal clad switchgear.

For purposes of this fire hazards analysis, the entire turbine power complex is considered a fire area.

4.11.1 Description

The turbine power complex is shown on drawing E-023-001. Exterior walls are constructed of metal siding. Walls adjacent to other buildings are of reinforced concrete or drywall construction. These walls have 3 hour fire resistance ratings. Doorways to adjacent structures are equipped with Class A fire doors. Floors are constructed of reinforced concrete. The roof is of metal deck construction with roofing that meets FM Class I requirements.

The ventilation system for the turbine power complex consists of supply plenums and supply fans supplying cooled or heated outdoor air to various areas. This supply air is directed to the atmosphere through relief louvers. All duct penetrations through the walls and floor have 3 hour rated fire dampers with 160? F fusible links.

There is no safe shutdown equipment located in the turbine power complex.

Fire detection equipment for this building consists of ionization detectors for the 125 volt DC equipment area (elevation 620'-6") and switchgear and MCC area (elevation 647'-6"). Fire suppression equipment consists of manual carbon dioxide hose reels for the electrical equipment (elevations 620'-6" and 647'-6"), and water type hose reels throughout the remainder of the turbine power complex.

4.11.2 Analysis

The major combustible in the turbine power complex is cable insulation. Conservatively, this amount of combustible material would require the protection of 2 hour rated fire walls as adequate barriers between the turbine power complex and adjacent buildings.

4.11.3 Conclusions

The objective of preventing a fire in the turbine power complex from spreading to an adjacent building containing safe shutdown equipment is achieved. This is accomplished by the designed 3 hour rated fire walls when 2 hour rated fire walls would be sufficient.

4.12 HEATER BAY

The heater bay is a four story structure. Separate buildings are located on the Unit 1 and 2 sides of the plant. The Unit 1 heater bay is bounded by the turbine building on the south, with the north and west walls exposed; the majority of the east wall is bounded by the auxiliary boiler building with the remainder of the wall exposed. The Unit 2 heater bay is bounded by the turbine building on the north, with the east, south and west walls exposed.

This building contains heaters associated with the condensate, feedwater and building heating systems. For purposes of this fire hazards analysis, the entire heater bay is considered a fire area.

4.12.1 Description

The heater bay is shown on drawing E-023-001. Walls are constructed of reinforced concrete, except for metal siding on the north and south walls of the Unit 1 and Unit 2 buildings, respectively. Doorways to adjacent buildings are equipped with Class A fire doors. Walls have 3 hour fire resistance ratings with all penetrations sealed. Floors are constructed of reinforced concrete.

The ventilation system for the heater bay consists of supply fans blowing heated outdoor air to various areas. This supply air is exhausted to the atmosphere through the exhaust fans. The duct penetrations through the fire rated partition enclosing the lubricating oil purifier have 3 hour rated fire dampers with 160°F fusible links.

There is no safe shutdown equipment located in the heater bays.

Fire suppression equipment for this building consists of a preaction water spray system for the feedwater pump-turbine lubricating oil area. Manual water type hose stations and fire extinguishers are also provided.

4.12.2 Analysis

Combustibles within the heater bay include cable insulation, motor winding insulation and lubricating oil. The amount of combustible material would conservatively require the protection of 1 hour rated fire walls to prevent the spread of a fire to adjacent buildings. However, the adjacent buildings contain no safe shutdown equipment.

4.12.3 Conclusions

The objective of preventing a fire in the heater bay from affecting safe plant shutdown is achieved. This is accomplished by the designed 3 hour rated exterior fire walls and the absence of safe shutdown equipment in this building and the adjacent buildings.

4.13 OFF-GAS BUILDING

The off-gas builidng is a four story structure. Separate buildings are located on the Unit 1 and 2 sides of the plant. The Unit 1 off-gas building is bounded by the turbine building on the north and the turbine power complex on the east; the south and west walls are exposed. The Unit 2 off-gas building is bounded by the turbine building on the south and the turbine power complex on the east; the north and west walls are exposed.

This building contains equipment used in the filtering and absorption of radioactive, non-condensible gases from the main and auxiliary condensers.

For purposes of this fire hazards analysis, the entire off-gas building is considered a fire area.

4.13.1 Description

The off-gas building is shown on drawing E-023-001. Walls, floor and ceiling are constructed of reinforced concrete. Doorways to adjacent buildings are equipped with Class A fire doors. Walls have 3 hour fire resistance ratings with all penetrations sealed.

The ventilation system for the off-gas building consists of supply plenums and supply fans blowing cooled outdoor air to various areas. This supply air is discharged to the atmosphere by the exhaust fans. All duct penetrations through floors and walls have 3 hour rated fire dampers with 160° F fusible links.

There is no safe shutdown equipment located in the off-gas building.

Fire suppression equipment for this building consists of a manually actuated deluge type water spray system for charcoal filters, water type hose stations and fire extinguishers.

4.13.2 Analysis

Combustibles in the off-gas building include charcoal and hydrogen ga:. Special consideration was given to the charcoal filters and to a possible explosive hydrogen mixture, as hazards in this building. The charcoal filters are provided wit'. heat sensors that initiate signals in the control room so that the deluge system can be manually actuated. The components and piping for the off-gas system up to the recombiners are designed to withstand a hydrogen explosion. The ventilation system supplies sufficient circulation of room air so that any hydrogen leakage will be limited to levels below 4 percent by volume hydrogen concentration.

4.13.3 Conclusions

The objective of preventing a fire in the off-gas building from affecting safe plant shutdown is achieved. This is accomplished by the absense of safe shutdown equipment in this building and adjacent buildings, and a manually actuated deluge system in the charcoal filters.

4.14 RADWASTE BUILDING

The radwaste building is a four story structure. It is located on the Unit 1 side of the plant and is bounded by the diesel generator building and control complex on the south, and the auxiliary and intermediate buildings on the east. The north and west walls are exposed.

The radwaste building houses equipment used in the storage and processing of liquid and solid radioactive waste.

For purposes of this fire hazards analysis, the entire radwaste building is considered a fire area.

4.14.1 Description

The radwaste building is shown on drawing E-023-001. Walls, floor and ceiling are constructed of reinforced concrete. Doorways to adjacent buildings are equipped with Class A fire doors. Walls have 3 hour fire resistance ratings with all penetrations sealed.

The ventilation system for this building consists of a supply plenum and two 100 percent capacity fans supplying heated outdoor air to various areas. This supply air is exhausted through a charcoal filter train and is then discharged to the atmosphere by one of the two 100 percent capacity exhaust fans. All duct penetrations through walls and floors have 3 hour rated fire dampers with 160?F fusible links.

There is no safe shutdown equipment located in the radwaste building.

Fire detection equipment for this building consists of ionization detectors for the radwaste control room. Fire suppression equipment comprises an automatic water sprinkler system for radwaste storage, manual water type hose stations, fire extinguishers, and a manually actuated deluge type water spray system for the charcoal filters.

4.14.2 Analysis

The major combustibles within the radwaste building are due to chemical storage, radwaste storage, cable and charcoal. A conservative estimate of these combustibles results in a low fire loading for the entire building.

Special consideration was given to equipment in the radwaste building containing high levels of radioactivity. This material is normally contained in tanks, piping and drains. If a fire occurred in this building, limited radioactivity would be released and would be collected by the drain system or charcoal exhaust system. It has been determined that the radioactive release due to this postulated fire in the radwaste building would be less than the releases analyzed in Sections 15.7.2 and 15.7.3 of the PNPP Final Safety Analysis Report (FSAR).

4.14.3 Conclusions

The objective of preventing a fire in the radwaste building from spreading to an adjacent building containing safe shutdown equipment is achieved. This is accomplished by the designed 3 hour rated fire barriers, an automatic sprinkler system in the radwaste storage area, and a deluge system for charcoal filters.

4.15 SERVICE WATER PUMPHOUSE

The service water pumphouse is a one story building located at the north end of the Unit 1 side of the plant. It is an isolated structure containing pumps and equipment for the non-safety class service water system.

For purposes of this analysis, the entire building is considered a fire area.

4.15.1 Description

The service water pumphouse is shown on drawing E-023-001. Walls are constructed of steel frame and metal siding. The floor is constructed of reinforced concrete and the roof is of steel frame and metal deck construction with roofing that meets FM Class 1 requirements.

The ventilation system for the service water pumphouse consists of supply fans blowing outdoor air into the building. This supply air is discharged to the atmosphere through wall relief louvers. There are no fire dampers associated with this system.

There is no safe shutdown equipment located in the service water pumphouse.

Fire suppression equipment for this building consists of manual water type hose stations and fire extinguishers.

4.15.2 Analysis

The combustibles in this building consist of cable insulation and motor winding insulation.

4.15.3 Conclusions

The objective of preventing a fire in the service water pumphouse from affecting safe plant shutdown is achieved. This is accomplished since this building contains no safe shutdown equipment and is remotely located relative to buildings that contain safe shutdown equipment.

4.16 TURBINE BUILDING

The turbine building is a five story structure. Separate buildings are located on the Unit 1 and 2 sides of the plant. The Unit 1 turbine building is bounded by the water treating building on the west, the off-gas building, turbine power complex and steam tunnel along the majority of the south wall, and is partially bounded by the heater bay and auxiliary boiler building on the north. The remainder of the north and south walls, and the east wall, are exposed. The Unit 2 turbine building is bounded by the off-gas building, turbine power complex and steam tunnel along the majority of the north wall, and is partially bounded by the heater bay on the south. The remainder of the north and south walls, and the east a t walls, are exposed.

The turbine building houses the turbine generator and related auxiliaries. These include the exciter, condensers, lubricating oil storage and handling equipment, and the hydrogen seal oil system.

For the purpose of this fire hazards analysis, this entire five story building is considered a fire area.

4.16.1 Description

The turbine building is shown on drawing E-023-001. Walls separating the turbine building from other buildings are constructed of either reinforced concrete or drywall and are 3 hour fire resistance rated. Floors are of reinforced concrete with numerous penetrations and metal gratings where equipment extends through floors. The roof is of steel frame and metal deck construction with roofing that meets FM Class 1 requirements. Doorways in boundary walls between the turbine building and other buildings are equipped with Class A fire doors. Other penetrations in these boundary walls are sealed to provide a 3 hour fire resistance rating.

The ventilation system serving the turbine building consists of supply fans blowing cooled outdoor air to various areas. This supply air is discharged to the atmosphere through the exhaust fans. All duct penetrations through boundary walls between the turbine building and other buildings have 3 hour rated fire dampers with 160?F fusible links.

No safe shutdown equipment is located in the turbine building.

Fire suppression systems located within the turbine building consists of the following:

a. An automatic preaction water spray system for the hydrogen seal oil unit.

b. An automatic preaction water spray system for the turbine generator bearing and piping above the operating floor.

c. An automatic wet pipe sprinkler system for areas below the operating floor.

d. Automatic total flooding CO_2 systems for the turbine lube oil tank room and the turbine lube oil purifier room.

Additional fire suppression equipment for manual fire fighting consists of water type hose stations and portable fire extinguishers.

4.16.2 Analysis

Combustibles within the turbine building are typical for a turbine generator complex. The major fire hazard is comprised of the large quantity of oil required for turbine bearing lubrication and cooling, and oil for the generator hydrogen seals.

4.16.3 Conclusions

The objective of preventing a fire in the turbine building from affecting safe plant shutdown is achieved. This is accomplished by the 3 hour fire resistance rating of the walls separating adjacent buildings from the turbine building, low fire loading in building areas, and the fire suppression equipment provided in the turbine building.

4.17 AUXILIARY BOILER BUILDING

The auxiliary boiler building is a one story structure. The building is located at the north end on the Unit 1 side of the plant. It is bounded on the south by the turbine building and on the west by the heater bay; the north and east walls are exposed.

The auxiliary building houses the auxiliary boiler, piping, and other equipment associated with the auxiliary boiler system.

For purposes of this fire hazards analysis, the entire building is considered a fire area.

4.17.1 Description

The auxiliary boiler building is shown on drawing E-023-001. The south and west walls separate the auxiliary boiler building from adjacent buildings and are constructed of reinforced concrete. The north and east walls are exposed to the outside and are constructed of metal siding. Walls to adjacent buildings have 3 hour fire resistance ratings. Doorways to adjacent buildings are equipped with Class A fire doors. Wall penetrations are sealed. The floor is constructed of reinforced concrete and the roof is of steel frame and metal deck construction with roofing that meets FM Class I requirements.

The ventilation system for the auxiliary boiler building consists of intake louvers and roof exhausters. There are no fire dampers in this system.

No safe shutdown equipment is located in the auxiliary boiler building.

Fire suppression systems located within the auxiliary boiler building consist of an automatic sprinkler system which provides coverage to the entire area, manual type water hose stations, and fire extinguishers.

4.17.2 Analysis

Combustibles within the auxiliary boiler building consist of fuel oil and cable insulation. The fuel oil is considered a hazard but will not jeopardize safe shutdown equipment.

4.17.3 Conclusions

The objective of preventing a fire in the auxiliary boiler building from spreading to adjacent buildings containing safe shutdown equipment is achieved. This is accomplished by building remoteness relative to safe shutdown equipment, barrier design and an automatic sprinkler system.

4.18 SERVICE BUILDING

The service building is a three story structure. It is located on the Unit 2 side of the plant. It is bounded by the diesel generator building and control complex on the north, with the east, south and west walls exposed.

The service building contains offices, administrative facilities and shops for the plant, and the security office.

For the purpose of this fire hazards analysis, this entire three story building is considered a fire area.

4.18.1 Description

The service building is shown on drawing E-023-001. The north wall is constructed of reinforced concrete and constitutes a 3 hour rated fire barrier. The east, south and west walls are exterior walls constructed of metal siding. The roof is of steel frame and metal deck construction with roofing that meets FM Class I requirements. Doorways in the north wall are equipped with Class A fire doors. Penetrations in the north wall are sealed to provide a 3 hour fire resistance rating.

The ventilation of the service building is accomplished by rooftop air handling units recirculating cooled air to various offices, ventilating fans blowing outside air to the storage areas, and wall ventilators in the machine shop. All duct penetrations through rated walls are provided with fire dampers with a rating consistent with the fire ratings of the walls.

No safe shutdown equipment is located in the service building. Safe shutdown equipment is located in the diesel generator building and control complex which are adjacent structures.

Fire suppression equipment for this service building consists of an automatic, wet pipe sprinkler system which provides coverage to the entire area. Portable fire extinguishers are also provided.

4.18.2 Analysis

No safe shutdown equipment is jeopardized by a fire in the service building. This building is separated from adjacent buildings containing safe shutdown equipment by 3 hour rated fire barriers.

4.18.3 Conclusions

The objective for the service building is to prevent fire in this building from jeopardizing the ability to safely shut down the plant. This objective is achieved since the service building is adequately separated from safe shutdown equipment in adjacent buildings that have 3 hour fire rated walls. The service building is also provided with an automatic, full coverage fire suppression system.

5.0 POINT-BY-POINT COMPARISON

This section contains a point-by-point comparison with NRC Branch Technical Position APCSB 9.5-1 Appendix A.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
Positions	
A. Overall Requirements of Nuclear Plant Fire Protection Program	
1. Personnel	
Responsibility for the overall fire protection program should be assigned to a designated person in the upper level of management. This person should retain ultimate responsibility even though formulation and assurance of program implementation is delegated. Such delegation of authority should be to staff personnel prepared by training and experience in fire protection and nuclear plant safety to provide a balanced approach in directing the fire protection programs for nuclear power plants. The qualification requirements for the fire protection engineer or consultant who will assist in the design and selection of equipment, inspect and test the completed physical aspects of the system, develop the fire protection program, and assist in the fire-fighting training for the operating plant should be stated. Subsequently, the FSAR should discuss the training and the updating provisions such as fire drills provided for maintaining the competence of the station fire-fighting and operating crew, including personnel responsible for maintaining and inspecting the fire protection equipment.	The Plant Manager is responsible for the overall fire protection program and retains ultimate responsiblity for program implementation. He will delegate authority to formulate the program to the plant fire protection staff, which will consist of key plant personnel prepared by training in fire protection and nuclear plant safety. The fire protection staff will be responsible for providing a balanced approach in directing the fire protection program. Responsibility for the design of fire protection facilities is assigned to the Manager, Nuclear Engineering Department who is assisted by the Nuclear Engineering staff and by the consulting engineers, Gilbert Associates, Inc. The fire protection engineers at Gilbert Associates, Inc. either hold or are qualified to hold full membership in the Society of Fire Protection Engineers and are licensed as Professional Engineers (Fire Protection) by the Commonwealth of Pennsylvania. The FSAR will discuss training for maintaining the competence of the station fire fighting and operating crew, including personnel responsible for maintaining and inspecting the fire protection equipment.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
The fire protection staff should be responsible for:	
(a) coordination of building layout and systems design with fire area requirements, including consideration of potential hazards associated with postulated design basis fires,	Responsibility for coordination of building layout and systems design with fire area requirements is assigned to the Manager, Nuclear Engineering Department and is assisted by Gilbert Associates, Inc.
(b) design and maintenance of fire detection, suppression, and extinguishing systems,	The plant fire protection staff is responsible for maintenance of fire detection, suppression and extinguishing systems.
(c) fire prevention activities,	The plant fire protection staff is responsible for fire prevention activities.
(d) training and manual fire-fighting activities of plant personnel and the fire brigade.	The plant fire protection staff is responsible for training and manual fire-fighting activities of plant personnel and the fire brigade. NFPA 6-1974 will be used as a guide for organization and operation of the fire loss prevention program.
(NOTE: NFPA 6 - Recommendations for Organization of Industrial Fire Loss Prevention, contains useful guidance for organization and operation of the entire fire loss prevention program.)	
2. Design Bases	
The overall fire protection program should be based upon evaluation of potential fire hazards throughout the plant and the effect of postulated design basis fires relative to maintaining ability to perform safety shutdown functions and minimize radioactive releases to the environment.	Section 4.0 of this report (Fire Hazards Analysis) provides this evaluation. Likewise, plant emergency procedures are based on maintaining the plant in a safe condition.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
3. Backup	
Total reliance should not be placed on a single automatic fire suppression system. Appropriate backup fire suppression capability should be provided.	In areas where automatic suppression systems are provided, adequate manual suppression equipment including fire hose stations and/or portable fire extinguishers are available.
4. Single Failure Criterion	
A single failure in the fire suppression system should not impair both the primary and backup fire suppression capability. For example, redundant fire water pumps with independent power supplies and controls should be provided. Postulated fires or fire protection system failures need not be considered concurrent with other plant accidents or the most severe natural phenomena. However, in the event of the most severe earthquake, i.e., the Safe Shutdown Earthquake (SSE), the fire suppression system should be capable of delivering water to manual hose stations located within hose reach of areas containing equipment required for safe plant shutdown. The fire protection systems should, however, retain their original design capability for (1) natural phenomena of less severity and greater frequency (approximately once in 10 years) such as tornadoes, hurricanes, floods, ice storms, or small intensity earthquakes which are characteristic of the site geographic region and (2) for potential man-created site related events such as oil barge collisions, aircraft crashes which have a reasonable probability of occurring at a specific plant site. The effects of lightning strikes should be included in the overall plant fire protection program.	The fire suppression systems satisfy the single failure criteria and are described in the fire hazard analysis. The present fire protection water supply is assumed to fail as a result of a SSE. Provisions are made for the emergency service water (ESW) system to supply hose stations in areas containing equipment required for safe plant shutdown independent of the fire protection system. The fire protection system is designed and installed in accordance with applicable NFPA standards. However, the piping that supplies the water from the ESW system to hose stations in areas with equipment required for safe plant shutdown is designed in accordance with B31.1 and is seismically supported to withstand the safe shutdown earthquake. The effects of lightning strikes have been considered in the design of the plant and lightning protection has been provided.

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5. Fire Suppression Systems	
Failure or inadvertent operation of the fire suppression system should not incapacitate safety related systems or components. Fire suppression systems that are pressurized during normal plant operation should meet the guidelines specified in APCSB Branch Technical Position 3-1, "Protection Against Postulated Piping Failures in Fluid Systems Outside Containment."	Failure or inadvertent operation of the fire suppression system will not incapacitate safety related systems or components. Fire suppression systems that are pressurized during normal operation meet the guidelines specified in APCSB Branch Technical Position 3-1.
6. Fuel Storage Areas	
The fire protection program (plans, personnel and equipment) for buildings storing new reactor fuel and for adjacent fire zones which could affect the fuel storage zone should be fully operational before fuel is received at the site.	Manual suppression equipment, such as hose stations or portable extinguishers, installed in the fuel handling building will be operational. Interim fire protection plant fire brigades, etc., will be established before fuel is received at the site.
7. Fuel Loading	
The fire protection program for an entire reactor unit should be fully operational prior to initial fuel loading in that reactor unit.	The fire protection program for the reactor unit will be completed and operational prior to initial fuel loading.
8. Multiple-Reactor Sites	
On multiple-reactor sites where there are operating reactors and construction of remaining units is being completed, the fire protection program should provide continuing evaluation and include additional fire barriers, fire protection capability, and administrative controls necessary to protect the operating units from construction fire hazards. The superintendent of the operating plant should have the lead responsibility for site fire protection.	When PNPP Unit 1 is operating and Unit 2 is under construction, the two units will be separated by a security fence, except for the common connection between the fuel handling and intermediate buildings and the common control complex. The common connection between the buildings is sealed off by a security barrier. Access will be limited by security personnel preventing Unit 2 construction personnel from entering Unit 1.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
	The spatial separation, in conjunction with 3 hour fire barriers between structures housing safety related equipment, precludes the need for any additional fire protection evaluation for potential construction fire hazards. The Plant Manager will have the lead responsibility for fire protection after Unit 1 is operational.
9. Simultaneous Fires Simultaneous fires in more than one reactor need not be postulated, where separation requirements are met. A fire involving more than one reactor unit need not be postulated except for facilities shared between units.	Required postulated fires have been considered in the fire hazards analysis, Section 4.0.
B. Administrative Procedures, Controls and Fire Brigade	
1. Administrative procedures consistent with the need for maintaining the performance of the fire protection system and personnel in nuclear power plants should be provided. Guidance is contained in the following publications: NFPA 4 - Organization for Fire Services NFPA 4A - Organization for Fire Department NFPA 6 - Industrial Fire Loss Prevention NFPA 7 - Management of Fire Emergencies NFPA 8 - Management Responsibility for Effects of Fire on Operations NFPA 27 - Private Fire Brigades	The administrative procedures will be implemented.

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2. Effective administrative measures should be implemented to prohibit bulk storage of combustible materials inside or adjacent to safety related buildings or systems during operation or maintenance periods. Regulatory Guide 1.39, "Housekeeping Requirements for Water-Cooled Nuclear Power Plants", provides guidance on housekeeping, including the disposal of combustible materials.	The administrative measures will be implemented.
3. Normal and abnormal conditions or other anticipated operations such as modifications (e.g., breaking fire stops, impairment of fire detection and suppression systems) and refueling activities should be reviewed by appropriate levels of management and appropriate special actions and procedures such as fire watches or temporary fire barriers implemented to assure adequate fire protection and reactor safety. In particular:	CEI will comply.
(a) Work involving ignition sources such as welding and flame cutting should be done under closely controlled conditions. Procedures governing such work should be reviewed and approved by persons trained and experienced in fire protection. Persons performing and directly assisting in such work should be trained and equipped to prevent and combat fires. If this is not possible, a person qualified in fire protection should directly monitor the work and function as a fire watch.	CEI will comply.
(b) Leak testing, and similar procedures such as air flow determination, should use one of the commercially available aerosol techniques. Open flames or combustion generated smoke should not be permitted.	CEI will comply with the exception that other leak detectors of a non-fire hazard type may be used.

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(c) Use of combustible material, e.g., HEPA and charcoal filters, dry ion exchange resins or other combustible supplies, in safety related areas should be controlled. Use of wood inside buildings containing safety related systems or equipment should be permitted only when suitable non-combustible subsiitutes are not available. If wood must be used, only fire retardant treated wood (scaffolding, lay down blocks) should be permitted. Such materials should be allowed into safety related areas only when they are to be used immediately. Their possible and probable use should be considered in the fire hazard analysis to determine the adequacy of the installed fire protection systems.	CEI will comply.
4. Nuclear power plants are frequently located in remote areas, at some distance from public fire departments. Also, first response fire departments are often volunteer. Public fire department response should be considered in the overall fire protection program. However, the plant should be designed to be self-sufficient with respect to fire fighting activities and rely on the public response only for supplemental or backup capability.	CEI will comply.
5. The need for good organization, training and equipping of fire brigades at nuclear power plant sites requires effective measures be implemented to assure proper discharge of these functions. The guidance in Regulatory Guide 1.101, "Emergency Planning for Nuclear Power Plants", should be followed as applicable.	CEI will comply.

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(a) Successful fire fighting requires testing and maintenance of the fire protection equipment, emergency lighting and communication, as well as practice as brigades for the people who must utilize the equipment. A test plan that lists the individuals and their responsibilities in connection with routine tests and inspections of the fire detection and protection systems should be developed. The test plan should contain the types, frequency and detailed procedures for testing. Procedures should also contain instructions on maintaining fire protection during those periods when the fire protection system is impaired or during periods of plant maintenance, e.g., fire watches or temporary hose connections to water systems.	CEI will comply.
(b) Basic training is a necessary element in effective fire fighting operation. In order for a fire brigade to operate effectively, it must operate as a team. All members must know what their individual duties are. They must be familiar with the layout of the plant and equipment location and operation in order to permit effective fire-fighting operations during times when a particular area is filled with smoke or is insufficiently lighted. Such training can only be accomplished by conducting drills several times a year (at least quarterly) so that all members of the fire brigade have had the opportunity to train as a team, testing itself in the major areas of the plant. The drills should include the simulated use of equipment in each area and should be preplanned	CEI will comply.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
and post-critiqued to establish the training objective of the drills and determine how well these objectives have been met. These drills should periodically (at least annually) include local fire department participation where possible. Such drills also permit supervising personnel to evaluate the effectiveness of communications within the fire brigade and with the on scene fire team leader, the reactor operator in the control room, and the off-site command post.	
(c) To have proper coverage during all phases of operation, members of each shift crew should be trained in fire protection. Training of the plant fire brigade should be coordinated with the local fire department so that responsiblities and duties are delineated in advance. This coordination should be part of the training course and implemented into the training of the local fire department staff. Local fire departments should be educated in the operational precautions when fighting fires on nuclear power plant sites. Local fire departments should be made aware of the need for radioactive protection of personnel and the special hazards associated with a nuclear power plant site.	CEI will comply.
(d) NFPA 27, "Private Fire Brigade" should be followed in organization, training, and fire drills. This standard also is applicable for the inspection and maintenance of fire fighting equipment. Among the standards referenced in this document, the following should be utilized:	CEI will comply.

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NFPA 194, "Standard for Screw Threads and Gaskets for Fire Hose Couplings", NFPA 196, "Standard for Fire Hose," NFPA 197, "Training Standard on Initial Fire Attacks", NFPA 601, "Recommended Manual of Instructions and Duties for the Plant Watchman on Guard." NFPA booklets and pamphlets listed on page 27-11 of Volume 8, 1971-72 are also applicable for good training references. In addition, courses in fire protection and fire suppression which are recognized and/or sponsored by the fire protection industry should be utilized.	
C. Quality Assurance Program	
Quality assurance (QA) programs of applicants and contractors should be developed and implemented to assure that the requirements for design, procurement, installation, and testing and administrative controls for the fire protection program for safety related areas as defined in this Branch Position are satisfied. The program should be under the management control of the QA organization. The QA program criteria that apply to the fire protection program should include the following:	Corporate Nuclear Quality Assurance Program (QA Program) as it addresses the Perry Nuclear Power Plant Fire Protection Program is implemented to ensure that the project commitments for design, procurement installation, testing, and administrative controls are satisified. The QA Program includes inspections, tests, or audits, where applicable, to verify equipment and/or systems meet the intent that the project committed to.
1. Design Control and Procurement Document Control	
Measures should be established to assure that all design-related guidelines of the Branch Technical Position are included in design and procurement documents and that deviations therefrom are controlled.	The QA Program ensures that the design related commitments to this program are adhered to and procurement documents reflect these requirements. This is accomplished where necessary through audits, inspections, and reviews. All changes to these documents or deviations are controlled and reviewed similarly to the original documents. These reviews are performed by qualified personnel.

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2. Instructions, Procedures and Drawings Inspections, tests, administrative controls, fire drills and training that govern the fire protection program should be prescribed by documented instructions, procedures or drawings and should be accomplished in accordance with these documents.	The QA Program ensures that inspections, tests, fire drills, administrative controls, and training as committed to for fire protection are prescribed by documented instructions, procedures and/or drawings and are accomplished in accordance with these documents.
3. Control of Purchased Material, Equipment and Services Measures should be established to assure that purchased material, equipment and services conform to the procurement documents.	The QA Program will verify the adequacy of purchased material, equipment, and services. This is accomplished by one or more of the following: (a) detailed receipt inspection for compliance of equipment to the procurement documents and verification of completeness of the documents for equipment already on site; (b) review of manufacturer's certified test results when applicable; (c) ensure UL and/or Factory Mutual approval was obtained when required by design documents; (d) witness testing when applicable.
4. Inspection A program for independent inspection of activities affecting fire protection should be established and executed by, or for, the organization performing the activity to verify conformance with documented installation drawings and test procedures for accomplishing the activities.	A program will be established for independent inspection of installation and testing activities. The results of the inspection will be documented and evaluated.
5. Test and Test Control A test program should be established and implemented to assure that testing is performed and verified by inspection and audit to demonstrate conformance with design and system readiness requirements. The tests should be performed in accordance with written test procedures; test results should be properly evaluated and acted on.	A test program will be established and implemented to verify that the system conforms with operational and system readiness requirements. The tests will be performed in accordance with approved written test procedures. Cognizant personnel will evaluate test results and appropriate actions taken when required.

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6. Inspection, Test and Operating Status	
Measures should be established to provide for the identification of items that have satisfactorily passed required tests and inspections.	Items that have satisfactorily passed required test or inspections are identified by appropriate means.
7. Non-Conforming Items	
Measures should be established to control items that do not conform to specified requirements to prevent inadvertent use of installation.	Measures are established to assure that non-conforming items are identified to prevent their inadvertent use or installation.
8. Corrective Action	
Measures should be established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material and non-conformances are promptly identified, reported and corrected.	Measures are established to assure that conditions adverse to fire protection, such as failures, malfunctions, deficiencies, deviations, defective components, uncontrolled combustible material and nonconformances are promptly identified, reported and corrected.
9. Records	
Records should be prepared and maintained to furnish evidence that the criteria enumerated above are being met for activities affecting the fire protection program.	Records are prepared and maintained to furnish documented evidence that commitments of the fire protection program and the quality criteria are met.
10. Audits	
Audits should be conducted and documented to verify compliance with the fire protection program including design and procurement documents; instructions; procedures and drawings; and inspection and test activities.	Audits are conducted and documented to written procedures to verify compliance with the committed fire protection program. Audits are performed by qualified personnel not having direct responsibility with the activity being audited.
D. General Guidelines for Plant Protection	
1. Building Design	
(a) Plant Layouts should be arranged to:	
(1) Isolate safety related systems from unacceptable fire hazards, and	The fire hazards analysis portion or this report (Section 4.0) identifies the fire areas and the safe shutdown equipment within each area.

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(2) Separate redundant safety related systems from each other so that both are not subject to damage from a single fire hazard.	Locations where redundant systems are exposed to a single fire hazard are identified in the fire hazards analysis (Section 4.0). Adequate fire protection is provided for these locations.
(b) In order to accomplish 1.(a) above, safety related systems and fire hazards should be identified throughout the plant. Therefore, a detailed fire hazard analysis should be made. The fire hazards analysis should be reviewed and updated as necessary.	See the fire hazards analysis, Section 4.0.
(c) For multiple reactor sites, cable spreading rooms should not be shared between reactors. Each cable spreading room should be separated from other areas of the plant by barriers (walls and floors) having a minimum fire resistance of three hours. Cabling for redundant safety divisions should be separated by walls having three hour fire barriers.	These requirements for the cable spreading rooms are met.
(d) Interior wall and structural components, thermal insulation materials and radiation shielding materials and sound-proofing should be non-combustible. Interior finishes should be non-combustible or listed by a nationally recognized testing laboratory, such as Factory Mutual or Underwriters' Laboratory, Inc. for flame spread, smoke and fuel contribution of 25 or less in its use configuration (ASTM E-84 Test), "Surface Burning Characteristics of Building Materials").	Plant structural components satisfy this criterion. Other materials are noncombustible, where possible.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
(e) Metal deck roof construction should be non-combustible (see the building materials directory of the Underwriters Laboratory, Inc.) or listed as Class I by Factor Mutual System Approval Guide.	Metal deck roof construction meets the requirements of Class I of the Factory Mutual Loss Prevention Guidelines.
(f) Suspended ceilings and their supports should be of non-combustible construction. Concealed spaces should be devoid of combustibles.	Suspended ceilings and their supports are of noncombustible construction.
(g) High voltage - high amperage transformers installed inside buildings containing safety related systems should be of the dry type or insulated and cooled with non-combustible liquid.	Indoor transformers meet this criterion.
(h) Buildings containing safety related systems should be protected from exposure or spill fires involving oil filled transformers by: (1) locating such transformers at least 50 feet distant; or (2) ensuring that such building walls within 50 feet of oil filled transformers are without openings and have a fire resistance rating of at least three hours.	Subject exposed building walls within 50 feet of the outdoor oil filled transformers have a fire resistance rating of three hours.
(i) Floor drains, sized to remove expected fire fighting water flow should be provided in those areas where fixed water fire suppression systems are installed. Drains should also be provided in other areas where hand hose lines may be used if such fire fighting water could cause unacceptable	Floor drains are designed to remove the expected fire fighting water flow from areas where fixed fire suppression systems are installed or where fire hose may be used. Protection of equipment exposed to water damage is provided as required.

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damage to equipment in the area. Equipment should be installed on pedestals, or curbs should be provided as required to contain water and direct it to floor drains. (See NFPA 92M, "Waterproofing and Draining of Floors.") Drains in areas containing combustible liquids should have provisions for preventing the spread of the fire throughout the drain system. Water drainage from areas which may contain radioactivity should be sampled and analyzed before discharge to the environment.	Drains in areas containing combustible liquids are designed to prevent the spread of fire throughout the drain system. Water drainage from areas which may contain radioactivity is collected by storage tanks in the radwaste building for normal liquid waste processing.
(j) Floors, walls and ceilings enclosing separate fire areas should have minimum fire rating of three hours. Penetrations in these fire barriers, including conduits and piping, should be sealed or closed to provide a fire resistance rating at least equal to that of the fire barrier itself. Door openings should be protected with equivalent rated doors, frames and hardware that have been tested and approved by a national recognized laboratory. Such doors should be normally closed and locked or alarmed with alarm and annunciation in the control room. Penetrations for ventilation system should be protected by a standard "fire door damper" where required. (Refer to NFPA 80, "Fire Doors and Windows.")	The floors, walls and ceilings enclosing separate fire areas (as defined in the fire hazards analysis, Section 4.0) have minimum fire resistance ratings of 3 hours. All penetrations to these fire areas are sealed or dampered to maintain the continuous 3 hour fire resistance rating. Door openings to these fire areas are provided with approved doors and hardware for openings in a 3 hour rated wall. These doors will either be locked, alarmed, or self-closing.
2. Control of Combustibles	
(a) Safety related systems should be isolated or separated from combustible materials. When this	The fire hazards analysis identifies these hazards and the protection afforded.

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is not possible because of the nature of the safety system or the combustible material, special protection should be provided to prevent a fire from defeating the safety system function. Such protection may involve a combination of automatic fire suppression, and construction capable of withstanding and containing a fire that consumes all combustibles present. Examples of such combustible materials that may not be separable from the remainder of its system are:	
(1) Emergency diesel generator fuel oil day tanks	
(2) Turbine-generator oil and hydraulic control fluid systems	
(3) Reactor coolant pump lube oil system	
(b) Bulk gas storage (either compressed or cryogenic), should not be permitted inside structures housing safety-related equipment. Storage of flammable gas such as hydrogen, should be located outdoors or in separate detached buildings so that a fire or explosion will not adversely affect any safety related systems or equipment.	Bulk gas is stored in outside areas in accordance with OSHA 1910.101. A fire or explosion will not adversely affect any safety related systems or equipment.
(Refer to NFPA 50A, "Gaseous Hydrogen Systems.")	
Care should be taken to locate high pressure gas storage containers with the long axis parallel to building walls. This will minimize the possibility of	High pressure gas storage containers are located with the long axes parallel to building walls.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
wall penetration in the event of a container failure. Use of compressed gases (especially flammable and fuel gases) inside buildings should be controlled. Refer to NFPA 6, "Industrial Fire Loss Prevention.")	
(c) The use of plastic materials should be minimized. In particular, haloginated plastics such as polyvinyl chloride (PVC) and neoprene should be used only when substitute non-combustible materials are not available. All plastic materials, including flame and fire retardant materials, will burn with an intensity and BTU production in a range similar to that of ordinary hydrocarbons. When burning, they produce heavy smoke that obscures visibility and can plug air filters, especially charcoal and HEPA. The haloginated plastics also release free chlorine and hydrogen chloride when burning which are toxic to humans and corrosive to equipment.	Plastic materials throughout the plant are negligible.
(d) Storage of flammable liquids should, as a minimum, comply with the requirements of NFPA 30, "Flammable and Combustible Liquids Code."	Flammable liquids will be stored in accordance with the requirements of NFPA 30 and OSHA 1910.106.
3. Electric Cable Construction, Cable Trays and Cable Penetrations	
(a) Only non-combustible materials should be used for cable tray construction.	Cable trays are of noncombustible steel construction.
(b) See Section E.3 for fire protection guidelines for cable spreading rooms.	

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(c) Automatic water sprinkler systems should be provided for cable trays outside the cable spreading room. Cables should be designed to allow wetting down with deluge water without electrical faulting. Manual hose stations and portable hand extinguishers should be provided as backup. Safety related equipment in the vicinity of such cable trays, that does not itself require water fire protection, but is subject to unacceptable damage from sprinkler water discharge, should be protected from sprinkler system operation or malfunction.	Automatic water type fire suppression systems are provided in areas of concentrated cable loading, as identified in the fire hazards analysis (Section 4.0). Manual hose stations and portable hand extinguishers are provided as backup. Potential water damage has been considered where these systems are used.
(d) Cable and cable tray penetration of fire barriers (vertical and horizontal) should be sealed to give protection at least equivalent to that fire barrier. The design of fire barriers for horizontal and vertical cable trays should, as a minimum, meet the requirements of ASTM E-119, "Fire Test of Building Construction and Materials," including the hose stream test.	Cable penetrations in fire barriers are sealed consistent with fire barrier fire resistance requirements.
(e) Fire breaks should be provided as deemed necessary by the fire hazards analysis. Flame or flame retardant coatings may be used as a fire break for grouped electrical cables to limit spread of fire in cable ventings. (Possible cable derating owing to use of such coating materials must be considered during design.	As a result of the fire hazards analysis, fire break design is deemed adequate.
(f) Electric cable constructions should as a minimum pass the current IEEE No. 383 flame test. (This does not imply that cables passing this test will not require additional fire protection.)	Electric cable construction satisfies IEEE 383 flame test requirements.

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(g) To the extent practical, cable construction that does not give off corrosive gases while burning should be used.	Cable will satisfy IEEE 383-1974 flame test requirements.
(h) Cable trays, raceways, conduit, trenches, or culverts should be used only for cables. Miscellaneous storage should not be permitted, nor should piping for flammable or combustible liquids or gases be installed in these areas.	This criterion is satisfied.
(i) The design of cable tunnels, culverts and spreading rooms should provide for automatic or manual smoke venting as required to facilitate manual fire fighting capability.	These areas were studied; smoke venting is provided as deemed necessary.
(j) Cables in the control room should be kept to the minimum necessary for operation of the control room. All cables entering the control room should terminate there. Cables should not be installed in floor trenches or culverts in the control room.	Cables in the control room come from the termination cabinets in the cable spreading area and terminate in control panels, consoles or equipment. The cables are installed in wireways in the base of prefabricated floor modules.
4. Ventilation	
(a) The products of combustion that need to be removed from a specific fire area should be evaluated to determine how they will be controlled. Smoke and corrosive gases should generally be automatically discharged directly outside to a safe location. Smoke and gases containing radioactive materials should be monitored in the fire area to determine if release to the environment is within the permissible limits of the plant Technical Specifications.	Ventilation for critical areas is evaluated in Sections 2.0 and 4.0 of this report. Areas having potential for release of radioactive material are monitored.

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(b) Any ventilation system designed to exhaust smoke or corrosive gases should be evaluated to ensure that inadvertent operation or single failures will not violate the controlled areas of the plant design. This requirement includes containment functions for protection of the public and maintaining habitability for operations personnel.	The ventilation systems which would be used for smoke removal satisfy this criterion.
(c) The power supply and controls for mechanical ventilation systems should be run outside the fire area served by the system.	This criterion is met except in the control complex. However, in the control complex redundant sets of ventilating equipment are provided and located in separate fire areas.
(d) Fire suppression systems should be installed to protect charcoal filters in accordance with Regulatory Guide 1.52, "Design Testing and Maintenance Criteria for Atmospheric Cleanup Air Filtration."	Charcoal filters are not engineered safety feature filters. However, manual deluge systems are provided for the protection of the charcoal filters.
(e) The fresh air supply intakes to areas containing safety related equipment or systems should be located remote from the exhaust air outlets and smoke vents of other fire areas to minimize the possibility of contaminating the intake air with the products of combustion.	Fresh air supply intakes are remotely located with respect to exhaust air outlets. Thus the possibility of contaminating the intake air with the products of combustion is minimized.
(f) Stairwells should be designed to minimize smoke infiltration during a fire. Staircases should serve as escape routes and access routes for fire fighting. Fire exit routes should be clearly marked. Stairwells, elevators and chutes should be enclosed in masonry	Stairwells are enclosed as indicated on the fire protection layout drawings. Stairwells serve as escape routes and access routes for fire fighting. Fire exit routes are clearly marked. Stairwells and elevators are in 3 hour fire resistance rated

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towers with minimum fire rating of three hours and automatic fire doors at least equal to the enclosure construction, at each opening into the building. Elevators should not be used during fire emergencies.	enclosures. The stairwells are provided with Class A fire doors and the elevators with Class B fire doors. Escape and access routes will be established by pre-fire plan and will be practiced in drills by operating and fire brigade personnel.
(g) Smoke and heat vents may be useful in specific areas such as cable spreading rooms and diesel fuel oil storage areas and switchgear rooms. When natural-convection ventilation is used, a minimum ratio of 1 sq. foot of venting area per 200 sq. feet of floor area should be provided. If forced-convection ventilation is used, 300 CFM should be provided for every 200 sq. feet of floor area. See NFPA No. 204 for additional guidance on smoke control.	Forced convection ventilation is provided throughout the plant, and is in excess of 300 cfm for each 200 ft^2 of floor area.
(h) Self-contained breathing apparatus, using full face positive pressure masks, approved by NIOSH (National Institute for Occupational Safety and Health - approval formerly given by the U. S. Bureau of Mines) should be provided for fire brigade, damage control and control room personnel. Control room personnel may be furnished breathing air by a manifold system piped from a storage reservoir if practical. Service or operating life should be a minimum of one half hour for the self-contained units.	CEI will comply.
At least two extra air bottles should be located onsite for each self-contained breathing unit. In addition, an onsite 6-hour	

supply of reserve air should be provided and arranged to permit quick and complete replenishment of exhausted supply air bottles as they are returned. If compressors are used as a source of breathing air, only units approved for breathing air should be used. Special care must be taken to locate the compressor in areas free of dust and contaminants.

(i) Where total flooding gas extinguishing systems are used, area intake and exhaust ventilation dampers should close upon initiation of gas flow to maintain necessary gas concentration. (See NFPA 12, "Carbon Dioxide Systems", and 12A, "Halon 1301 Systems.")

Where required, ventilation dampers close on actuation of gaseous extinguishing systems to maintain the necessary gas concentration.

5. Lighting and Communication

Lighting and two way voice communication are vital to safe shutdown and emergency response in the event of fire. Suitable fixed and portable emergency lighting and communication devices should be provided to satisfy the following requirements:

(a) Fixed emergency lighting should consist of sealed beam units with individual 8-hour minimum battery power supplies.

PNPP has a backup a-c power supply for areas where lighting is necessary for safe shutdown. In addition, a completely separate d-c lighting system is provided, supplied by batteries ensuring at least 2 hours continuous operation.

(b) Suitable sealed beam battery powered portable hand lights should be provided for emergency use.

CEI will comply.

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(c) Fixed emergency communication should use voice powered head sets at pre-selected stations.	Amplified voice headsets at pre-selected stations will be used. The headset system is powered from a central power source cabinet using vital 120 volt a-c. Each headset has an integral earpiece amplifier and boom mounted transmitter.
(d) Fixed repeaters installed to permit use of portable radio communication units should be protected from exposure fire damage.	There will not be any fixed repeaters installed in the plant.
E. Fire Detection and Suppression	
1. Fire Detection	
(a) Fire detection systems should as a minimum comply with NFPA 72D, "Standard for the Installation, Maintenance and Use of Proprietary Protective Signaling Systems."	Fire detection systems comply with NFPA 72D.
(b) Fire detection system should give audible and visual alarm and annunciation in the control room. Local audible alarms should also sound at the location of the fire.	Fire detection systems give audible and visual alarms in the control room. The control room operator can actuate an audible fire alarm which sounds throughout the plant via the PA system. Local alarms do not sound at the location of the fire.
(c) Fire alarms should be distinctive and unique. They should not be capable of being confused with any other plant system alarms.	Fire alarms are distinctive and unique and will not be confused with any other plant systems alarm.
(d) Fire detection and actuation systems should be connected to the plant emergency power supply.	These systems are connected to the plant emergency power supply.
2. Fire Protection Water Supply Systems	—
(a) An underground yard fire main loop should be installed to furnish anticipated fire water requirements. NFPA 24 - Standard for Outside Protection - gives necessary guidance for such installation. It references	The undergound yard fire main loop is installed in accordance with NFPA 24. Underground pipe is unlined nickel copper alloy steel. Above ground pipe is carbon steel.

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other design codes and standards developed by such organizations as the American National Standards Institute (ANSI) and the American Water Works Association (AWWA). Lined steel or cast iron pipe should be used to reduce internal tuberculation. Such tuberculation deposits in an unlined pipe over a period of years can significantly reduce water flow through the combination of increased friction and reduced pipe diameter. Means for treating and flushing the systems should be provided. Approved visually indicating sectional control valves, such as Post Indicator Valves, should be provided to isolate portions of the main for maintenance or repair without shutting off the entire system.	Flushing is accomplished using fire hydrants. No additional treatment is necessary. Sectional control valves (post indicator valves) are provided to isolate portions of the fire main for maintenance or repair without shutting down the entire system.
The fire main system piping should be separate from service or sanitary water system piping.	Fire main piping is separate from domestic and sanitary water service piping.
(b) A common yard fire main loop may serve multi-unit nuclear power plant sites, if cross-connected between units. Sectional control valves should permit maintaining independence of the individual loop around each unit. For such installations, common water supplies may also be utilized. The water supply should be sized for the largest single expected flow. For multiple reactor sites with widely separated plants (approaching 1 mile or more), separate yard fire main loops should be used.	A common yard fire main loop serves PNPP Units 1 and 2. Sectional control valves (post indicator valves) are provided to permit independence of the individual loop around each unit.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
(c) If pumps are required to meet system pressure or flow requirements, a sufficient number of pumps should be provided so that 100% capacity will be available with one pump inactive (e.g., three 50% pumps or two 100% pumps). The connection to the yard fire main loop from each fire pump should be widely separated, preferably located on opposite sides of the plant. Each pump should have its own driver with independent power supplies and control. At least one pump (if not powered from the emergency diesels) should be driven by non-electrical means, preferably diesel engine. Pumps and drivers should be located in rooms separated from the remaining pumps and equipment by a minimum three-hour fire wall. Alarms indicating pump running, driver availability, or failure to start should be provided in the control room.	Two 100 percent capacity fire pumps (2500 gpm at 125 psig; one diesel driven and one electrical motor driven) are provided. Connections to the yard fire main loop are well separated with sectionalizing valves between connections. The diesel driven fire pump is separated from the electric motor driven fire pump by a 3 hour rated fire barrier in the emergency service water pumphouse. Alarms indicating pump running, driver availability, and failure to start are provided in the control room.
Details of the fire pump installation should as a minimum conform to NFPA 20, "Standard for the Installation of Centrifugal Fire Pumps."	The fire pump installation conforms to NFPA 20.
(d) Two separate reliable water supplies should be provided. If tanks are used, two 100% (minimum of 300,000 gallons each) system capacity tanks should be installed. They should be so interconnected that pumps can take suction from either or both. However, a leak in one tank or its piping should not cause both tanks to drain. The main plant fire water supply capacity should be capable of refilling either tank in a minimum of eight hours.	Water supply is from Lake Erie.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
Common tanks are permitted for fire and sanitary or service water storage. When this is done, however, minimum fire water storage requirements should be dedicated by means of a vertical standpipe for other water services.	Not applicable.
(e) The fire water supply (total capacity and flow rate) should be calculated on the basis of the largest expected flow rate for a period of two hours, but not less than 300,000 gallons. This flow rate should be based (conservatively) on 1,000 gpm for manual hose streams plus the greater of: (1) all sprinkler heads opened and flowing in the largest designed fire area; or (2) the largest open head deluge system(s) operating.	The maximum flow demand is estimated to be 2700 gpm to the most remote deluge system, plus 1000 gpm for manual hose streams. A single pump is designed to operate at 150 percent of rated capacity and provide 3750 gpm at 80 psig.
(f) Lakes or fresh water ponds of sufficient size may qualify as sole source of water for fire protection, but require at least two intakes to the pump supply. When a common water supply is permitted for fire protection and the ultimate heat sink, the following conditions should also be satisfied:	Lake Erie is the source of fire service water. Two intakes are provided for each fire pump.
(1) The additional fire protection water requirements are designed into the total storage capacity; and	Not applicable.
(2) Failure of the fire protection system should not degrade the function of the ultimate heat sink.	Not applicable.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
(g) Outside manual hose installation should be sufficient to reach any location with an effective hose stream. To accomplish this hydrants should be installed approximately every 250 feet on the yard main system. The lateral to each hydrant from the yard main should be controlled by a visually indicating or key operated (curb) valve. A hose house, equipped with hose and combination nozzle, and other auxiliary equipment recommended in NFPA 24, "Outside "Protection", should be provided as needed but at least every 1,000 feet.	Fire hydrants are located around the perimeter of PNPP Units 1 and 2 as shown on drawing E-023-001. The lateral to each fire hydrant is provided with a valve. The system is designed so that the sectional control valves (post indicator valves) can isolate one, two or three fire hydrants. Each fire hydrant is provided with a hose house containing 2-1/2 inch hose, combination fog nozzle, and auxiliary equipment.
Threads compatible with those used by local fire departments should be provided on all hydrants, hose couplings and standpipe risers.	Threads compatible with those used by local fire departments are provided on hydrants, hose couplings and standpipe risers.
3. Water Sprinklers and Hose Standpipe Systems	
(a) Each automatic sprinkler system and manual hose station standpipe should have an independent connection to the plant underground water main. Headers fed from each end are permitted inside buildings to supply multiple sprinkler and standpipe systems. When provided, such headers are considered an extension of the yard main system. The header arrangement should be such that no single failure can impair both the primary and backup fire protection systems.	Automatic sprinkler/deluge systems and manual hose station standpipes are fed from headers. The header arrangement is such that no single failure can impair both a primary sprinkler/deluge system and its backup manual hose station standpipe system.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
Each sprinkler and standpipe system should be equipped with OS&Y (outside screw and yoke) gate valve, or other approved shut off valve, and water flow alarm. Safety related equipment that does not itself require sprinkler water fire protection, but is subject to unacceptable damage if wetted by sprinkler water discharge should be protected by water shields or baffles.	Each sprinkler and standpipe system is equipped with an OS&Y gate valve. Each sprinkler system is equipped with a water flow alarm. Standpipe systems in areas containing safe shutdown equipment are equipped with a water flow alarm. Where safety related equipment is subject to unacceptable water damage if wetted by sprinkler water discharge, it has been protected.
(b) All valves in the fire water systems should be electrically supervised. The electrical supervision signal should indicate in the control room and other appropriate command locations in the plant (See NFPA 26, "Supervision of Valves.")	Control and sectionalizing valves in the fire water system are electrically supervised and actuate alarms in the control room.
(c) Automatic sprinkler systems should as a minimum conform to requirements of appropriate standards such as NFPA 13, "Standard for the Installation of Sprinkler Systems", and NFPA 15, "Standard for Water Spray Fixed Systems."	Automatic water type suppression systems throughout PNPP satisfy the design and installation requirements of the appropriate standards such as NFPA 13 and 15.
(d) Interior manual hose installation should be able to reach any location with at least one effective hose stream. To accomplish this, standpipes with hose connections equipped with a maximum of 75 feet of 1-1/2 inch woven jacket lined fire hose and suitable nozzles should be provided in all buildings, including containment, on all floors and should be spaced at not more than 100-foot intervals. Individual standpipes should be of at least 4-inch diameter for	Interior manual hose stations are located throughout major buildings (refer to layout drawings). With the exceptions of a few locations, a maximum of 75 feet of 1-1/2 inch fire hose is provided. Standpipe and piping supplying the hose stations are sized in accordance with system demands.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
multiple hose connections and 2-1/2-inch diameter for single hose connections. These systems should follow the requirements of NFPA No. 14, "Standpipe and Hose Systems" for sizing, spacing and pipe support requirements.	
Hose stations should be located outside entrances to normally unoccupied areas and inside normally occupied areas. Standpipes serving hose stations in areas housing safety related equipment should have shut off valves and pressure reducing devices (if applicable) outside the area.	Hose stations have been located to facilitate access and use for fire fighting operations. Shutoff valves and pressure reducing devices are provided for each hose station.
Provisions should be made to supply water at least to standpipes and hose connections for manual fire fighting in areas within hose reach of equipment required for safe plant shutdown in the event of a Safe Shutdown Earthquake (SSE). The standpipe system serving such hose stations should be analyzed for SSE loading and should be provided with supports to assure system pressure integrity. The piping and valves for the portion of hose standpipe system affected by this functional requirement should at least satisfy ANSI Standard B31.1, "Power Piping." The water supply for this condition may be obtained by manual operator actuation of valve(s) in a connection to the hose standpipe header from a normal Seismic Category I water system such as Essential Service Water System. The cross	These conditions are met in areas containing equipment required for safe plant shutdown in the event of a SSE.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
connection should be (a) capable of providing flow to at least two hose stations (approximately 75 gpm/hose station), and (b) designed to the same standards as the Seismic Category I water system; it should not degrade the performance of the Seismic Category I water system.	
(e) The proper type of hose nozzles to be supplied to each area should be based on the fire hazard analysis. The usual combination spray/straight-stream nozzle may cause unacceptable mechanical damage (for example, the delicate electronic equipment in the control room) and be unsuitable. Electrically safe nozzles should be provided at locations where electrical equipment or cabling is located.	All areas are provided with adjustable pattern, fog only, nozzles. Personnel are adequately trained to make proper use of hose stations.
(f) Certain fires such as those involving flammable liquids respond well to foam suppression. Consideration should be given to use of any of the available foams for such specialized protection application. These include the more common chemical and mechanical low expansion foams, high expansion foam and the relatively new aqueous film forming foam (AFFF).	The only major flammable liquid hazards at the plants are the auxiliary boiler fuel oil storage tank and the fuel oil unloading area; these have foam system protection as described in Section 4.0.
4. Halon Suppression Systems	
The use of Halon fire extinguishing agents should as a minimum comply with the requirements of NFPA 12A and 12B, "Halogenated Fire Extinguishing Agent Systems - Halon 1301 and Halon 1211." Only UL or FM approved agents should be used.	No Halon fire extinguishing systems are installed at PNPP.

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In addition to the guidelines of NFPA 12A and 12B, preventative maintenance and testing of the systems, including check weighing of the Halon cylinders should be done at least quarterly.	
Particular consideration should also be given to:	
(a) minimum required Halon concentration and soak time	
(b) toxicity of Halon	
(c) toxicity and corrosive characteristics of thermal decomposition products of Halon.	
5. <u>Carbon Dioxide Suppression Systems</u>	
The use of carbon dioxide extinguishing systems should as a minimum comply with the requirements of NFPA 12, "Carbon Dioxide Extinguishing Systems."	A low pressure carbon dioxide system is provided to supply total flooding systems, local application systems, and hose reels utilized throughout the plant. The system design is in accordance with the requirements of NFPA 12. Consideration is given for each system regarding items (a) through (f).
Particular consideration should also be given to:	
(a) minimum required CO2 concentration and soak time;	
(b) toxicity of CO2;	
(c) possibility of secondary thermal shock (cooling) damage;	
(d) offsetting requirements for venting during CO2 injection to prevent overpressurization versus sealing to prevent loss of agent;	
(e) design requirements from overpressurization; and	

(f) possibility and probability of CO2 systems being out-of-service because of personnel safety consideration. CO2 systems are disarmed whenever people are present in an area so protected. Areas entered frequently (even though duration time for any visit is short) have often been found with CO2 systems shut off.

6. Portable Extinguishers

Fire extinguishers should be provided in accordance with guidelines of NFPA 10 and 10A, "Portable Fire Extinguishers, Installation, Maintenance and Use." Dry chemical extinguishers should be installed with due consideration given to cleanup problems after use and possible adverse effects on equipment installed in the area.

Applicant Response: Portable fire extinguishers are provided and maintained in accordance with NFPA 10 and 10A, respectively.

F. Guidelines for Specific Plant Areas

1. Primary and Secondary Containment

(a) Normal Operation

Fire protection requirements for the primary and secondary containment areas should be provided on the basis of specific identified hazards. For example:

Applicant Response: The fire hazards analysis (Section 4.0) outlines the protection for identified hazards in the containment area.

(1) Lubricating oil or hydraulic fluid system for the primary coolant pumps

(2) Cable tray arrangements and cable penetrations

(3) Charcoal filters

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Because of the general inaccessability of these areas during normal plant operations, protection should be provided by automatic fixed systems. Automatic sprinklers should be installed for those hazards identified as requiring fixed suppression.	The systems provided for the identified hazards are automatic in operation except for the motor operated isolation valves which can be opened from the control room upon a fire signal.
Operation of the fire protection systems should not compromise integrity of the containment or the other safety related systems. Fire protection activities in the containment areas should function in conjunction with total containment requirements such as control of contaminated liquid and gaseous release and ventilation.	Operation of the fire protection systems will not compromise the integrity of the containment or the other safety related systems.
Fire detection systems should alarm and annunciate in the control room. The type of detection used and the location of the detectors should be most suitable to the particular type of fire that could be expected from the identified hazard. A primary containment general area fire detection capability should be provided as backup for the above described hazard detection. To accomplish this, suitable smoke detection (e.g., visual obscuration, light scattering and particle counting) should be installed in the air recirculation system ahead of any filters.	Where fire detection systems are provided, they alarm and annunciate in the control room.
Automatic fire suppression capability need not be provided in the primary containment atmospheres that are inerted during normal operation. However, special fire protection requirements during refueling and maintenance operations should be satisfied as provided below.	

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(b) Refueling and Maintenance	
Refueling and maintenance operations in containment may introduce additional hazards such as contamination control materials, decontamination supplies, wood planking, temporary wiring, welding and flame cutting (with portable compressed fuel gas supply). Possible fires would not necessarily be in the vicinity of fixed detection and suppression systems.	CEI will comply.
Management procedures and controls necessary to assure adequate fire protection are discussed in Section 3a.	
In addition, manual fire fighting capability should be permanently installed in containment. Standpipes with hose stations, and portable fire extinguishers, should be installed at strategic locations throughout containment for any required manual fire fighting operations.	
Adequate self-contained breathing apparatus should be provided near the containment entrances for fire fighting and damage control personnel. These units should be independent of any breathing apparatus or air supply systems provided for general plant activities.	
2. Control Room	
The control room is essential to safe reactor operation. It must be protected against disabling fire damage and should be separated from other areas of the plant by floors, walls and roofs having minimum fire resistance ratings of three hours.	Each control room (Units 1 and 2) meets these requirements.

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Control room cabinets and consoles are subject to damage from two distinct fire hazards: (a) Fire originating within a cabinet or console; and (b) Exposure fire involving combustibles in the general room area.	
Manual fire fighting capability should be provided for both hazards. Hose stations and portable water and Halon extinguishers should be located in the control room to eliminate the need for operators to leave the control room. An additional hose piping shut off valve and pressure reducing device should be installed outside the control room.	
Hose stations adjacent to the control room with portable extinguishers in the control room are acceptable.	Hose stations are provided adjacent to the control room and fire extinguishers are located within.
Nozzles that are compatible with the hazards and equipment in the control room should be provided for the manual hose station. The nozzles chosen should satisfy actual fire fighting needs, satisfy electrical safety and minimize physical damage to electrical equipment from hose stream impingement.	The nozzles provided meet these requirements.
Fire detection in the control room cabinets, and consoles should be provided by smoke and heat detectors in each fire area. Alarm and annunciation should be provided in the control room. Fire alarms in other parts of the plant should also be alarmed and annunciated in the control room.	Fire detection in the control room is described in the fire hazards analysis portion of this report (Section 4.0); alarm and annunciation is provided in the control room.

Breathing apparatus for control room operators should be readily available. Control room floors, ceiling, supporting structures, and walls, including penetrations and doors, should be designed to a minimum fire rating of three hours. All penetration seals should be air tight.	These positions are satisfied.
The control room ventilation intake should be provided with smoke detection capability to automatically alarm locally and isolate the control room ventilation system to protect operators by preventing smoke from entering the control room. Manually operated venting of the control room should be available so that operators have the option of venting for visibility.	The design criteria is met except the isolation of the control room ventilation system is by manual operation only.
Cables should not be located in concealed floor and ceiling spaces. All cables that enter the control room should terminate in the control room. That is, no cabling should be simply routed through the control room from one area to another.	As described in the fire hazards analysis portion of this report (Section 4.0), the cable is routed in wireways which are part of the floor modules. These wireways are protected by carbon dioxide suppression systems.
Safety related equipment should be mounted on pedestals or the control room should have curbs and drains to direct water away from such equipment. Such drains should be provided with means for closing to maintain integrity of the control room in the event of other accidents requiring control room isolation.	Panels and consoles are mounted on the floor section of the prefabricated modules. Floor drains are provided with valves for isolation.
3. Cable Spreading Room	
The primary fire suppression in the cable spreading room should be an automatic water system such as closed head sprinklers, open head duluge, or open directional spray nozzles. Deluge and open spray systems should	A preaction sprinkler system meeting these requirements is located in each cable spreading room.

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have provisions for manual operation at a remote station; however, there should be provisions to preclude inadvertent operation. Location of sprinkler heads or spray nozzles should consider cable tray sizing and arrangements to assure adequate water coverage. Cables should be designed to allow wetting down with deluge water without electrical faulting.	
Open head deluge and open directional spray systems should be zoned to that a single failure will not deprive the entire area of automatic fire suppression capability.	Not applicable.
The use of foam is acceptable, provided it is of a type capable of being delivered by a sprinkler or deluge system, such as an Aqueous Film Forming Foam (AFFF).	Not applicable.
An automatic water suppression system with manual hoses and portable extinguisher backup is acceptable, provided:	In addition to the preaction system, each cable spreading room has manual hose and portable extinguisher backup.
(a) At least two remote and separate entrances are provided to the room for access by fire brigade personnel; and	Remote separate entrances are provided.
(b) Aisle separation provided between tray stacks should be at least three feet wide and eight feet high.	Aisle separation generally meets these requirements. The aisles are typically three feet wide and eleven feet high. There are a few cases where the aisles are only 2.5 feet wide.
Alternatively, gas systems (Halon or CO_2) may be used for primary fire suppression if they are backed up by an installed water spray system and hose stations and portable extinguishers immediately outside the room and if the access requirements stated above are met.	Not applicable.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
Electric cable construction should, as a minimum, pass the flame test in IEEE Std. 383, "IEEE Standard for Type Test of Class 1E Electric Cables, Field Splices and Connections for Nuclear Power Generating Stations."	Electrical cable construction passes the flame test in IEEE Std. 383-1974.
Drains to remove fire fighting water should be provided with adequate seals when gas extinguishing systems are also installed.	Drains are provided to remove fire fighting water; there is no gas extinguishing system.
Redundant safety related cable division should be separated by walls with a three-hour fire rating.	Redundant safety related cable divisions are separated by walls with 3 hour fire ratings.
For multiple-reactor unit sites, cable spreading rooms should not be shared between reactors. Each cable spreading room of each unit should have divisional cable separation as stated above and be separated from the other and the rest of the plant by a wall with a minimum fire rating of three hours. (See NFPA 251, "Fire Tests, Building Construction and Materials", or ASTM E-119, "Fire Test of Building Construction and Materials", for fire test resistance rating.)	This criterion is met.
The ventilation system to the cable spreading room should be designed to isolate the area upon actuation of any gas extinguishing system in the area. In addition, smoke venting of the cable spreading room may be desirable. Such smoke venting systems should be controlled automatically by the fire detection or suppression system as appropriate. Capability for remote manual control should also be provided.	There is no gas extinguishing system. Manually actuated smoke venting is provided.
4. Plant Computer Room	
Safety related computers should be separated from other areas of the plant by barriers having a minimum three-hour fire resistant rating.	PNPP computers are not safety related, but this criterion is met for each unit's computer room.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
Automatic fire detection should be provided to alarm and annunciate in the control room and alarm locally. Manual hose stations and portable water and halon fire extinguishers should be provided.	Automatic fire detection, manual hose stations, and portable fire extinguishers are provided. The fire detection system alarms and annunciates in the control room.
5. Switchgear Rooms	
Switchgear rooms should be separated from the remainder of the plant by minimum three-hour rated fire barriers, if practicable. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Fire hose stations and portable extinguishers should be readily available.	Safety related switchgear rooms are separated from the remainder of the plant by walls, floors and ceilings which have 3 hour fire resistance ratings. Automatic fire detection devices, which actuate alarms and annunciate in the control room, are provided. Fire hose and portable fire extinguishers are readily available.
Acceptable protection for cables that pass through the switchgear room is automatic water or gas agent suppression. Such automatic suppression must consider preventing unacceptable damage to electrical equipment and possible necessary containment of agent following discharge.	Cables do not pass through the switchgear room.
6. Remote Safety Related Panels	
The general area housing remote safety related panels should be provided with automatic fire detectors that alarm locally and alarm and annunciate in the control room. Combustible materials should be controlled and limited to those required for operation. Portable extinguishers and manual hose stations should be provided.	The general areas housing safety related panels necessary for safe shutdown are provided with fire detectors which alarm and annunciate in the control room. Portable extinguishers and manual hose stations are provided.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
7. Station Battery Rooms	
Battery rooms should be protected against fire explosions. Battery rooms should be separated from each other and other areas of the plant by barriers having a minimum fire rating of three-hours inclusive of all penetrations and openings. (See NFPA 69, "Standard on Explosion Prevention Systems.") Ventilation systems in the battery rooms should be capable of maintaining the hydrogen concentration well below 2 vol. % hydrogen concentration. Standpipe and hose and portable extinguishers should be provided.	This criterion is met; see the fire hazards analysis portion of this report (Section 4.0) for details.
Alternatives:	
(a) Provide a total fire rated barrier enclosure of the battery room complex that exceeds the fire load contained in the room.	
(b) Reduce the fire load to be within the fire barrier capability of 1-1/2 hours.	
OR	
(c) Provide a remote manual actuated sprinkler system in each room and provide the 1-1/2 hour fire barrier separation.	
8. Turbine Lubrication and Control Oil Storage and Use Areas	
A blank fire wall having a minimum resistance rating of three hours should separate all areas containing safety related systems and equipment from the turbine oil system.	No safety related equipment is exposed to the turbine oil storage areas.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
9. Diesel Generator Areas	
Diesel generators should be separated from each other and other areas of the plant by fire barriers having a minimum fire resistance rating of three hours.	The design criterion is met.
Automatic fire suppression such as AFFF foam, or sprinklers should be installed to combat any diesel generator or lubricating oil fires. Automatic fire detection should be provided to alarm and annunicate in the control room and alarm locally. Drainage for fire fighting water and means for local manual venting of smoke should be provided.	A total flooding carbon dioxide system is provided. The fire detection system alarms and annunciates in the control room.
Day tanks with total capacity up to 1100 gallons are permitted in the diesel generator area under the following conditions: (a) The day tank is located in a separate enclosure, with a minimum fire resistance rating of three hours, including doors or penetrations. These enclosures should be capable of containing the entire contents of the day tanks. The enclosure should be ventilated to avoid accumulation of oil fumes. (b) The enclosure should be protected by automatic fire suppression systems such as AFFF or sprinklers.	The day tank (capacity 550 gallons) is located in the diesel generator room, thereby included in the carbon dioxide suppression system coverage. The tank and supports are coated with a fire retardant material to a thickness which provides a 3 hour rating. The tank is vented directly to the outdoors. There is an oil catch pan below the tank which drains to the floor drain system. Check valves are provided in lines subject to gravity flow.
10. Diesel Fuel Oil Storage Areas	
Diesel fuel oil tanks with a capacity greater than 1100 gallons should not be located inside the buildings containing safety related equipment. They should be located at least	Diesel fuel for the emergency diesel generators is stored in underground tanks.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
50 feet from any building containing safety related equipment, or if located within 50 feet, they should be housed in a separate building with construction having a minimum fire resistance rating of three hours. Buried tanks are considered as meeting the three hour fire resistance requirements. See NFPA 30, "Flammable and Combustible liquids Code", for additiocal guidance.	
When located in a separate building, the tank should be protected by an automatic fire suppression system such as AFFF or sprinklers.	
.anks, unless buried, should not be located directly above or below safety related systems or equipment regardless of the fire rating of separating floors or ceilings.	
11. Safety Related Pumps	
Pump houses and rooms housing safety related pumps or other safety related equipment should be separated from other areas of the plant by fire barriers having at least three-hour ratings. These rooms should be protected by automatic sprinkler protection unless a fire hazard analysis can demonstrate that a fire will not endanger other safety related equipment required for safety plant shutdown. Early warning fire detection should be installed with alarm and annunciation locally and in the control room. Local hose stations and portable extinguishers should also be provided.	The safety related pumps are located in the emergency service water pumphouse. The fire hazards analysis portion of this report (Section 4.0) outlines fire protection for safety related pumps.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
Equipment pedestals or curbs and drains should be provided to remove and direct water away from safety related equipment.	Safety related pumps are installed on concrete pads. Adequate water drainage is provided.
Provisions should be made for manual control of the ventilation system to facilitate smoke removal if required for manual fire fighting operation.	Provisions are available for manual smoke removal if required.
12. New Fuel Area	
Hand portable extinguishers should be located within this area. Also, local hose stations should be located outside but within hose reach of this area. Automatic fire detection should alarm and annunciate in the control room and alarm locally. Combustibles should be limited to a minimum in the new fuel area. The storage area should be provided with a drainage system to preclude accumulation of water.	Hand portable extinguishers and local hose stations are provided for this area. See the fire hazards analysis portion of this report (Section 4.0) for further details.
The storage configuration of new fuel should always be so maintained as to preclude criticality for any water density that might occur during fire water application.	The new fuel storage racks are designed to meet this criterion.
13. Spent Fuel Pool Area	
Protection for the spent fuel pool area should be provided by local hose stations and portable extinguishers. Automatic fire detection should be provided to alarm and annunciate in the control room and to alarm locally.	Hand portable extinguishers and local hose stations are provided for this area. See the fire hazards analysis portion of this report (Section 4.0) for further details.
14. Radwaste Building	
The radwaste building should be separated from other areas of the plant by fire barriers having at least three-hour ratings. Automatic sprinklers should be used in all areas	This criterion is met. See the fire hazard analysis portion of this report (Section 4.0) for details.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
where combustible materials are located. Automatic fire detection should be provided to annunciate and alarm in the control room and alarm locally. During a fire, the ventilation systems in these areas should be capable of being isolated. Water should drain to liquid radwaste building sumps.	
Acceptable alternative fire protection is automatic fire detection to alarm and annunciate in the control room, in addition to manual hose stations and portable extinguishers consisting of hand held and large wheeled units.	
15. Decontamination Areas	
The decontamination areas should be protected by automatic sprinklers if flammable liquids are stored. Automatic fire detection should be provided to annunciate and alarm in the control room and alarm locally. The ventilation system should be capable of being isolated. Local hose stations and hand portable extinguishers should be provided as backup to the sprinkler system.	The decontamination area is protected by automatic sprinklers backed up by local hose stations and hand portable extinguishers.
16. Safety Related Water Tanks	
Storage tanks that supply water for safe shutdown should be protected from the effects of fire. Local hose stations and portable extinguishers should be provided. Portable extinguishers should be located in nearby hose houses. Combustible materials should not be stored next to outdoor tanks. A minimum of 50 feet of separation should be provided between outdoor tanks and combustible materials where feasible.	See portion of fire hazards analysis (Section 4.0) pertaining to condensate storage tank.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
17. Cooling Towers	
Cooling towers should be of non-combustible construction or so located that a fire will not adversely affect any safety related systems or equipment. Cooling towers should be of non-combustible construction when the basins are used for the ultimate heat sink or for the fire protection water supply.	Cooling towers are of non-combustible construction.
18. Miscellaneous Areas	
Miscellaneous areas such as records storage areas, shops, warehouses, and auxiliary boiler rooms should be so located that a fire or effects of a fire, including smoke, will not adversely affect any safety related systems or equipment. Fuel oil tanks for auxiliary boilers should be buried or provided with dikes to contain the entire tank contents.	This criterion is complied with; see the fire hazards analysis portion of this report (Section 4.0) for details of individual situations.
G. Special Protection Guidelines	
1. Welding and Cutting, Acetylene - Oxygen Fuel Gas Systems	
This equipment is used in various areas throughout the plant. Storage locations should be chosen to permit fire protection by automatic sprinkler systems. Local hose stations and portable equipment should be provided as backup. The requirements of NFPA 51 and 51B are applicable to these hazards. A permit system should be required to utilize this equipment. (Also refer to 2f herein.)	CEI will comply.
2. Storage Areas for Dry Ion Exchange Resins	
Dry ion exchange resins should not be stored near essential safety related systems. Dry unused resins should be	The resins to be used are the wet type; CEI will not be using dry ion exchange resins at PNPP.

Position For Plants Which Have Application Docketed But Construction Permit Not Received As Of 7/1/76	Applicant Response
protected by automatic wet pipe sprinkler installations Detection by smoke and heat detectors should alarm and annunciate in the control room and alarm locally. Local hose stations and portable extinguishers should provide backup for these areas. Storage areas of dry resin should have curbs and drains. (Refer to NFPA 92M, "Waterproofing and Draining of Floors.")	
3. Hazardous Chemicals	
Hazardous chemicals should be stored and protected in accordance with the recommendations of NFPA 49, "Hazardous Chemicals Data." Chemicals storage areas should be well ventilated and protected against flooding conditions since some chemicals may react with water to produce ignition.	CEI will comply.
4. Materials Containing Radioactivity	
Materials that collect and contain radioactivity such as spent ion exchange resins, charcoal filters, and HEPA filters should be stored in closed metal tanks or containers that are located in areas free from ignition sources or combustibles. These materials should be protected from exposure to fires in adjacent areas as well. Consideration should be given to requirements for removal of isotopic decay heat from entrained radioactive materials.	CEI will comply.

LAYOUT DRAWINGS

E-023-001

through

E-023-034

BUILDING IDENTIFICATIO

AB - AUXILIARY BUILDING

CC - CONTROL COMPLEX

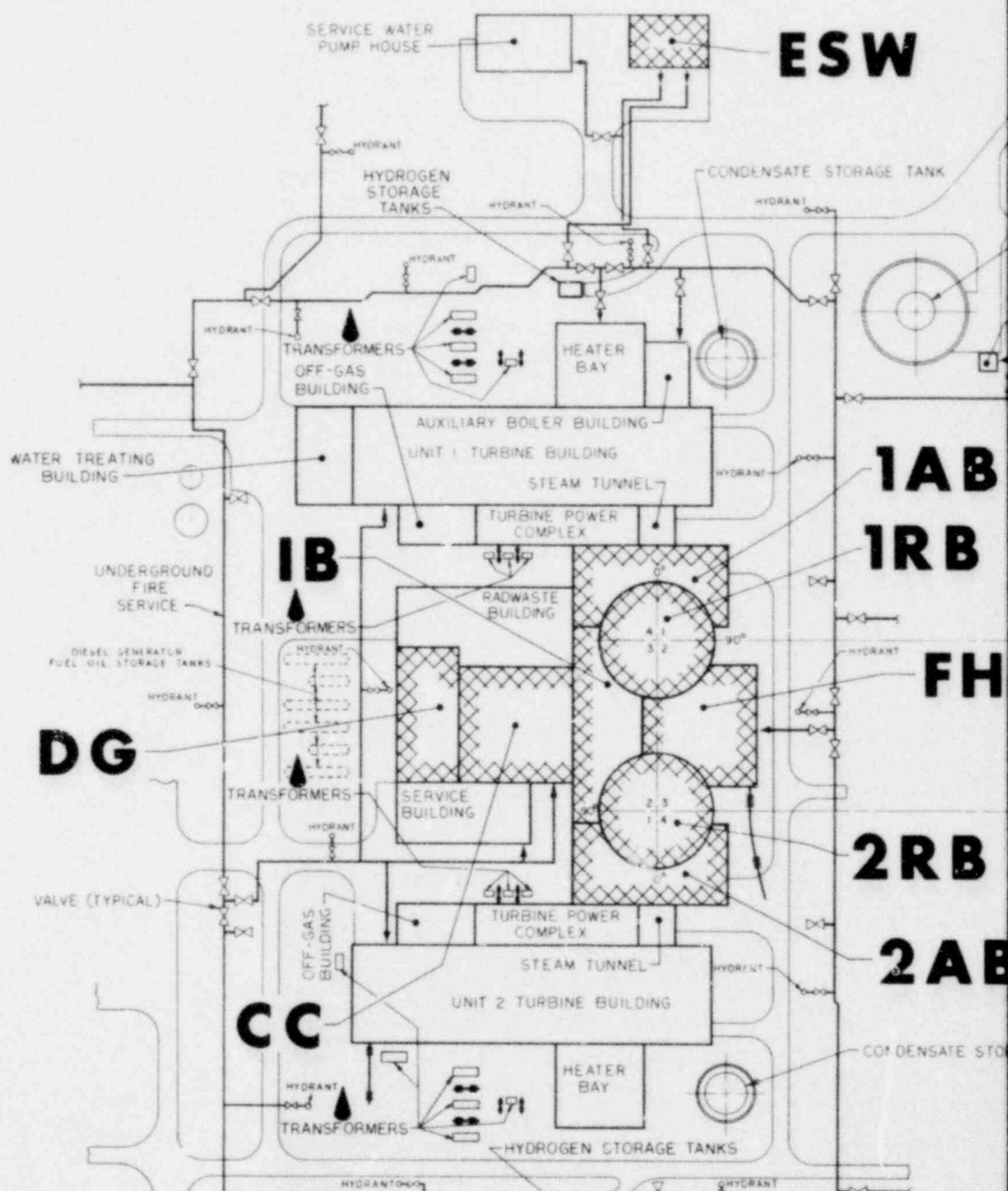
DG - DIESEL GENERATOR BUILDING

ESW - EMERGENCY SERVICE WATER PUMPHOUSE

FH - FUEL HANDLING BUILDING

IB

R



PLAN

LEGEND

INTERMEDIATE BUILDING

REACTOR BUILDING

N

FUEL OIL STORAGE TANK (FIXED FOAM FIRE SUPPRESSION)

FUEL OIL PUMP HOUSE

UNIT 1

UNIT 2

AGE TANK

1. WALL DESIGNATIONS:

FIRE AREA/ZONE BOUNDARIES

RATED FIRE BARRIER AT BOUNDARY

RATED FIRE BARRIER

CONTINUOUS FROM FLOOR TO CEILING

(HEIGHT ABOVE FLOOR) NOT CONTINUOUS FROM FLOOR TO CEILING

2. DOORS: RATINGS LABEL (A OR B)

WIRE GATES: G

3. SAFE SHUTDOWN EQUIPMENT

4. CABLE TRAYS/ENGINEERING SAFEGUARD:

1 — 1 — DIVISION 1

2 — 2 — DIVISION 2

5. FIRE BARRIERS:

HORIZONTAL

VERTICAL

FIRE AREA/ZONE CODE

2AB-1b

UNIT

BUILDING

REFERENCE FLOOR

SUB-DIVISION

6. SAFE SHUTDOWN DAMPERS

7. SAFE SHUTDOWN VALVES

SAFE SHUTDOWN RELIEF VALVES

8. FIRE HOSE STATIONS:

REELS (WATER UNLESS NOTED) (HOSE LENGTH 75' UNLESS NOTED)

CABINETS HC (WATER UNLESS NOTED) (HOSE LENGTH 75' UNLESS NOTED)

9. FIRE SUPPRESSION SYSTEMS:

WATER

CO_2

10. FIRE DETECTION SYSTEM:

S SMOKE DETECTION

11. SAFE SHUTDOWN INSTRUMENTS:

(NUMBER) - TEMPERATURE DETECTOR

12. FIRE EXTINGUISHERS:

DC DRY CHEMICAL

CO_2 CARBON DIOXIDE

W WATER

REVISIONS

DATE	RELEASED FOR	ENGR

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

PERRY NUCLEAR POWER PLANT UNITS 1 & 2

PLANT LAYOUT SPECIAL

FIRE PROTECTION EVALUATION

PLOT PLAN

GILBERT ASSOCIATES, INC.

C GENERAL REVISION AS PER OUT-OF-HOUSE REVIEW

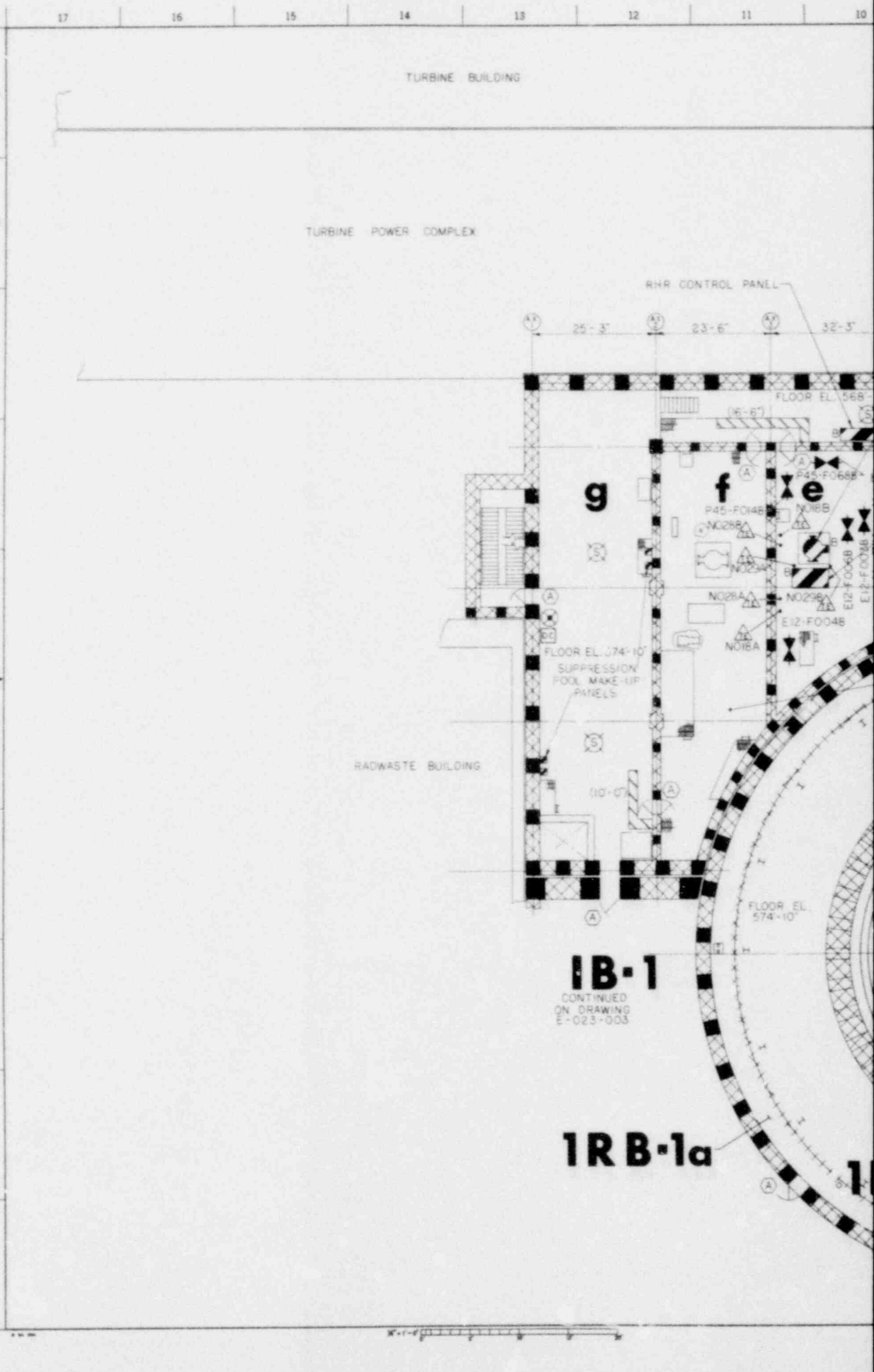
B GENERAL REVISION AS PER IN-HOUSE REVIEW

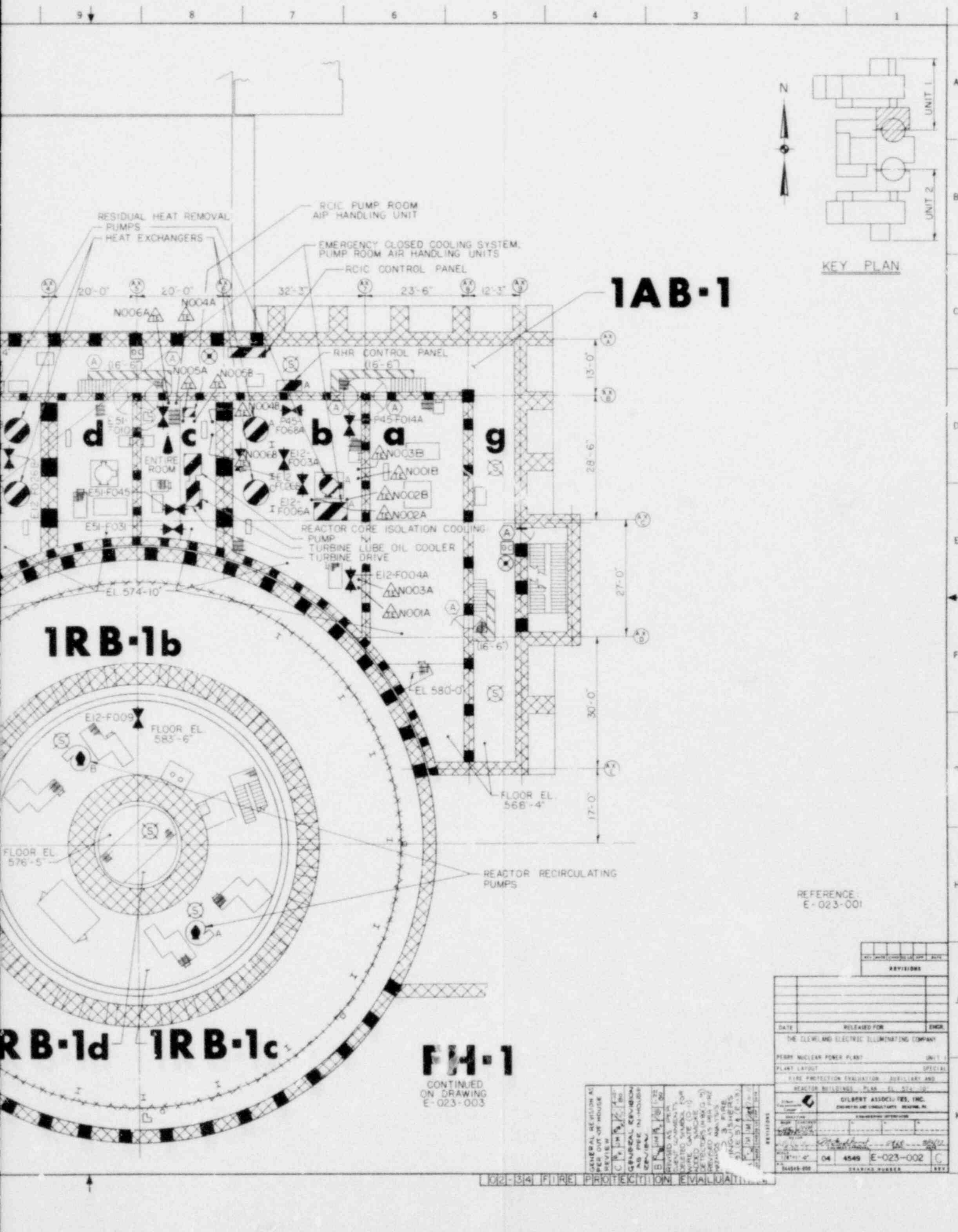
A REVISED AS PER FIRE HAZARDS ANALYSIS, IN LEGEND ADDED ITEM 6 (G-3), REVISED ITEM 2 (D-4) & 4 (E-G), ON PLANT ADDED QUADRANTS & ORIENTATION TO PLAN

04 4549 E-023-001 C

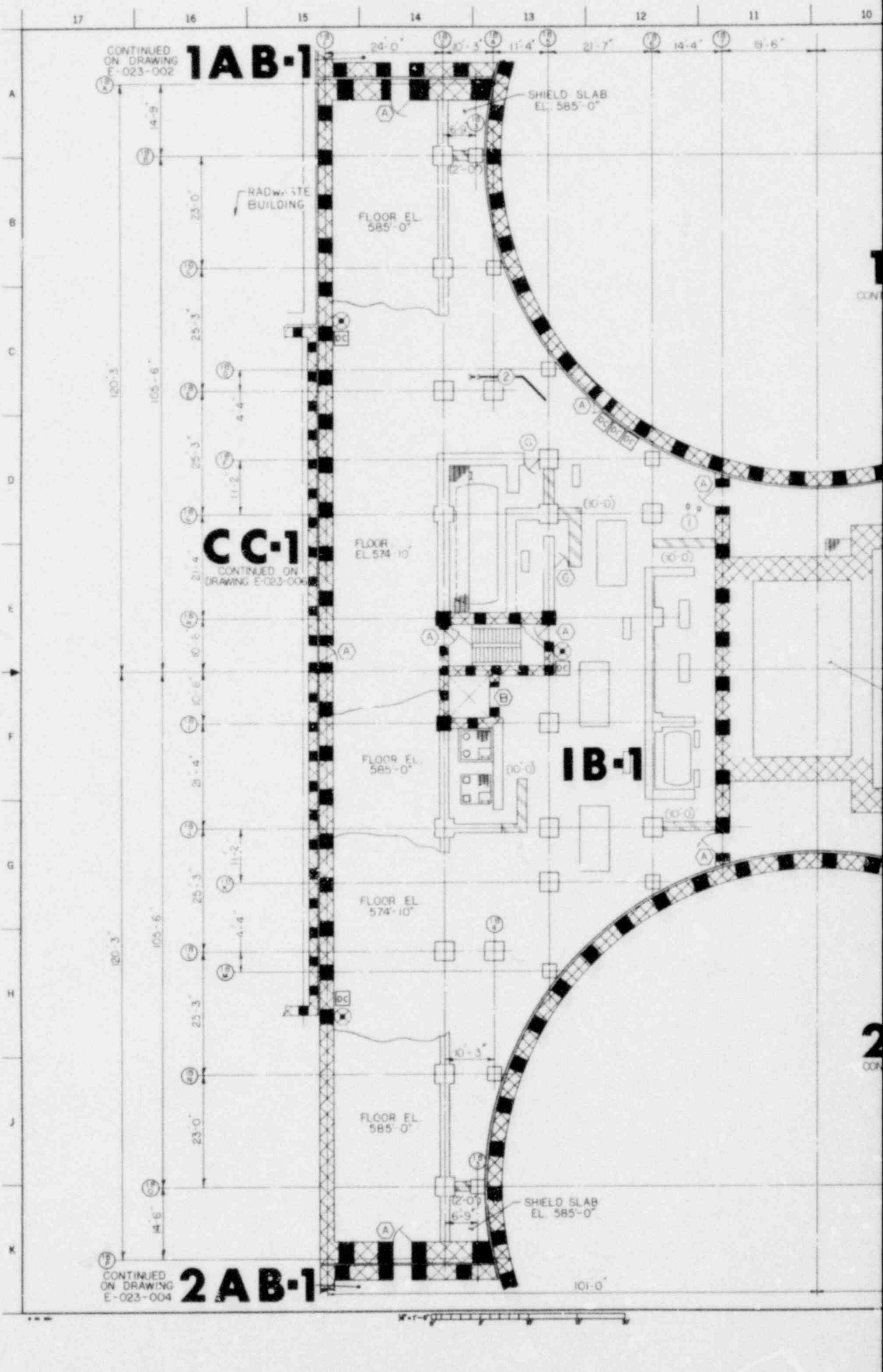
DRAWING NUMBER REV

01-34 FIRE PROTECTION EVALUATION

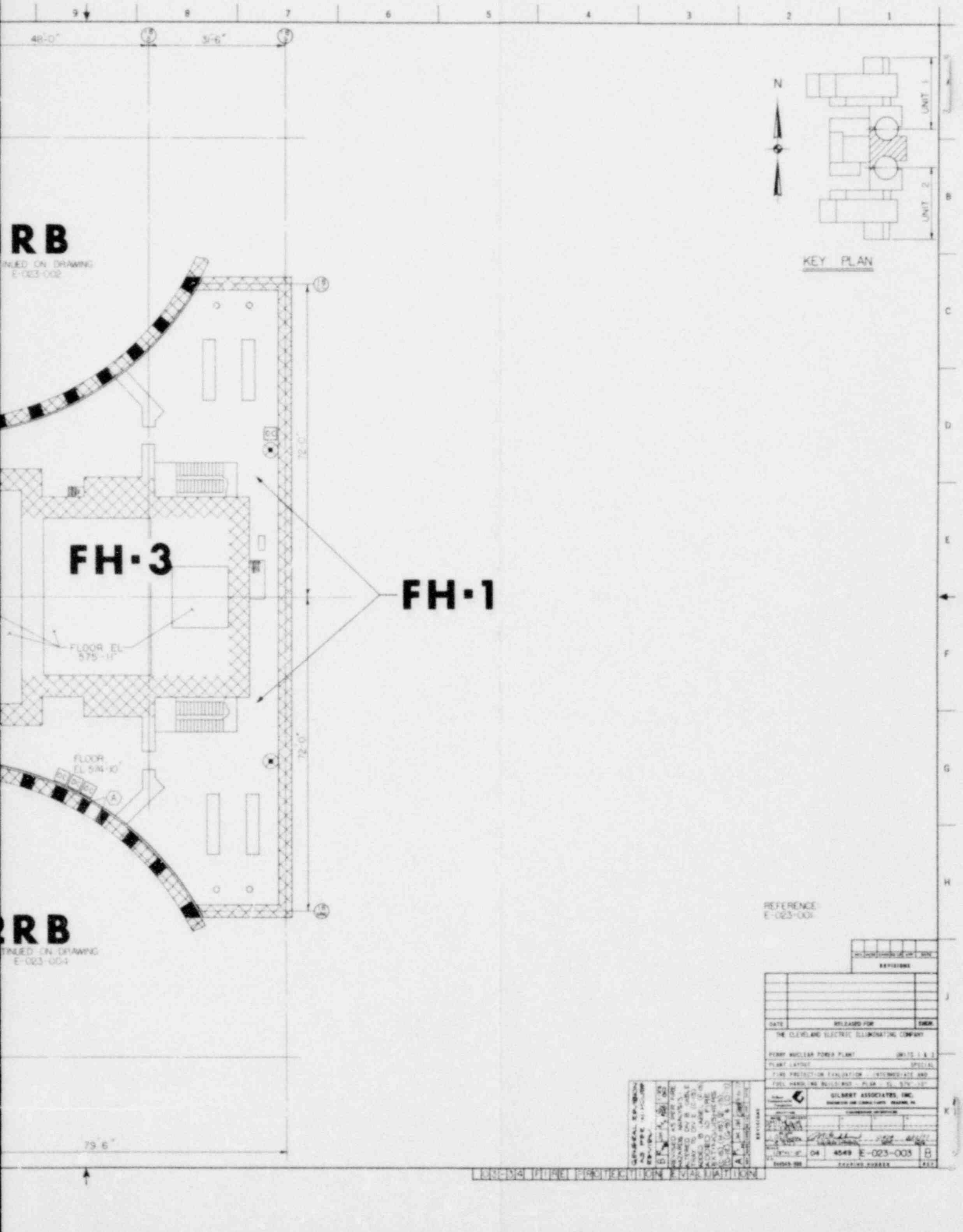

17
16
15
14
13
12
11
10
A
B
C
D
E
F
G
H
J
K
TURBINE BUILDING
TURBINE POWER COMPLEX
RHR CONTROL PANEL
25'-3"
23'-6"
32'-3"
FLOOR EL. 568-
(16'-6")
g
f
e
P45-F068B
P45-F014B
N018B
N028B
N029A
N028A
N029B
E12-F004B
E12-F006B
N018A
FLOOR EL. 574'-10"
SUPPRESSION POOL MAKE-UP PANELS
RADWASTE BUILDING
(10'-0")
FLOOR EL. 574'-10"
1B-1
CONTINUED ON DRAWING E-023-003
1RB-1a



RESIDUAL HEAT REMOVAL
PUMPS
HEAT EXCHANGERS
RCIC PUMP ROOM AIR HANDLING UNIT
EMERGENCY CLOSED COOLING SYSTEM, PUMP ROOM AIR HANDLING UNITS
RCIC CONTROL PANEL
RHR CONTROL PANEL (16'-6")
1AB-1
d
c
b
a
g
ENTIRE ROOM
REACTOR CORE ISOLATION COOLING
PUMP
TURBINE LUBE OIL COOLER
TURBINE DRIVE
EL. 574'-10"
EL 580'-0"
1RB-1b
FLOOR EL. 583'-6"
FLOOR EL. 568'-4"
FLOOR EL. 576'-5"
REACTOR RECIRCULATING PUMPS
1RB-1d
1RB-1c
FH-1
CONTINUED ON DRAWING E-023-003
KEY PLAN
UNIT 1
UNIT 2
REFERENCE: E-023-001
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
PLANT LAYOUT
FIRE PROTECTION EVALUATION - AUXILIARY AND REACTOR BUILDINGS - PLAN - EL. 574'-10"
GILBERT ASSOCIATES, INC.
E-023-002
02-34 FIRE PROTECTION EVALUATION

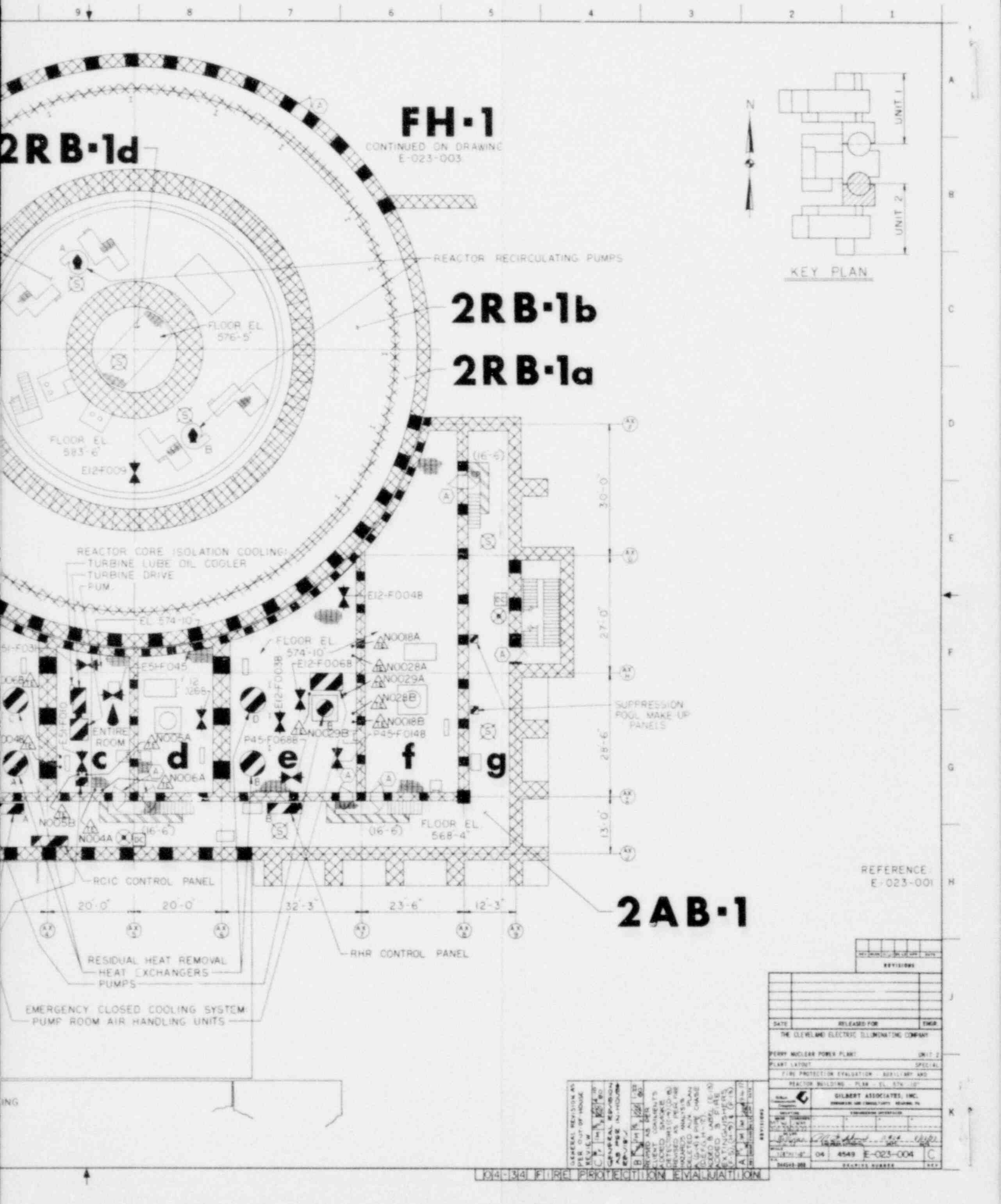


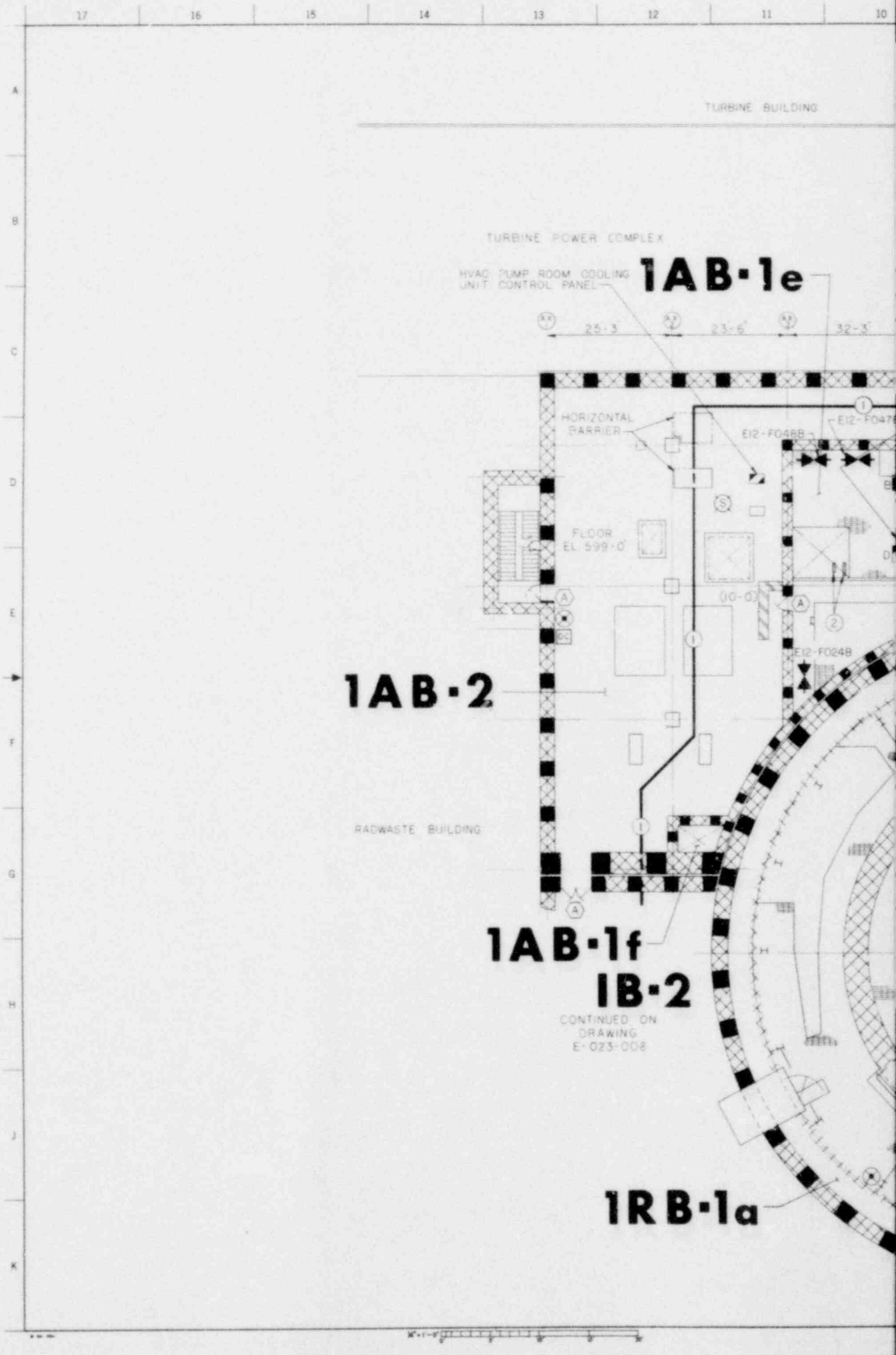
CONTINUED ON DRAWING E-023-002
1AB-1
SHIELD SLAB EL. 585'-0"
RADWASTE BUILDING
FLOOR EL. 585'-0"
CC-1
CONTINUED ON DRAWING E-023-006
FLOOR EL. 574'-10"
FLOOR EL. 585'-0"
IB-1
FLOOR EL. 574'-10"
FLOOR EL. 585'-0"
SHIELD SLAB EL. 585'-0"
CONTINUED ON DRAWING E-023-004
2AB-1
101'-0"



9
8
7
6
5
4
3
2
1
48'-0"
31'-6"
79'-6"
72'-0"
72'-0"
RB
CONTINUED ON DRAWING E-023-002
RB
CONTINUED ON DRAWING E-023-004
FH-3
FH-1
FLOOR EL 575'-11"
FLOOR EL 574'-10"
N
UNIT 1
UNIT 2
KEY PLAN
REFERENCE: E-023-001
REVISIONS
DATE
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - INTERMEDIATE AND
FUEL HANDLING BUILDINGS - PLAN - EL 574'-10"
GILBERT ASSOCIATES, INC.
04
4549
E-023-003
B
DRAWING NUMBER
GENERAL REVISION
C
D
E
F
G
H
J
K
FIRE PROTECTION EVALUATION

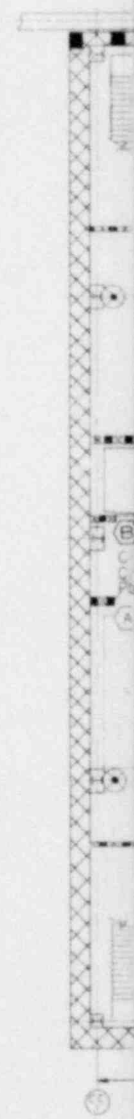

2RB-1c
IB-1
CONTINUED ON DRAWING E-023-003
FLOOR EL 574'-10"
FLOOR EL 568'-4"
EL 580'-0"
(10'-0")
FLOOR EL 574'-10"
SUPPRESSION POOL MAKE-UP PANELS
N001A
N003A
N002B
N002A
E12-F004A
E12-F006A
E12-F003A
N001B
N003B
FLOOR EL 574'-10"
g
a
b
P45-F014A
P45-F068A
(16'-6")
25'-3"
23'-6"
32'-3"
RHR CONTROL PANEL
RCIC PUMP ROOM AIR HANDLING UNIT
TURBINE POWER COMPLEX
TURBINE BUILD


FH-1
CONTINUED ON DRAWING E-023-003
2RB-1d
2RB-1b
2RB-1a
2AB-1
REACTOR RECIRCULATING PUMPS
FLOOR EL. 576-5"
FLOOR EL. 583-6"
E12-F009
REACTOR CORE ISOLATION COOLING:
TURBINE LUBE OIL COOLER
TURBINE DRIVE
PUMP
EL. 574-10"
FLOOR EL. 574-10"
E12-F004B
E12-F006B
E12-F003B
E51-F045
P45-F068B
P45-F014B
N001BA
N002BA
N0029A
N002BB
N001BB
N0029B
N005A
N006A
N005B
N004A
ENTIRE ROOM
c
d
e
f
g
(16-6")
FLOOR EL. 568-4"
SUPPRESSION POOL MAKE-UP PANELS
RCIC CONTROL PANEL
RHR CONTROL PANEL
RESIDUAL HEAT REMOVAL
HEAT EXCHANGERS
PUMPS
EMERGENCY CLOSED COOLING SYSTEM
PUMP ROOM AIR HANDLING UNITS
20'-0"
32'-3"
23'-6"
12'-3"
30'-0"
27'-0"
28'-6"
13'-0"
KEY PLAN
UNIT 1
UNIT 2
N
REFERENCE: E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNIT 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - AUXILIARY AND REACTOR BUILDING - PLAN - EL. 574'-10"
GILBERT ASSOCIATES, INC.
04
4549
E-023-004
C
DRAWING NUMBER
REV
GENERAL REVISION AS PER OUT-OF-HOUSE REVIEW
GENERAL REVISION AS PER IN-HOUSE REVIEW
04-34 FIRE PROTECTION EVALUATION

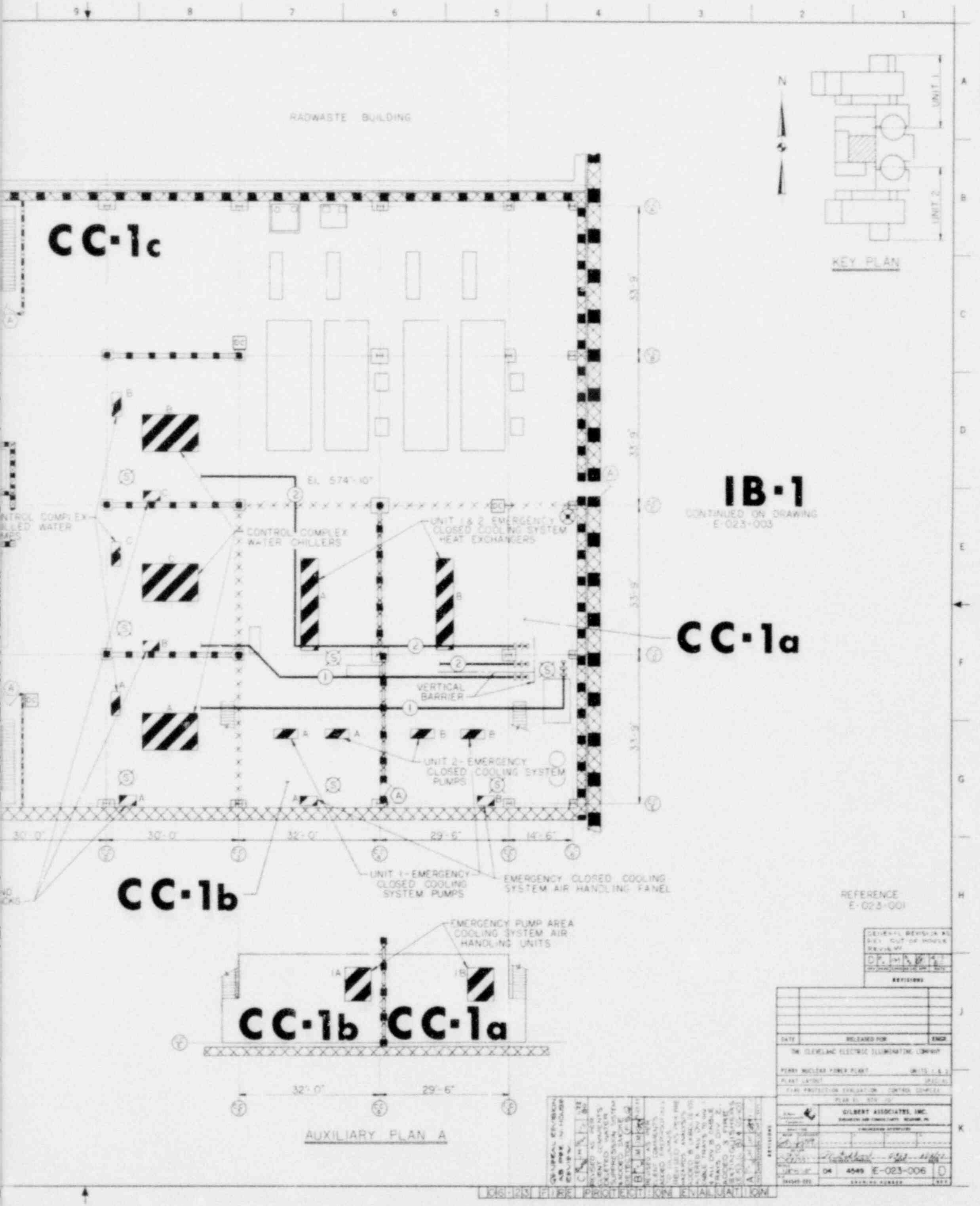


17
16
15
14
13
12
11
10
A
B
C
D
E
F
G
H
J
K
TURBINE BUILDING
TURBINE POWER COMPLEX
HVAC PUMP ROOM COOLING
UNIT CONTROL PANEL
1AB-1e
25-3
23-6
32-3
HORIZONTAL
BARRIER
E12-F048B
FLOOR
EL 599-0
(10-0)
E12-F024B
1AB-2
RADWASTE BUILDING
1AB-1f
IB-2
CONTINUED ON
DRAWING
E-023-008
1RB-1a

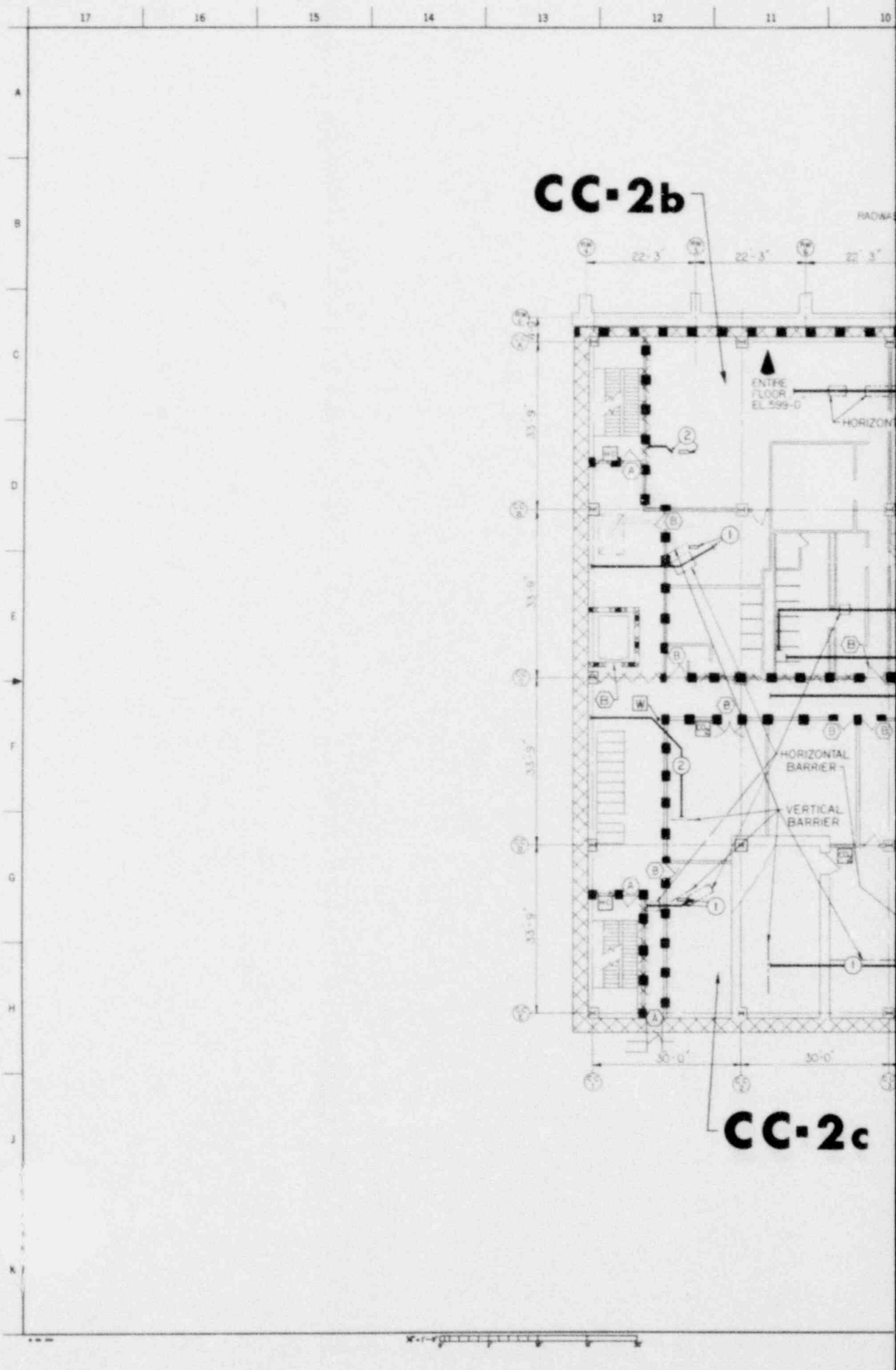
KEY PLAN
UNIT 1
UNIT 2
N
RESIDUAL HEAT REMOVAL HEAT EXCHANGERS
STEAM TUNNEL
1AB-1b
HORIZONTAL BARRIER
VERTICAL BARRIER
E12-F047A
E12-F048A
FLOOR EL 599-0"
RHR HEAT EXCH PANELS
E12-F024A
E51-F068
1AB-2
PLATFORM EL 606-0"
FLOOR EL 599-0"
FLOOR EL 599-9"
E12-F006
177 CONTROL ROD DRIVES
REACTOR RECIRCULATING PUMP
1RB-1d
1RB-1c
FLOOR EL 599-9
FH-2
CONTINUED ON DRAWING E-023-008
1RB-1b
REFERENCE E-023-001
REVISIONS
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
PLANT LAYOUT
FIRE PROTECTION EVALUATION
GILBERT ASSOCIATES, INC.
04
4549
E-023-005
B
FIRE PROTECTION EVALUATION



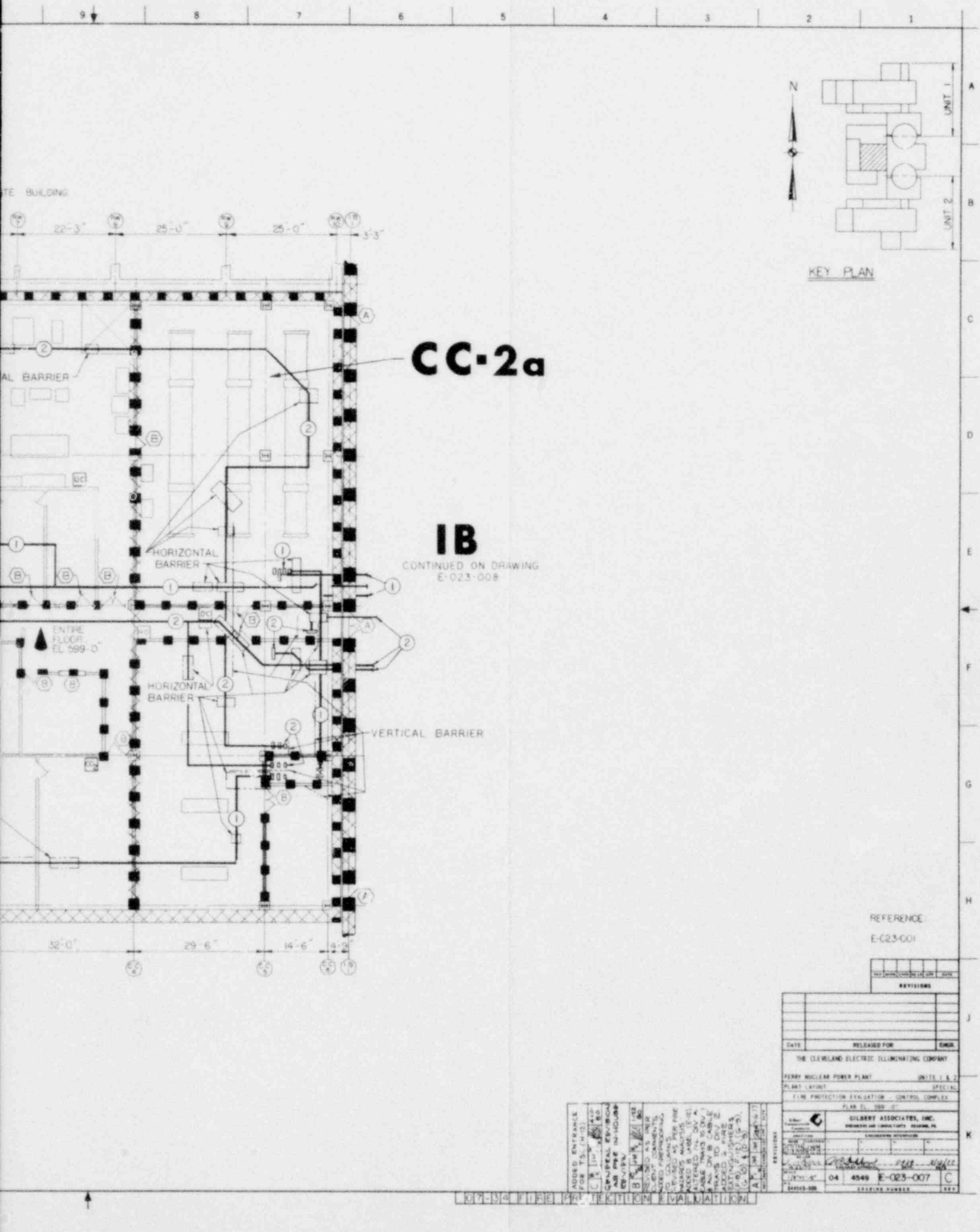
CONTROL COMPLEX
CHILLED WATER PUMP A
CHILLER AND ECCW INSTRUMENT R



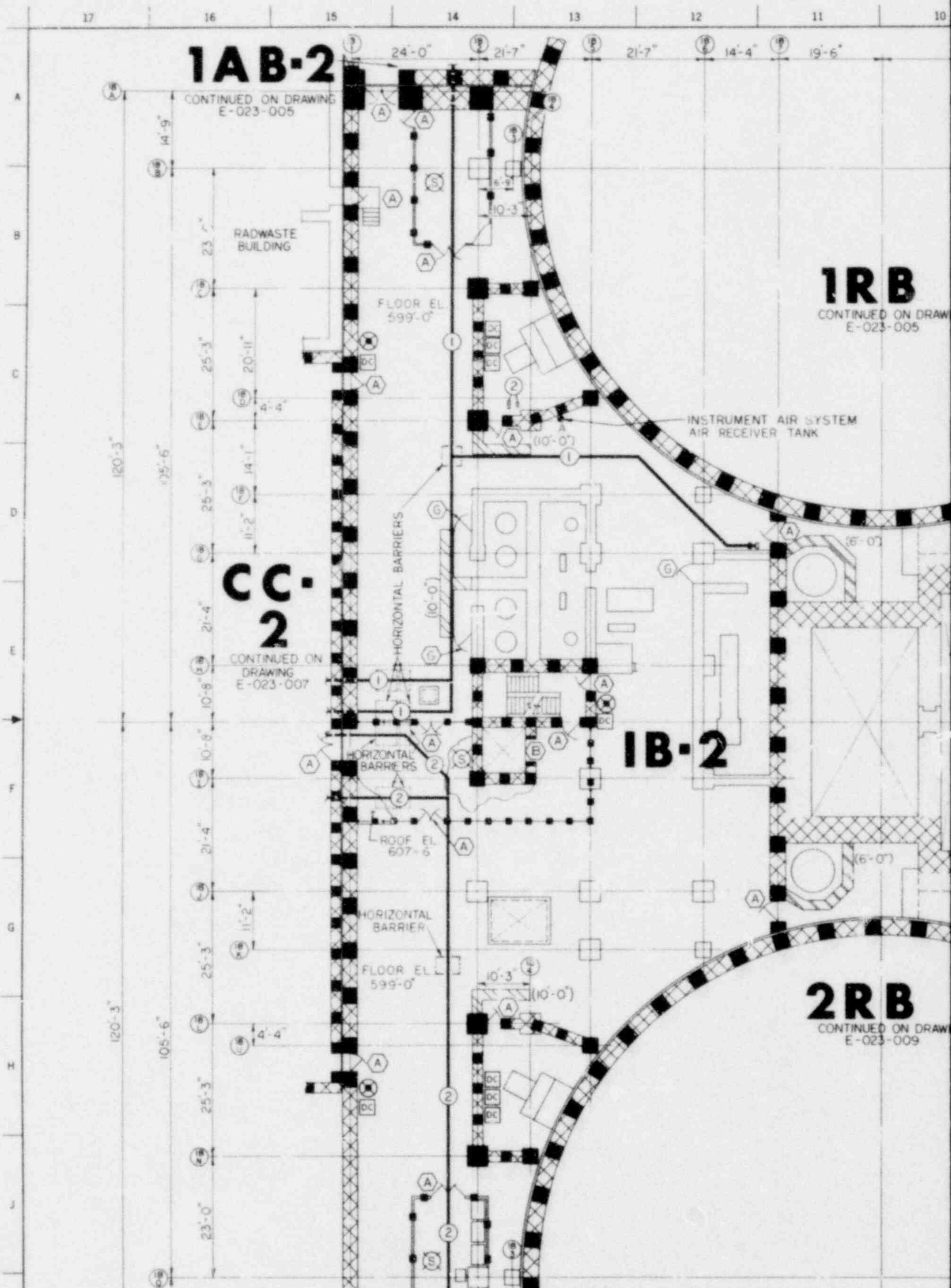
RADWASTE BUILDING
KEY PLAN
UNIT 1
UNIT 2
N
CC-1c
CC-1a
CC-1b
IB-1
CONTINUED ON DRAWING E-023-003
EL 574'-10"
CONTROL COMPLEX WATER CHILLERS
UNIT 1 & 2 EMERGENCY CLOSED COOLING SYSTEM HEAT EXCHANGERS
VERTICAL BARRIER
UNIT 2 - EMERGENCY CLOSED COOLING SYSTEM PUMPS
UNIT 1 - EMERGENCY CLOSED COOLING SYSTEM PUMPS
EMERGENCY CLOSED COOLING SYSTEM AIR HANDLING PANEL
EMERGENCY PUMP AREA COOLING SYSTEM AIR HANDLING UNITS
30'-0"
30'-0"
32'-0"
29'-6"
14'-6"
33'-9"
33'-9"
33'-9"
33'-9"
1A
1B
CC-1b
CC-1a
32'-0"
29'-6"
AUXILIARY PLAN A
REFERENCE E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
FIRE PROTECTION EVALUATION CONTROL COMPLEX
GILBERT ASSOCIATES, INC.
04
4549
E-023-006
D
DRAWING NUMBER
FIRE PROTECTION EVALUATION

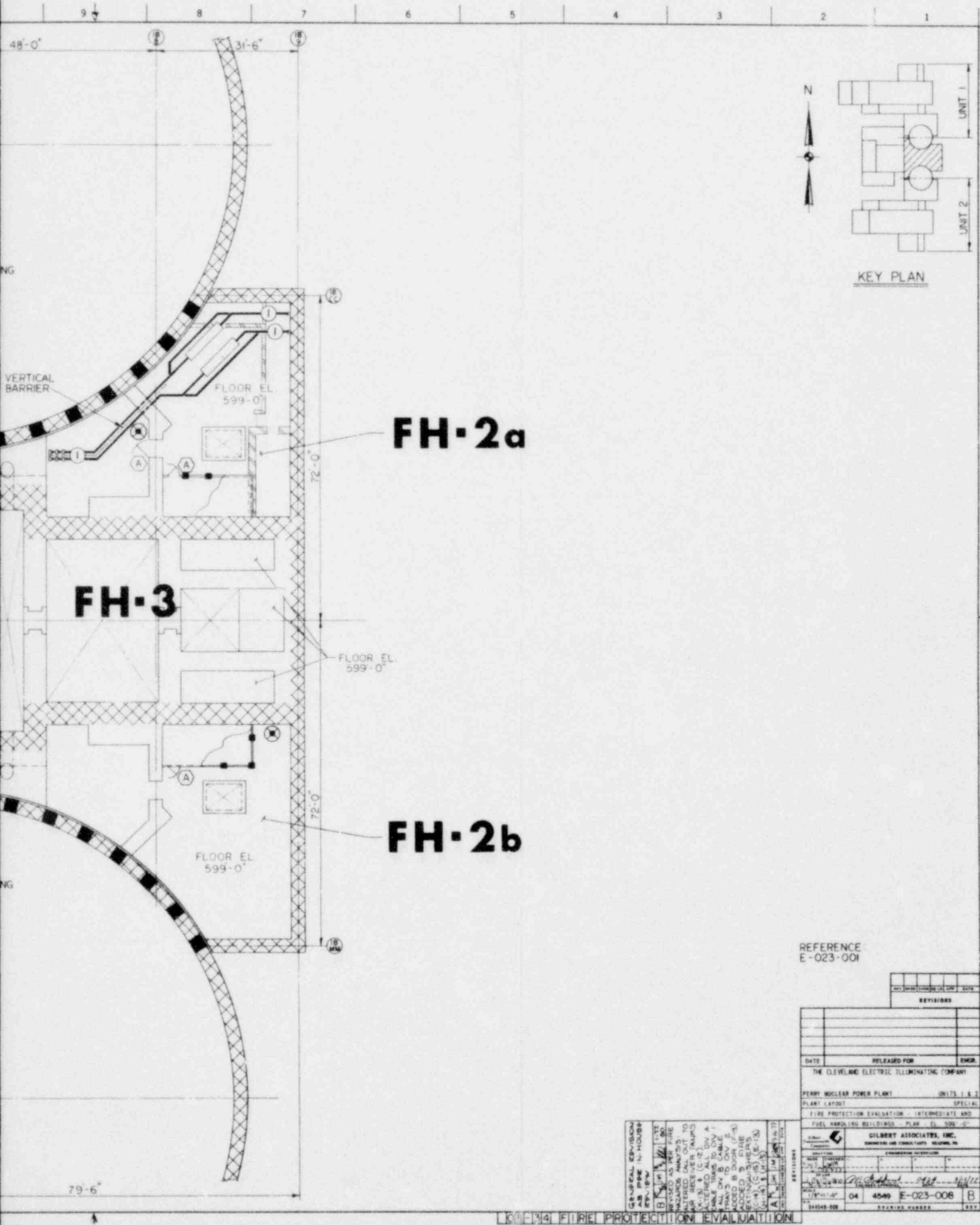


CC-2b
CC-2c
RADWAS
ENTIRE
FLOOR
EL 599-0
HORIZONT
HORIZONTAL
BARRIER
VERTICAL
BARRIER
22'-3"
33'-9"
30'-0"

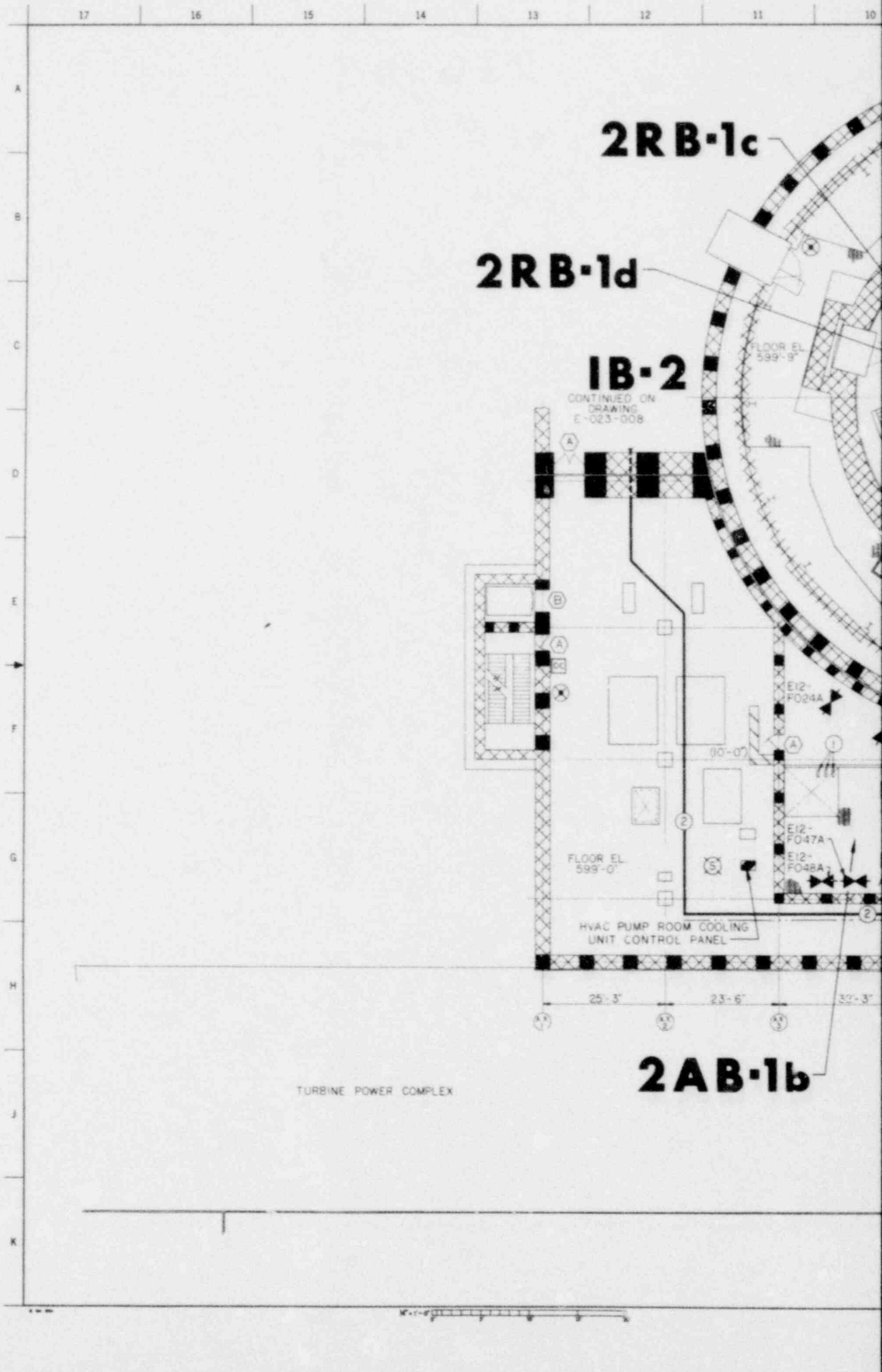


CC-2a
IB
CONTINUED ON DRAWING E-023-008
HORIZONTAL BARRIER
VERTICAL BARRIER
ENTIRE FLOOR EL 599'-0"
22'-3"
25'-0"
25'-0"
3'-3"
32'-0"
29'-6"
14'-6"
4'-3"
N
UNIT 1
UNIT 2
KEY PLAN
REFERENCE: E-023-001
REVISIONS
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 & 2
PLANT LAYOUT SPECIAL
FIRE PROTECTION EVALUATION - CONTROL COMPLEX
PLAN EL 599'-0"
GILBERT ASSOCIATES, INC.
04 4549 E-023-007 C
DRAWING NUMBER
ADDED ENTRANCE FOR TSC (H-12)
GENERAL REVISION AS PER IN-HOUSE REVIEW
REVISED AS PER CLIENT COMMENTS
07-34 FIRE PROTECTION EVALUATION

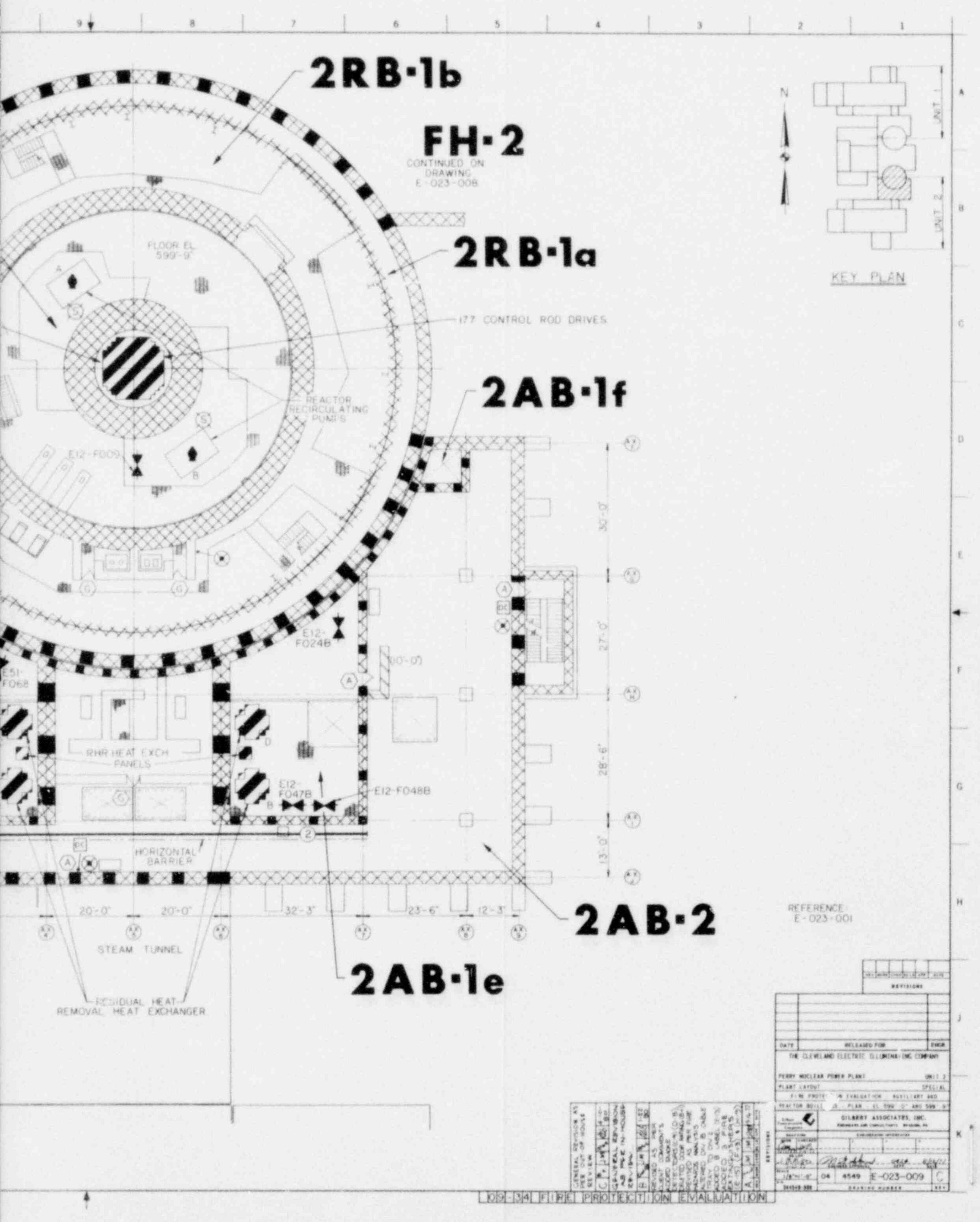

1AB-2
CONTINUED ON DRAWING E-023-005
RADWASTE BUILDING
FLOOR EL 599'-0"
1RB
CONTINUED ON DRAWING E-023-005
INSTRUMENT AIR SYSTEM AIR RECEIVER TANK
HORIZONTAL BARRIERS
CC-2
CONTINUED ON DRAWING E-023-007
IB-2
HORIZONTAL BARRIERS
ROOF EL 607'-6"
HORIZONTAL BARRIER
FLOOR EL 599'-0"
2RB
CONTINUED ON DRAWING E-023-009
INSTRUMENT AIR SYSTEM AIR RECEIVER TANK
CONTINUED ON DRAWING E-023-009
2AB-2
101'-0"

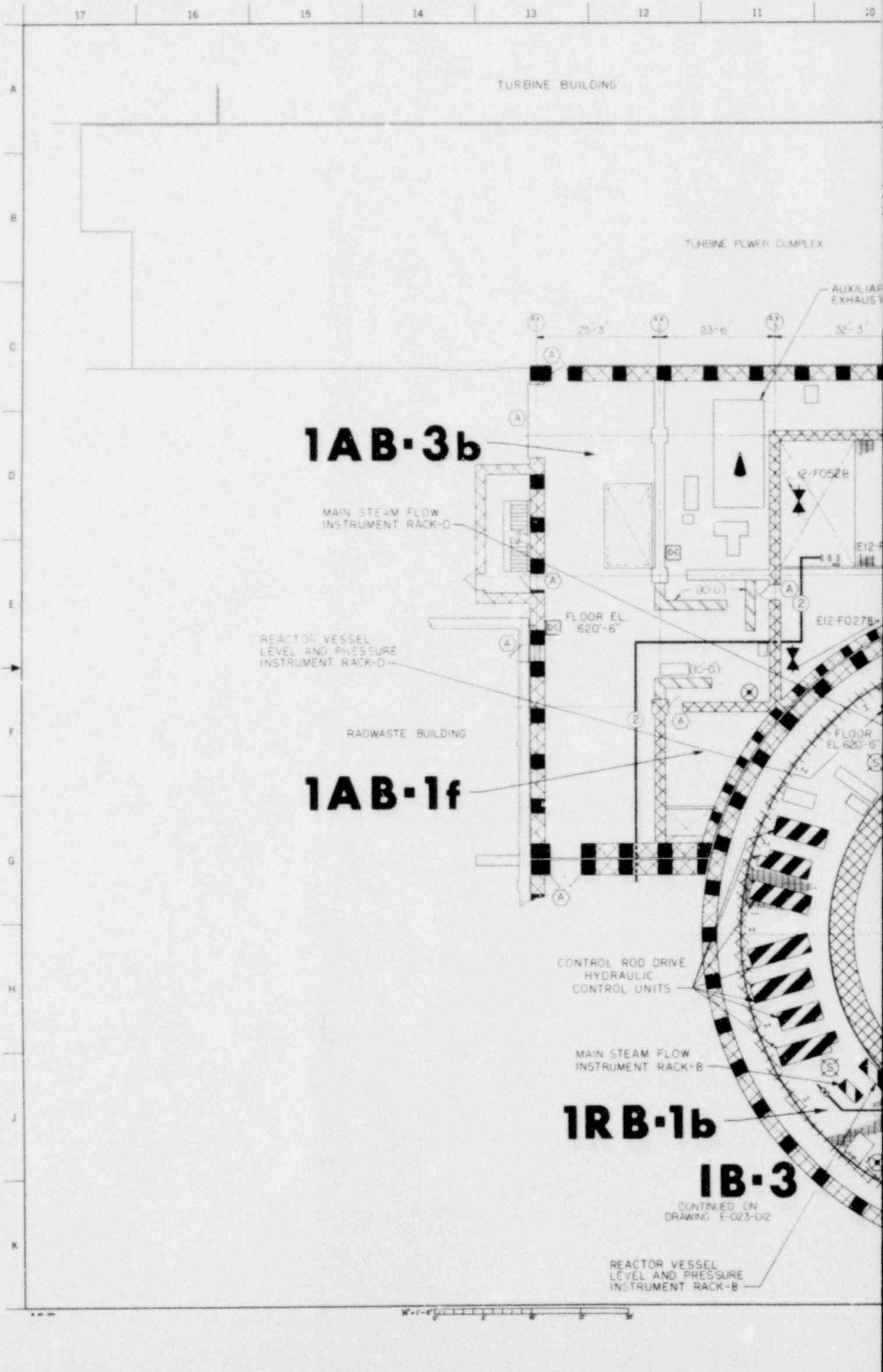


08-3/4 FIRE PROTECTION EVALUATION

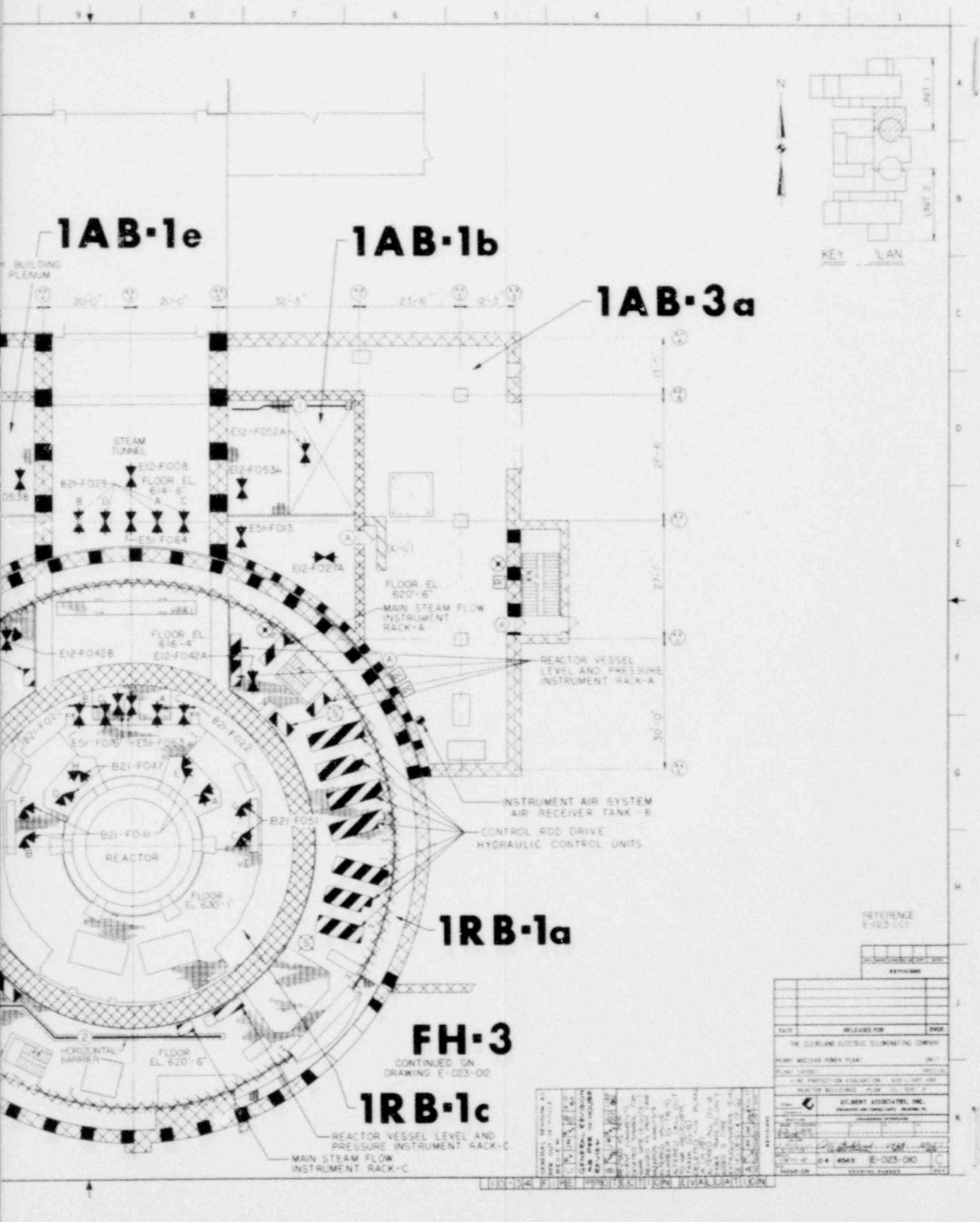


2RB-1c
2RB-1d
IB-2
CONTINUED ON DRAWING E-023-008
FLOOR EL 599'-9"
FLOOR EL 599'-0"
E12-F024A
E12-F047A
E12-F048A
(10'-0")
HVAC PUMP ROOM COOLING UNIT CONTROL PANEL
25'-3"
23'-6"
32'-3"
2AB-1b
TURBINE POWER COMPLEX

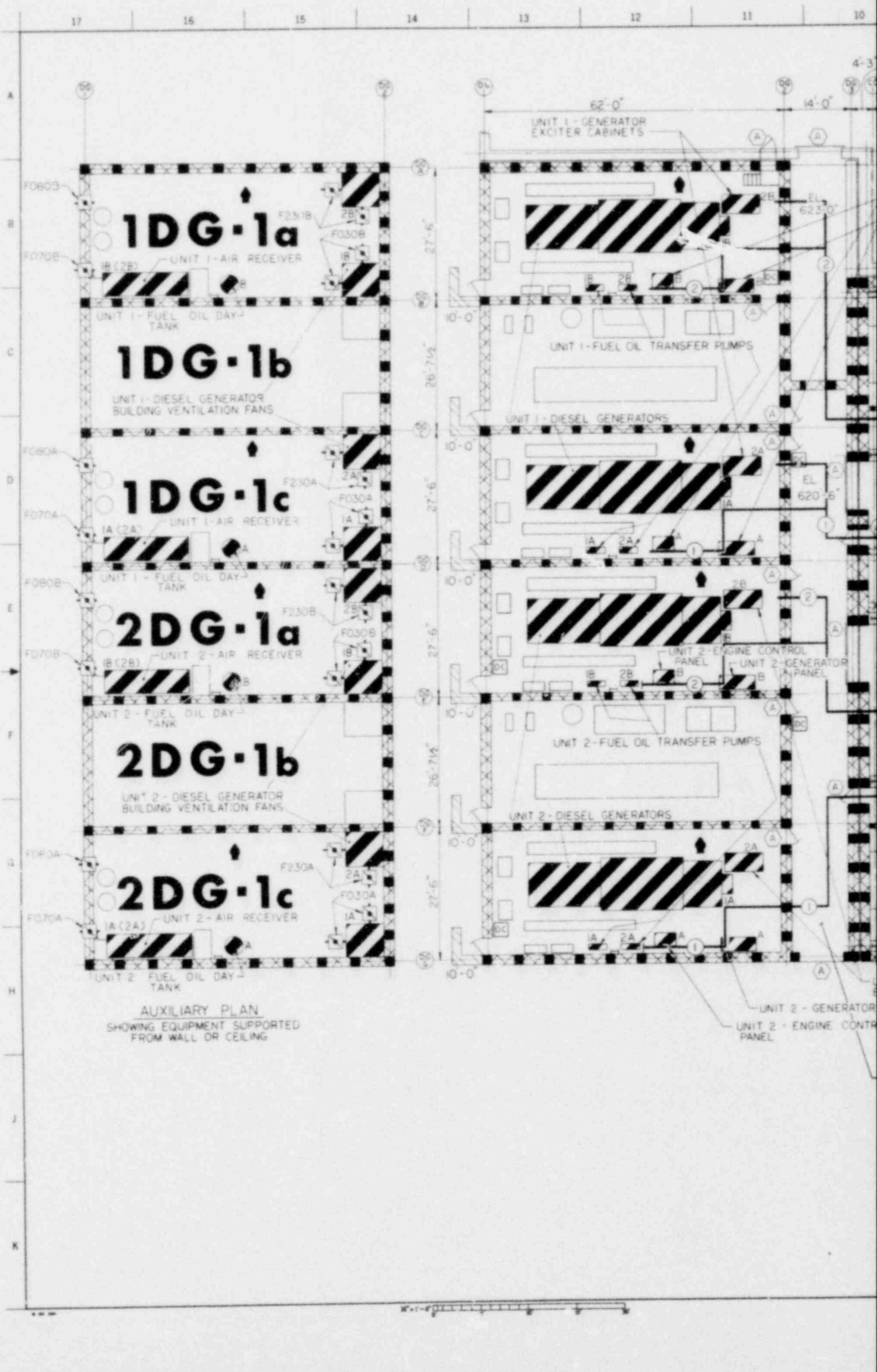

2RB-1b
FH-2
CONTINUED ON DRAWING E-023-008
2RB-1a
FLOOR EL. 599'-9"
177 CONTROL ROD DRIVES
2AB-1f
REACTOR RECIRCULATING PUMPS
E12-F009
E12-F024B
E51-F068
RHR HEAT EXCH PANELS
E12-F047B
E12-F048B
HORIZONTAL BARRIER
30'-0"
27'-0"
28'-6"
13'-0"
20'-0"
20'-0"
32'-3"
23'-6"
12'-3"
STEAM TUNNEL
2AB-2
2AB-1e
RESIDUAL HEAT REMOVAL HEAT EXCHANGER
KEY PLAN
UNIT 1
UNIT 2
N
REFERENCE: E-023-001
REVISIONS
DATE
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNIT 2
PLANT LAYOUT SPECIAL
FIRE PROTECTION EVALUATION AUXILIARY AND
REACTOR BUILDING PLAN EL 599'-0" AND 599'-9"
GILBERT ASSOCIATES, INC.
E-023-009
C
09-34 FIRE PROTECTION EVALUATION



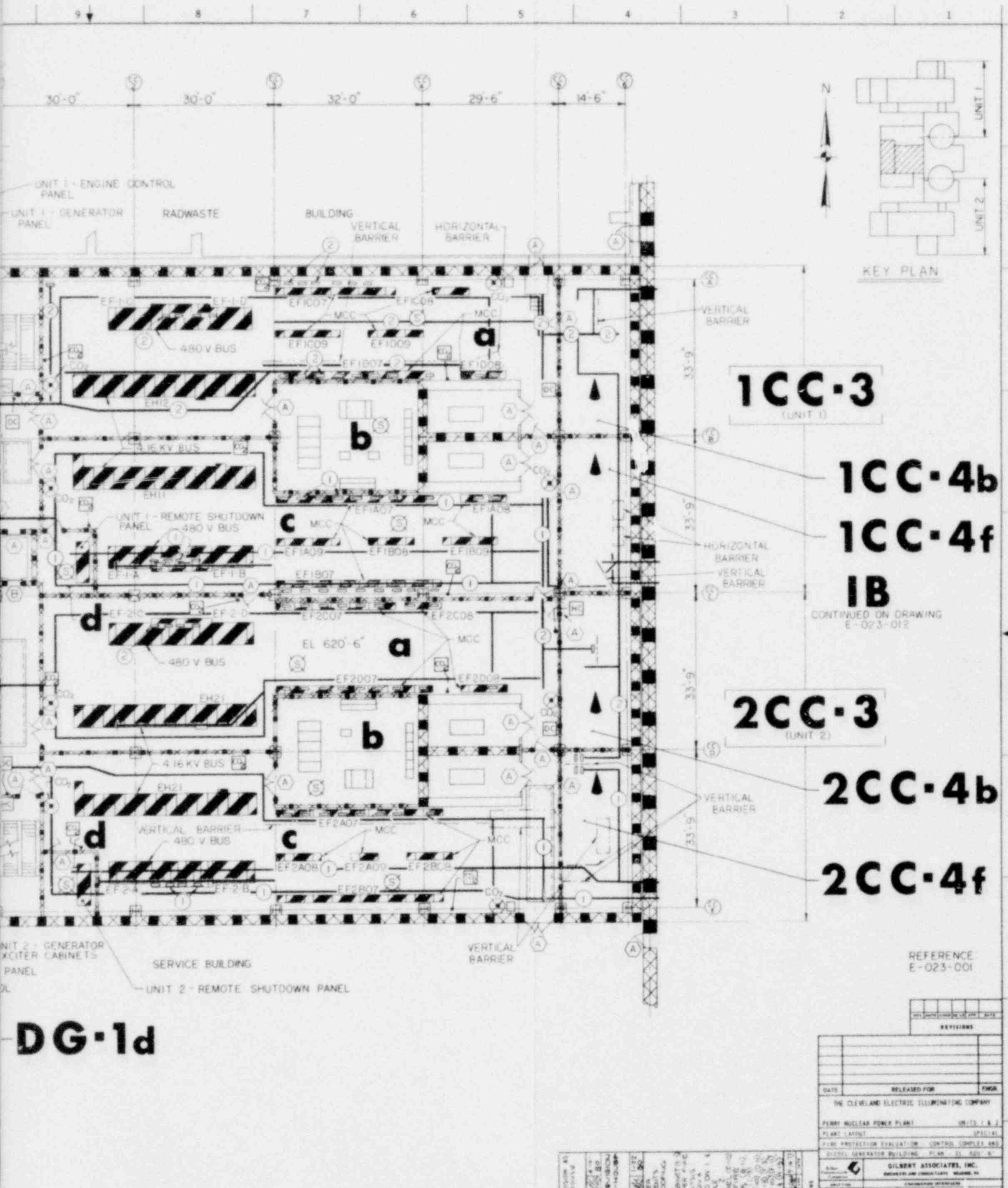
TURBINE BUILDING
TURBINE POWER COMPLEX
1AB-3b
MAIN STEAM FLOW INSTRUMENT RACK-D
FLOOR EL. 620'-6"
REACTOR VESSEL LEVEL AND PRESSURE INSTRUMENT RACK-D
RADWASTE BUILDING
1AB-1f
CONTROL ROD DRIVE HYDRAULIC CONTROL UNITS
MAIN STEAM FLOW INSTRUMENT RACK-B
1RB-1b
IB-3
CONTINUED ON DRAWING E-023-012
REACTOR VESSEL LEVEL AND PRESSURE INSTRUMENT RACK-B



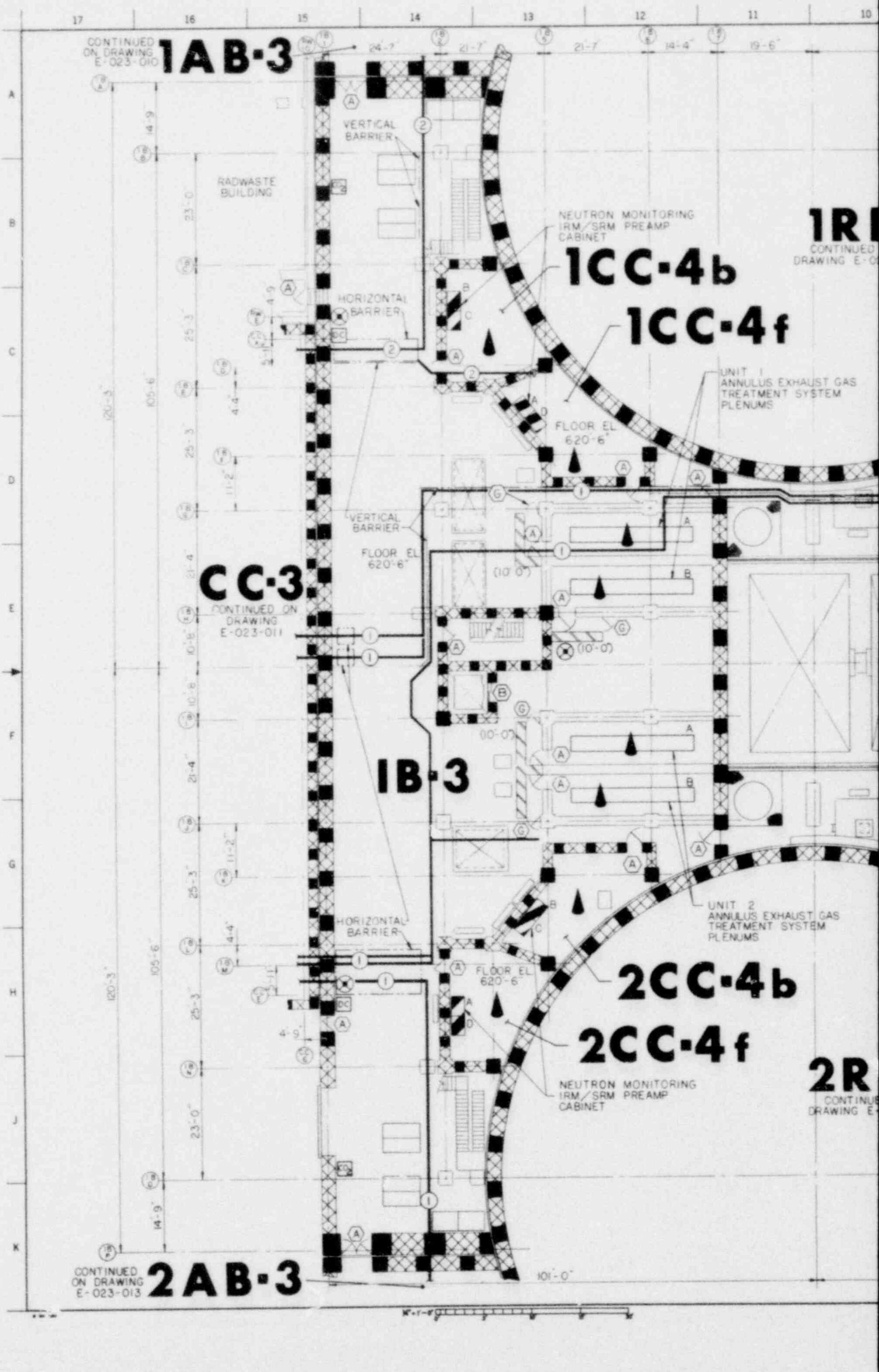
1AB-1e
1AB-1b
1AB-3a
BUILDING PLENUM
STEAM TUNNEL
FLOOR EL. 614'-6"
FLOOR EL. 620'-6"
MAIN STEAM FLOW INSTRUMENT RACK-A
FLOOR EL. 616'-4"
REACTOR VESSEL LEVEL AND PRESSURE INSTRUMENT RACK-A
INSTRUMENT AIR SYSTEM AIR RECEIVER TANK - B
CONTROL ROD DRIVE HYDRAULIC CONTROL UNITS
REACTOR
FLOOR EL. 630'-1"
1RB-1a
FH-3
CONTINUED ON DRAWING E-023-012
HORIZONTAL BARRIER
FLOOR EL. 620'-6"
1RB-1c
REACTOR VESSEL LEVEL AND PRESSURE INSTRUMENT RACK-C
MAIN STEAM FLOW INSTRUMENT RACK-C
KEY PLAN
UNIT 1
UNIT 2
REFERENCE E-023-001
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
GILBERT ASSOCIATES, INC.
E-023-010
10-34 FIRE PROTECTION EVALUATION

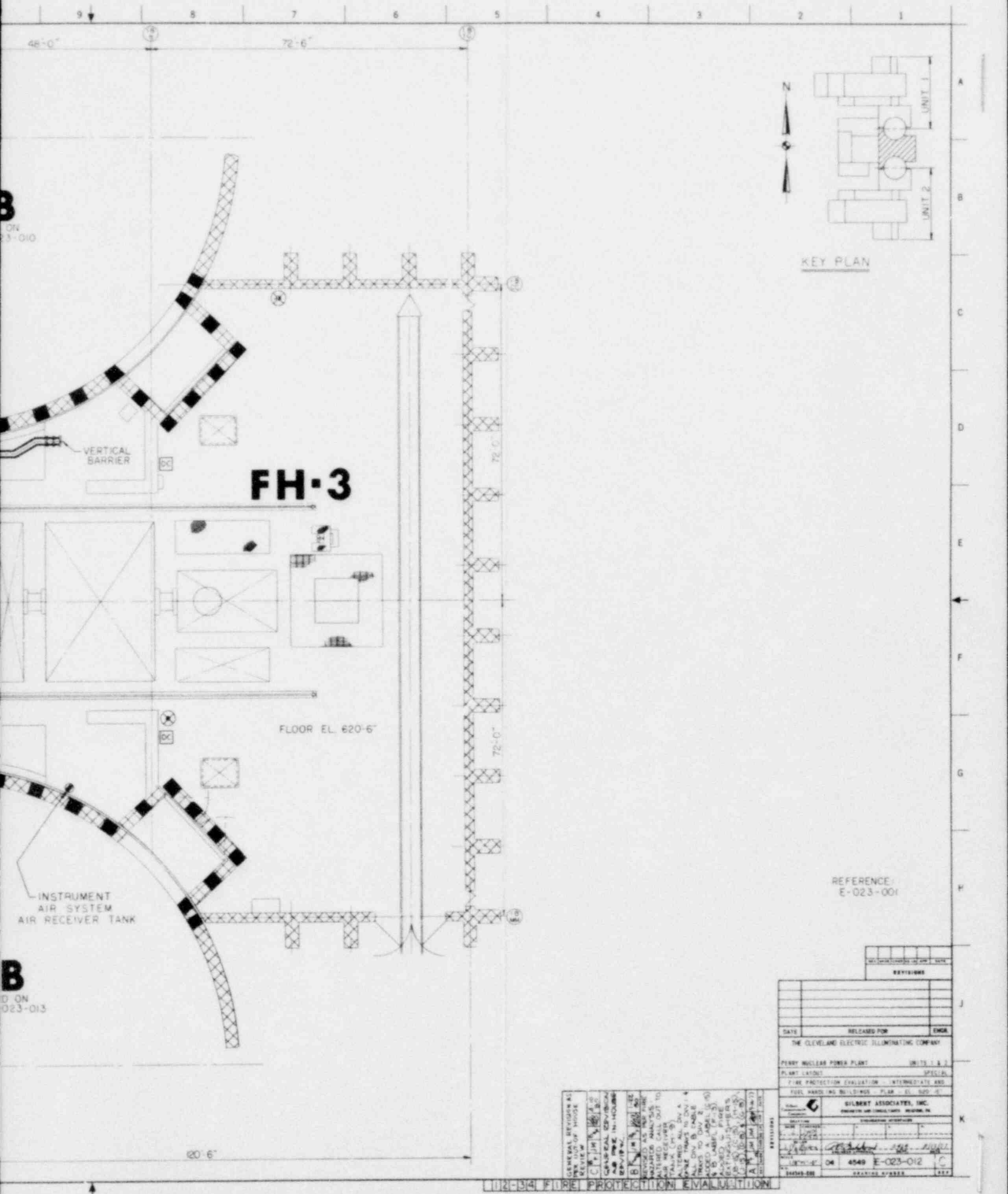


1DG·1a
UNIT 1-AIR RECEIVER
UNIT 1-FUEL OIL DAY TANK
1DG·1b
UNIT 1-DIESEL GENERATOR BUILDING VENTILATION FANS
1DG·1c
UNIT 1-AIR RECEIVER
UNIT 1 - FUEL OIL DAY TANK
2DG·1a
UNIT 2-AIR RECEIVER
UNIT 2 - FUEL OIL DAY TANK
2DG·1b
UNIT 2 - DIESEL GENERATOR BUILDING VENTILATION FANS
2DG·1c
UNIT 2 - AIR RECEIVER
UNIT 2 FUEL OIL DAY TANK
AUXILIARY PLAN
SHOWING EQUIPMENT SUPPORTED FROM WALL OR CEILING
62'-0"
14'-0"
UNIT 1 - GENERATOR EXCITER CABINETS
UNIT 1-FUEL OIL TRANSFER PUMPS
UNIT 1 - DIESEL GENERATORS
UNIT 2-ENGINE CONTROL PANEL
UNIT 2-GENERATOR PANEL
UNIT 2-FUEL OIL TRANSFER PUMPS
UNIT 2- DIESEL GENERATORS
UNIT 2 - GENERATOR
UNIT 2 - ENGINE CONTR PANEL
EL 623'-0"
EL 620'-6"

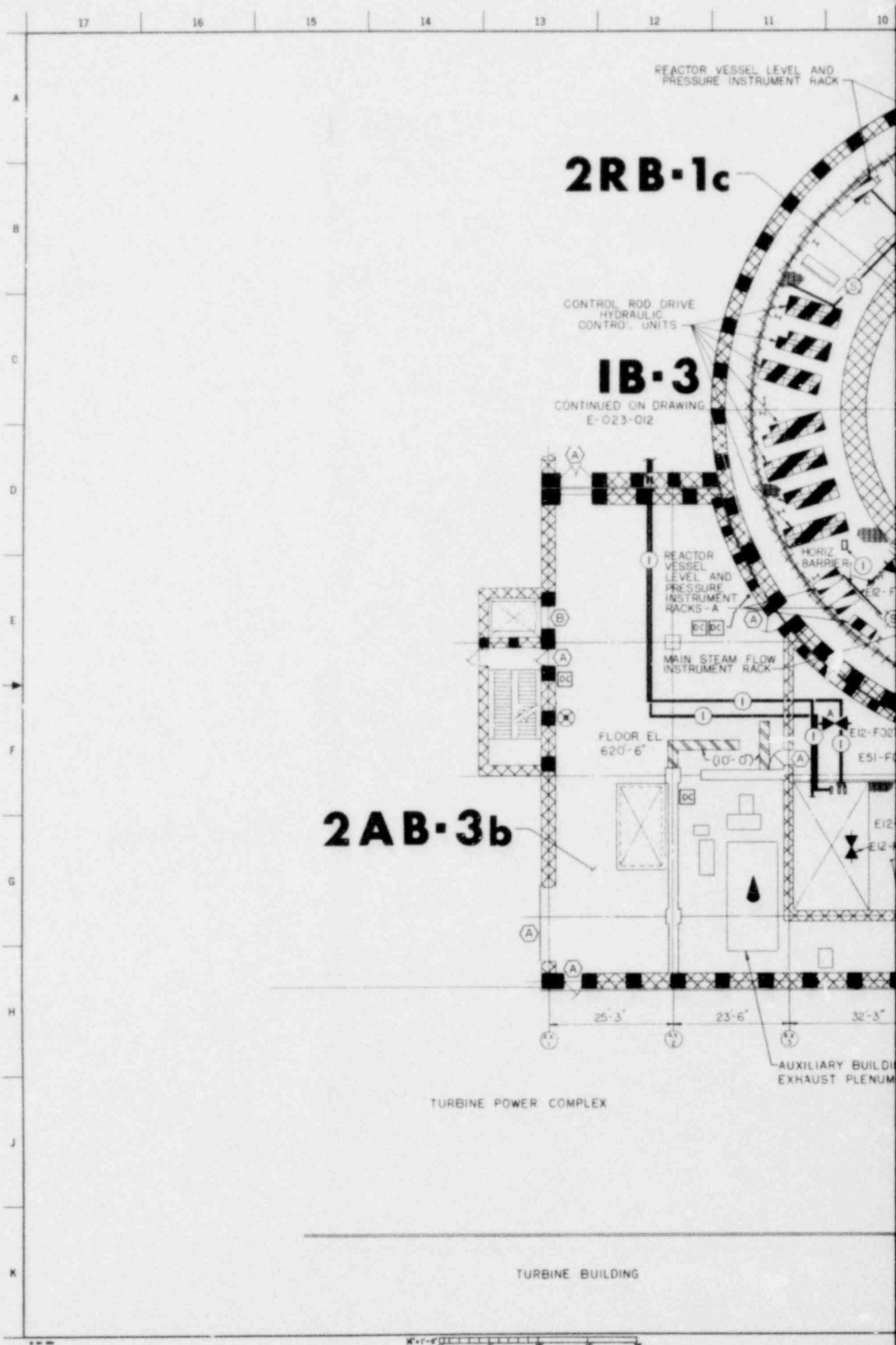


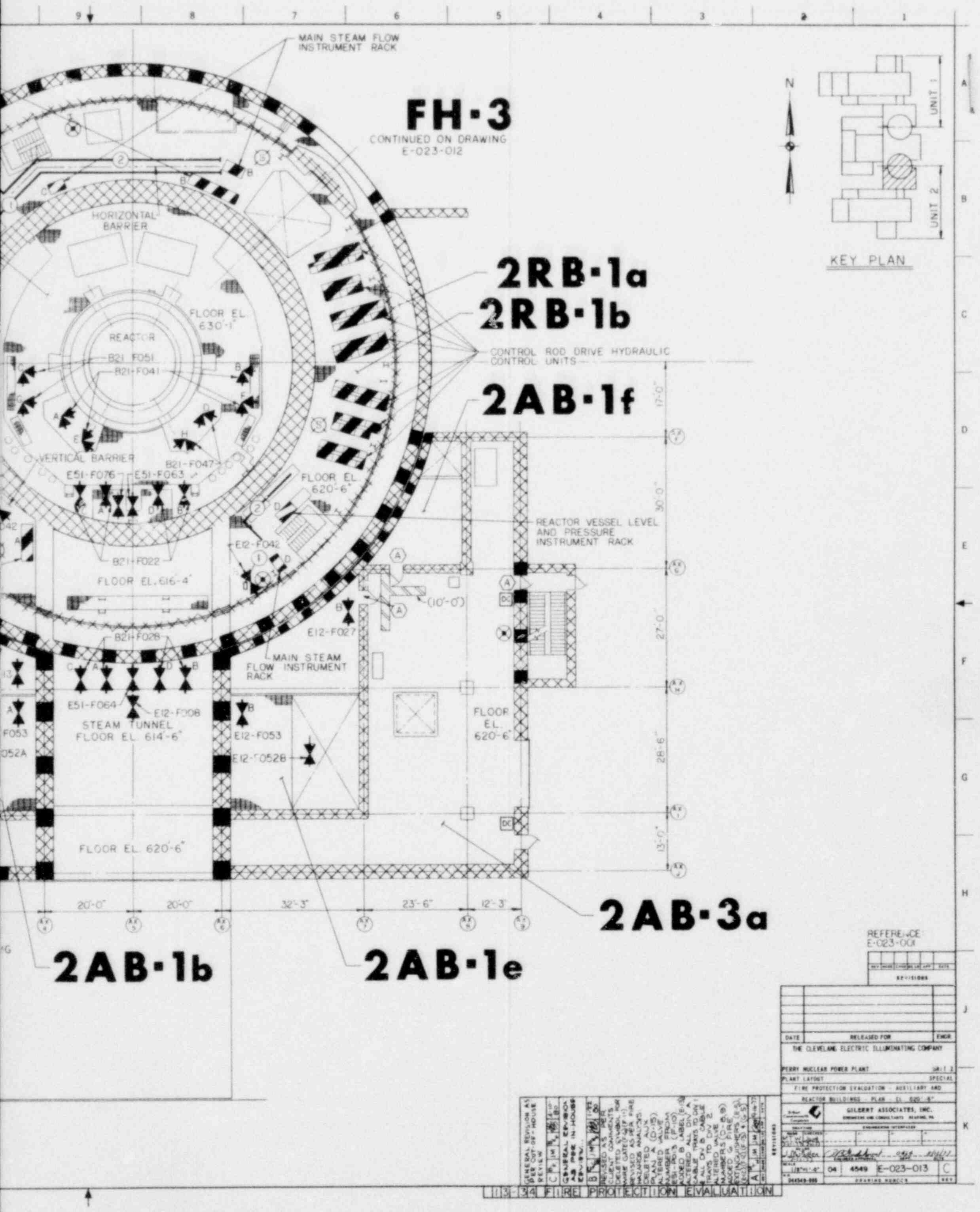
KEY PLAN
N
UNIT 1
UNIT 2
UNIT 1 - ENGINE CONTROL PANEL
UNIT 1 - GENERATOR PANEL
RADWASTE BUILDING
VERTICAL BARRIER
HORIZONTAL BARRIER
480 V BUS
4.16 KV BUS
MCC
UNIT 1 - REMOTE SHUTDOWN PANEL
EL 620'-6"
1CC-3
(UNIT 1)
1CC-4b
1CC-4f
1B
CONTINUED ON DRAWING E-023-012
2CC-3
(UNIT 2)
2CC-4b
2CC-4f
UNIT 2 - GENERATOR EXCITER CABINETS
SERVICE BUILDING
UNIT 2 - REMOTE SHUTDOWN PANEL
DG-1d
REFERENCE E-023-001
REVISIONS
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 & 2
PLANT LAYOUT SPECIAL
FIRE PROTECTION EVALUATION CONTROL COMPLEX AND DIESEL GENERATOR BUILDING PLAN EL 620'-6"
GILBERT ASSOCIATES, INC.
04 4549 E-023-011 C


1AB-3
CONTINUED ON DRAWING E-023-010
VERTICAL BARRIER
RADWASTE BUILDING
NEUTRON MONITORING IRM/SRM PREAMP CABINET
1CC-4b
1CC-4f
1RI
CONTINUED DRAWING E-0
HORIZONTAL BARRIER
UNIT 1 ANNULUS EXHAUST GAS TREATMENT SYSTEM PLENUMS
FLOOR EL 620'-6"
VERTICAL BARRIER
FLOOR EL 620'-6"
CC-3
CONTINUED ON DRAWING E-023-011
IB-3
UNIT 2 ANNULUS EXHAUST GAS TREATMENT SYSTEM PLENUMS
HORIZONTAL BARRIER
2CC-4b
2CC-4f
NEUTRON MONITORING IRM/SRM PREAMP CABINET
2R
CONTINUE DRAWING E-
CONTINUED ON DRAWING E-023-013
2AB-3
101'-0"

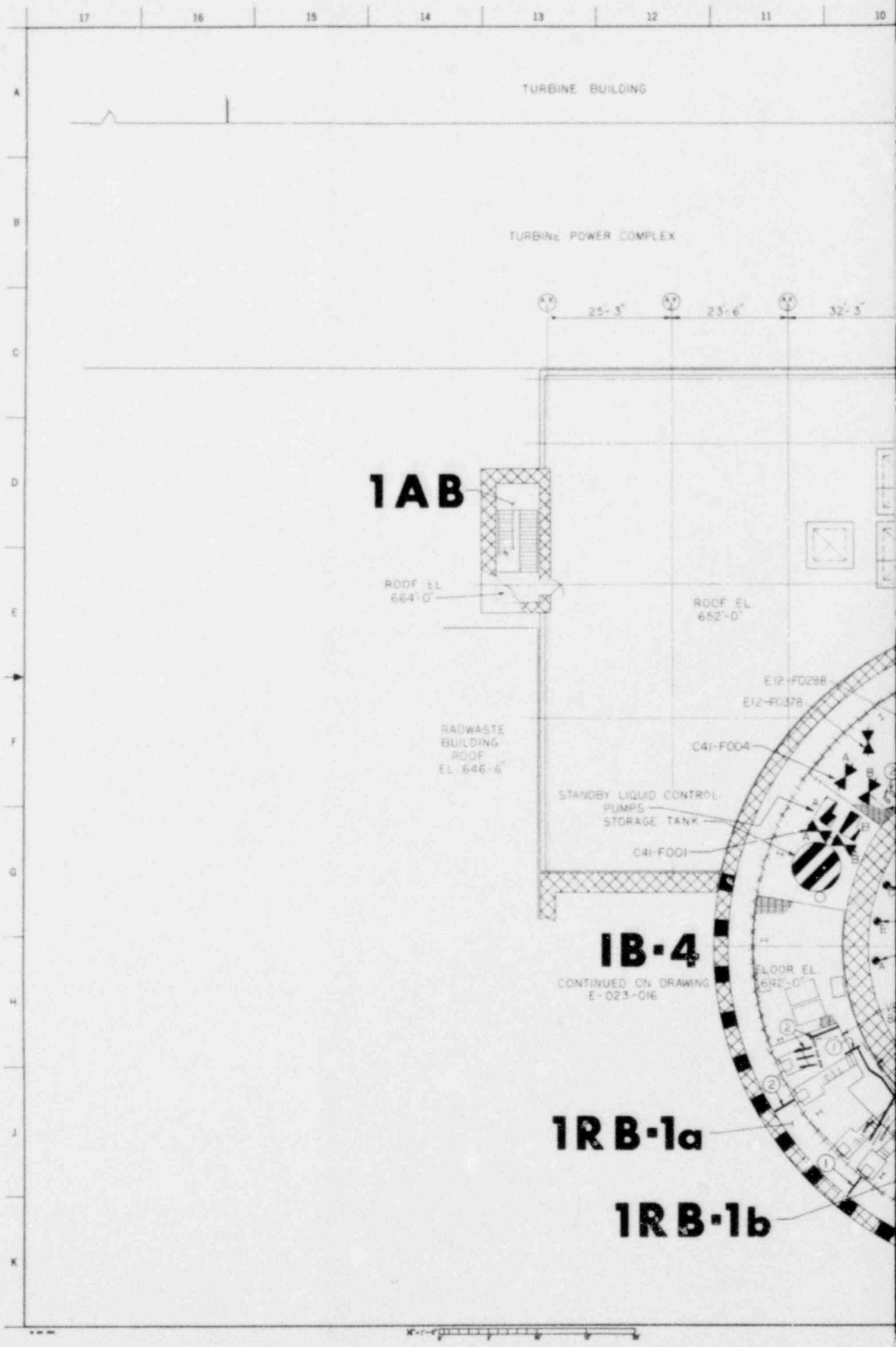


48'-0"
72'-6"
N
KEY PLAN
UNIT 1
UNIT 2
ON
23-010
VERTICAL BARRIER
DC
FH-3
FLOOR EL. 620'-6"
72'-0"
72'-0"
INSTRUMENT AIR SYSTEM AIR RECEIVER TANK
D ON
023-013
REFERENCE:
E-023-001
120'-6"
REVISIONS
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - INTERMEDIATE AND
FUEL HANDLING BUILDINGS - PLAN - EL. 620'-6"
GILBERT ASSOCIATES, INC.
04
4549
E-023-012
C
DRAWING NUMBER
12-34 FIRE PROTECTION EVALUATION

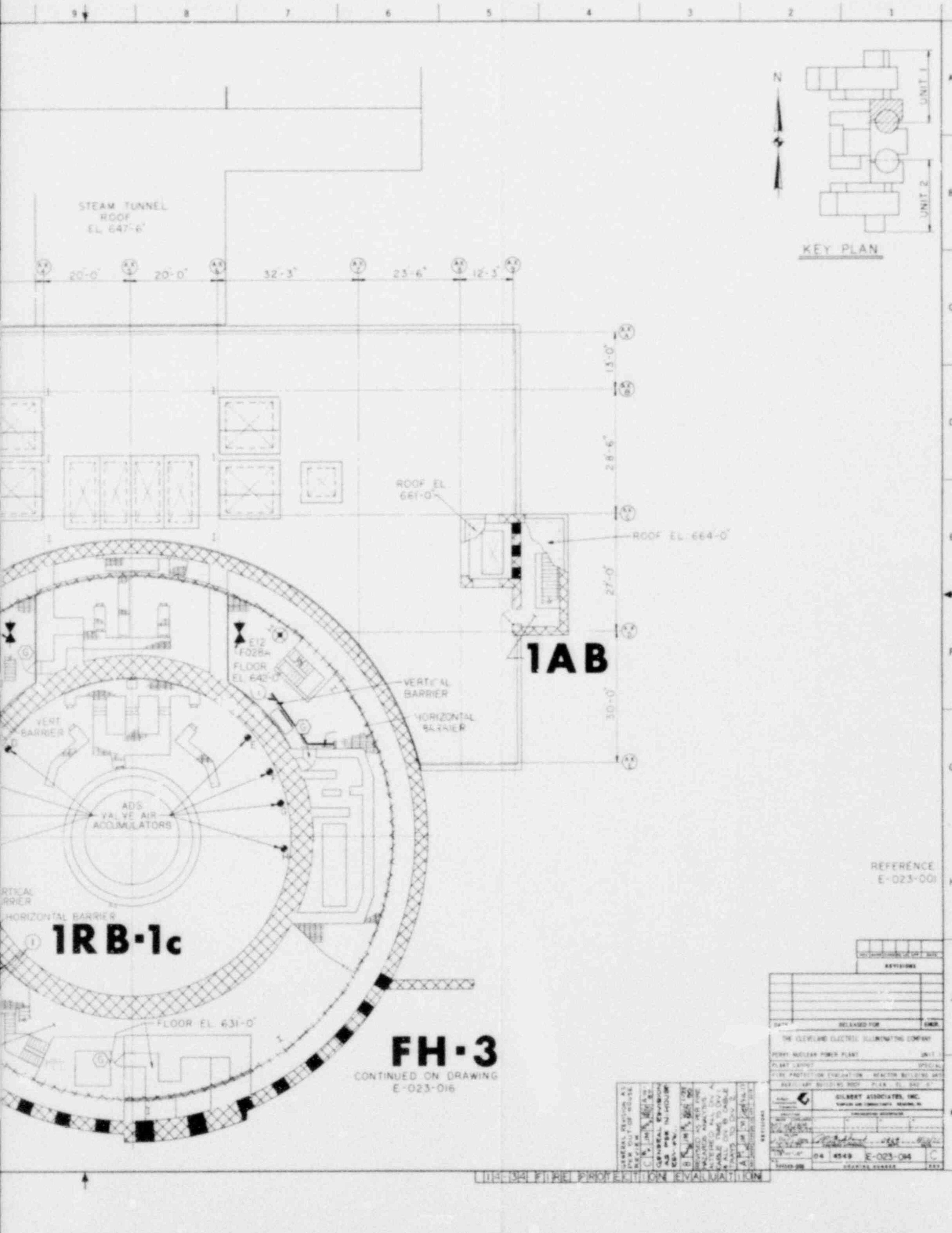

17
16
15
14
13
12
11
10
A
B
C
D
E
F
G
H
J
K
REACTOR VESSEL LEVEL AND PRESSURE INSTRUMENT RACK
2RB-1c
CONTROL ROD DRIVE HYDRAULIC CONTROL UNITS
IB-3
CONTINUED ON DRAWING E-023-012
REACTOR VESSEL LEVEL AND PRESSURE INSTRUMENT RACKS-A
HORIZ BARRIER
MAIN STEAM FLOW INSTRUMENT RACK
FLOOR EL 620'-6"
(10'-0")
2AB-3b
25'-3"
23'-6"
32'-3"
AUXILIARY BUILDI
EXHAUST PLENUM
TURBINE POWER COMPLEX
TURBINE BUILDING



FH-3
CONTINUED ON DRAWING E-023-012
MAIN STEAM FLOW INSTRUMENT RACK
KEY PLAN
UNIT 1
UNIT 2
N
2RB-1a
2RB-1b
CONTROL ROD DRIVE HYDRAULIC CONTROL UNITS
2AB-1f
HORIZONTAL BARRIER
REACTOR
FLOOR EL. 630'-1"
B21-F051
B21-F041
VERTICAL BARRIER
B21-F047
E51-F076
E51-F063
FLOOR EL. 620'-6"
REACTOR VESSEL LEVEL AND PRESSURE INSTRUMENT RACK
E12-F042
B21-F022
FLOOR EL. 616'-4"
(10'-0")
E12-F027
B21-F028
MAIN STEAM FLOW INSTRUMENT RACK
E51-F064
E12-F008
STEAM TUNNEL FLOOR EL. 614'-6"
E12-F053
E12-F052B
F053
052A
FLOOR EL. 620'-6"
17'-0"
30'-0"
27'-0"
28'-6"
13'-0"
20'-0"
20'-0"
32'-3"
23'-6"
12'-3"
2AB-3a
2AB-1b
2AB-1e
REFERENCE: E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNIT 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - AUXILIARY AND REACTOR BUILDINGS - PLAN - EL 620'-6"
GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS READING, PA
ENGINEERING INTERFACES
04
4549
E-023-013
C
GENERAL REVISION AS PER OUT-OF-HOUSE REVIEW
GENERAL REVISION AS PER IN-HOUSE REVIEW
REVISED AS PER CLIENT COMMENTS
13-34 FIRE PROTECTION EVALUATION



17
16
15
14
13
12
11
10
A
B
C
D
E
F
G
H
J
K
TURBINE BUILDING
TURBINE POWER COMPLEX
25'-3"
23'-6"
32'-3"
1AB
ROOF EL
664'-0"
ROOF EL
652'-0"
E12-F028B
E12-F037B
RADWASTE
BUILDING
ROOF
EL 646'-6"
C41-F004
STANDBY LIQUID CONTROL
PUMPS
STORAGE TANK
C41-F001
IB-4
CONTINUED ON DRAWING
E-023-016
FLOOR EL
642'-0"
1RB-1a
1RB-1b



9
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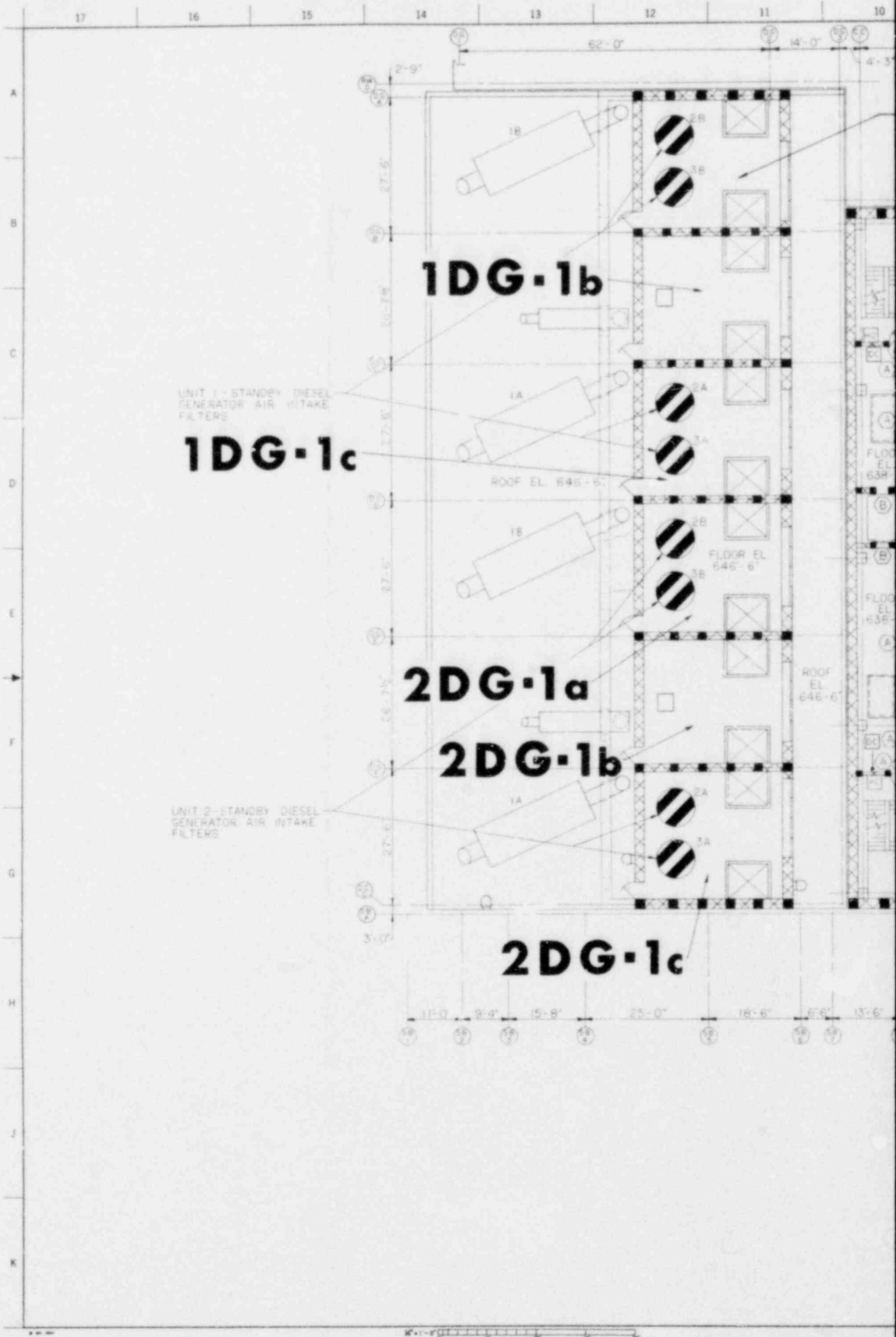
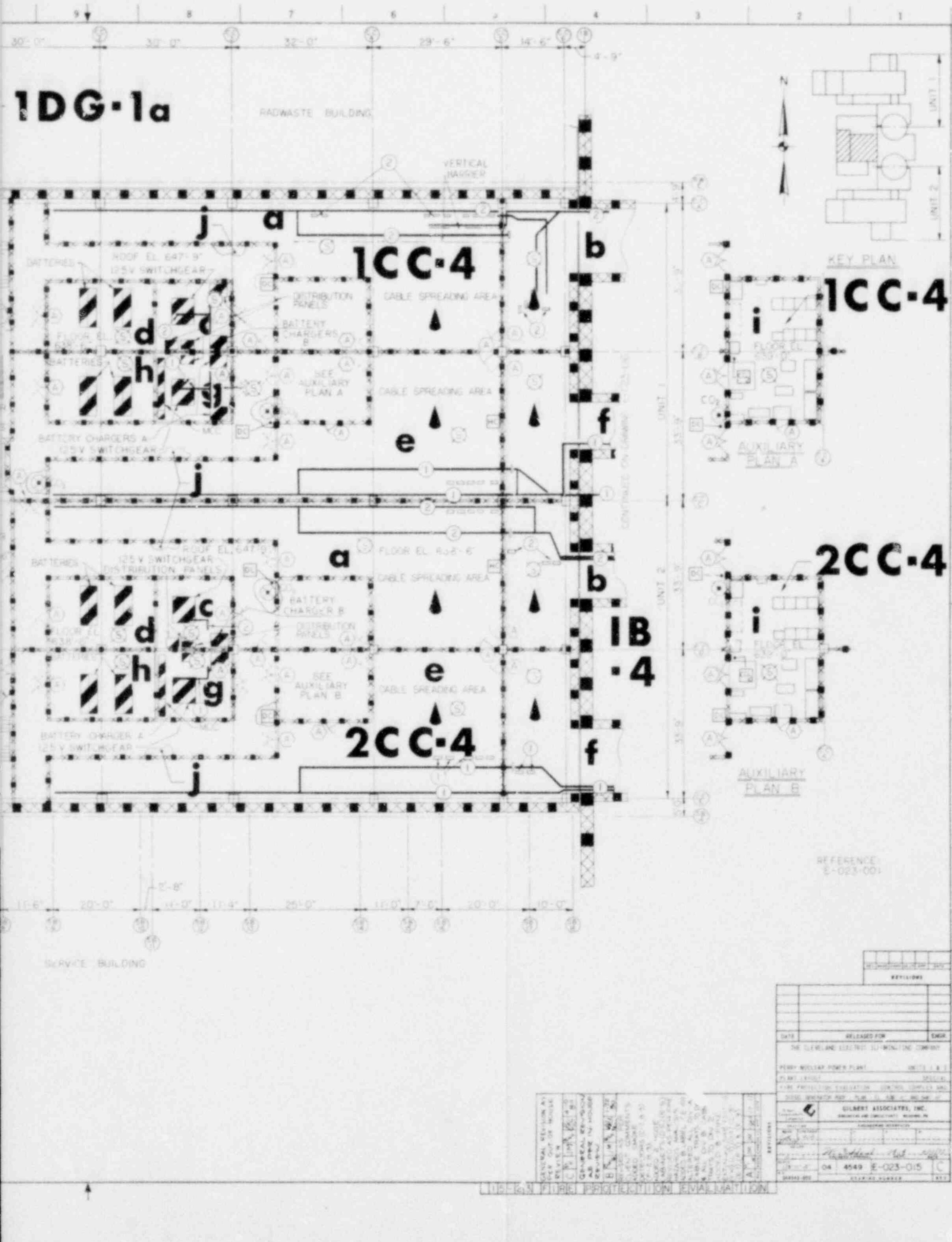
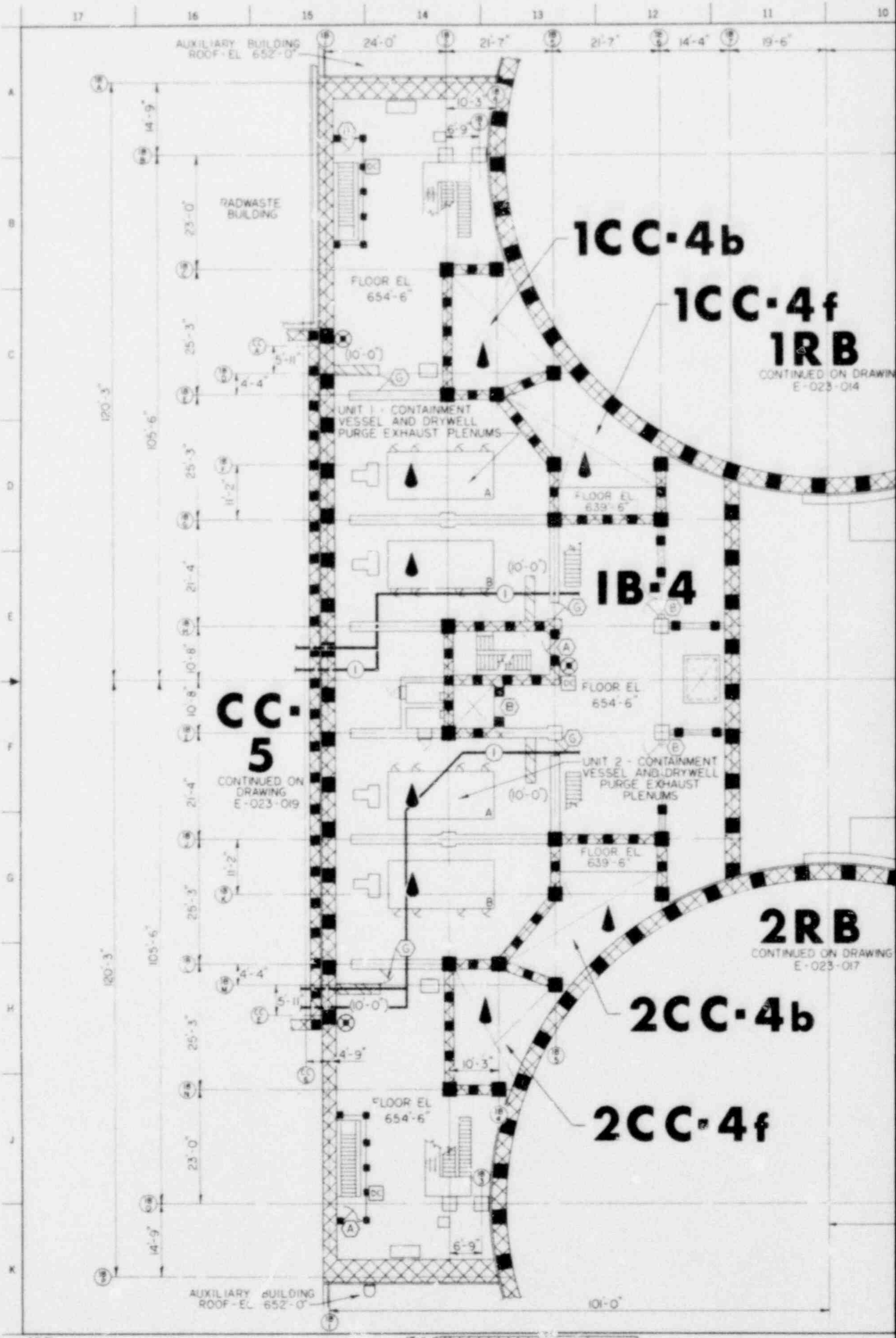
3
2
1
A
B
C
D
E
F
G
H
J
K
N
UNIT 1
UNIT 2
KEY PLAN
STEAM TUNNEL
ROOF
EL 647'-6"
20'-0"
20'-0"
32'-3"
23'-6"
12'-3"
13'-0"
28'-6"
27'-0"
30'-0"
ROOF EL
661'-0"
ROOF EL 664'-0"
1AB
E12
F028A
FLOOR
EL 642'-0"
VERTICAL
BARRIER
HORIZONTAL
BARRIER
VERT
BARRIER
ADS
VALVE AIR
ACCUMULATORS
HORIZONTAL BARRIER
1RB-1c
FLOOR EL 631'-0"
FH-3
CONTINUED ON DRAWING
E-023-016
REFERENCE
E-023-001
REVISIONS
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNIT 1
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - REACTOR BUILDING AND
AUXILIARY BUILDING ROOF - PLAN - EL 642'-0"
GILBERT ASSOCIATES, INC.
04
4549
E-023-014
C
DRAWING NUMBER
GENERAL REVISION AS PER OUT OF HOUSE REVIEW
GENERAL REVISION AS PER IN-HOUSE REVIEW
REVISED AS PER FIRE HAZARDS ANALYSIS
FIRE PROTECTION EVALUATION



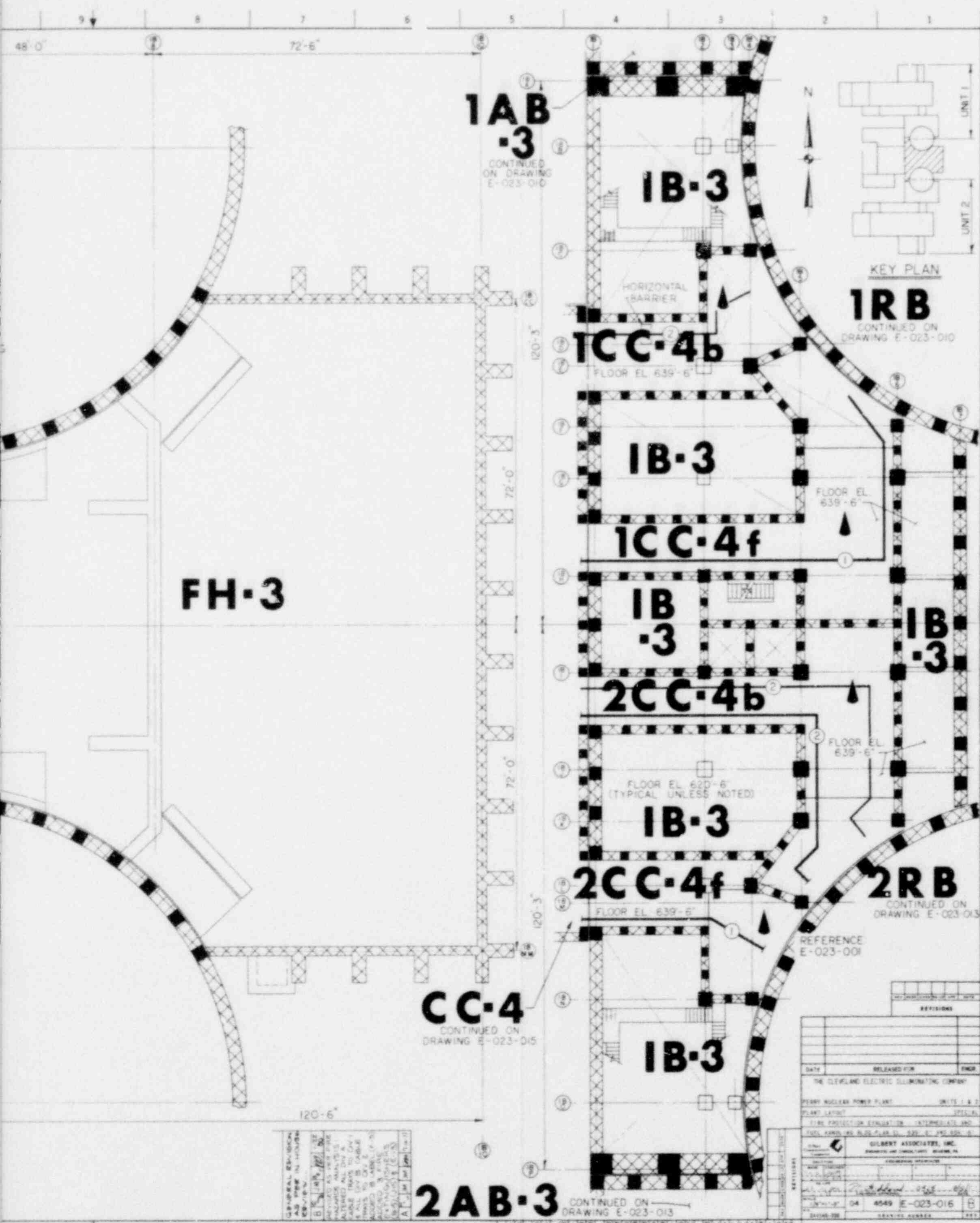
62'-0"
14'-0"
1DG-1b
UNIT 1 - STANDBY DIESEL GENERATOR AIR INTAKE FILTERS
1DG-1c
ROOF EL. 646'-6"
FLOOR EL 646'-6"
ROOF EL 646'-6"
2DG-1a
2DG-1b
UNIT 2 - STANDBY DIESEL GENERATOR AIR INTAKE FILTERS
2DG-1c

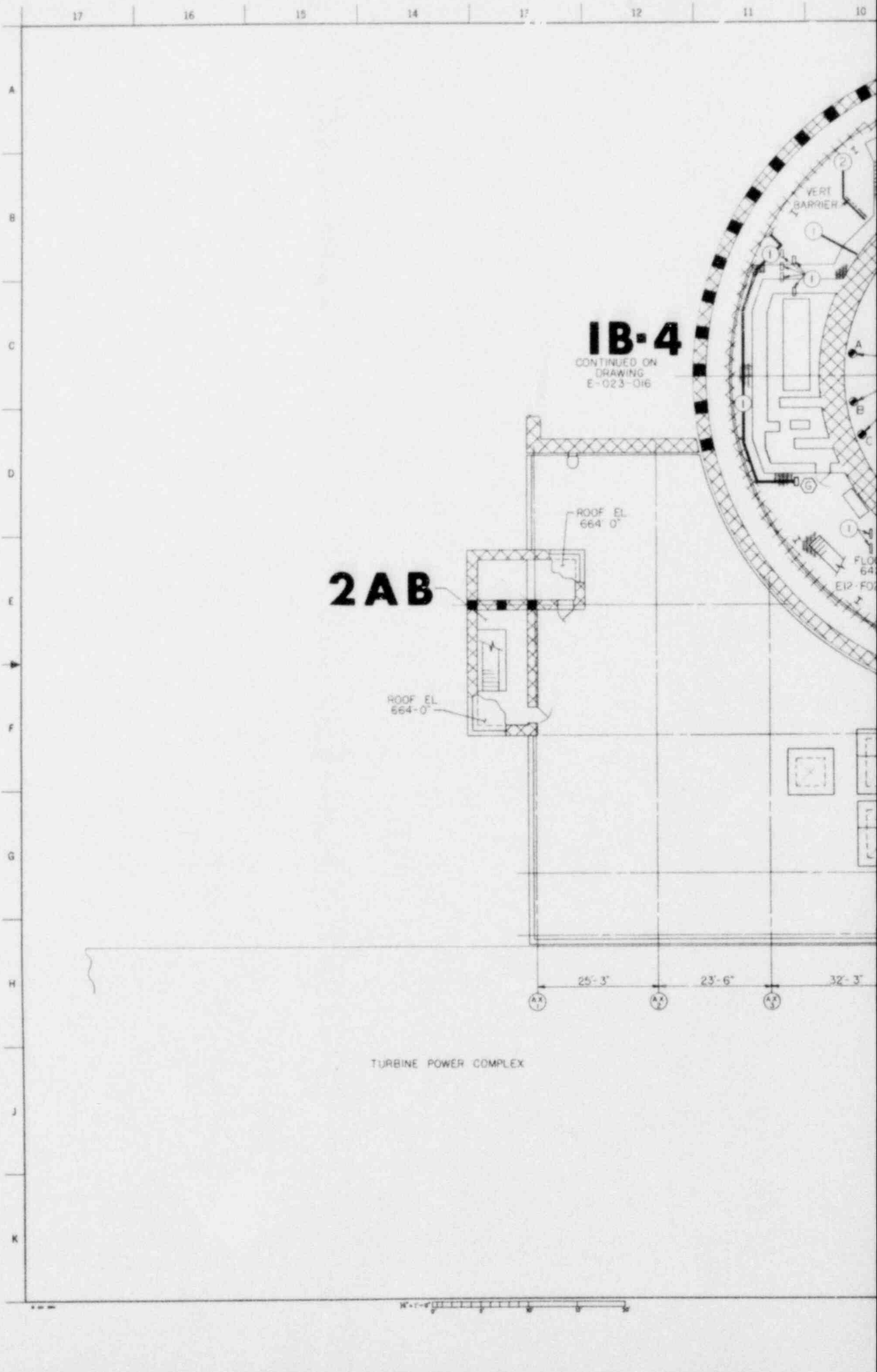


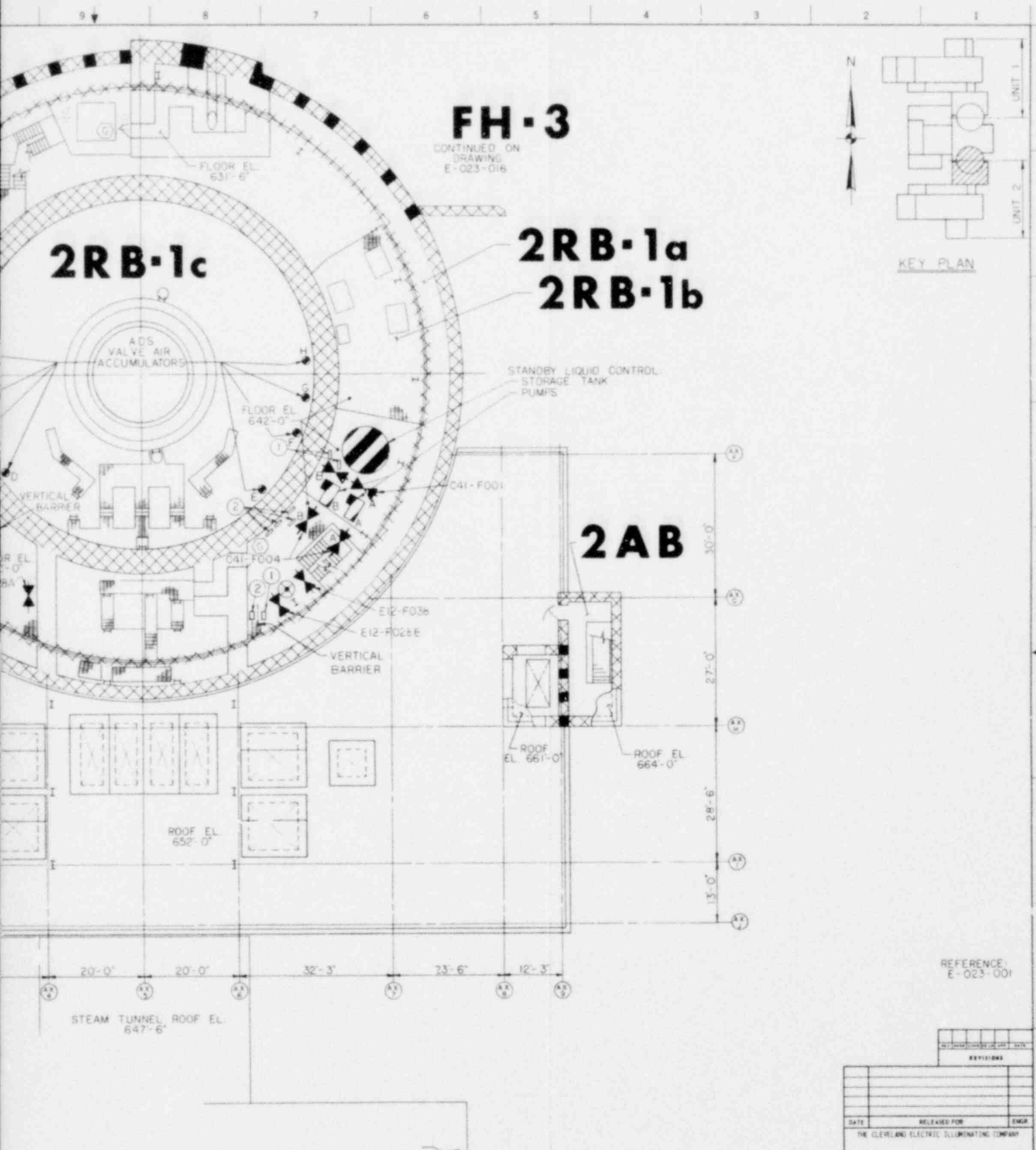
1DG-1a
RADWASTE BUILDING
VERTICAL BARRIER
1CC-4
2CC-4
IB-4
ROOF EL. 647'-9"
125 V SWITCHGEAR
BATTERIES
DISTRIBUTION PANELS
BATTERY CHARGERS B
CABLE SPREADING AREA
SEE AUXILIARY PLAN A
SEE AUXILIARY PLAN B
BATTERY CHARGERS A
FLOOR EL. 638'-6"
UNIT 1
UNIT 2
AUXILIARY PLAN A
AUXILIARY PLAN B
KEY PLAN
REFERENCE: E-023-001
SERVICE BUILDING
FIRE PROTECTION EVALUATION
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 & 2
GILBERT ASSOCIATES, INC.
E-023-015



AUXILIARY BUILDING ROOF-EL 652'-0"
RADWASTE BUILDING
FLOOR EL 654'-6"
1CC-4b
1CC-4f
1RB
CONTINUED ON DRAWING E-023-014
UNIT 1 - CONTAINMENT VESSEL AND DRYWELL PURGE EXHAUST PLENUMS
FLOOR EL 639'-6"
1B-4
FLOOR EL 654'-6"
CC-5
CONTINUED ON DRAWING E-023-019
UNIT 2 - CONTAINMENT VESSEL AND DRYWELL PURGE EXHAUST PLENUMS
FLOOR EL 639'-6"
2RB
CONTINUED ON DRAWING E-023-017
2CC-4b
2CC-4f
FLOOR EL 654'-6"
AUXILIARY BUILDING ROOF-EL 652'-0"
101'-0"


1AB
•3
CONTINUED
ON DRAWING
E-023-010
IB•3
HORIZONTAL
BARRIER
1CC•4b
FLOOR EL 639'-6"
IB•3
FLOOR EL.
639'-6"
1CC•4f
IB
•3
IB
•3
2CC•4b
FLOOR EL.
639'-6"
FLOOR EL 620'-6"
(TYPICAL UNLESS NOTED)
IB•3
2CC•4f
FLOOR EL 639'-6"
REFERENCE
E-023-001
FH•3
CC•4
CONTINUED ON
DRAWING E-023-015
IB•3
1RB
CONTINUED ON
DRAWING E-023-010
2RB
CONTINUED ON
DRAWING E-023-013
KEY PLAN
UNIT 1
UNIT 2
N
48'-0"
72'-6"
120'-3"
72'-0"
72'-0"
120'-3"
120'-6"
2AB•3
CONTINUED ON
DRAWING E-023-013
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
FIRE PROTECTION EVALUATION - INTERMEDIATE AND
FUEL HANDLING BLDG-PLAN EL
GILBERT ASSOCIATES, INC.
E-023-016
B


IB-4
CONTINUED ON
DRAWING
E-023-016
2AB
VERT
BARRIER
ROOF EL
664' 0"
ROOF EL
664'-0"
25'-3"
23'-6"
32'-3"
TURBINE POWER COMPLEX



C	GENERAL REVISION AS PER OUT OF HOUSE REVIEW	B	GENERAL REVISION AS PER IN-HOUSE REVIEW
A	REVISED AS PER FIRE HAZARDS ANALYSIS, ALTERED ALL DIV A CABLE TRAYS TO DIV 1 & ALL DIV B CABLE TRAYS TO DIV 2		

REVISIONS

DATE | RELEASED FOR | ENGR

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

PERRY NUCLEAR POWER PLANT — UNIT 2

PLANT LAYOUT — SPECIAL

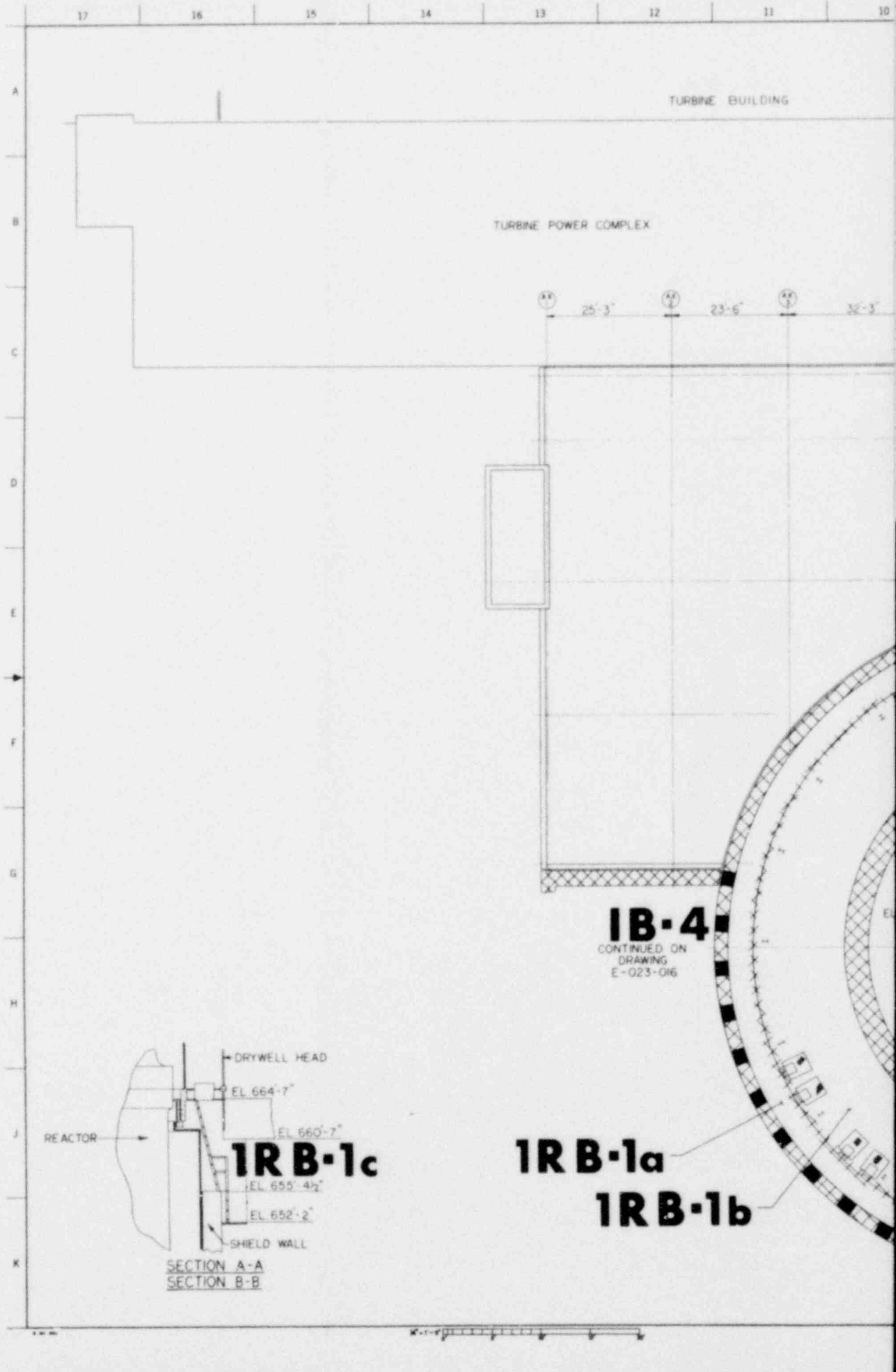
FIRE PROTECTION EVALUATION - REACTOR BUILDING AND AUXILIARY BUILDING ROOF - PLAN - EL 642'-6"

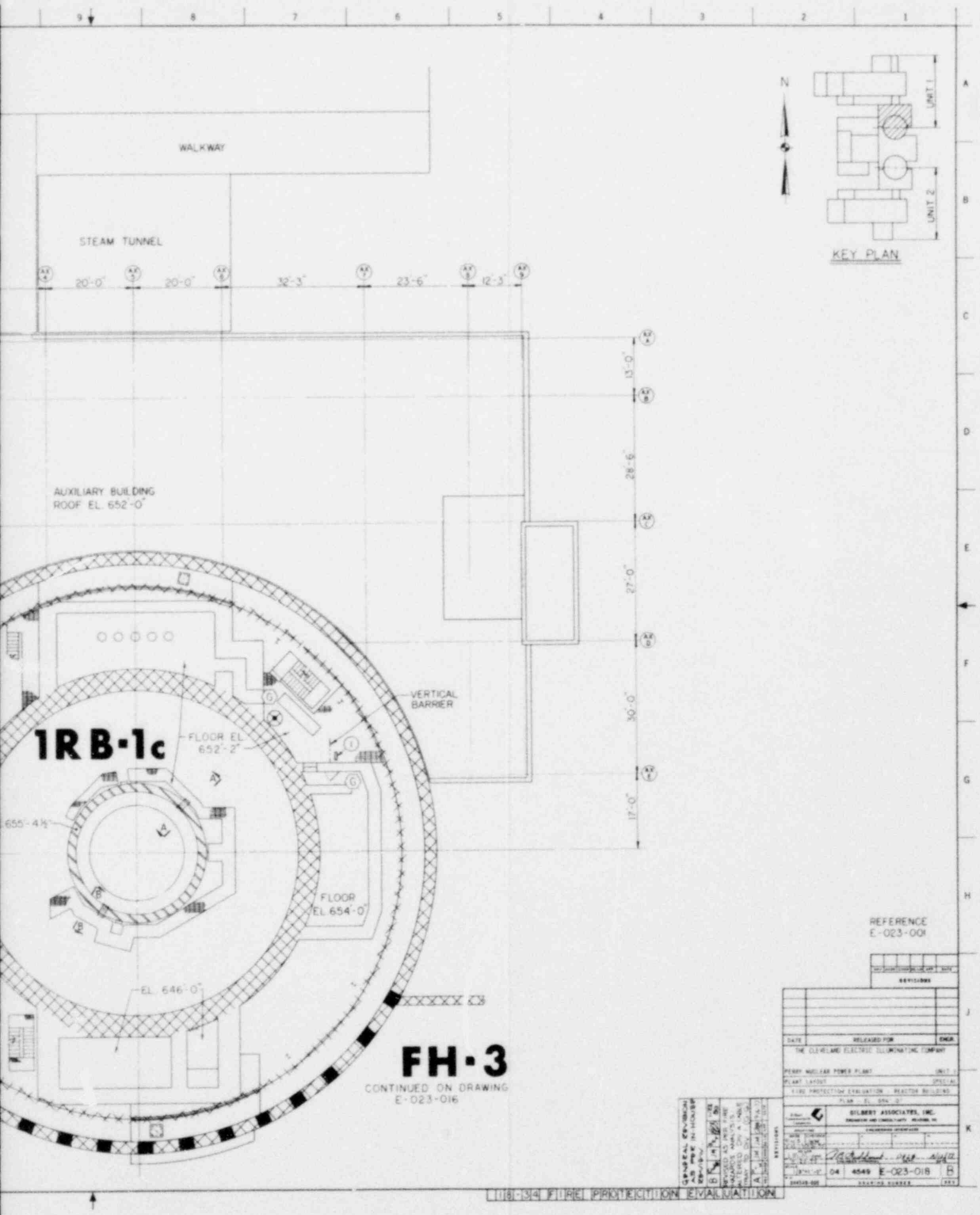
GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS READING, PA

04 | 4549 | E-023-017 | C

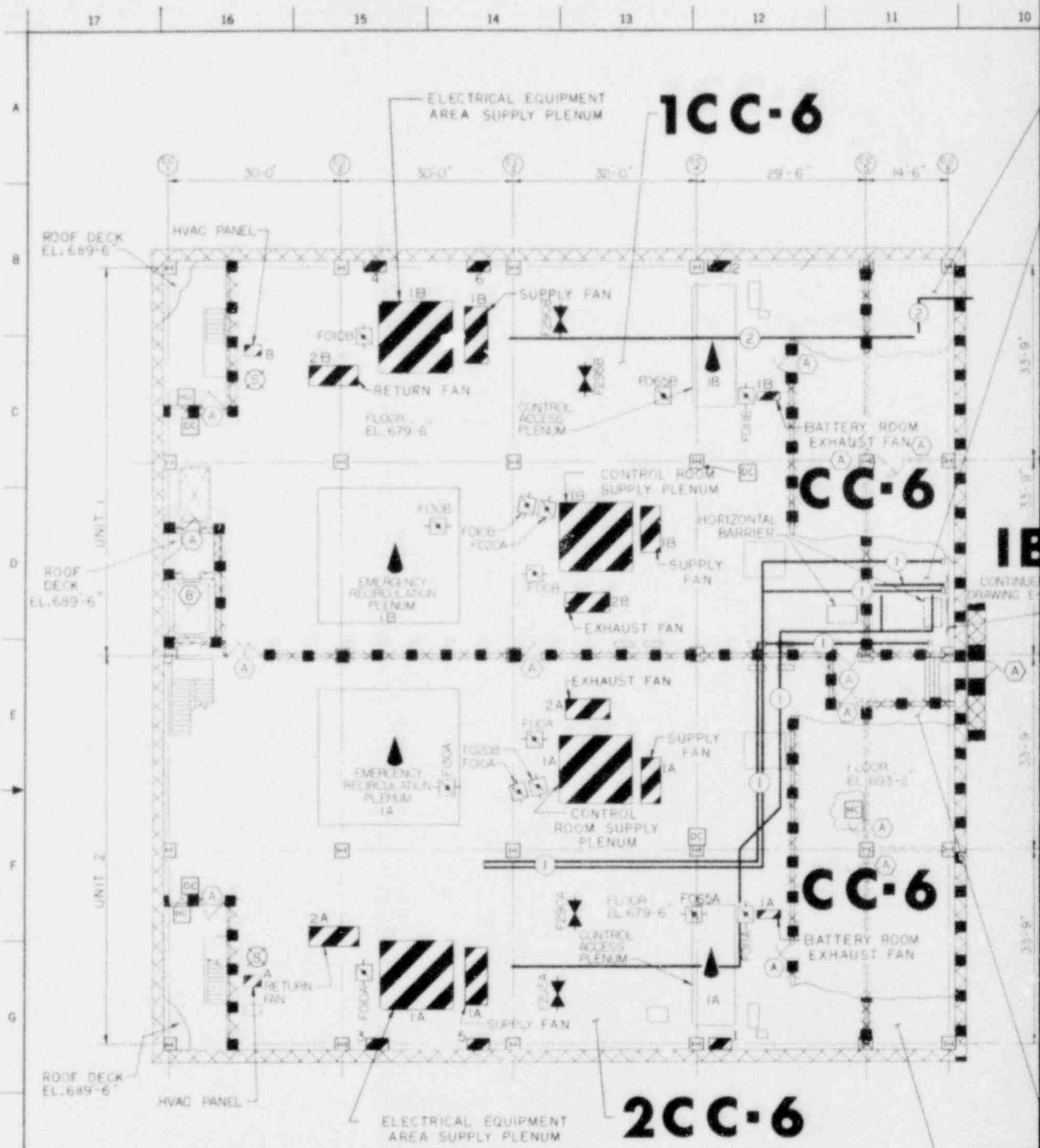
DRAWING NUMBER

17-34 FIRE PROTECTION EVALUATION


TURBINE BUILDING
TURBINE POWER COMPLEX
25'-3"
23'-6"
32'-3"
1B-4
CONTINUED ON DRAWING E-023-016
DRYWELL HEAD
EL 664'-7"
EL 660'-7"
REACTOR
1RB-1c
EL 655' 4½"
EL 652'-2"
SHIELD WALL
SECTION A-A
SECTION B-B
1RB-1a
1RB-1b



WALKWAY
STEAM TUNNEL
20'-0"
20'-0"
32'-3"
23'-6"
12'-3"
13'-0"
28'-6"
27'-0"
30'-0"
17'-0"
AUXILIARY BUILDING
ROOF EL. 652'-0"
VERTICAL BARRIER
1RB-1c
FLOOR EL 652'-2"
655'-4½"
FLOOR EL 654'-0"
EL. 646'-0"
FH-3
CONTINUED ON DRAWING E-023-016
N
UNIT 1
UNIT 2
KEY PLAN
REFERENCE E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNIT 1
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - REACTOR BUILDING
GILBERT ASSOCIATES, INC.
04
4549
E-023-018
B
DRAWING NUMBER
GENERAL REVISION AS PER IN-HOUSE REVIEW
REVISED AS PER FIRE HAZARDS ANALYSIS, ALTERED DIV A CABLE TRAY TO DIV
118-34 FIRE PROTECTION EVALUATION

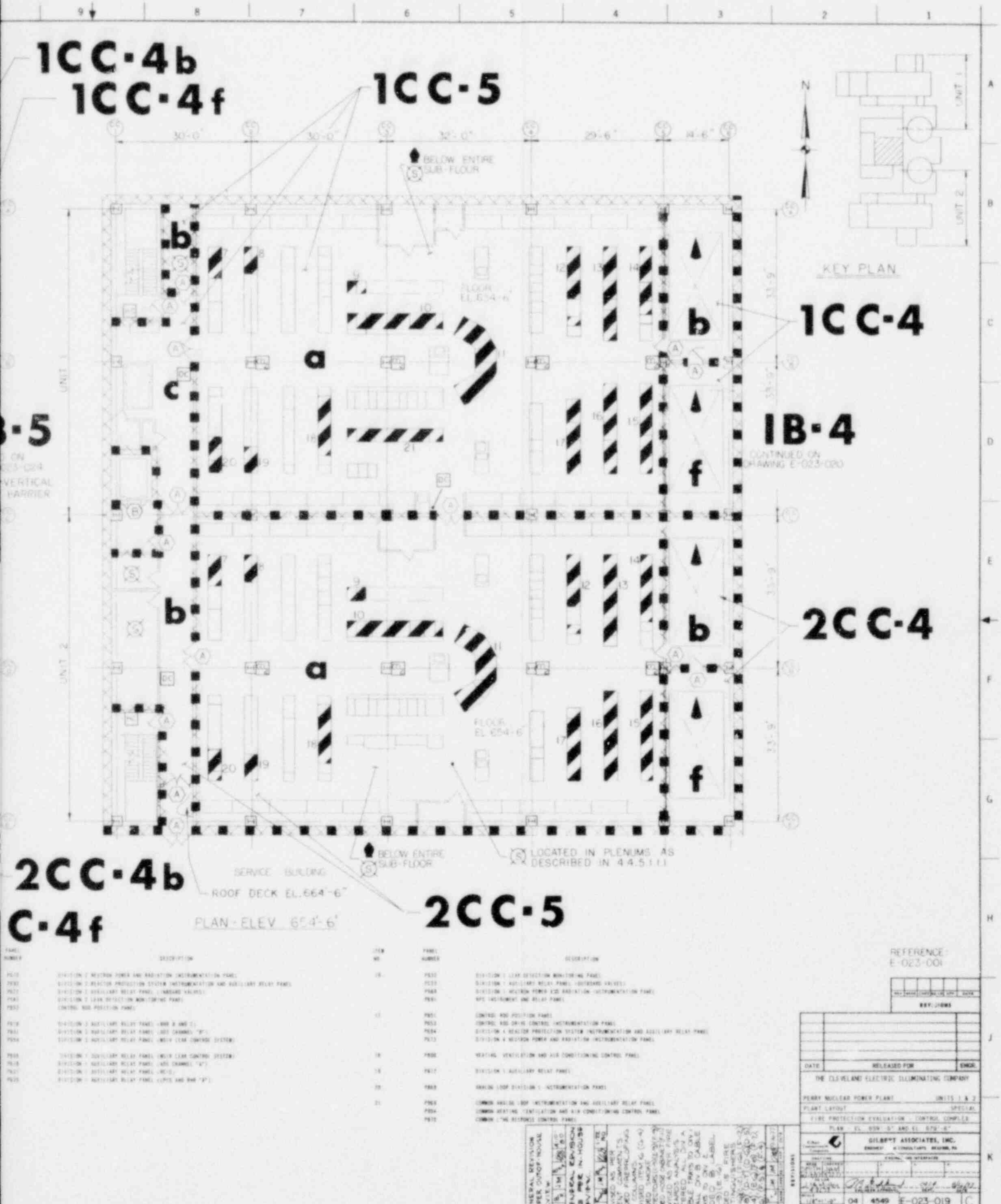


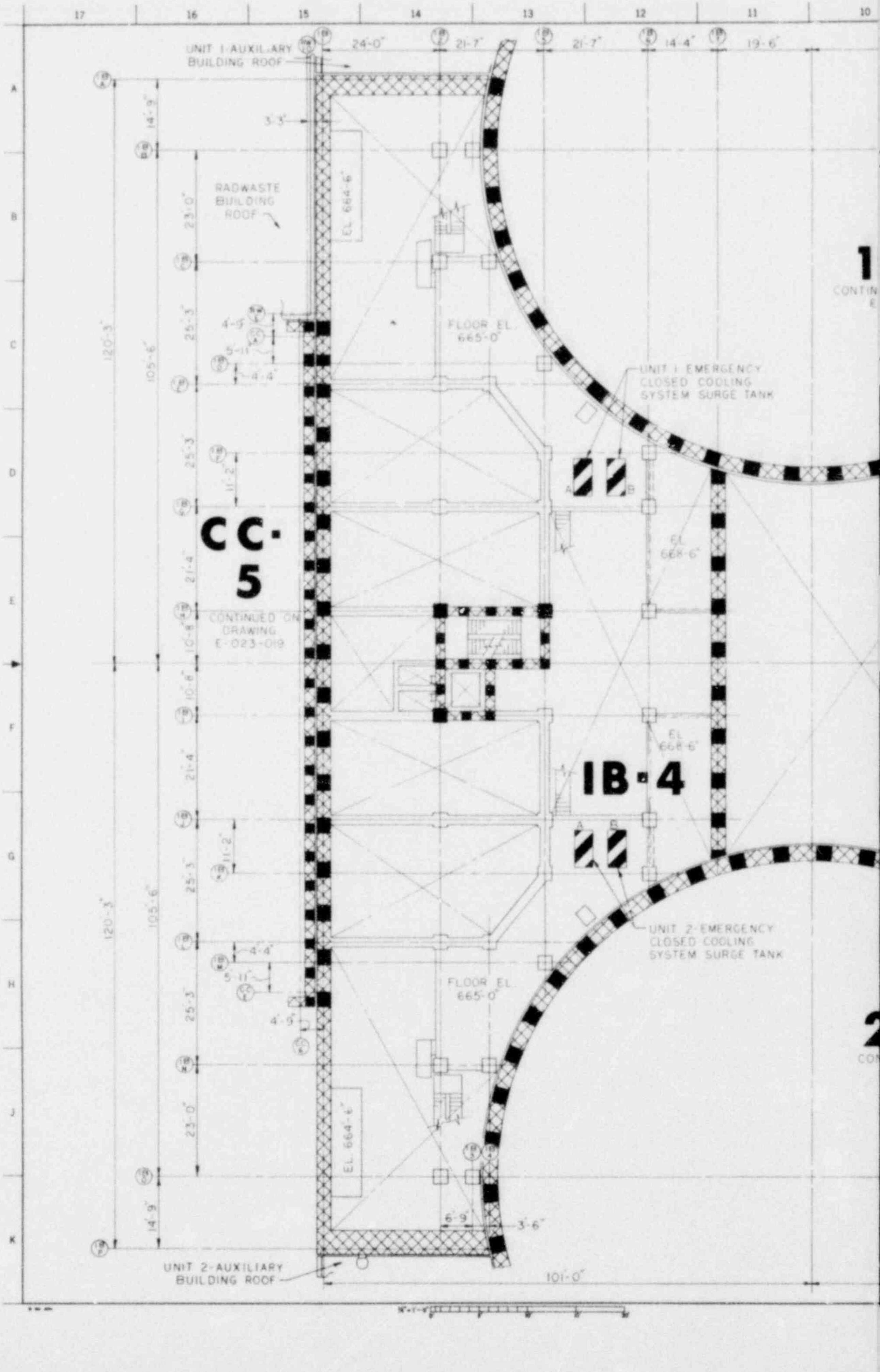
PLAN - ELEV 679'-6"

ITEM NO	PANEL NUMBER	DESCRIPTION
1	P152	DIVISION 1 CONTROL ROOM HVAC AND EMERGENCY RECIRCULATION SYSTEM INSTRUMENT PANEL A
2	P153	DIVISION 2 CONTROL ROOM HVAC AND EMERGENCY RECIRCULATION SYSTEM INSTRUMENT ENCLOSURE B
3	P154	DIVISION 1 MCC SWITCHGEAR AND MISCELLANEOUS ELECTRICAL EQUIPMENT AREA HVAC AND BATTERY ROOM EXHAUST SYSTEM INSTRUMENT ENCLOSURE A
4	P155	DIVISION 2 MCC SWITCHGEAR AND MISCELLANEOUS ELECTRICAL EQUIPMENT AREA HVAC AND BATTERY ROOM EXHAUST SYSTEM INSTRUMENT ENCLOSURE B
5	P156	MCC SWITCHGEAR AND MISCELLANEOUS ELECTRICAL EQUIPMENT AREA HVAC AND BATTERY ROOM EXHAUST SYSTEM INSTRUMENT ENCLOSURE C
6	P157	MCC SWITCHGEAR AND MISCELLANEOUS ELECTRICAL EQUIPMENT AREA HVAC AND BATTERY ROOM EXHAUST SYSTEM INSTRUMENT ENCLOSURE D

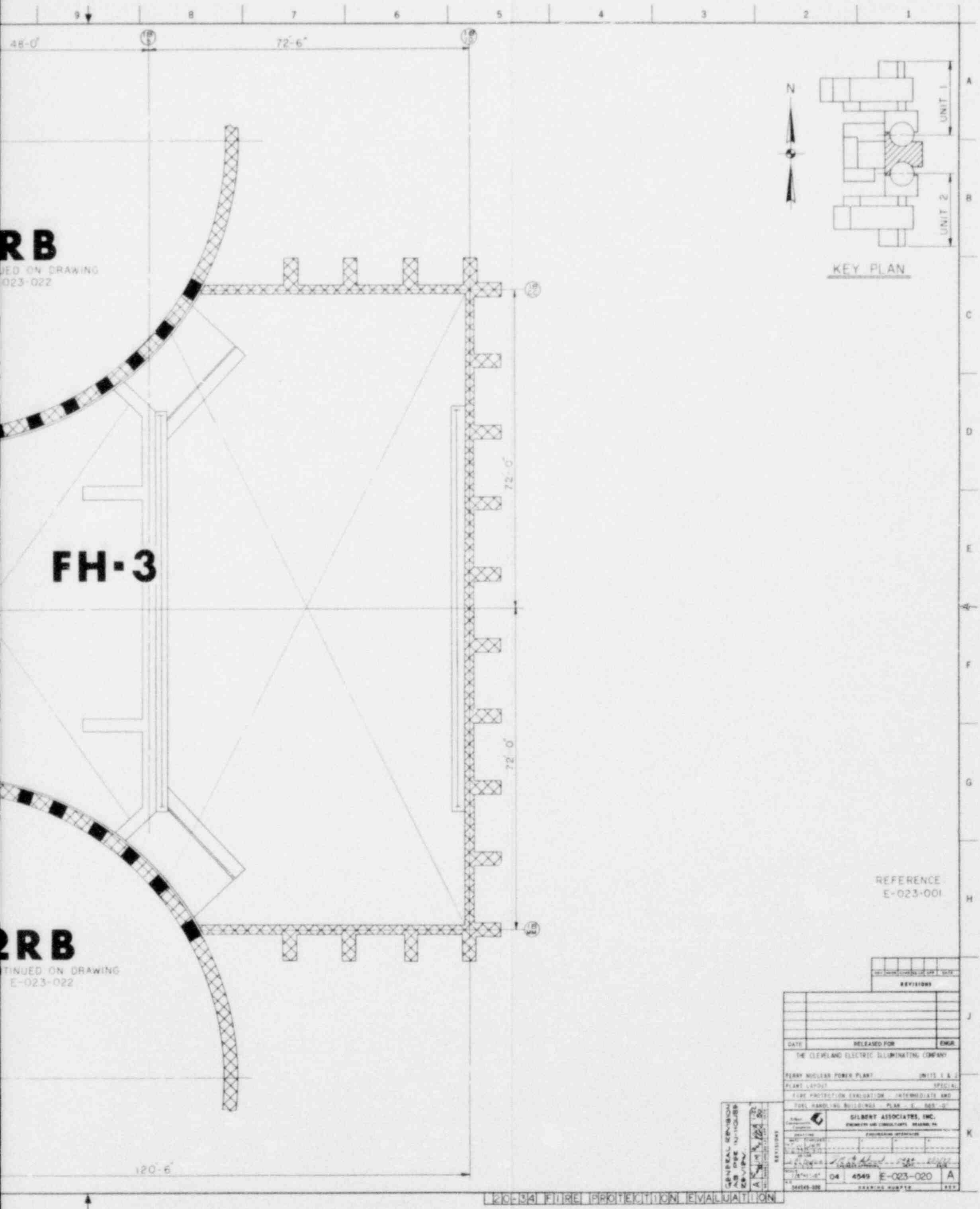
ITEM NO	PANEL NUMBER	DESCRIPTION
7	[illegible]	[illegible] DIVISION 3 INSTRUMENTATION PANEL
8	[illegible]	DIVISION 2 AUXILIARY RELAY PANEL
9	[illegible]	DIVISION 1 CONTAINMENT AND DRYWELL ISOLATION VALVE CONTROL PANEL
	[illegible]	DIVISION 2 CONTAINMENT AND DRYWELL ISOLATION VALVE CONTROL PANEL
10	[illegible]	DIESEL GENERATOR BENCHBOARD
	[illegible]	EMERGENCY CORE COOLING SYSTEMS BENCHBOARD
11	[illegible]	UNIT CONTROL CONSOLE
12	[illegible]	DIVISION 3 NEUTRON POWER AND RADIATION INSTRUMENTATION PANEL
	[illegible]	DIVISION 3 REACTOR PROTECTION SYSTEM INSTRUMENTATION AND AUXILIARY RELAY PANEL
	[illegible]	DIVISION 3 AUXILIARY RELAY PANEL

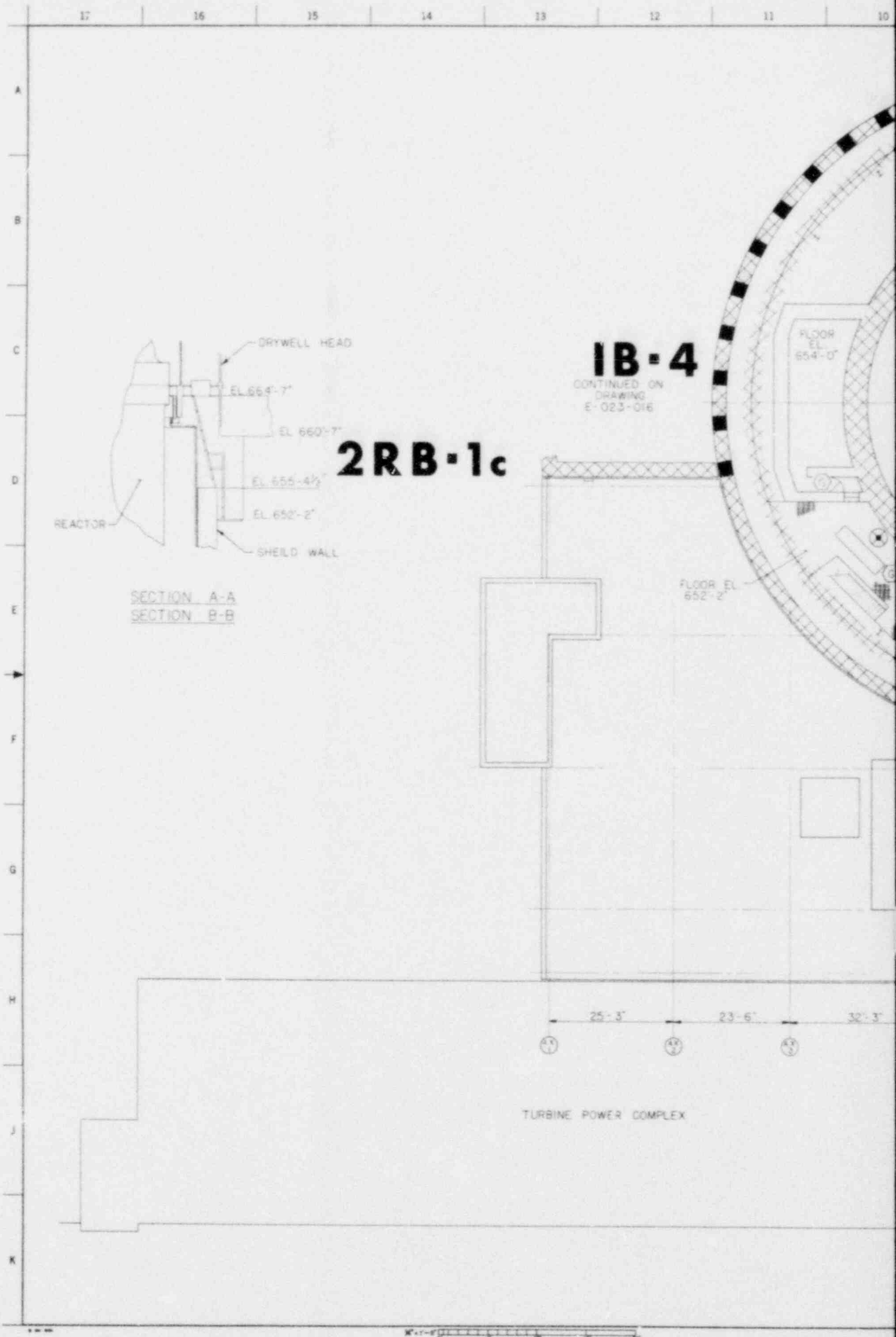
ITEM NO
13
14
15

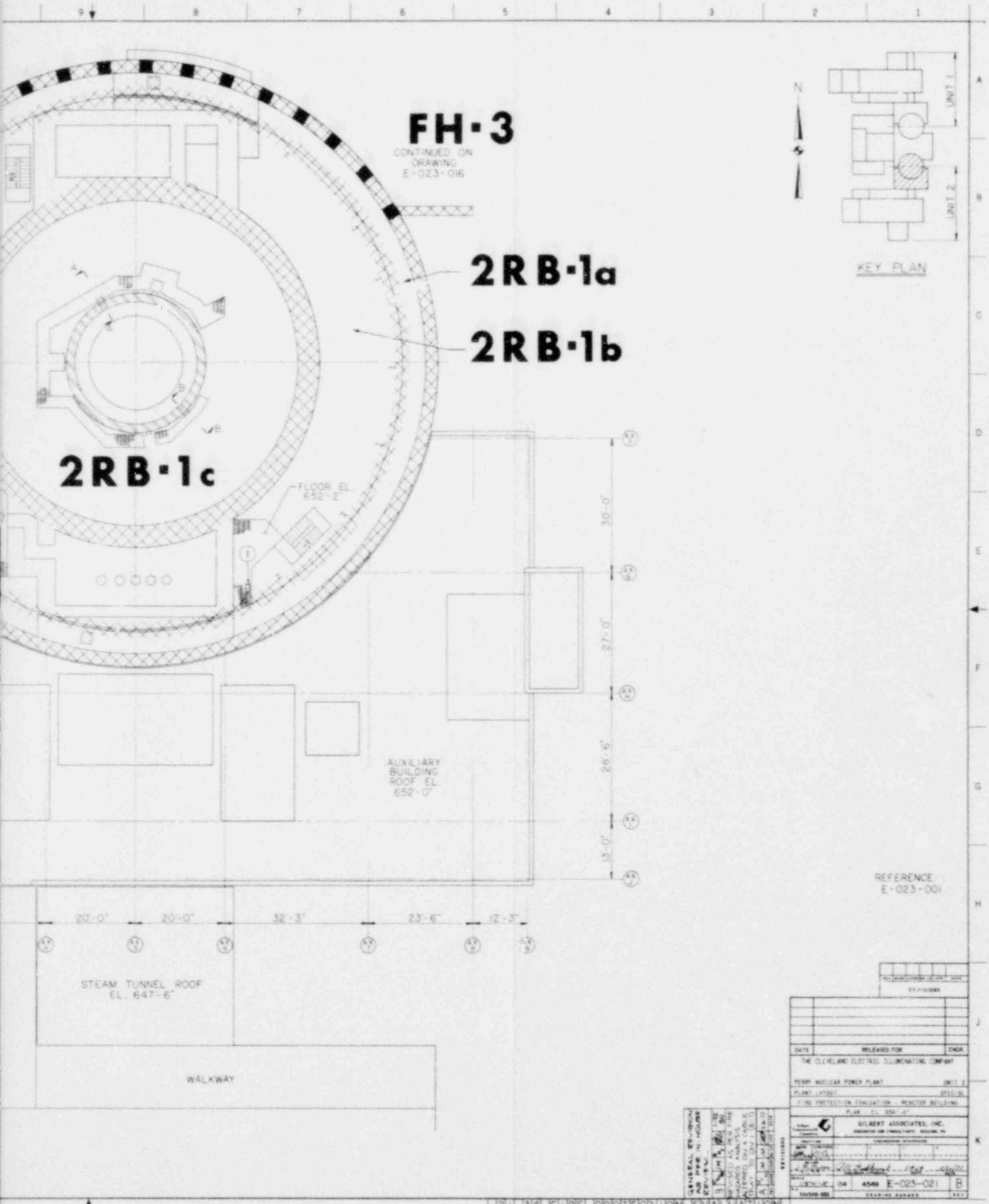

1CC-4b
1CC-4f
1CC-5
BELOW ENTIRE SUB-FLOOR
FLOOR EL.654'-6"
KEY PLAN
UNIT 1
UNIT 2
1CC-4
IB-4
CONTINUED ON DRAWING E-023-020
2CC-4
LOCATED IN PLENUMS AS DESCRIBED IN 4.4.5.1.1.
SERVICE BUILDING
ROOF DECK EL.664'-6"
2CC-4b
C-4f
2CC-5
PLAN - ELEV 654'-6"
REFERENCE: E-023-001
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - CONTROL COMPLEX
GILBERT ASSOCIATES, INC.
E-023-019
GENERAL REVISION AS PER OUT-OF-HOUSE REVIEW
GENERAL REVISION AS PER IN-HOUSE REVIEW
19 34 FIRE PROTECTION EVALUATION



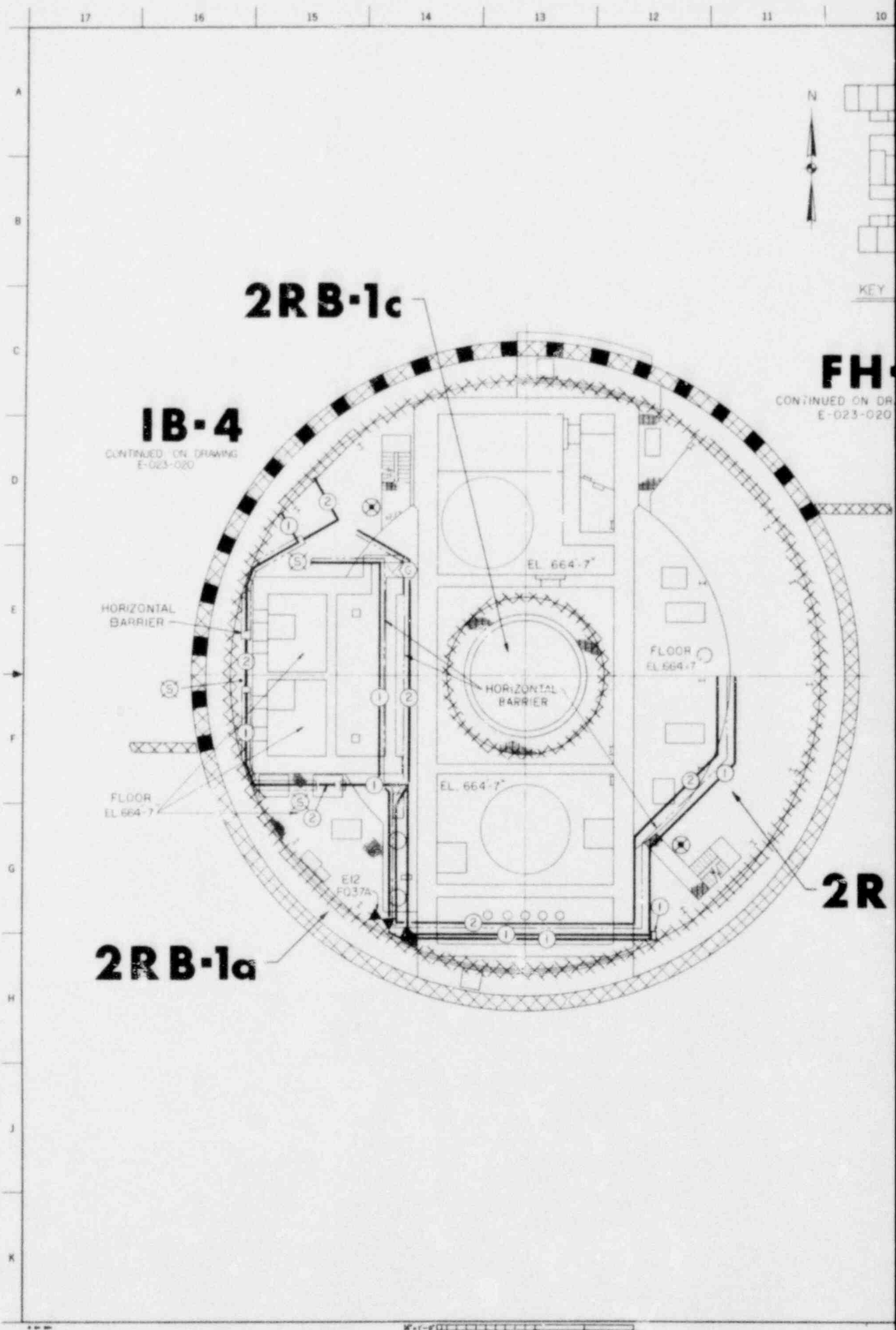
UNIT 1-AUXILIARY BUILDING ROOF
RADWASTE BUILDING ROOF
EL 664-6"
FLOOR EL 665-0"
UNIT 1 EMERGENCY CLOSED COOLING SYSTEM SURGE TANK
EL 668-6"
CC-5
CONTINUED ON DRAWING E-023-019
IB-4
UNIT 2-EMERGENCY CLOSED COOLING SYSTEM SURGE TANK
UNIT 2-AUXILIARY BUILDING ROOF
101'-0"
120'-3"
105'-6"
24'-0"
21'-7"
14'-4"
19'-6"


46'-0"
72'-6"
RB
UED ON DRAWING
023-022
FH-3
72'-0"
72'-0"
2RB
TINUED ON DRAWING
E-023-022
120'-6"
N
UNIT 1
UNIT 2
KEY PLAN
REFERENCE
E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - INTERMEDIATE AND
FUEL HANDLING BUILDINGS - PLAN
GILBERT ASSOCIATES, INC.
04
4549
E-023-020
A
DRAWING NUMBER
GENERAL REVISION
20-34 FIRE PROTECTION EVALUATION


17
16
15
14
13
12
11
10
A
B
C
D
E
F
G
H
J
K
DRYWELL HEAD
EL 664'-7"
EL 660'-7"
EL 655'-4½"
EL 652'-2"
REACTOR
SHEILD WALL
SECTION A-A
SECTION B-B
2RB-1c
IB-4
CONTINUED ON DRAWING E-023-016
FLOOR EL 654'-0"
FLOOR EL 652'-2"
25'-3"
23'-6"
32'-3"
TURBINE POWER COMPLEX



FH-3
CONTINUED ON DRAWING E-023-016
2RB-1a
2RB-1b
2RB-1c
FLOOR EL. 652'-2"
KEY PLAN
UNIT 1
UNIT 2
N
30'-0"
27'-0"
26'-6"
13'-0"
AUXILIARY BUILDING ROOF EL. 652'-0"
20'-0"
20'-0"
32'-3"
23'-6"
12'-3"
STEAM TUNNEL ROOF EL. 647'-6"
WALKWAY
REFERENCE: E-023-001
DATE
RELEASED FOR
ENGR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNIT 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - REACTOR BUILDING
GILBERT ASSOCIATES, INC.
04
4549
E-023-021
B
GENERAL REVISION AS PER IN-HOUSE REVIEW
REVISED AS PER FIRE HAZARDS ANALYSIS
2 1 3 4 FIRE PROTECTION EVALUATION



17
16
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14
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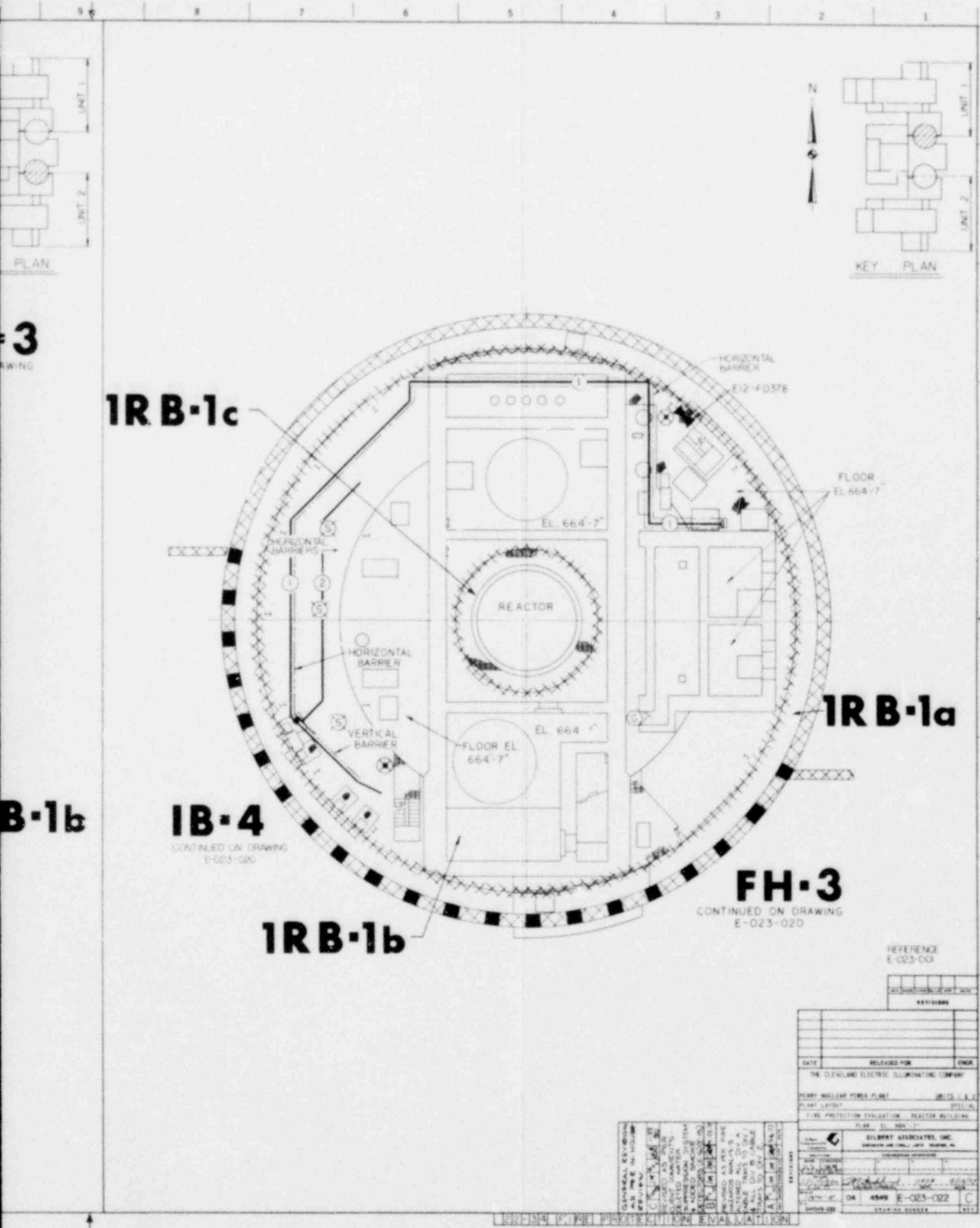
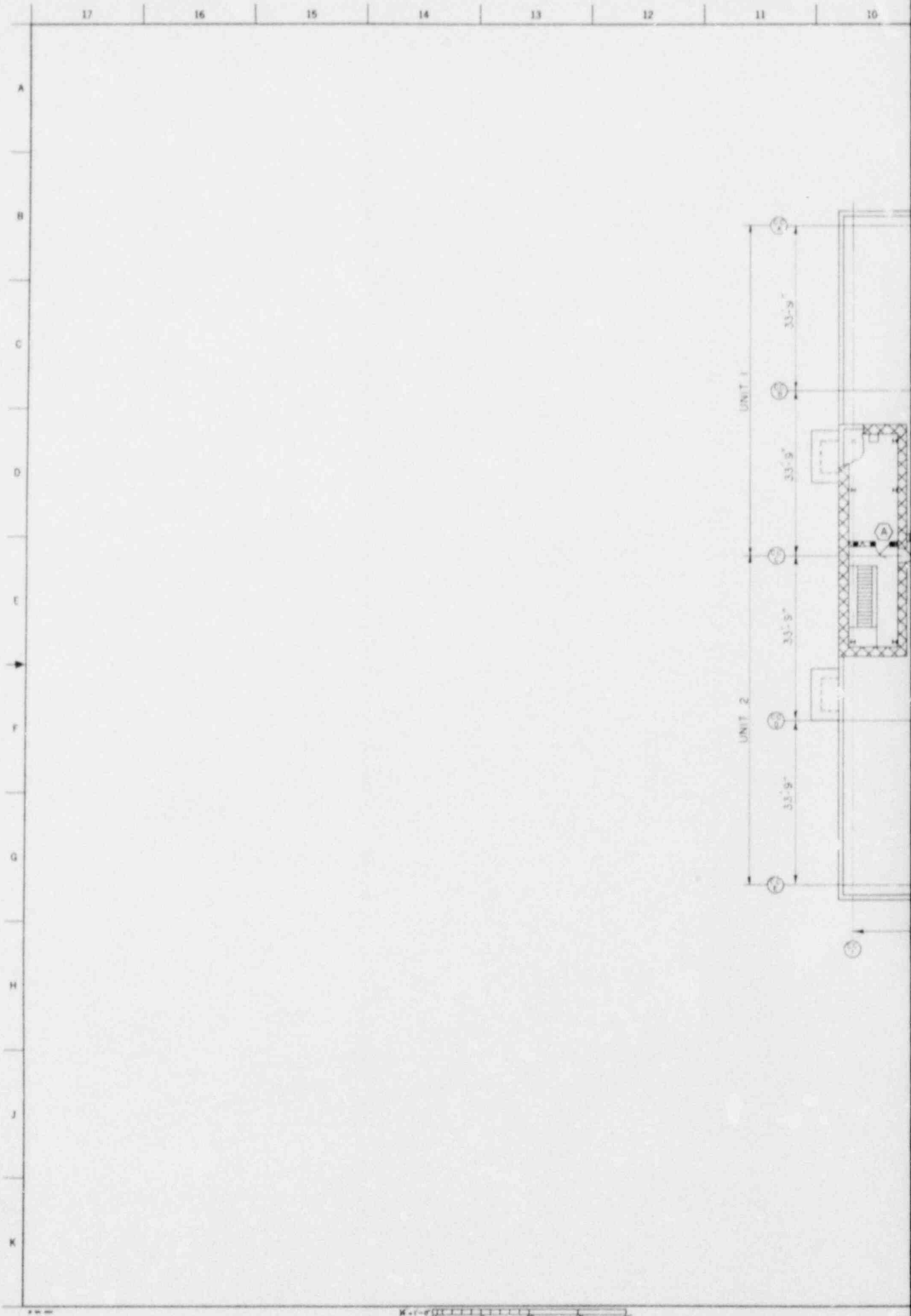
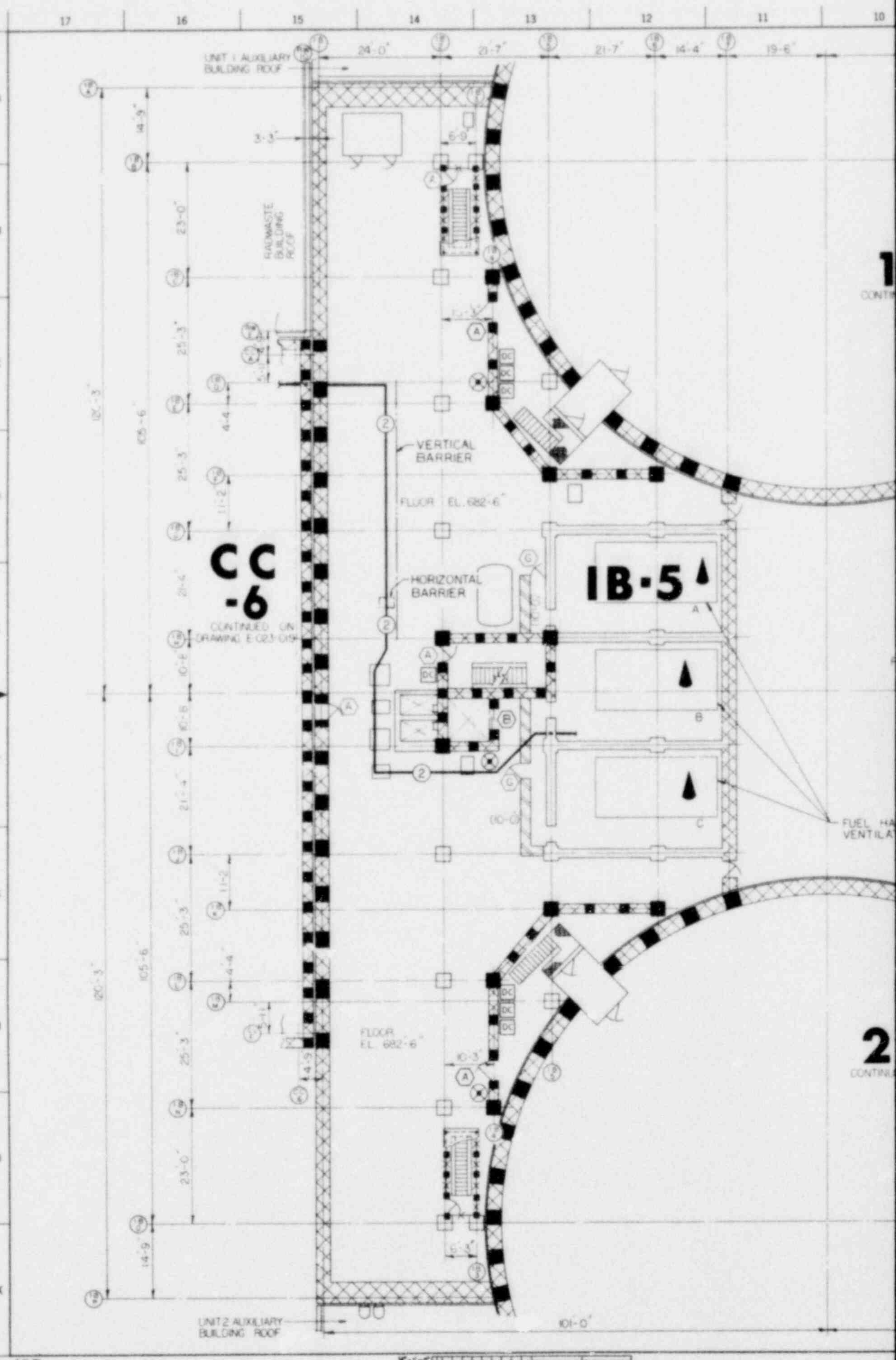
A
B
C
D
E
F
G
H
J
K
N
KEY
2RB-1c
FH
CONTINUED ON DR
E-023-020
IB-4
CONTINUED ON DRAWING
E-023-020
HORIZONTAL
BARRIER
EL. 664-7"
FLOOR
EL 664-7
HORIZONTAL
BARRIER
EL. 664-7"
FLOOR
EL 664-7
E12
F037A
2R
2RB-1a



PLAN
3
AWING
1RB-1c
B-1b
IB-4
CONTINUED ON DRAWING
E-023-020
1RB-1b
N
KEY PLAN
UNIT 1
UNIT 2
HORIZONTAL
BARRIER
E12-F037B
FLOOR
EL.664-7"
EL. 664-7"
HORIZONTAL
BARRIERS
REACTOR
HORIZONTAL
BARRIER
VERTICAL
BARRIER
FLOOR EL
664-7"
EL. 664-7"
1RB-1a
FH-3
CONTINUED ON DRAWING
E-023-020
REFERENCE
E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - REACTOR BUILDING
PLAN - EL. 664'-7"
GILBERT ASSOCIATES, INC.
E-023-022
C
DRAWING NUMBER
GENERAL REVISION
REVISED AS PER FIRE HAZARDS ANALYSIS
22F34 FIRE PROTECTION EVALUATION


17
16
15
14
13
12
11
10
A
B
C
D
E
F
G
H
J
K
UNIT 1
UNIT 2
33'-9"
33'-9"
33'-9"
33'-9"

N
UNIT 1
UNIT 2
KEY PLAN
CONTROL COMPLEX
ROOF
EL. 707'-2"
INTERMEDIATE BUILDING
ROOF - EL. 707'-6"
30'-0"
30'-0"
32'-0"
29'-6"
14'-6"
REFERENCE:
E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - CONTROL COMPLEX ROOF
PLAN - EL. 707'-6"
GILBERT ASSOCIATES, INC.
04
4549
E-023-023
—
DRAWING NUMBER
REV
23-34 FIRE PROTECTION EVALUATION



17
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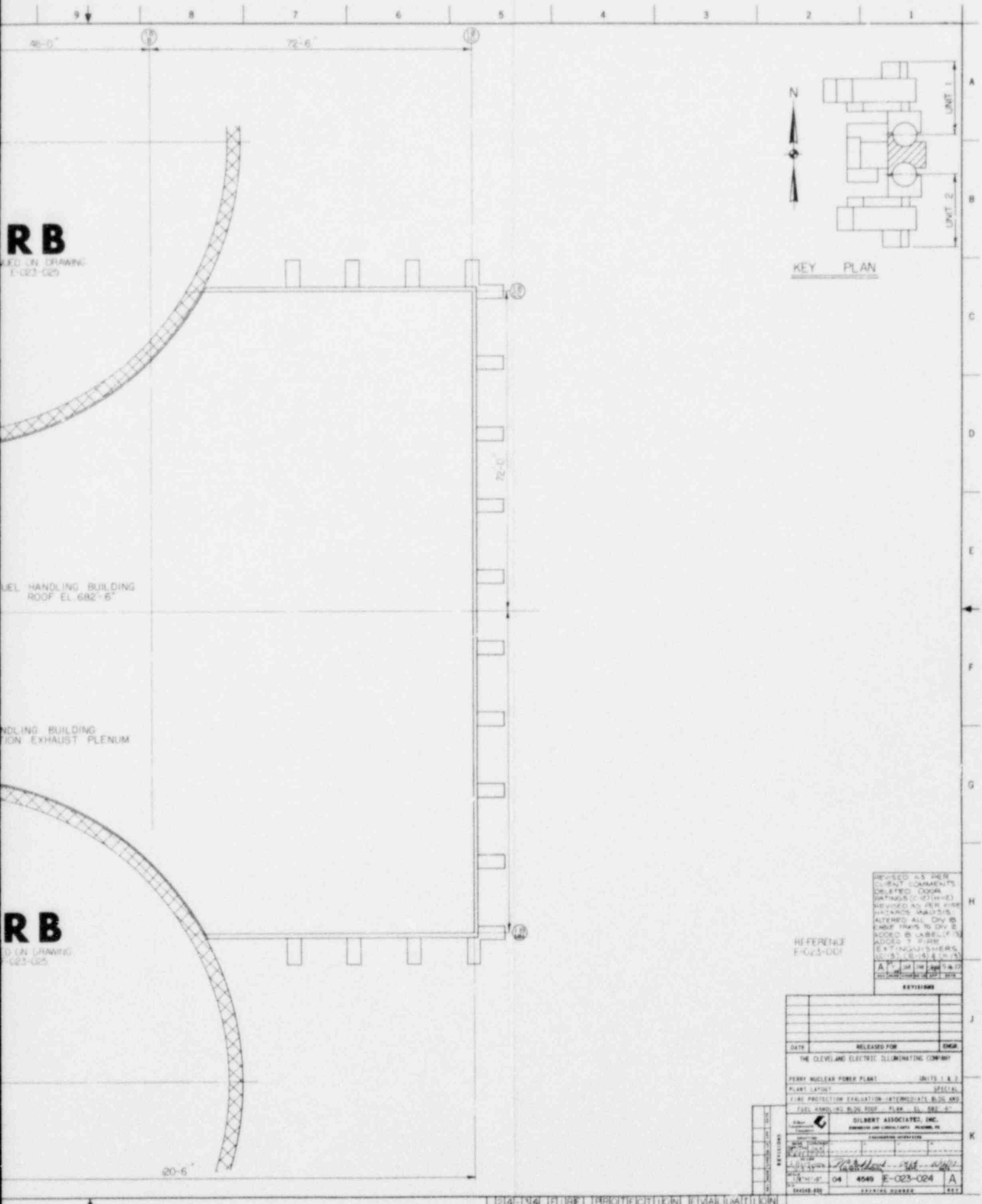
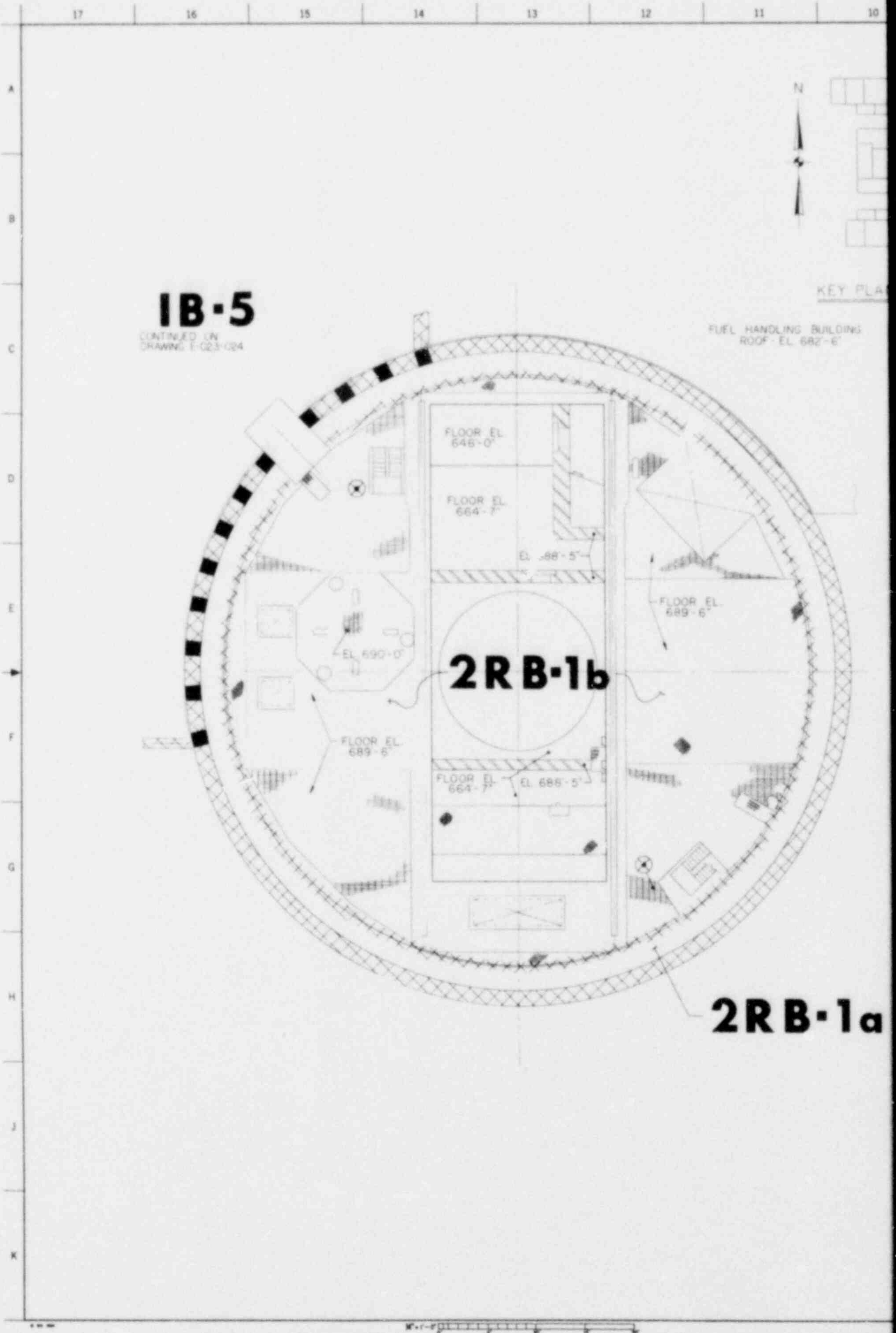
10
UNIT 1 AUXILIARY BUILDING ROOF
RADWASTE BUILDING ROOF
VERTICAL BARRIER
FLOOR EL. 682-6"
CC -6
CONTINUED ON DRAWING E-023-019
HORIZONTAL BARRIER
IB-5
FLOOR EL. 682-6"
UNIT 2 AUXILIARY BUILDING ROOF
101-0"



46'-0"
72'-6"
N
UNIT 1
UNIT 2
KEY PLAN
RB
UED ON DRAWING E-023-025
72'-0"
UEL HANDLING BUILDING
ROOF EL.682'-6"
NDLING BUILDING
TION EXHAUST PLENUM
RB
ED ON DRAWING E-023-025
20'-6"
REFERENCE E-023-001
REVISED AS PER CLIENT COMMENTS DELETED DOOR RATINGS (C-12) (H-12) REVISED AS PER FIRE HAZARDS ANALYSIS ALTERED ALL DIV B CABLE TRAYS TO DIV 2 ADDED B LABEL (F-15) ADDED 7 FIRE EXTINGUISHERS
REVISIONS
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION-INTERMEDIATE BLDG AND
FUEL HANDLING BLDG ROOF - PLAN - EL 682'-6"
GILBERT ASSOCIATES, INC.
REVISIONS
04
4549
E-023-024
A
DRAWING NUMBER
REV
24-34 FIRE PROTECTION EVALUATION



17
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A
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C
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E
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G
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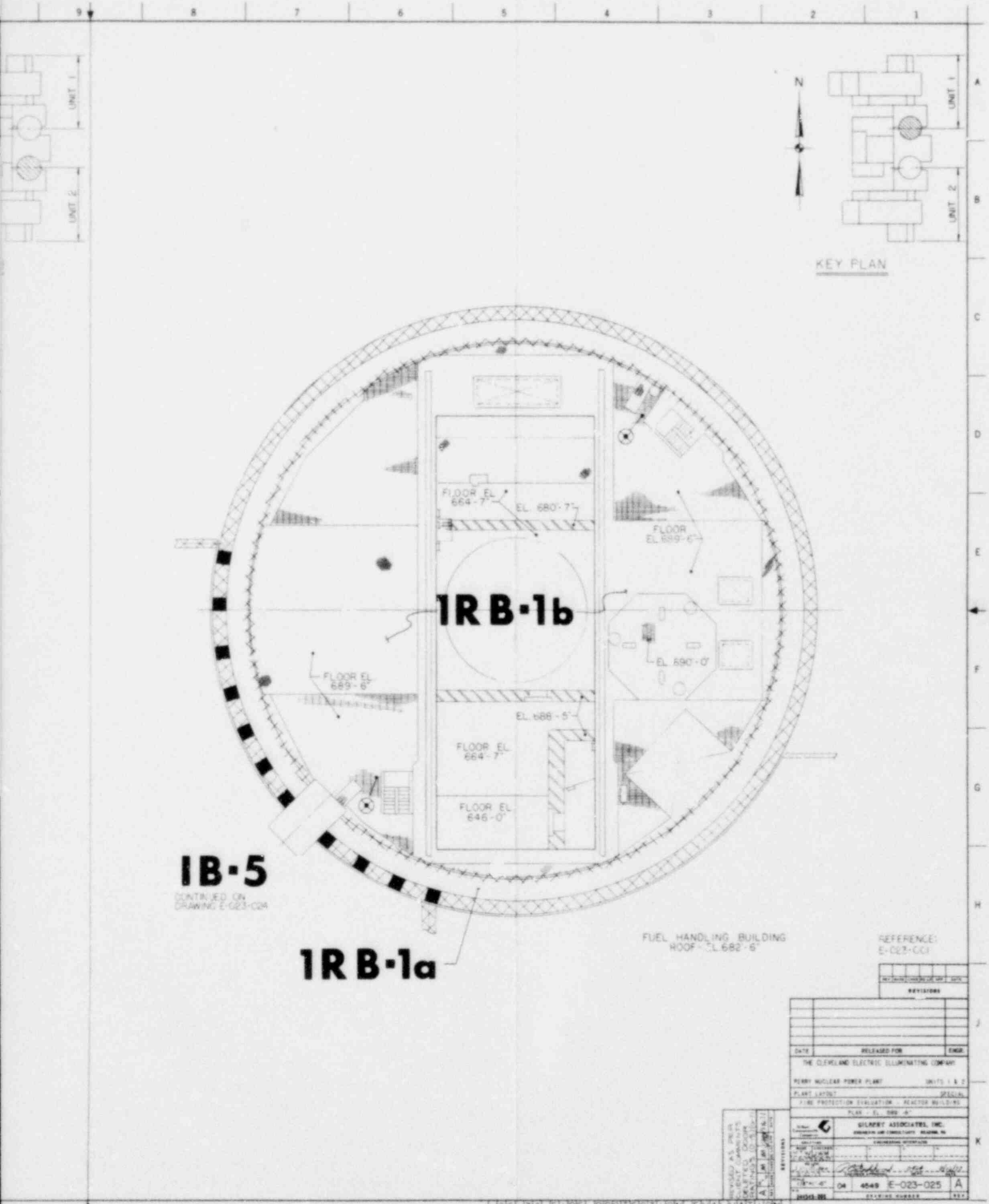
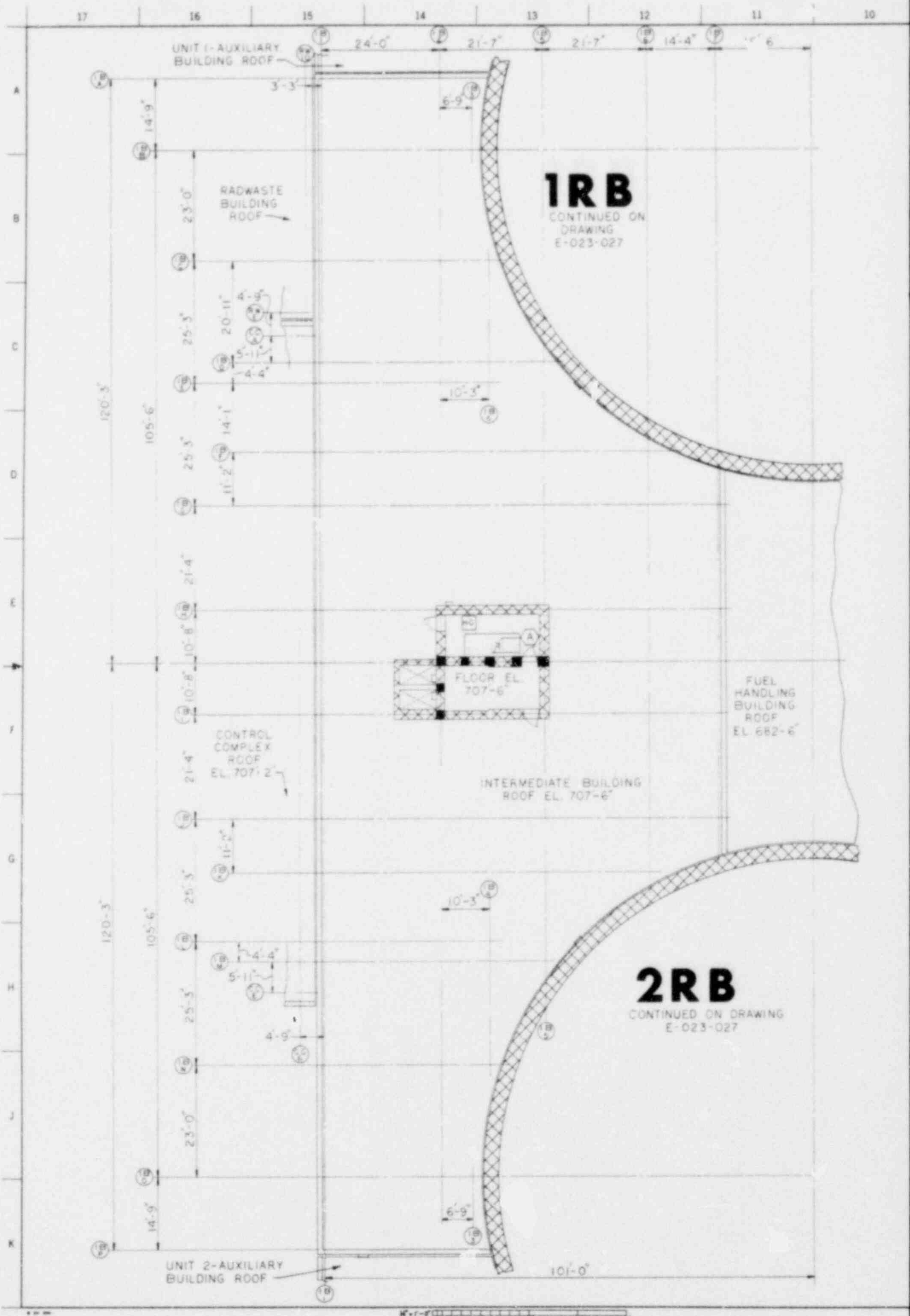
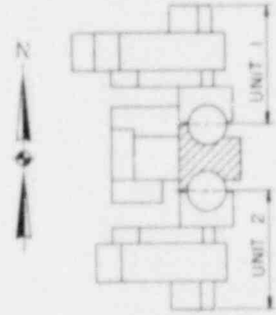
J
K
N
KEY PLA
IB-5
CONTINUED ON
DRAWING E-023-024
FUEL HANDLING BUILDING
ROOF EL 682'-6"
FLOOR EL
646'-0"
FLOOR EL
664'-7"
EL 688'-5"
FLOOR EL
689'-6"
EL 690'-0"
2RB-1b
FLOOR EL
689'-6"
FLOOR EL
664'-7"
EL 688'-5"
2RB-1a



N
UNIT 1
UNIT 2
KEY PLAN
FLOOR EL 664'-7"
EL. 680'-7"
FLOOR EL 689'-6"
1RB-1b
EL. 690'-0"
FLOOR EL 689'-6"
EL. 688'-5"
FLOOR EL 664'-7"
FLOOR EL 646'-0"
1B-5
CONTINUED ON DRAWING E-023-024
1RB-1a
FUEL HANDLING BUILDING ROOF - EL 682'-6"
REFERENCE: E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 & 2
PLANT LAYOUT SPECIAL
FIRE PROTECTION EVALUATION - REACTOR BUILDING
PLAN - EL. 689'-6"
GILBERT ASSOCIATES, INC.
A REVISED AS PER CLIENT COMMENTS DELETED DOOR RATINGS
REVISIONS
04 4549 E-023-025 A
DRAWING NUMBER
REV
25-34 FIRE PROTECTION EVALUATION



UNIT 1-AUXILIARY BUILDING ROOF
RADWASTE BUILDING ROOF
1RB
CONTINUED ON DRAWING E-023-027
FLOOR EL. 707-6"
FUEL HANDLING BUILDING ROOF EL. 682-6"
CONTROL COMPLEX ROOF EL. 707-2"
INTERMEDIATE BUILDING ROOF EL. 707-6"
2RB
CONTINUED ON DRAWING E-023-027
UNIT 2-AUXILIARY BUILDING ROOF



KEY PLAN

REFERENCE:
E-023-001

REVISIONS

DATE	RELEASED FOR	ENGR.

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

PERRY NUCLEAR POWER PLANT — UNITS 1 & 2

PLANT LAYOUT — SPECIAL

FIRE PROTECTION EVALUATION INTERMEDIATE BUILDING

ROOF - PLAN - EL. [illegible] AND [illegible]

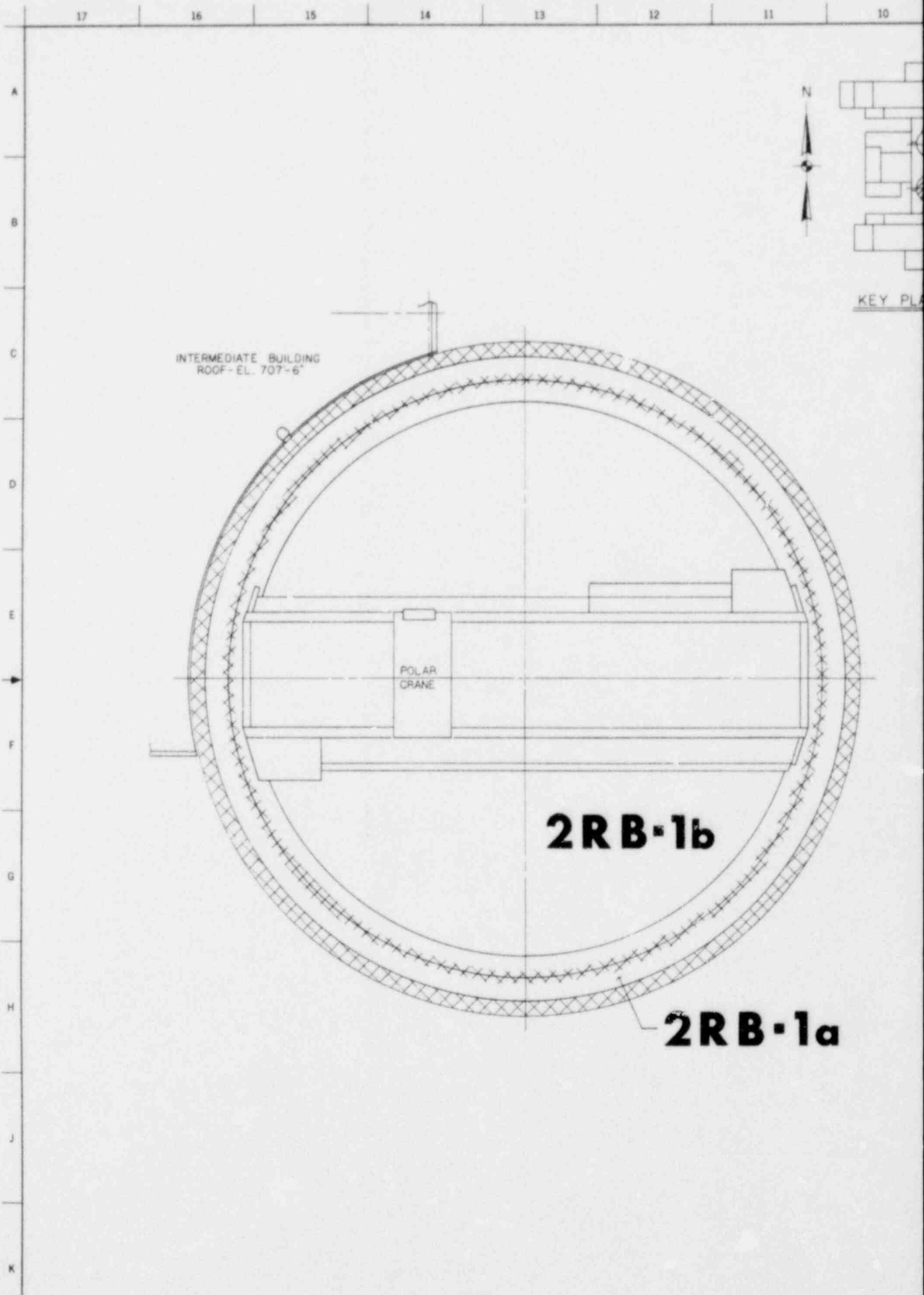
GILBERT ASSOCIATES, INC.

ENGINEERS AND CONSULTANTS READING, PA

04 4549 E-023-026 —

DRAWING NUMBER

26-34 FIRE PROTECTION EVALUATION



17
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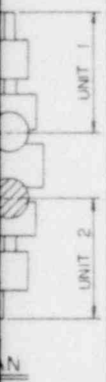
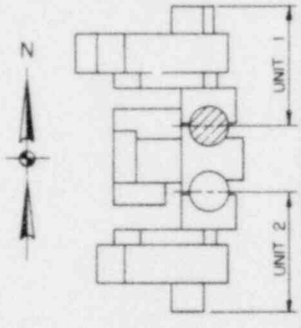
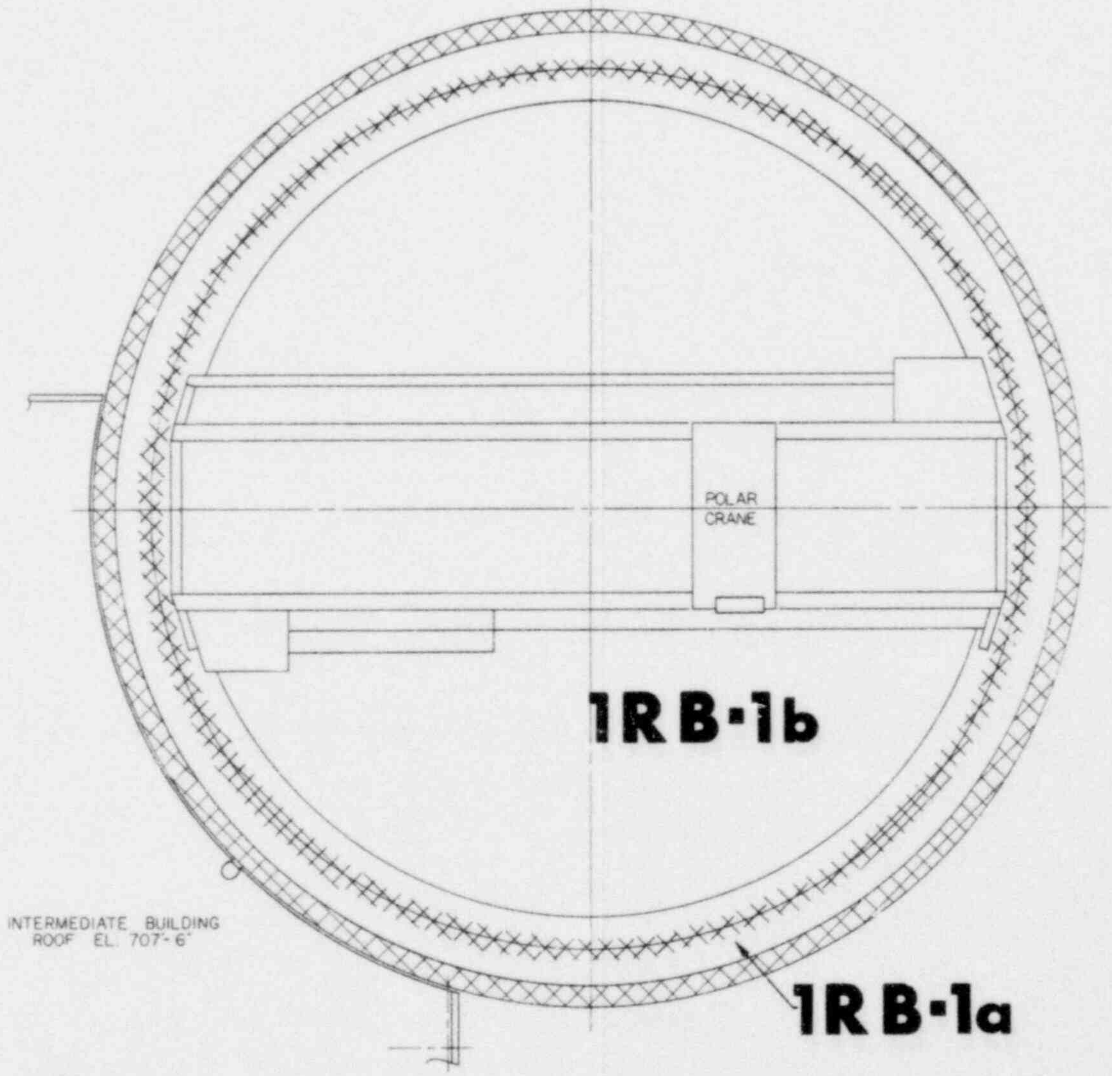
A
B
C
D
E
F
G
H
J
K
N
KEY PL
INTERMEDIATE BUILDING
ROOF - EL. 707'-6"
POLAR
CRANE
2RB-1b
2RB-1a





KEY PLAN



REFERENCE
E-023-001

REVISIONS

DATE | RELEASED FOR | ENGR.

THE CLEVELAND ELECTRIC ILLUMINATING COMPANY

PERRY NUCLEAR POWER PLANT UNITS 1 & 2

PLANT LAYOUT SPECIAL

FIRE PROTECTION EVALUATION - REACTOR BUILDING

PLAN - EL. 721'-0"

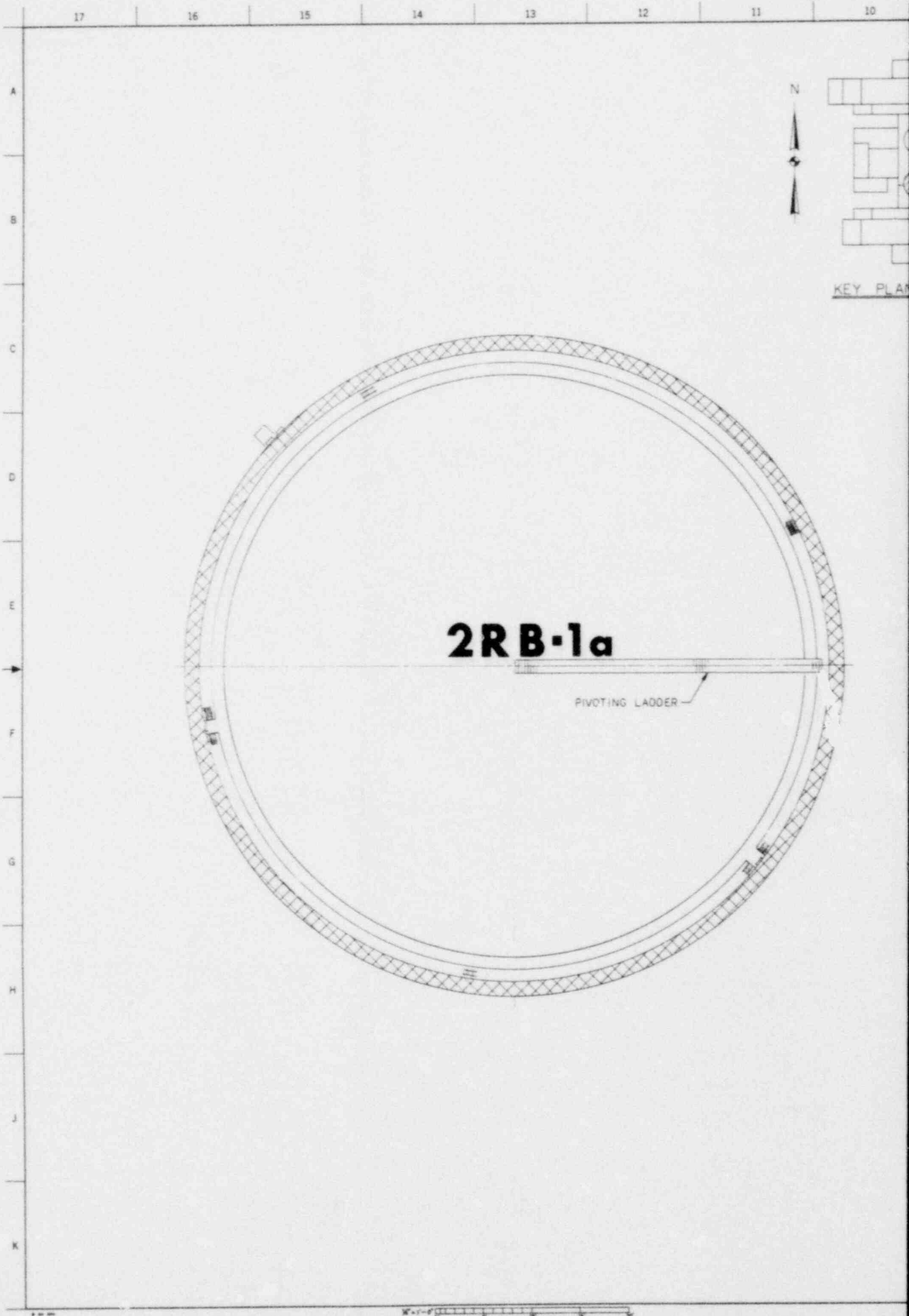
GILBERT ASSOCIATES, INC.
ENGINEERS AND CONSULTANTS READING, PA

ENGINEERING INTERFACES

SCALE 1/8"=1'-0" | 04 | 4549 | E-023-027 | —

DRAWING NUMBER | REV

27-34 FIRE PROTECTION EVALUATION



17
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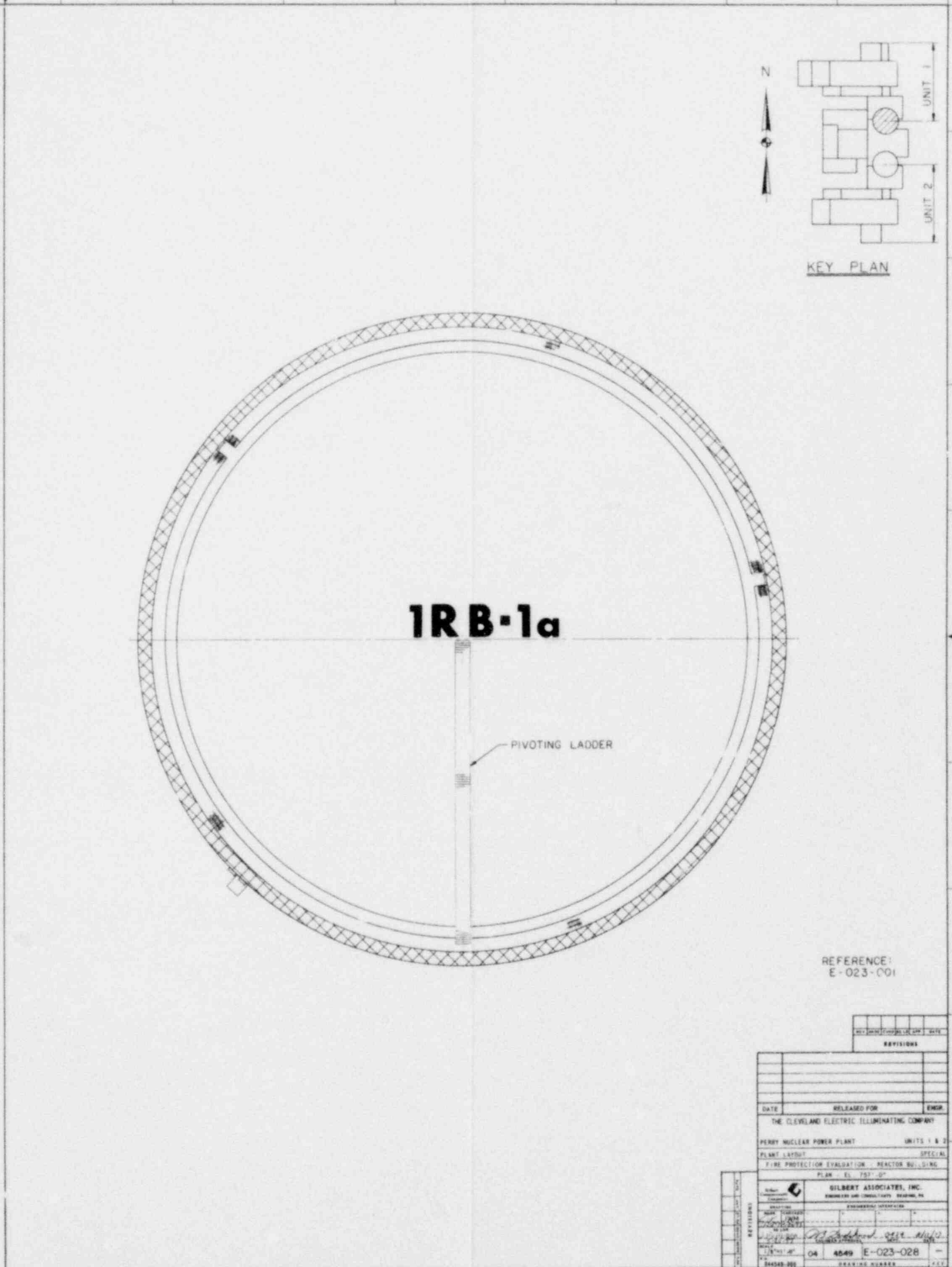
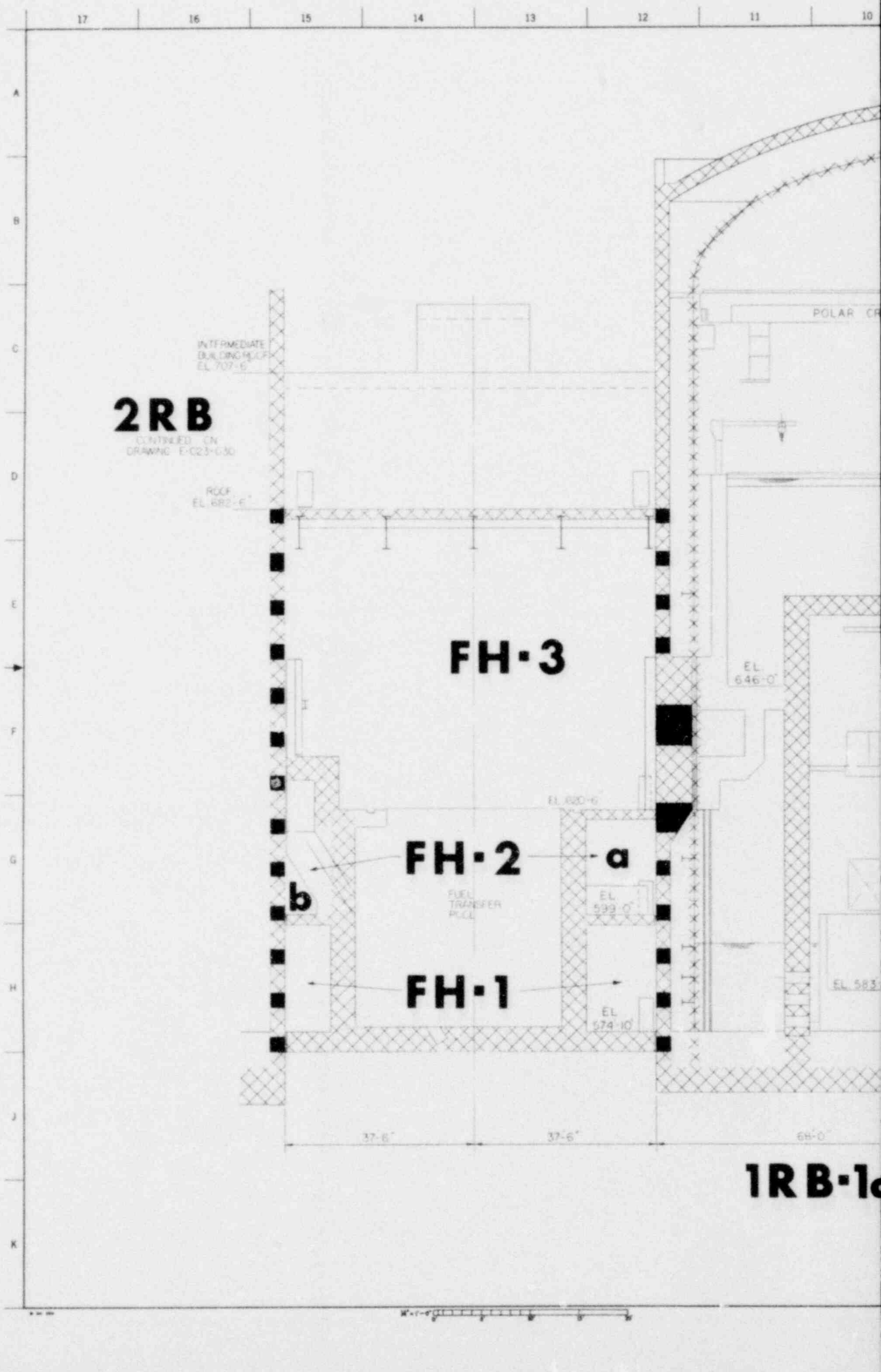
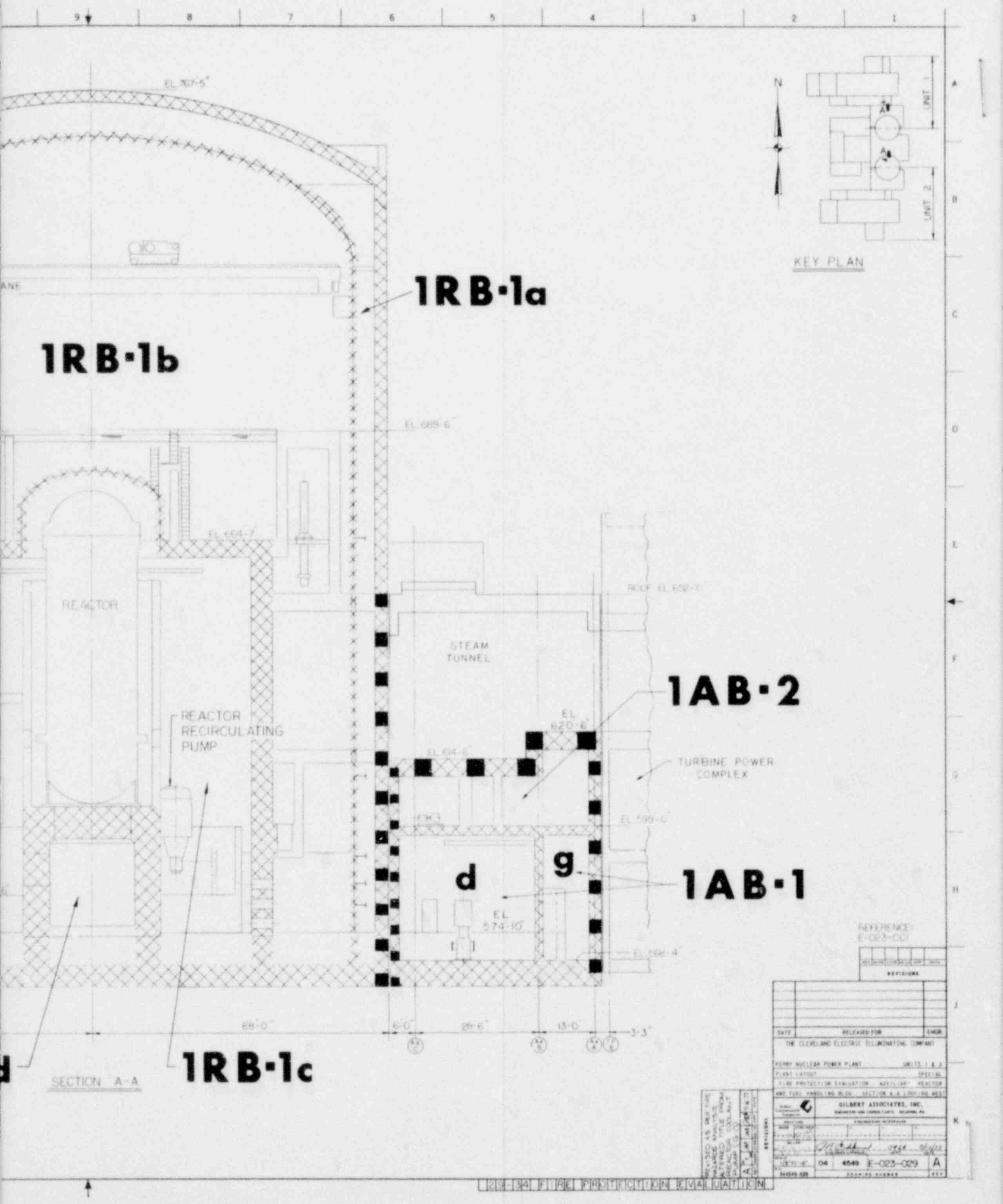
A
B
C
D
E
F
G
H
J
K
N
KEY PLAN
2RB-1a
PIVOTING LADDER

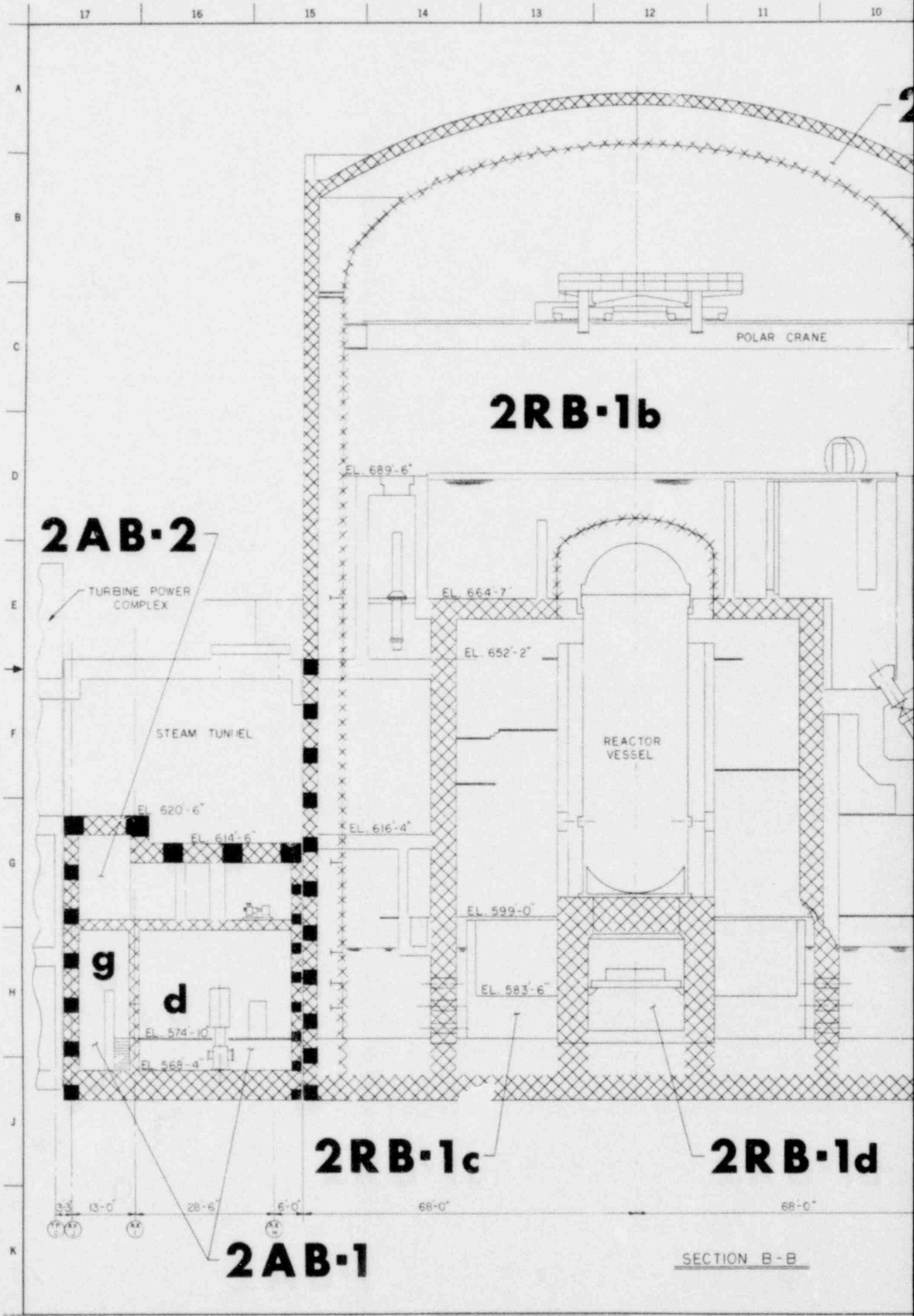


28-34 FIRE PROTECTION EVALUATION


2RB
CONTINUED ON DRAWING E-023-030
INTERMEDIATE BUILDING ROOF EL 707-6"
ROOF EL 682-6"
POLAR CR
FH-3
EL 646-0"
EL 620-6
FH-2
a
b
FUEL TRANSFER POOL
EL 599-0"
FH-1
EL 574-10
EL 583
37-6"
37-6"
68-0"
1RB-1a



EL 767-5"
KEY PLAN
N
UNIT 1
UNIT 2
1RB-1a
1RB-1b
EL 689-6"
EL 664-7"
REACTOR
ROOF EL 652-0"
STEAM TUNNEL
1AB-2
EL 620-6"
REACTOR RECIRCULATING PUMP
EL 614-6"
TURBINE POWER COMPLEX
EL 599-0"
d
g
1AB-1
EL 574-10"
REFERENCE: E-023-001
68'-0"
6'-0"
28'-6"
13'-0"
3'-3"
SECTION A-A
1RB-1c
REVISIONS
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 & 2
PLANT LAYOUT SPECIAL
FIRE PROTECTION EVALUATION - AUXILIARY REACTOR AND FUEL HANDLING BLDG - SECTION A-A LOOKING WEST
GILBERT ASSOCIATES, INC.
REVISED AS PER FIRE HAZARDS ANALYSIS ALTERED TITLE FROM REACTOR COOLANT PUMP
04
4549
E-023-029
A
DRAWING NUMBER
23-34 FIRE PROTECTION EVALUATION



2RB-1b
2AB-2
TURBINE POWER COMPLEX
STEAM TUNNEL
POLAR CRANE
REACTOR VESSEL
EL. 689'-6"
EL. 664'-7"
EL. 652'-2"
EL. 620'-6"
EL. 614'-6"
EL. 616'-4"
EL. 599'-0"
EL. 583'-6"
EL. 574'-10"
EL. 568'-4"
g
d
2RB-1c
2RB-1d
2AB-1
3-3
13'-0"
28'-6"
6'-0"
68'-0"
68'-0"
17
16
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13
12
11
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A
B
C
D
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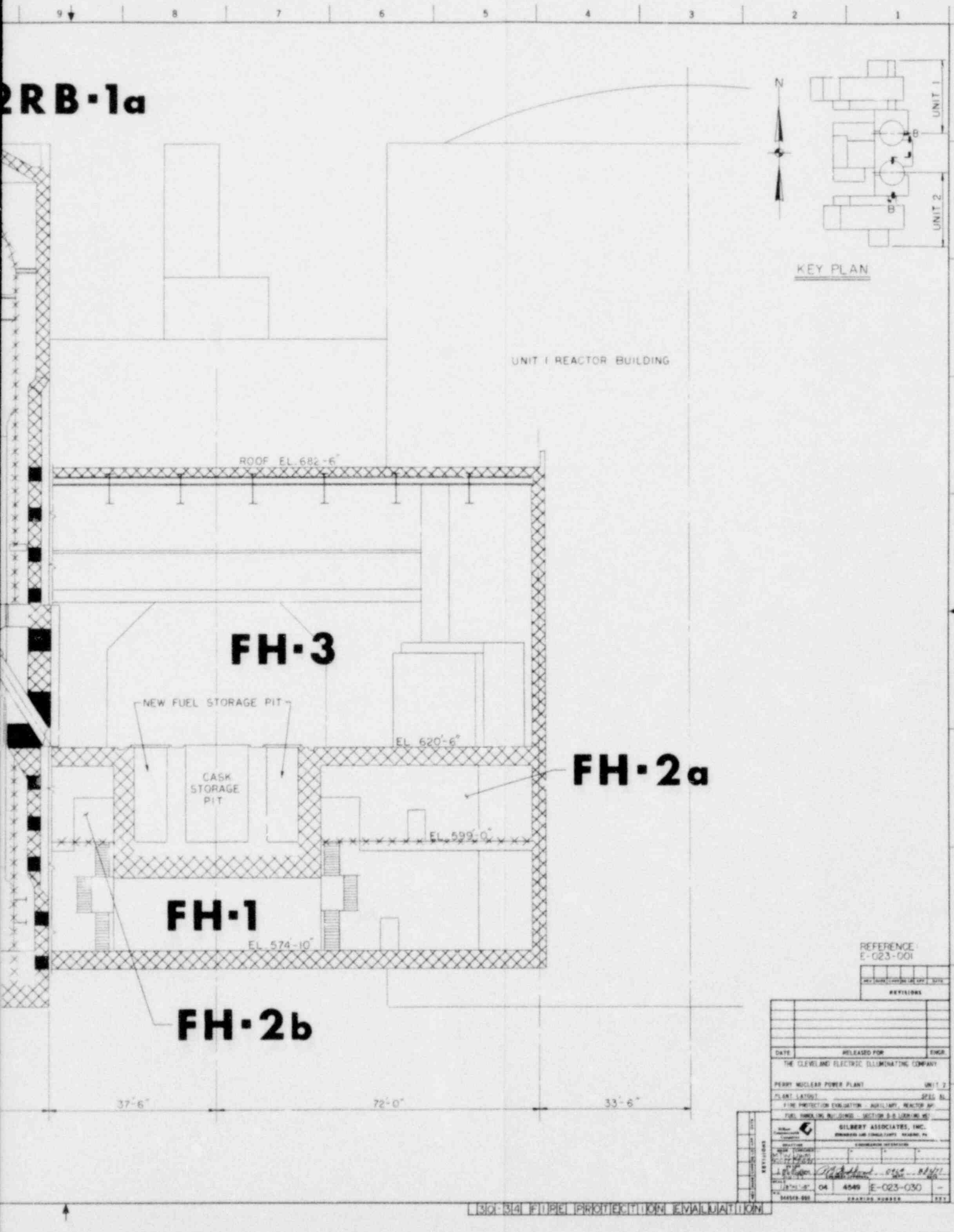
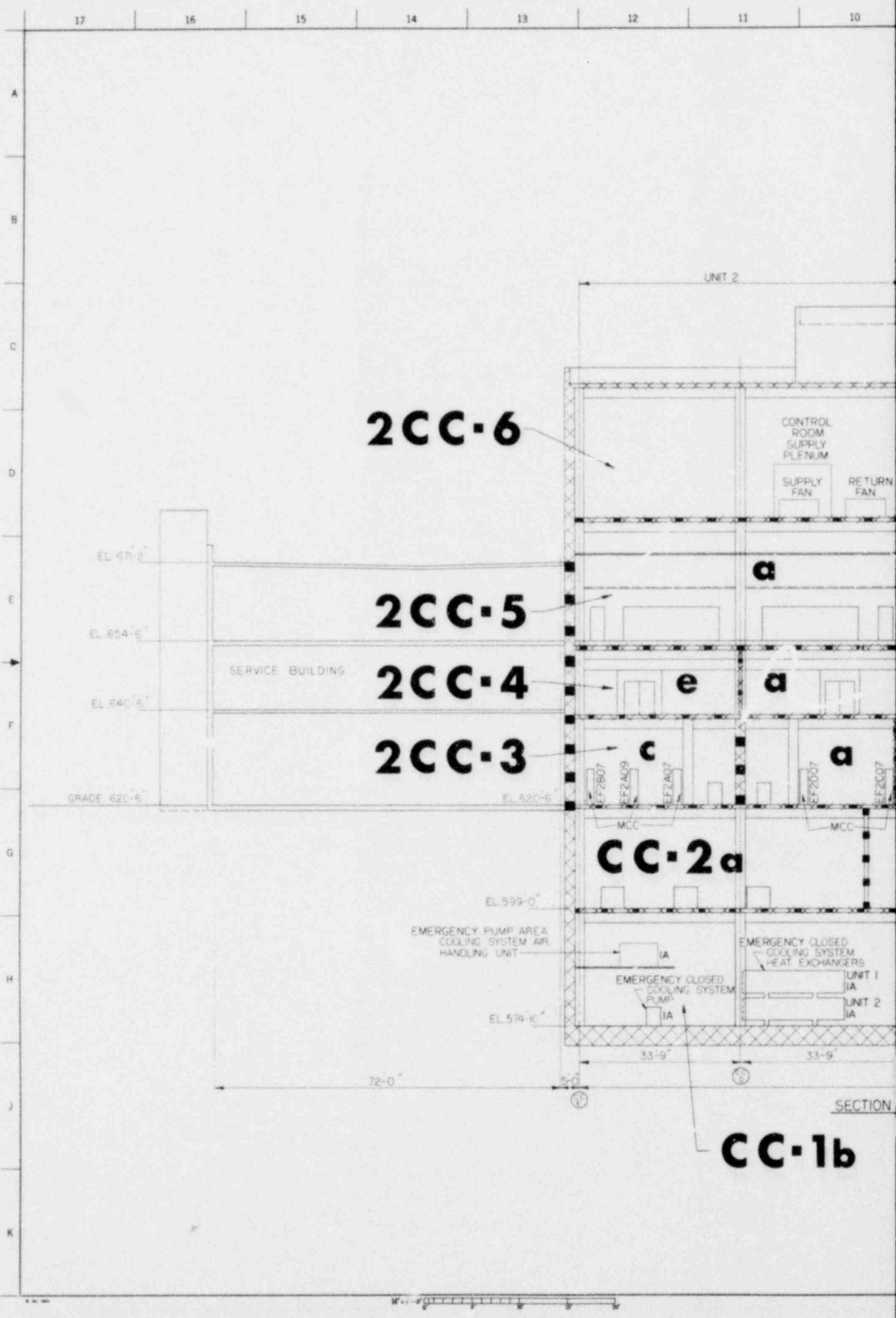
F
G
H
J
K

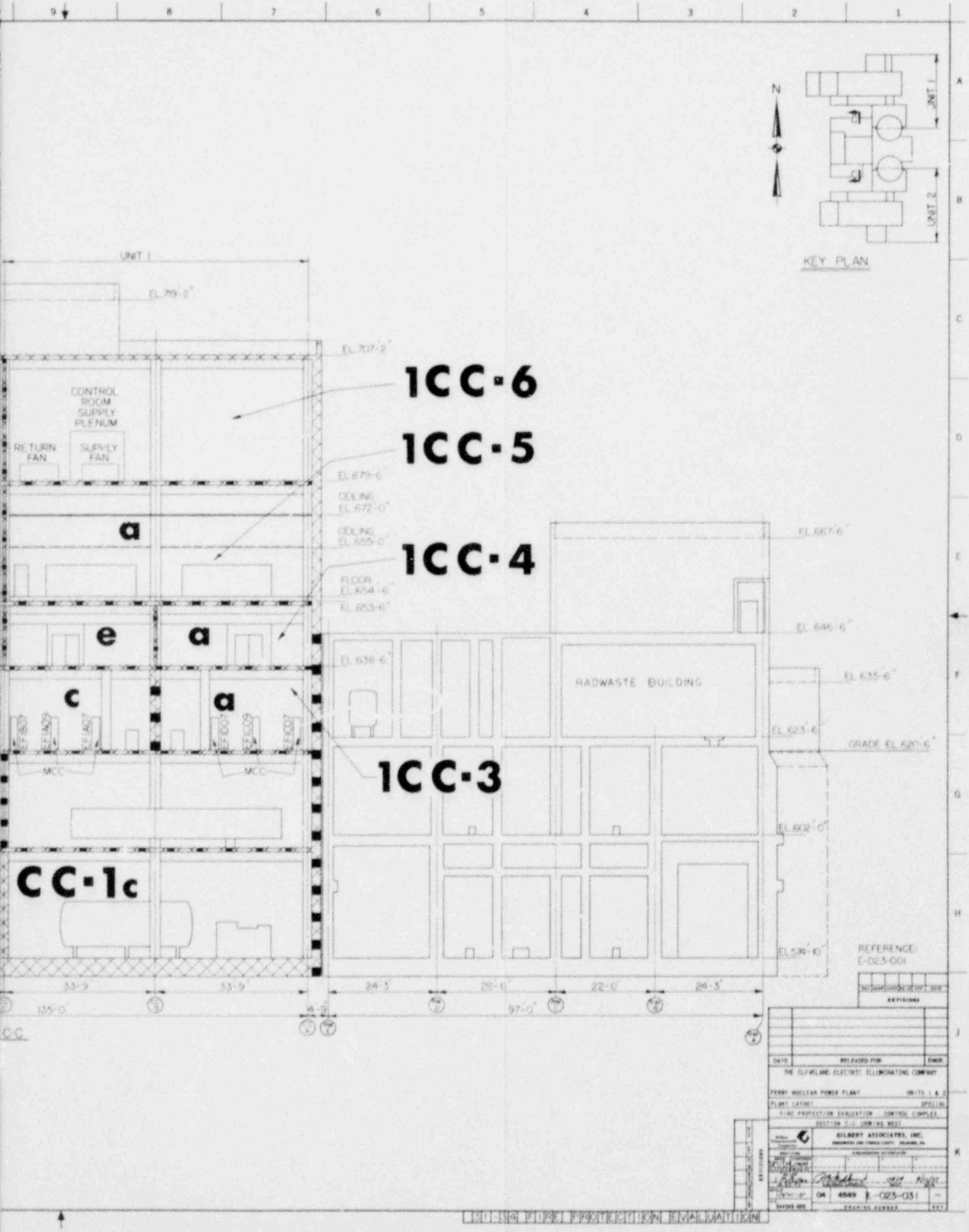
SECTION B-B

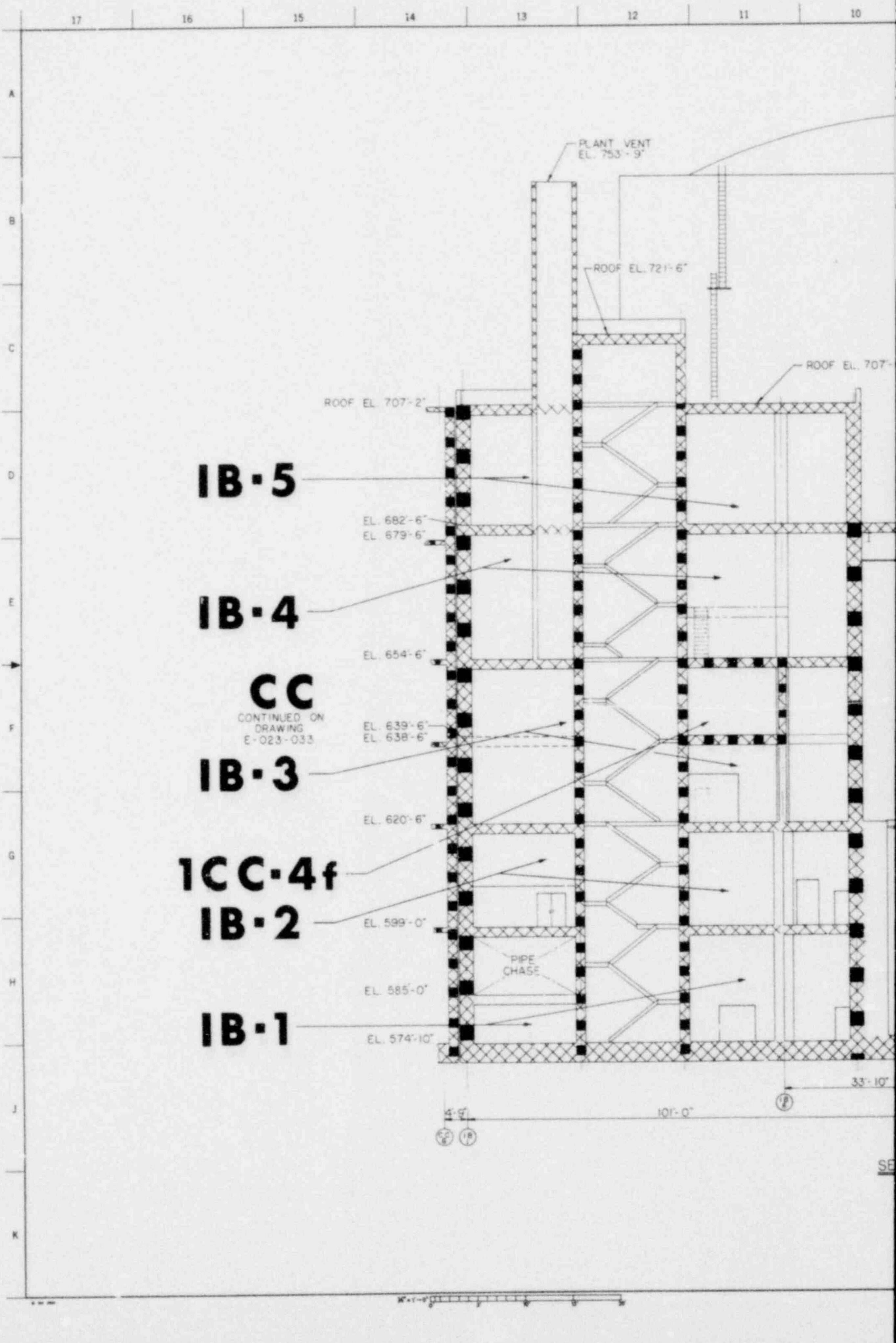


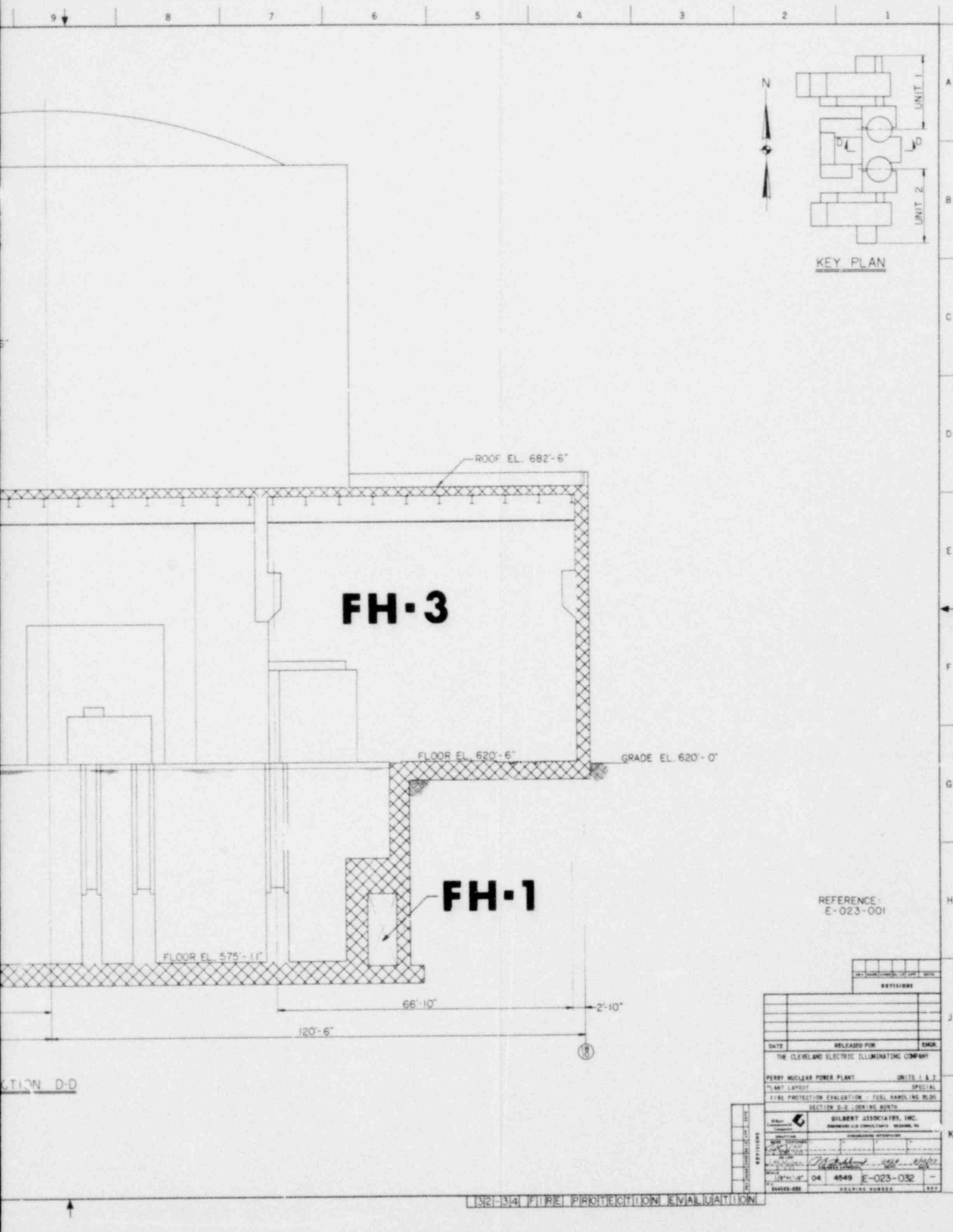
30-34 FIRE PROTECTION EVALUATION



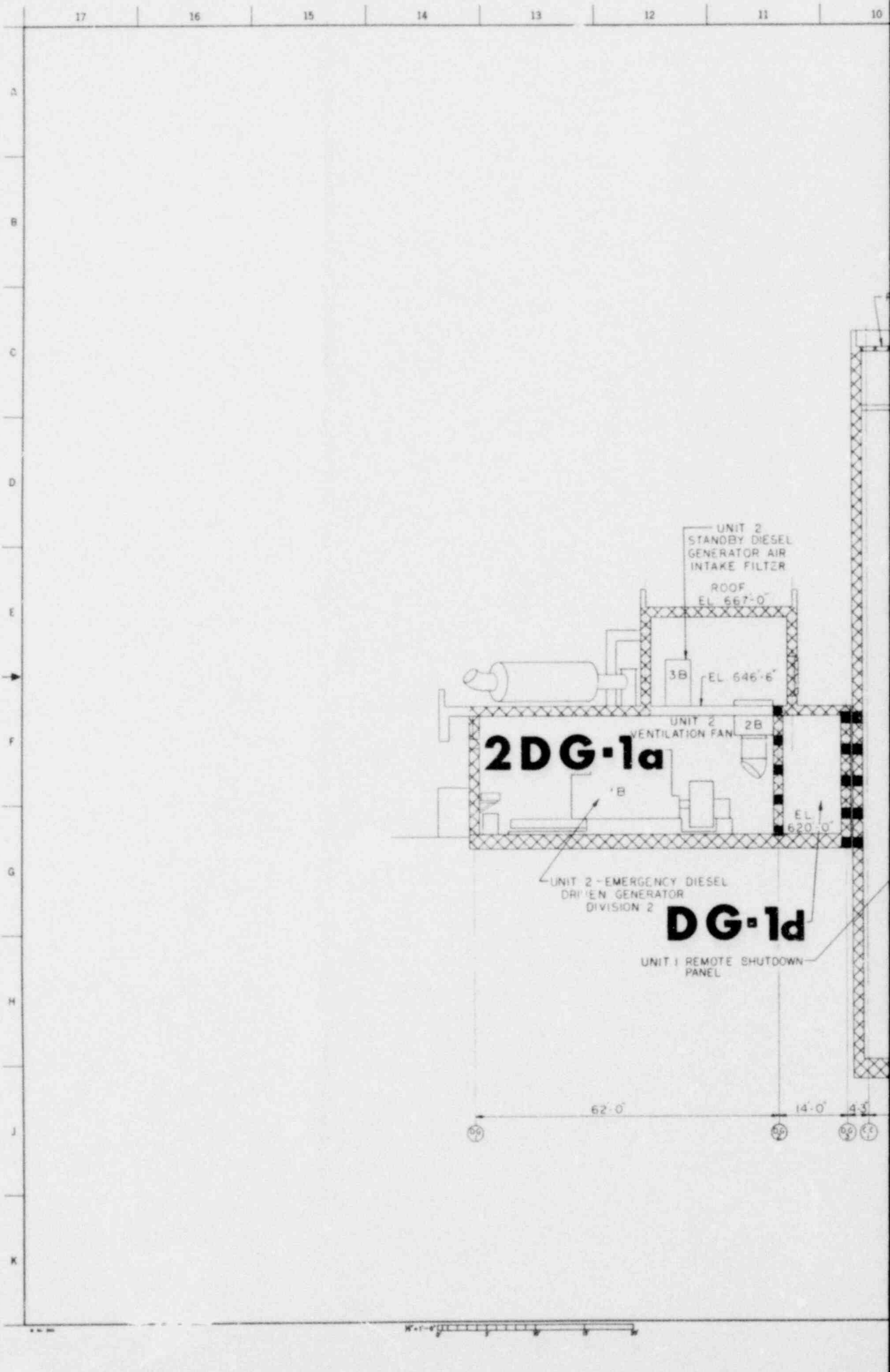
UNIT 2
CONTROL ROOM SUPPLY PLENUM
SUPPLY FAN
RETURN FAN
2CC-6
2CC-5
2CC-4
2CC-3
a
e
c
CC-2a
CC-1b
EL 671-2"
EL 654-6"
EL 640-6"
GRADE 620-6"
EL 620-6"
EL 599-0"
EL 574-10"
SERVICE BUILDING
EF2B07
EF2A09
EF2A07
EF2D07
EF2C07
MCC
EMERGENCY PUMP AREA COOLING SYSTEM AIR HANDLING UNIT
IA
EMERGENCY CLOSED COOLING SYSTEM HEAT EXCHANGERS
UNIT 1
UNIT 2
EMERGENCY CLOSED COOLING SYSTEM PUMP
33-9"
72-0"
5-0
SECTION


KEY PLAN
UNIT 1
UNIT 2
N
UNIT 1
EL 719'-2"
EL 707'-2"
CONTROL ROOM SUPPLY PLENUM
RETURN FAN
SUPPLY FAN
1CC-6
1CC-5
EL 679'-6"
CEILING EL 672'-0"
CEILING EL 655'-0"
a
1CC-4
FLOOR EL 654'-6"
EL 653'-6"
e
a
EL 667'-6"
EL 646'-6"
EL 638'-6"
c
a
RADWASTE BUILDING
EL 635'-6"
EL 623'-6"
GRADE EL 620'-6"
MCC
MCC
1CC-3
EL 602'-0"
CC-1c
EL 574'-10"
REFERENCE: E-023-001
33'-9"
33'-9"
24'-3"
26'-6"
22'-0"
24'-3"
135'-0"
4'-5"
97'-0"
C-C
REVISIONS
DATE
RELEASED FOR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION CONTROL COMPLEX
SECTION C-C LOOKING WEST
GILBERT ASSOCIATES, INC.
04
4549
E-023-031
DRAWING NUMBER
FIRE PROTECTION EVALUATION

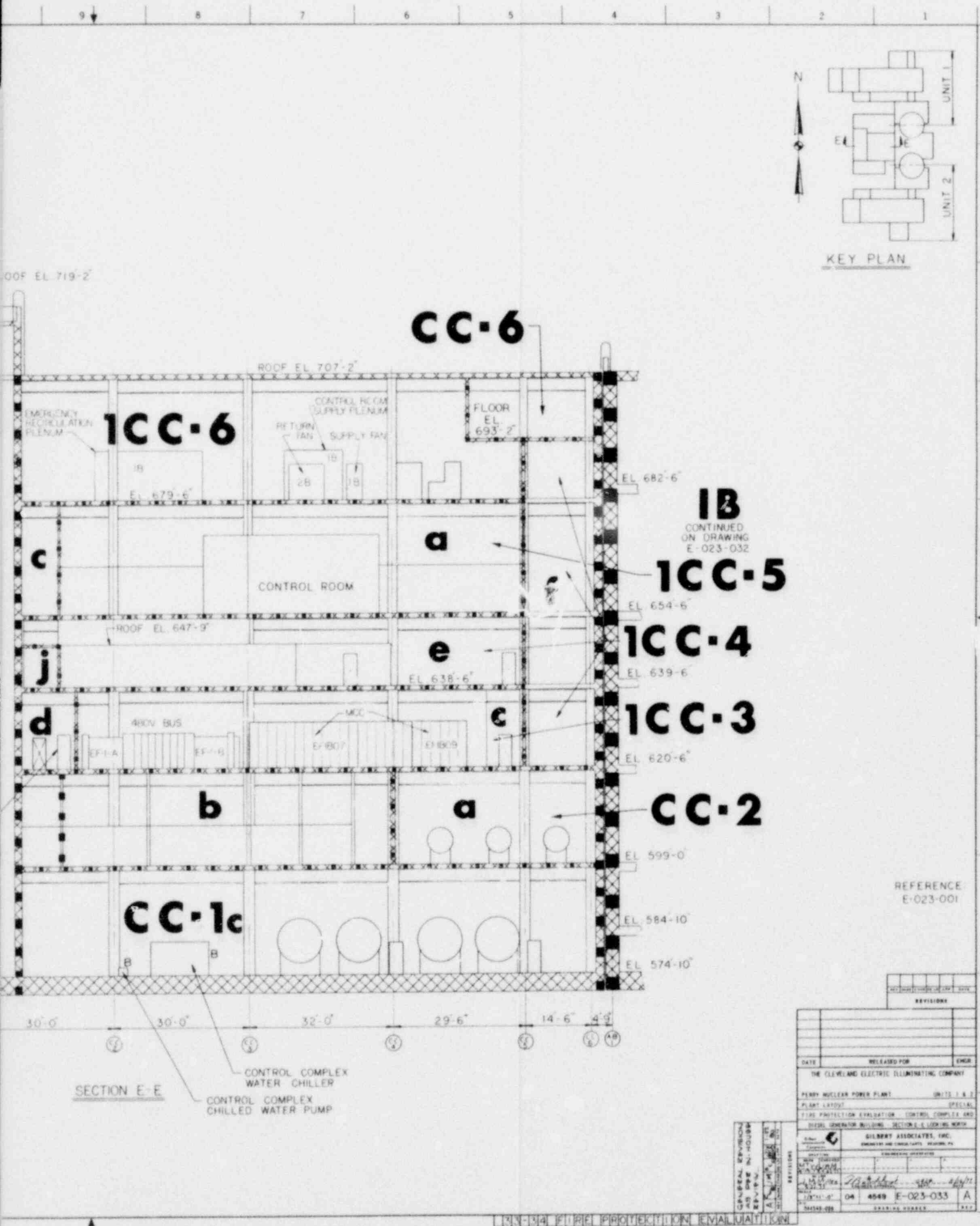

PLANT VENT
EL. 753'-9"
ROOF EL. 721'-6"
ROOF EL. 707'-
ROOF EL. 707'-2"
IB-5
EL. 682'-6"
EL. 679'-6"
IB-4
EL. 654'-6"
CC
CONTINUED ON
DRAWING
E-023-033
EL. 639'-6"
EL. 638'-6"
IB-3
EL. 620'-6"
1CC-4f
IB-2
EL. 599'-0"
PIPE
CHASE
EL. 585'-0"
IB-1
EL. 574'-10"
33'-10"
4'-9"
101'-0"



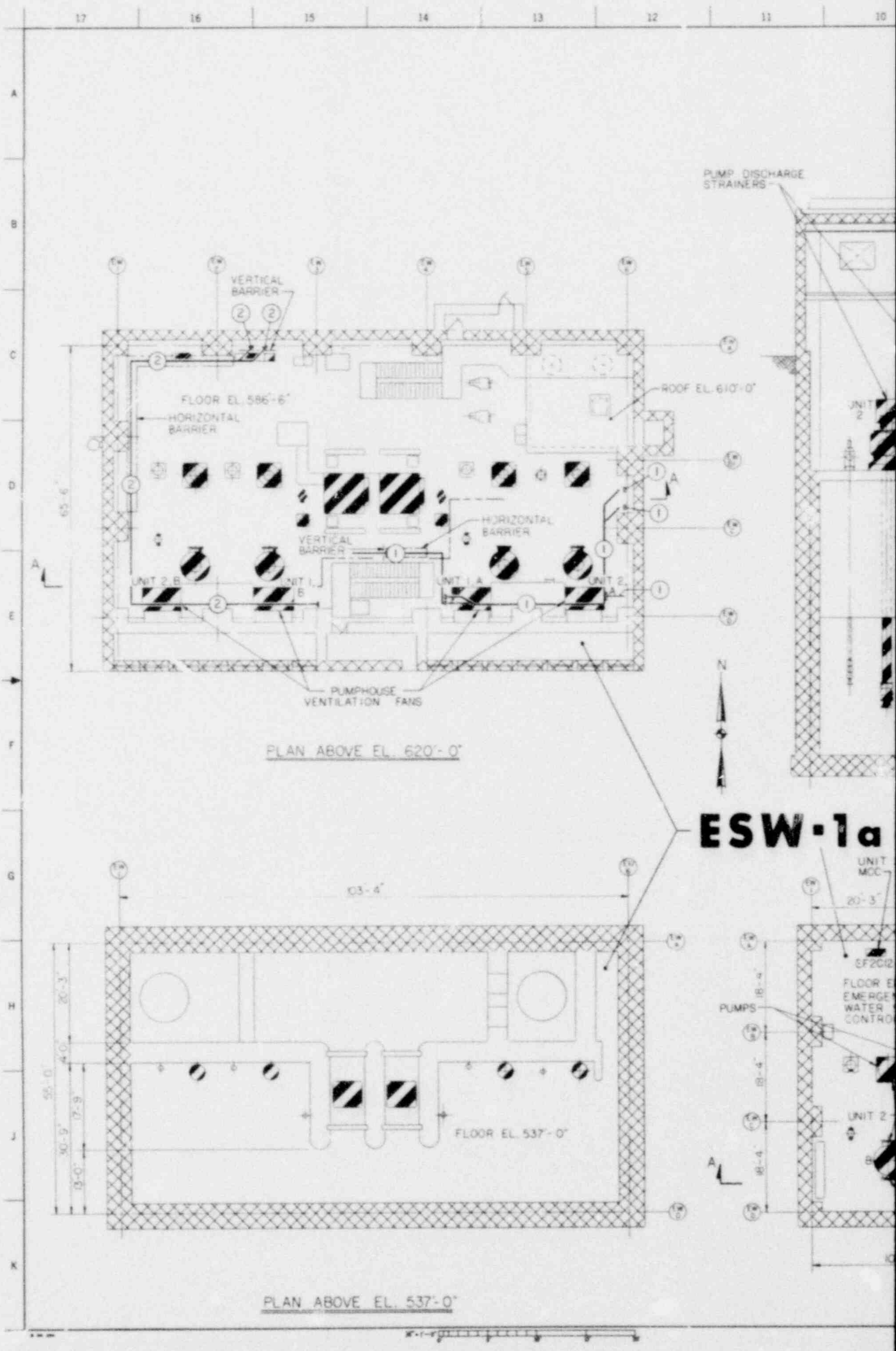
32-34 FIRE PROTECTION EVALUATION



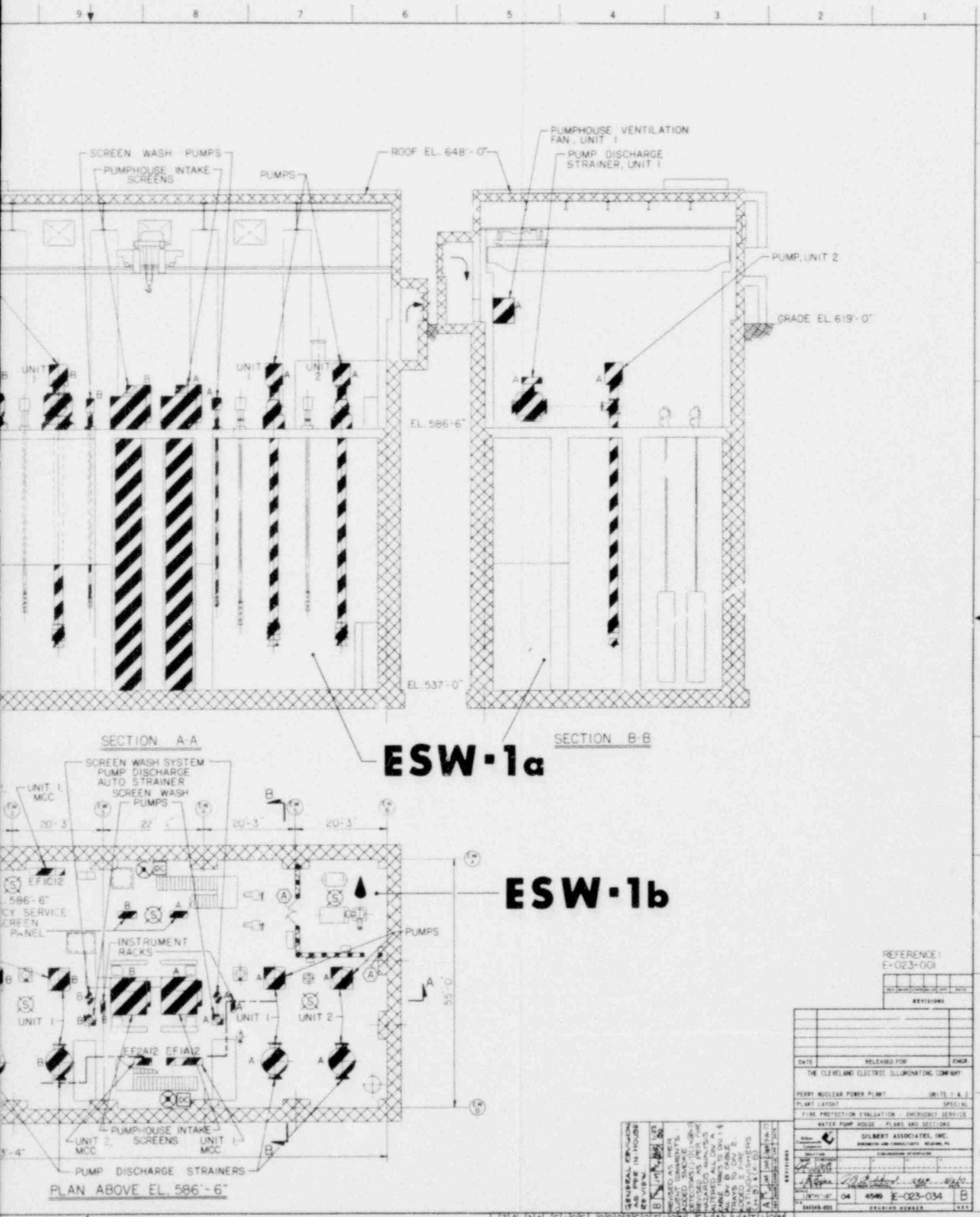
17
16
15
14
13
12
11
10
A
B
C
D
E
F
G
H
J
K
UNIT 2
STANDBY DIESEL
GENERATOR AIR
INTAKE FILTER
ROOF
EL. 667'-0"
3B
EL. 646'-6"
UNIT 2
VENTILATION FAN
2B
2DG-1a
EL.
620'-0"
UNIT 2 - EMERGENCY DIESEL
DRIVEN GENERATOR
DIVISION 2
DG-1d
UNIT 1 REMOTE SHUTDOWN
PANEL
62'-0"
14'-0"



KEY PLAN
UNIT 1
UNIT 2
N
ROOF EL 719'-2"
CC-6
ROOF EL 707'-2"
EMERGENCY RECIRCULATION PLENUM
1CC-6
CONTROL ROOM SUPPLY PLENUM
RETURN FAN
SUPPLY FAN
FLOOR EL 693'-2"
EL 679'-6"
EL 682'-6"
1B
CONTINUED ON DRAWING E-023-032
a
c
CONTROL ROOM
1CC-5
EL 654'-6"
ROOF EL 647'-9"
e
1CC-4
j
EL 638'-6"
EL 639'-6"
d
480V BUS
MCC
EF1-A
EF1-B
EF1B07
EF1B09
1CC-3
EL 620'-6"
b
a
CC-2
EL 599'-0"
REFERENCE E-023-001
CC-1c
EL 584'-10"
EL 574'-10"
30'-0"
30'-0"
32'-0"
29'-6"
14'-6"
4'-9"
SECTION E-E
CONTROL COMPLEX WATER CHILLER
CONTROL COMPLEX CHILLED WATER PUMP
REVISIONS
DATE
RELEASED FOR
ENGR
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT UNITS 1 & 2
PLANT LAYOUT SPECIAL
FIRE PROTECTION EVALUATION - CONTROL COMPLEX AND
DIESEL GENERATOR BUILDING - SECTION E-E LOOKING NORTH
GILBERT ASSOCIATES, INC.
04 4549 E-023-033 A
DRAWING NUMBER



PUMP DISCHARGE STRAINERS
VERTICAL BARRIER
FLOOR EL. 586'-6"
HORIZONTAL BARRIER
ROOF EL. 610'-0"
VERTICAL BARRIER
HORIZONTAL BARRIER
UNIT 2 B
UNIT 1 B
UNIT 1 A
UNIT 2 A
PUMPHOUSE VENTILATION FANS
PLAN ABOVE EL. 620'-0"
ESW-1a
103'-4"
FLOOR EL. 537'-0"
PLAN ABOVE EL. 537'-0"
PUMPS



SCREEN WASH PUMPS
PUMPHOUSE INTAKE SCREENS
PUMPS
ROOF EL. 648'-0"
PUMPHOUSE VENTILATION FAN, UNIT 1
PUMP DISCHARGE STRAINER, UNIT 1
PUMP, UNIT 2
GRADE EL. 619'-0"
EL. 586'-6"
EL. 537'-0"
SECTION A-A
SECTION B-B
ESW-1a
SCREEN WASH SYSTEM PUMP DISCHARGE AUTO STRAINER
SCREEN WASH PUMPS
UNIT 1, MCC
ESW-1b
INSTRUMENT RACKS
PUMPS
UNIT 1
UNIT 2
PUMPHOUSE INTAKE SCREENS
UNIT 2, MCC
UNIT 1, MCC
PUMP DISCHARGE STRAINERS
PLAN ABOVE EL. 586'-6"
REFERENCE: E-023-001
REVISIONS
DATE
RELEASED FOR
ENGR.
THE CLEVELAND ELECTRIC ILLUMINATING COMPANY
PERRY NUCLEAR POWER PLANT
UNITS 1 & 2
PLANT LAYOUT
SPECIAL
FIRE PROTECTION EVALUATION - EMERGENCY SERVICE WATER PUMP HOUSE - PLANS AND SECTIONS
GILBERT ASSOCIATES, INC.
E-023-034
B
FIRE PROTECTION EVALUATION