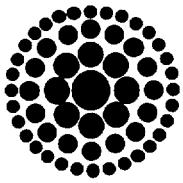


50-302

Florida
Power
CORPORATION
Crystal River Unit 3
Docket No. 50-302

June 21, 1996
3F0696-04

U.S. Nuclear Regulatory Commission
Attention: Document Control Desk
Washington, D.C. 20555

Subject: Appendix R Exemption Requests

References: A. FPC to NRC letter 3F0294-15, dated February 9, 1994
B. FPC to NRC letter 3F0195-03, dated January 6, 1995

Dear Sir:

Pursuant to 10 CFR 50.12(a), Florida Power Corporation (FPC) requests exemptions from Sections III.G and III.J of 10 CFR 50, Appendix R.

- Enclosure A provides a request for exemption for certain redundant safe shutdown cables in the Auxiliary Building (AB) Elevations 95 and 119 and in the Intermediate Building (IB) Elevation 119.

- Enclosure B provides a request for exemption to allow use of AC-powered lighting and in one particular area, portable battery-powered lighting units for safe shutdown activities.

These requests are supported by the enclosed evaluations which include (1) the specific exemption requests, (2) information on Crystal River Unit 3 fire protection and lighting systems, and (3) a technical evaluation of the requests. The enclosed evaluations demonstrate that the combination of existing conditions and fire protection features along with proposed enhancements to the sprinkler system provides adequate protection of the public health and safety and satisfies the exemption criteria of 10 CFR 50.12(a). Accordingly, we request the exemption be granted.

1/1
A006

The technical evaluations in support of the requests for exemption from the requirements of Appendix R Section III.G.2.c were prepared by a "traditional" fire protection approach that considered the hazards in the areas and the defense-in-depth fire protection program. Although originally discussed in meetings with the NRC, fire modeling (the EPRI-Tailored Collaboration tools) and risk assessment were not used in forming the basis for the request for exemption. Therefore, the EPRI-Tailored Collaboration tools are not being submitted as part of the enclosed evaluation.

As indicated in Enclosure A, FPC will be implementing Appendix R post-fire safe shutdown analysis changes and plant modifications that will render two previously granted exemptions from specific requirements of Appendix R unnecessary, and will eliminate the dependence on Thermo-Lag fire barriers for a third previously granted exemption. The request contained herein for the Intermediate Building elevation 119 will replace the previously granted exemption for that area.

Should you have any questions concerning these requests, please call Mr. Bill Rossfeld at (352) 563-4374.

Sincerely,

Gary Boldt

G. L. Boldt
Vice President
Nuclear Production

GLB/SCP:ff

Enclosures

xc: Regional Administrator, Region II
NRR Project Manager
Senior Resident Inspector

ENCLOSURE A

APPENDIX R SECTION III.G.2.c EXEMPTION REQUEST

1.0 Executive Summary

Florida Power Corporation (FPC) is requesting an exemption from the requirements of 10 CFR 50, Appendix R, Section III.G.2.c, for certain redundant safe shutdown cables in the Auxiliary Building (AB) Elevations 95 and 119 and in the Intermediate Building (IB) Elevation 119. Section III.G.2.c requires "*Enclosure of cable and equipment and associated non-safety circuits of one redundant train in a fire barrier having a 1-hour rating. In addition, fire detectors and an automatic fire suppression system shall be installed in the fire area.*" To protect these cables from fire in accordance with Appendix R, FPC installed Thermo-Lag fire barriers to enclose one train of redundant safe shutdown cables within these three fire areas (AB-95-3, AB-119-6, and IB-119-201). These three fire areas contain fire detectors and an automatic fire suppression system. Based on vendor information available at the time, Thermo-Lag fire barriers were considered to be 1-hour fire rated barriers. From inspection of the fire barriers in these three fire areas and comparison to the results of the NEI fire test program, it has been concluded that these barriers are not 1-hour fire rated barriers. In lieu of upgrading these fire barriers with an overlay material or complete replacement of the fire barriers with an alternative material, FPC proposes to enhance the automatic fire suppression system coverage in these fire areas, thereby providing sprinkler coverage beyond the requirements of Section III.G.2.c as described in Generic Letter 86-10. Thermo-Lag upgrades of these barriers are not feasible, however the existing Thermo-Lag fire barriers would be maintained as-installed. The enhanced fire suppression capability together with strong administrative controls, provide defense-in-depth protection which justifies this exemption request.

2.0 Introduction

Crystal River Unit 3 (CR-3) was licensed to operate in December 1976. All plants licensed to operate before January 1, 1979 are required to comply with, inter alia, 10 CFR 50, Appendix R, Sections III.G, III.J and III.O and 10 CFR 50.48(b). FPC modified CR-3 by adding fire protection features that, taken together, were considered adequate to comply with Sections III.G, III.J and III.O of Appendix R. Those modifications included installation of Thermo-Lag fire barriers. These fire barriers were installed in 1984 and 1985 in support of FPC's due date for implementation of Appendix R in July 1985. In addition, FPC was granted approval for one exemption from Appendix R criteria in 1983, and six exemptions in 1985 which were important in establishing initial compliance. An NRC Team Inspection was performed at CR-3 in July and August of 1985 in the areas of fire protection and FPC's actions regarding Appendix R Sections III.G, III.J, III.L, and III.O. No violations or deviations were identified.

Problems with the manufacturer's rating of Thermo-Lag fire barriers have resulted in a re-evaluation of our basis for Appendix R compliance, and our use of Thermo-Lag to achieve compliance. As reported in our December 21, 1995 letter, FPC designed a Thermo-Lag Resolution Strategy to explore all the options available for resolution of the Thermo-Lag fire barrier issues, with a goal of identifying solutions that considered both safety benefit and cost. The FPC Thermo-Lag Resolution Strategy consisted of four (4) major activities, titled: "Appendix R

Reanalysis", "NEI Application Guide", "Alternate Barriers", and "EPRI-Tailored Collaboration (TC)". The "Appendix R Reanalysis" activities were to identify means of reducing the plant's reliance on Thermo-Lag fire barriers by either analysis changes and/or plant modifications. The "NEI Application Guide" effort was to identify any installed configurations that were 1 or 3 hour fire rated barriers and configurations that could, with minor upgrades, be qualified as 1 or 3 hour rated barriers. The "Alternative Barrier" evaluations were intended to investigate other materials that could be used as an overlay or as a replacement to the Thermo-Lag fire barriers. The "EPRI-TC" effort which included "common sense", traditional fire hazard assessments, was intended to identify the Thermo-Lag configurations that were acceptable as installed for the hazard in the area and to identify those configurations that would be acceptable with additional fire protection features.

Through the Thermo-Lag Resolution Strategy, FPC has committed the resources and initiated the actions to achieve an approximate 77% reduction in the raceways (conduits and cable trays) that require Thermo-Lag fire barriers. In addition, FPC is in the process of upgrading and/or replacing the fire barriers for an additional 5% of the raceways which are currently wrapped with Thermo-Lag. Further, with regard to the Reactor Building, FPC has completed upgrades to the radiant energy shields which resolves another 3% of the Thermo-Lag fire barriers. It is the remaining 15% of the Thermo-Lag fire barriers that are the subject of the exemption requests contained herein.

FPC believes that all available options for the remaining 15% of Thermo-Lag fire barriers have been evaluated and that FPC is left with a limited course of action. The cables protected by these Thermo-Lag barriers are required for post-fire safe shutdown and alternatives are not feasible. The cables can not be rerouted to eliminate the need for fire barriers because of the relative locations of the equipment interconnected by the cables, and due to the location of redundant equipment and circuits. FPC is faced with either (a) upgrading and/or replacing the fire barriers, (b) justifying the acceptability of the current configurations, or (c) achieving an equivalent level of protection by enhancing the fire protection features in these areas (basically establishing an alternative fire protection configuration per the NRC guidelines). Upgrading and/or replacing the fire barriers is not recommended because of the high cost driven by locations of these raceways (mostly, in high overhead areas) and the complexity of the installation. While FPC considers the installed configurations adequate for the fire hazards in these areas, FPC is not requesting an exemption to justify the installed configurations. Instead FPC is proposing to achieve the underlying intent of the Appendix R requirements by enhancing the fire protection features in these areas.

As indicated above, FPC has been granted seven previous exemptions to Appendix R. Five of these exemptions were relief from the requirements to separate redundant equipment by 3-hour rated barriers and two of the exemptions were relief from the requirement to provide a fixed suppression system in fire areas for which alternative shutdown capability had been provided. FPC will implement analysis changes and plant modifications that will render two of these exemptions unnecessary, and eliminate the dependence on fire barriers for a third exemption. Another of these previously granted exemptions is replaced by the request contained herein. Thus, FPC has limited the role of exemptions in achieving Appendix R compliance and is pursuing exemptions only in limited cases based on alternative fire protection configurations.

3.0 Specific Exemption Requested

Florida Power Corporation hereby submits a request for exemption from the requirements of 10 CFR 50, Appendix R, Section III.G.2.c in accordance with the provisions of 10 CFR 50.12. This exemption will allow the use of fire barriers with less than a 1-hour fire rating in three fire areas where the automatic fire suppression system has been enhanced by the addition of more sprinkler heads. The three fire areas are Fire Area AB-95-3, Fire Area AB-119-6 and Fire Area IB-119-201.

3.1 No Undue Risk

In accordance with 10 CFR 50.12(a)(1), Florida Power Corporation demonstrates herein that the requested exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. The request does not create conditions adverse to the safe operation of the unit in that an adequate level of fire protection is maintained consistent with the intent of Appendix R as described below.

3.2 Special Justifying Circumstances

The special circumstances which justify the Commission's approval of the exemption request is consistent with the following requirement of 10 CFR 50.12.

10 CFR 50.12(a)(2)(ii) *Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.*

As indicated in the Supplementary Information which was provided with publishing 10 CFR 50, Appendix R (Federal Register/ Vol. 45, No. 225/ November 19, 1980), the purpose for Section III.G, "Fire Protection of Safe Shutdown Capability " was to ensure the capability to achieve and maintain safe shutdown conditions during and after any postulated fire in the plant. The use of a 1-hour fire rated barrier in conjunction with an automatic fire suppression system and fire detection was (a) for the automatic suppression, to "*ensure prompt, effective application of suppressant to a fire that could endanger safe shutdown capability*" and (b) for the fire barrier, to "*ensure that fire damage will be limited to one train until the fire is extinguished*". The necessity for fire barriers recognized that automatic suppression would not actuate until sufficient heat has been generated by a fire. Unprotected cables could be damaged before the suppression system actuated.

The requested exemption does not prevent achieving the underlying purpose of the rule. The existing sprinkler system in these three fire areas with sprinkler heads located (a) at the ceiling, (b) below significant obstructions, and (c) at a lower level for direct floor coverage, provides prompt and effective suppression of any fire in these areas. The proposed additional sprinkler heads located in close proximity to the Thermo-Lag fire barriers along with the protection provided by the Thermo-Lag fire barriers, will protect one train of safe shutdown cables until the fire is extinguished. Thus, as the following evaluation demonstrates, reasonable assurance has been provided for the capability to achieve and maintain safe shutdown conditions during and after any postulated fire in these plant areas.

4.0 Evaluation

At CR-3, fire protection has been provided using a "defense-in-depth" philosophy. The objectives of the Fire Protection Program are (1) to prevent fires from starting, (2) to rapidly detect and suppress those fires which do occur, while limiting the fire damage, and (3) to design plant systems such that essential plant functions will not be damaged from the effects of fires.

4.1 General Information

Administrative Controls

Administrative controls are provided by the Fire Protection Plan and the Plant Operating Quality Assurance Manual. Administrative controls address in-situ and transient combustibles, temporary structures, ignition sources, smoking, leak testing, design, maintenance, plant modification processes, and surveillance of installed systems.

Administrative controls are designed to control the type, amount, use and location of combustibles. Proper control of combustibles minimizes the possibility of starting, spreading, or contributing to a fire. Combustibles are classified as either "in-situ" or "transient." In-situ combustibles represent the permanent fire loading. In-situ combustibles are evaluated in the Fire Hazards Analysis as contributors to the fire loading in their respective fire zones. Modifications of fixed plant features are evaluated for impact on the Fire Hazards Analysis as part of the design control process. The evaluation is performed by Nuclear Engineering and considers the following elements: (a) the changes in fire loading, (b) the impact on existing fire suppression/detection, and (c) the impact on existing barriers.

Transient combustibles represent the variable fire loading. The use of transient combustibles is monitored to ensure that acceptable fire loadings are not exceeded without proper compensatory measures. A monitoring program is maintained to assure fire loading is within the Fire Hazards Analysis limits. The program consists of weekly inspections performed by the Fire Protection Staff as documented in SP-809, "Fire Protection Weekly Inspection" and by the Operations Staff in accordance with AI-1000, "Good Housekeeping/Material Condition Program." The SP-809 inspection reports are reviewed on a quarterly basis to determine if recurrent problems exist.

CR-3's Fire Protection Program also recognizes the importance of establishing and maintaining control of ignition sources to minimize the possibility of starting a fire. As a result, ignition sources are controlled through the use of a Fire Prevention Work Permit (FPWP). Prior to undertaking work activities involving spark-producing tasks, a FPWP review and inspection is performed: (1) to identify and remove potential transient fire hazards from the work area, and (2) to assure that fixed suppression systems (if provided in the work area) are operable and adequate portable suppression equipment is available.

Limiting packing, crating, and dunnage within the Radiation Controlled Area (RCA) is an objective of the CR-3 Radioactive Waste Management Program. Work controls and pre-job planning limit introduction of unnecessary solid and liquid waste within the Auxiliary Building and Intermediate Building. This program, while

greatly reducing costs associated with waste disposal, also reduces fuel loading of transient combustibles in these areas.

Fire Brigade

Manual fire fighting at CR-3 is performed by the Shift Fire Brigade. The Brigade is composed of a Fire Team Leader and a minimum of four Fire Brigade members. Fire Brigade members are qualified by the completion of classroom training, passing a medical physical, certification with respiratory protection devices, completion of a fire protection familiarization walkdown, and participation in an initial fire drill. Annual requalification is required, which includes quarterly classroom training. Hands-on training is conducted on-site in a newly constructed three-story burn building. Class A and B fires of various configurations are fought by Fire Brigade members, including flammable liquid pool fires, compressed gas fueled fires, and mock-ups of electrical raceways. Fire drills are conducted for each shift on a quarterly basis, including drills on evening and midnight shifts.

The Fire Team Leader is normally the Operations Assistant Nuclear Shift Supervisor. Currently consideration is being given to more frequently placing this responsibility on the Chief Nuclear Operator. The Team Leader may, if required, be another member of the Operations staff who possesses a Reactor Operator License or equivalent knowledge of plant safety related systems as determined by the Nuclear Shift Supervisor. The Fire Team Leader must be qualified as a Fire Brigade member and must receive advanced training on fire incident command.

To aid the Fire Team Leader, FPC maintains detailed Pre-Fire Plans to provide information on each area of the plant. These include color layout drawings of each area showing the locations of area entrances, fire fighting equipment, fire or safety hazards, and important plant components. Written descriptions accompany each drawing which list information important to successfully combat a fire such as important equipment, hazards, tactics, ventilation and construction information, and available suppression equipment.

Fire Detection and Fire Suppression Systems

Fire Detection Systems - Fire and smoke detection are accomplished by locating product of combustion (POC) and thermal detectors in safety related areas and where a significant potential for fire exists. Fire detection systems employed at CR-3 fall into three functional categories: (1) those that initiate alarms only, (2) those that initiate fire extinguishing systems and alarms, and (3) those that initiate fire damper closure or other ventilation system functions and alarms. These systems provide alarms locally and at remote panels located in the fire area and the Control Room. The fire areas addressed by this exemption request are provided with fire detectors that initiate alarms only.

Fire Suppression Systems - Large fire areas are protected with automatic sprinklers or Halon, while equipment hazards are protected with water spray or carbon dioxide systems. The plant fire brigade has access to properly located fire hydrants, hose stations, and portable extinguishers.

The fire protection system includes two dedicated 360,000 gallon fire service water storage tanks. The tanks are equipped with level monitors with indication

provided in the Control Room. Each tank can be isolated from the system in the event of a failure. There are three fire service pumps, two diesel engine driven and one electric motor driven located in a pump house which is separated from the other plant buildings and structures. Each diesel driven pump is equipped with its own dual starting batteries and automatic battery charging system. The fire service yard main loop completely surrounds the plant. Each of the three fire service pumps can feed into the loop or the system can be supplied by the adjacent Units 1 and 2 fire service system. Headers from either end of the loop supply the Turbine Building fixed water spray system, sprinkler systems and manual hose station standpipes. The Control Complex, Auxiliary Building, shop areas, and the Emergency Diesel Generator Rooms are each supplied by a looped fire service water supply line leading off the yard main loop. Valves are provided to isolate sections of these systems for maintenance or in case of failure in the loop. Seven fire hydrants are installed on the yard main loop. The 95′ and 119′ elevations of the Auxiliary Building and the 119′ elevation of the Intermediate Building have installed wet pipe sprinkler systems. Water flow to these systems activates local and Control Room alarms.

In addition, mobile fire and foam carts are located in the plant for use by the Fire Brigade. Portable fire extinguishers are used primarily as a first defense measure until the fire brigade arrives on the scene. Fire extinguishers are located throughout the plant and are of the ABC dry chemical, CO_2, or Halon 1211 types. An NFPA Class II standpipe system is installed throughout the plant except for the Reactor Building which has a Class III system. Fire hose stations are provided in the Control Complex, Turbine Building, Intermediate Building, and Auxiliary Building. These stations are equipped with single hoses with 1 1/2" connections and fog nozzles.

Thermo-Lag Fire Barriers

CR-3 is one of the nuclear utility industry's largest users of Thermo-Lag 330 fire barrier material. Raceways at CR-3 are protected with Thermo-Lag 330 for both one and three-hour applications. An Appendix R re-analysis demonstrated that approximately 20% of these raceways are still required for safe shutdown. These raceways traverse fire zones in the Control Complex, Intermediate Building, and the Auxiliary Building. The raceway barriers in the Control Complex are being upgraded or replaced with Mecatiss. All of the Thermo-Lag 330 fire barrier material protecting these raceways was installed by MAR 82-10-19-04 and was intended to meet or exceed installation criteria set forth in Thermal Science Incorporated (TSI) Technical Manual 20684. This installation was done under the guidance and technical supervision of a TSI factory representative and an augmented FPC Quality Assurance program.

Since 1993 these raceways have twice been visually inspected and documented for construction attributes and spacial orientation. No deviations from installation criteria have been identified as a result of these inspections. Summaries of twenty-four "important barrier parameters" were discussed in references A and B. At CR-3, the raceway Thermo-Lag fire barriers were fabricated and installed with greater board or clamshell thickness (0.625" installed vs. 0.50" specified for 1-hour and 1.25" installed vs 1.0" specified for 3-hour) and smaller gap spacing (1/8" or less) between barrier sections than called for by the TSI vendor manual. In addition, all panel and clamshell joints were pre- and post-buttered and fasteners were spaced at closer centerline spacing than specified by TSI. Since the issuance of Information Notice 92-46, FPC documented all Thermo-Lag

repair/removal work. Documentation of the "important barrier parameters" relative to this repair work has lead to the conclusion that the installation attributes described above were consistently applied to installed fire barriers. Further, FPC's application of the TSI "18-inch" rule is considered highly conservative in retrospect. Of over 22,000 linear feet of installed Thermo-Lag fire barrier, nearly 15,000 feet was installed to accommodate non-essential or intervening thermal shorts. This interpretation of fire barrier requirements for thermal shorts is felt to enhance fire barrier performance relative to heat transfer to the essential raceway.

In response to issues raised by the NRC regarding consistency of the chemical composition of installed Thermo-Lag materials as they relate to the NEI test program, FPC provided samples for independent laboratory analysis. Using pyrolysis gas chromatography and mass spectroscopy, it has been concluded that Thermo-Lag installed and stocked at CR-3 is consistent in terms of chemical composition to that used in the NEI fire barrier test program and used elsewhere in the nuclear industry.

Many full scale fire tests have been performed to evaluate various baseline and upgraded Thermo-Lag fire barrier system designs for electrical raceways. FPC has been one of a select group of utilities that has attempted to replicate as-installed fire barriers for testing in accordance with Supplement 1 to Generic Letter 86-10. FPC conducted tests of Thermo-Lag fire barrier material in Morestel, France in December 1994 and at Underwriters Labs (UL) in Chicago, Illinois in November, 1995. The results of these tests were submitted by FPC to the NRC for review and comment. These particular tests as well as tests done by others have generic applicability to installed Thermo-Lag fire barrier configurations at CR-3.

As a result of over 54 Thermo-Lag fire barrier tests performed since 1992, two basic Thermo-Lag fire barrier failure mechanisms have been identified. These tests have shown that as a conduit raceway fire barrier decreases in size (i.e., 3/4" conduit) barrier performance decreases. Conversely, as cable tray raceway fire barrier size increases (i.e., 36"x 4" ladder back cable tray) barrier performance also decreases. In the case of the smaller raceway, the failure mechanism is purely thermal due to premature loss of cross sectional area of the fire barrier. In large section raceway the failure mechanism is due to tensile mechanical failure at the barrier corner seams, followed by thermal failure due to the introduction of hot gases into the protected raceway fire barrier envelope.

By careful observation of CR-3 raceway fire barrier construction details, analysis of both generic and site specific fire barrier tests, and consideration given to Thermo-Lag failure mechanisms, an estimate of the expected duration of protection for Thermo-Lag covered raceway required for safe shutdown at CR-3 can be performed. Specific analysis for cable raceway in each fire area is contained in subsequent sections of this evaluation.

4.2 Fire Area AB-95-3

Layout and Contents

This fire area encompasses the Auxiliary Building Elevation 95 with the exception of the cubicles housing makeup pumps MUP-1A and MUP-1B. However, the area of interest is limited to Fire Zone AB-95-3B and a portion of Fire Zone AB-95-3G. The layout of the area of interest is shown on Figures 1A and 1B. Fire Zone AB-95-3B is a long narrow corridor with a high ceiling (approximately 24 feet high) which runs the length of the north end of the Auxiliary Building. There is an open stairway at the east end of the hallway which leads up to the 119 foot elevation of the Auxiliary Building. The corridor is open to adjacent fire zones at either end. The zone is bounded by 3-hour rated walls on the north, east, west, ceiling and floor. The south wall is reinforced concrete with unsealed penetrations. Ventilation ducts with no fire dampers communicate with zone AB-143-6X (stairwell) and AB-162-AD (Spent Fuel Floor). There are no appreciable combustibles in these adjacent zones near the south wall, and no redundant safe shutdown cables or equipment in either zone. The south wall ranges from approximately 24 to 36 inches in thickness.

The portion of interest in Fire Zone AB-95-3G is the corridor area outside the makeup pump cubicles. The floor and ceiling are 3 hour barriers. The wall separating zone AB-95-3G from zone AB-95-3B is concrete with an approximate thickness of 36 inches. The remaining walls are concrete with an approximate thickness of 24 inches.

The raceways (conduits and trays) required for post-fire safe shutdown in this area are conduits MUE1 and MUE7, and trays 100, 110, 500, 516, DPC7-T, DPC8-T and DPC9-T. The circuits in these raceways are associated with the makeup system and battery charging. Conduits MUE1 and MUE7 exit the makeup pump cubicle and enter tray 516. Tray 516 is a horizontal tray that proceeds from the area outside the makeup pump cubicles, across the corridor (Fire Zone AB-95-3B) then rises and enters the Control Complex. The portion of interest of tray 500 is a short horizontal section that runs from the makeup cubicle to tray 100 in the corridor (Fire Zone AB-95-3B). The portion of interest of tray 100 is the horizontal section from 500 down the corridor until the tray enters the Control Complex. DPC7-T, DPC8-T and DPC9-T are short vertical sections of armor-flex cables that run from the Control Complex to tray 110 (a short section of a horizontal tray). DPC7-T, DPC8-T, DPC9-T and tray 110 are located near the top of the stairway to the 119 Elevation of the Auxiliary Building.

The primary hazards in the area of interest include electrical cables, a motor control center, an air conditioning unit and several small enclosed panels. The motor control center (MCC) is 480V E.S. MCC 3B3 which is not required for post-fire safe shutdown in the event of a fire in this area. The motor control center is constructed to prevent faults in one cubicle from causing damage in adjacent cubicles. Individual cubicles are separated by sheet metal partitions and are fitted with inserts called 'buckets' which are molded sheet metal enclosures with four sides and a rear panel. The buckets provide mounting surfaces for individual cubicle components such as breakers, terminal strips, and instrument transformers. MCC cubicle doors are secured with threaded closure devices designed to contain the energy from faulted conditions. Breaker stabs protrude through the rear of the buckets and make contact with uninsulated bus bars in the backplane of the MCC. Output and control cables are routed through wire chases

internal to the MCC. This design places barriers to the propagation of fire from an individual faulted cubicle to adjacent cubicles. Consequences of faults in output or control cables will be limited due to installed breakers and fuses.

Fire Protection Equipment

Ionization smoke detectors located within the area of interest provide an early warning alarm in the control room. Full zone automatic wet pipe sprinkler coverage is provided with sprinkler heads located at the ceiling, below significant obstructions, and below the lowest level cable trays for direct floor coverage. The open stairwell in the north east corner of Fire Zone AB-95-3B has draft curtains and closely spaced sprinkler heads around the stairwell opening. Figures 1A and 1B show the general layout of the existing sprinkler heads. The sprinkler heads in this area are rated at 165°F and are designed and located to provide complete coverage through the hazard area per NFPA 13-1983. An NFPA code conformance review was conducted and documented by an independent consultant, Mr. R. J. O'Laughlin, in 1988 to confirm the adequacy of the sprinkler spray system. In addition, an NRC inspection (Inspection Report #50-302/86-29 dated October 3, 1986) evaluated the adequacy of the sprinkler system spray pattern and found it to be acceptable.

To enhance the sprinkler coverage in this area, FPC will add sprinkler heads located in close proximity to the Thermo-Lag fire barriers. Figures 2A and 2B show the general layout of the additional sprinkler heads. The sprinkler heads will the same rating as the existing heads and will be located such that any temperature rise and heat experienced at the Thermo-Lag fire barriers due to a fire, will also be experienced at the additional sprinkler heads. With the sprinklers rated at 165°F, they would actuate long before the heat and hot gases from a fire challenge the integrity of the Thermo-Lag fire barriers.

Portable fire extinguishers and a hose station are available in adjacent zones of the Auxiliary Building. Additional extinguishers and a hose station are also available in the adjacent fire area in the Control Complex.

Fire Loading and Calculated Fire Severity

The fire loading in Fire Zone AB-95-3B is approximately 167,000 BTU/sq. ft. with a calculated fire duration of 2.1 hours. However, the high fire loading and maximum severity fire are due to an extremely conservative calculation of fire loading and duration and to the geometry of the fire zone. The calculation of fire loading and duration assumes every cable tray is filled to at least 50% and actual fill is used where it is greater than 50%. The fire zone itself is a narrow hallway (9 feet wide) with a high ceiling (about 24 feet high). The majority of the combustible loading is IEEE-383 qualified cable. The cables in the zone are in the range of 10 to 15 feet above the floor.

The fire loading in Fire Zone AB-95-3G is 138,000 BTU/sq. ft. with a calculated fire duration of 1.7 hours. However, only a small portion of the zone is of interest in this evaluation. In the area of interest, the combustibles are IEEE-383 qualified cables located in the overhead.

Fire Barrier Evaluation

Fire zones AB-95-3B and AB-95-3G contain the following Thermo-Lag 330 protected aluminum conduits and armor-flex cable raceways that are required for post-fire safe shutdown.

Conduit	Size	Spacial Orientation	Location
MUE 1	2"	horizontal and vertical	3G
MUE 7	2"	horizontal and vertical	3G
Raceway			
DPC7-T	4"	vertical	3B
DPC8-T	4"	vertical	3B
DPC9-T	4"	vertical	3B

Through NEI and FPC testing, it has been established that thermal failure of 3/4" conduit will occur around 26 to 29 minutes. By interpolation of NEI test 2-1 with consideration of the thickness of the CR-3 installation, thermal failure of the above 2" aluminum conduit and 4" armor-flex cable raceway fire barriers could be reasonably expected to occur in the 39-48 minute range. It should be noted that Thermo-Lag 330 covered armor-flex cable represents an untested configuration. The armor-flex cable casing is a fairly close match thermally and structurally to similar diameter aluminum and steel conduits. Although NEI test 2-1 did not include hose stream testing to determine if full barrier integrity was maintained in conjunction with thermal performance, an estimated barrier duration of 39-48 minutes for these larger conduit and armor-flex raceways is reasonable based on the enhanced construction attributes of CR-3 fire barriers, including thicker TSI shells and closer band/tie wire spacing. In addition, after DPC7, 8, and 9-T exit Tray 110 these armor-flex cables are individually wrapped in Thermo-Lag only a short distance (less than three 3 feet). The cables are then "gang-wrapped" against a massive concrete wall. The actual temperatures seen by these cables would be lower due to heat sink effects of the wall and the fact that the barrier is not exposed to radiant energy across its entire 360° circumference. Testing done by FPC in Morestel, France also showed that the "gang-wrapped" conduit arrangement performed better than individual wrapped conduits.

These fire zones also contain the following Thermo-Lag 330 protected ladderback cable tray raceways that are required for post-fire safe shutdown.

Tray	Size	Orientation	Location	Cable Fill Percentage
100	24 X 6	Horizontal	3B	14-34
110	24 X 6	Horizontal	3B	26
500	24 X 6	Horizontal	3B	33
516	24 x 6	Horizontal	3B & 3G	56

NEI testing for cable tray (Test 2-7) demonstrated that in tray sizes 24"x 6" fire barrier failure is primarily due to structural failure at side rail radial bends and/or tray bottoms. These structural failures result in single point thermocouple readings exceeding requirements in the 23-25 minute range. As with the conduit tests described above, no hose stream was applied in NEI test 2-7

when thermal failure first occurred. However, the trays at CR-3 are estimated to perform in the 23-25 minute time range, including an allowance for hose stream testing based on conservative construction attributes, percentage of cable tray fill, and greater panel thickness.

One portion of the tray raceway array for AB 95-3 represents an untested configuration. This portion is the tee section and radial bends in trays 100 and 500. This construction represents the longest free spans and greatest tensile stress of the fire barriers in the fire zone. In addition, no baseline NEI test is available for direct comparison. The bottom tray panel to tray side rail seam would be the likely region of structural failure. A barrier duration at this point of 23-25 minutes is estimated based on conservative barrier design and comparison to NEI test 2-7. There are two principle reasons for this. First, trays 100 and 500 will perform better than the test tray because the percentage of tray fill is generally greater than that seen in test 2-7 and thus the trays have greater thermal mass. Second, at CR-3 tie wires were alternated with banding to secure preformed panels on these trays. With a light skim coating (trowel grade) applied the tie wire drawn down tight to the panel, the wire is actually below the surface of the Thermo-Lag (as compared to banding at the surface). As the panel is exposed to a fire, a char actually forms over the wire protecting it from full furnace exposure. This, in turn, keeps the wire tighter to the panel than a steel band would. Thus the wire would not thermally expand and become loose like a steel band would (as in NEI test 2-7) and the fire barrier would not see a structural failure as quickly as with banding alone. Therefore, a claimed fire duration for these tee sections and radial bends of 23 to 25 minutes is supportable in lieu of specific configuration testing.

In conclusion, conduits in these fire zones would have on the order of an equivalent fire rating of 39 to 48 minutes. Tray and box configurations would have an equivalent fire rating of 23 to 25 minutes. Although no specific hose stream testing data can be presented, a small degradation in barrier performance would be likely due to the mechanical and thermal stresses associated with this portion of the test.

Assessment

To assess the ability of the suppression systems and the Thermo-Lag fire barriers to protect one train of safe shutdown cables, three categories of fires were evaluated for these fire zones: (1) a fire originating from a transient combustible, (2) a fire originating from failure of equipment or components in the area, and (3) a fire originating from a faulted cable.

Transient combustibles are strictly controlled per AI-2200, "Guidelines for Handling, Use and Control of Transient Combustibles." In addition to the procedural controls, transient combustibles made of wood, paper, plastic, and protective clothing would be of limited volume due to the layout and size of these fire zones including use of Fire Zone AB-95-3B as the main hallway for the Auxiliary Building. Transient combustibles of these types would not be allowed to accumulate in these zones. Fires from these types of combustibles would generate sufficient combustion products to be detected by the ionization smoke detectors before sufficient heat and hot gases would challenge other combustibles (IEEE-383 qualified cables) in these zones. The Fire Brigade would appropriately respond. Also, the existing sprinkler heads located below the lowest level cable trays would detect a heat rise and actuate before sufficient heat and hot gases

could challenge either the unprotected or Thermo-Lag protected cable trays. The sprinkler heads located below the lowest cable trays provide direct floor coverage and are capable of suppressing and extinguishing fires resulting from these types of transients.

Transient liquid combustibles would be limited to quantities which are being moved through these corridors in approved containers. A fire involving these types of transient combustibles could only result from a spill during movement of the containers and the introduction of an external ignition source to the spill. Equipment located in the area would not provide an ignition source to a spill because the equipment does not have any electrical or heat sources located near the floor. Spills would also be channeled to floor drains. Such an incident would be readily detected by the personnel involved in the movement of the containers thereby providing a prompt and appropriate response to the situation. Also, the existing sprinkler heads located below the lowest level cable trays would experience a heat rise and actuate before sufficient heat and hot gases could challenge either unprotected or Thermo-Lag protected cable trays. The sprinkler heads located below the lowest cable trays provide direct floor coverage and are capable of suppressing and containing fires resulting from these types of transients. The existing sprinkler heads located at the ceiling level and the additional sprinkler heads located in close proximity to the Thermo-Lag would also actuate before sufficient heat and hot gases challenge the cable trays. The geometry of the corridor is such that a floor based fire would not be expected to generate a significant temperature gradient from the cable trays to the sprinkler head locations such that the cable ignition point would be reached before actuation of the sprinkler heads. Any propagation of the floor based fire to unprotected cables would be limited. Thus, the sprinkler system in conjunction with the protection provided by the Thermo-Lag fire barriers would protect the safe shutdown cables until the fire is extinguished.

Equipment and components in these zones represent a minimal hazard. Components such as lighting fixtures are not located in close proximity to combustibles with low ignition temperatures and these type of components would not generate sufficient heat to challenge either unprotected or Thermo-Lag protected cable trays in the area. As with the transient combustibles, fires from the small enclosed panels would be detected by the ionization smoke detectors before sufficient heat and hot gases would challenge other combustibles (IEEE-383 qualified cables). The fire brigade would quickly respond to the alarm generated by the smoke detectors to extinguish the fire. Also, the existing sprinkler heads located below the lowest level cable trays would experience a heat rise and actuate before sufficient heat and hot gases could challenge either unprotected or Thermo-Lag protected cable trays. The sprinkler heads located below the lowest cable trays provide direct floor coverage and are capable of suppressing and containing, if not extinguishing fires resulting from this equipment.

Larger equipment such as the motor control center and the air conditioning unit are also enclosed units and represent minimal hazards to unprotected or Thermo-Lag protected circuits. Fires from the air conditioning unit would be detected by the ionization smoke detectors before sufficient heat and hot gases would challenge other combustibles (IEEE-383 qualified cables). The fire brigade would quickly respond to the alarm generated by the smoke detectors to extinguish the fire. The existing sprinkler heads located in the stairway would experience a heat rise and actuate before sufficient heat and hot gases could challenge either unprotected or Thermo-Lag protected cable trays. As described above, a failure

within the motor control center would be limited to one breaker cubicle due to the separation of the cubicles. A fire would be detected by the ionization smoke detectors before sufficient heat and hot gases would challenge the IEEE-383 qualified cables located above the motor control center. The fire brigade would quickly respond to the alarm generated by the smoke detectors to extinguish the fire. Also, the existing sprinkler heads located below the lowest level cable trays would experience a heat rise and actuate before sufficient heat and hot gases could challenge either unprotected or Thermo-Lag protected cable trays. The sprinkler heads located below the lowest cable trays provide direct floor coverage and are capable of suppressing and containing, if not extinguishing fires resulting from this equipment. If the fire were to spread quickly and was able to sustain itself as heat and hot gases were generated, the existing sprinkler heads located at the ceiling level and the additional sprinkler heads located in close proximity to the Thermo-Lag would also actuate. These sprinkler heads would actuate before sufficient heat and hot gases challenge the remaining unprotected or Thermo-Lag protected cable trays in the overhead. The geometry of the corridor is such that a fire would not be expected to generate a significant temperature gradient from the cable trays to the sprinkler head locations that would result in propagation of the fire before sprinkler actuation. Thus, the sprinkler system in conjunction with the protection provided by the Thermo-Lag fire barriers would protect the safe shutdown cables until the fire is extinguished.

The cables within the trays in this area are IEEE-383 qualified cable. IEEE-383 qualified cable is resistant to ignition and fire propagation. It is the design objective at CR-3 to use only IEEE-383 qualified cables. When special applications have prevented the use of this cable, the specific cables are routed in conduit. All power and control cables are protected by breakers and/or fuses sized to preclude any cable overheating. Instrument cables are not protected with interrupting devices, but the current carried by instrument cables is only in the 4-20 milliamp range which would preclude any cable overheating. If a failure did lead to overheating of the cable, it is not expected that the failure of the cable would lead to a fire in the cable tray. However, if a fire was initiated, the ionization smoke detectors would provide prompt detection and generate an alarm. The fire brigade would quickly respond to the alarm generated by the detectors to extinguish the fire. If the fire was able to sustain itself as heat and hot gases were generated, the existing sprinkler heads located at the ceiling level and the additional sprinkler heads located in close proximity to the Thermo-Lag would actuate. These sprinkler heads would actuate before sufficient heat and hot gases challenge the remaining unprotected or Thermo-Lag protected cable trays in the overhead. The geometry of the corridor is such that a cable tray fire would not be expected to generate a significant temperature gradient from the cable trays to the sprinkler head locations that would result in propagation of the fire before sprinkler actuation. Thus, the sprinkler system in conjunction with the protection provided by the Thermo-Lag fire barriers would protect the safe shutdown cables until the fire is extinguished.

In summary, for the types and the extent of fires that could occur in this fire area, the existing automatic wet pipe sprinkler system would provide prompt and effective suppression. The sprinkler system with the additional sprinkler heads in conjunction with the Thermo-Lag fire barriers would provide protection of one train of safe shutdown cables until the fire is extinguished. Therefore, application of the rule (10CFR50 Appendix R, Section III.G.2.c) is not necessary to achieve the underlying purpose of the rule in this fire area.

4.3 Fire Area AB-119-6

Layout and Contents

This fire area encompasses the Auxiliary Building Elevation 119 with the exception of the emergency diesel generator rooms. However, the area of interest in applying this exemption is limited to Fire Zone AB-119-6A. The layout of this fire zone is shown on Figure 3. The fire zone is a long narrow corridor with a high ceiling (approximately 40 feet high) which runs the length of the north end of the Auxiliary Building. There is an open stairway at the east end of the hallway which leads down to the 95 foot elevation of the Auxiliary Building. The corridor is open to adjacent fire zones at each end of the corridor. The zone is bounded by 3-hour rated walls on the north, east, west and floor. The south wall is reinforced concrete with unsealed penetrations. The ceiling is also constructed of reinforced concrete, however all penetrations are sealed. The south wall and ceiling are approximately 36 inches thick, but due to their thickness have not been tested. There is no redundant safe shutdown equipment separated by the unrated wall or ceiling.

The raceways required for post-fire safe shutdown in this fire zone are conduits AHC972, AHC973, MUR84, RCR251 and RCR235 and trays 107, 108, 121, 148, 511, and 567. The circuits in these raceways are associated with the makeup system, HVAC components, instrumentation, battery charging and essential power supplies. Conduits AHC972 and AHC973 enter this zone through the floor from Fire Area AB-95-3 and exit through the north wall, near the ceiling, into the Control Complex. Conduits MUR84 and RCR235 enter the zone through the floor from Fire Area AB-95-3 and terminate into junction box RC87 which is located near the mid point of the north wall (and provides an entry point to the Control Complex.) Conduit RCR251 enters the area through the north wall from Fire Area IB-119-201B and also terminates into junction box RC87. Cable trays 107, 108, 121, and 511 enter the zone through the floor from Fire Area AB-95-3B and exit into the north wall into the Control Complex. Cable tray 148 is a horizontal tray that enters from the Control Complex and terminates into cable tray 567 which, in turn, feeds into cable tray 121.

The primary hazards in this area include the electrical cables and two fan motors. The cable is IEEE-383 qualified cable with demonstrated resistance to ignition and fire propagation. The fan motors are Controlled Access Area Exhaust Fans (AHF-20A and AHF-20B) which are not required for post-fire safe shutdown. These exhaust fans are driven by 480VAC 3 phase motors with the fan and motor enclosed within a heavy gage steel enclosure.

Fire Protection Equipment

Ionization smoke detectors located within the zone provide an early warning alarm in the control room. Full zone automatic wet pipe sprinkler coverage is provided with sprinkler heads located at the ceiling, below significant obstructions, and below the lowest level cable trays for direct floor coverage. The open stairwell in the north east corner of the zone has draft curtains and closely spaced sprinkler heads around the stairwell opening. Figure 3 shows the general layout of the existing sprinkler heads. The sprinkler heads in this area are rated at 165°F and are designed and located to provide complete coverage through the hazard area per NFPA 13-1983. An NFPA code conformance review was conducted and documented by an independent consultant, Mr. R. J. O'Laughlin, in 1988 to confirm

the adequacy of the sprinkler spray system. In addition, an NRC inspection (Inspection Report #50-302/86-29 dated October 3, 1986) evaluated the adequacy of the sprinkler system spray pattern and found it to be acceptable.

To enhance the sprinkler coverage in this area, FPC will add sprinkler heads located in close proximity to the Thermo-Lag fire barriers. Figure 4 shows the general layout of the additional sprinkler heads. The sprinkler heads will be the same rating as the existing heads, and will be located such that any temperature rise experienced at the Thermo-Lag fire barriers due to a fire, will also be experienced at the additional sprinkler heads. With the sprinklers rated at 165°F, they would actuate long before the heat and hot gases from a fire challenge the integrity of the Thermo-Lag fire barriers.

Portable fire extinguishers are available in adjacent zones of the Auxiliary Building (east and west ends of corridor). Additional extinguishers and a hose station are also available in the adjacent fire area in the Intermediate Building and the hot machine shop.

Fire Loading and Calculated Fire Severity

The fire loading in this fire zone is 411,000 BTU/sq. ft. with a calculated fire duration of 5.1 hours. However, the high fire loading and maximum severity fire are due to an extremely conservative calculation of fire loading and duration, and due to the geometry of the fire zone. The calculation of fire loading and duration assumes every cable tray is filled to at least 50% and actual fill is used where it is greater than 50%. The fire zone itself is a narrow hallway (9 feet wide) with a very high ceiling (about 40 feet high). The combustible loading is almost completely IEEE-383 qualified cable, with remaining combustibles consisting of Thermo-Lag and protective clothing stored in metal bins and boxes in the adjacent dress-out area. The majority of the cable trays in the zone are in the range of 10 to 15 feet above the floor.

Fire Barrier Evaluation

Fire zone AB 119-6A contains the following Thermo-Lag protected conduits that are required for post-fire safe shutdown.

Conduit	Size	Spacial Orientation
ACH 972	1"	Vertical
ACH 973	2"	Vertical
RCR251	2"	Vertical
MUR 84	2"	Vertical
RCR 235	1-1/2"	Vertical

By NEI and FPC testing, it has been established that thermal failure of 3/4" conduit will occur in around 26-29 minutes. By interpolation of NEI test 2-1 with consideration of the thickness of the CR-3 installations, thermal failure of these raceways fire barriers could be reasonably expected to occur in the 34-39 minute range. Although no hose stream testing was done to determine if full barrier integrity was maintained in conjunction with thermal performance, an estimated barrier duration of 34-39 minutes for these conduits is reasonable based on enhanced construction attributes of CR-3 fire barriers, including thicker Thermo-Lag 330 shells and closer band/tie wire spacing. In addition,

because the conduits are located against a massive concrete wall, actual temperatures seen by the fire barrier would be lower due to heat sink effects and the fact that the barrier is not exposed to radiant energy across its entire 360° circumference.

Fire zone AB-119-6A contains the following Thermo-Lag protected ladderback cable trays that are required for post-fire safe shutdown.

Tray	Size	Orientation	Cable Fill Percentage
107	24 x 6	vertical	12
108	12 x 6	vertical	30
121	24 x 6	vertical	29-40
148	24 x 6	horizontal	37
511	24 x 6	vertical	30
567	24 x 6	horizontal	57

NEI testing for cable tray (Test 2-7) demonstrated that in tray sizes 24" x 6" fire barrier failure is primarily due to structural failure at side rail radial bends and/or tray bottoms. These structural failures result in single point thermocouple readings exceeding requirements in the 23-25 minute range. As with the conduit tests described above, no hose stream was applied in NEI test 2-7 when thermal failure first occurred. However, the trays at CR-3 are estimated to perform in the 23-25 minute time range, including an allowance for hose stream testing, based on conservative construction attributes, percentage of cable tray fill, and greater panel thickness. In addition, trays in a vertical orientation along the north wall would fare better due to their longitudinal panels being in compression, rather than tension. The NEI tests showed that the vertical panels on the tray side rails lasted longer (30-36 minutes) than their radial or horizontal counterparts.

Several portions of the raceway array for AB-119-6A represent untested configurations. These portions include where vertical trays 107, 108, 121, and 511 are initially gang wrapped at floor level in a large box enclosure and where tray 148 and 567 change direction radially and at tee sections. NEI testing (Tests 2-7 and 3-2) provide a basis for estimating barrier duration at CR-3 on the order of 23-25 minutes. NEI test 3-2 showed a large section box lasting 25 minutes when mounted at the furnace ceiling. This would be compared to the gang wrap of the trays at CR-3, where the trays are located at floor level and have one side against the north wall of the Auxiliary Building corridor. Due to this orientation the gang wrap would be expected to last as long or longer than that shown in NEI test 3-2.

The single greatest challenge to the tray array in fire zone AB-119-6A is from the "tee" section and horizontal radial bends in trays 148 and 567. This configuration represents the longest free spans and greatest tensile stress of the fire barriers in the fire zone. In addition, no baseline NEI test is available for direct comparison. Based on existing test results, the bottom tray panel seam to the tray side rail would be the most likely region of structural failure. A barrier duration at this point of 23-25 minutes is estimated based on conservative barrier design and comparison to NEI test 2-7. There are two principal reasons for this. First, trays 148 and 567 will perform better than the test tray because the percentage of tray fill is generally greater than that of NEI test 2-7 and thus the trays have greater thermal mass. Second, at CR-3

tie wires were alternated with banding to secure preformed panels on these trays. With a light skim coating of trowel grade Thermo-Lag applied to the tie wire drawn down tight to the panel, the wire is actually below the surface of the Thermo-Lag (as compared to banding at the surface). As the panel is exposed to a fire, a char actually forms over the wire protecting it from full furnace exposure. This in turn keeps the wire tighter to the panel than a steel band would. Thus, the wire would not thermally expand and become loose like a steel band (as in NEI test 2-7) and therefore the fire barrier would not see a structural failure as quickly as with banding alone. A claimed fire duration for these tee sections and radial bends of from 23 to 25 minutes is supportable in lieu of specific configuration testing.

In conclusion conduits in fire zone AB-119-6A would have an equivalent fire rating of 34 to 39 minutes based on arguments presented above. Likewise tray and box configurations would have an equivalent fire rating of 23-25 minutes. Although no specific hose stream testing can be presented, a small degradation in barrier performance would be likely due to the mechanical and thermal stresses associated with this portion of the test.

Assessment

As with the assessment for the previous fire zones, three categories of fires were evaluated for this zone: (1) a fire originating from a transient combustible, (2) a fire originating from failure of equipment or components in the area, and (3) a fire originating from a faulted cable.

Similar to the previous zone, transient combustibles made of wood, paper, or plastic, and protective clothing would be of limited volume since the zone is the main hallway in the Auxiliary Building leading to the Reactor Building personnel hatch. Transient combustibles of this type would not be allowed to accumulate in this zone. Transient liquid combustibles would also be limited to quantities which are being moved through the corridor.

Equipment and components in this zone also represent a limited hazard. Components such as lighting fixtures are not located in close proximity to combustibles with low ignition temperatures and these type of components would not generate sufficient heat to challenge the cable trays in the area. Larger equipment such as the ventilation fans and a freezer chest are enclosed units.

The cables within the trays in this zone are IEEE-383 qualified cable. All power and control cables are protected by breakers and/or fuses sized to preclude any cable overheating. Instrument cables are not protected with any interrupting device, but the current carried by instrument cables is in the 4-20 milliamp range which would preclude any cable overheating. The geometry of this corridor is such that a cable tray fire would not be expected to generate a significant temperature gradient from the cable trays to the sprinkler head locations that would result in propagation of the fire before sprinkler actuation.

In summary, as described above for the previous fire zones, for the types and the extent of fires that could occur in this fire area, the existing automatic wet pipe sprinkler system would provide prompt and effective suppression. The sprinkler system with the proposed additional sprinkler heads in conjunction with the Thermo-Lag fire barriers would provide protection of one train of safe shutdown cables until the fire is extinguished. Therefore, application of the

rule (10CFR50 Appendix R, Section III.G.2.c) is not necessary to achieve the underlying purpose of the rule in this fire area.

4.4 Fire Area IB-119-201

Layout and Contents

This area encompasses the Intermediate Building Elevation 119. The fire area is composed of two fire zones (201A and 201B). The exemption request applies to the east end of Fire Zone IB-119-201A and all of Fire Zone IB-119-201B. Fire Zone IB-119-201B is the personnel access area to the Reactor Building. The layout of this fire zone is shown on Figure 5A. The north, east and part of the south wall are reinforced concrete with a 3-hour rating. The remaining portion of the south wall is the Reactor Building wall which is reinforced concrete with an approximate thickness of 42 inches. The floor is concrete with an approximate thickness of 36 inches. The west side of the zone is a jailbar doorway to Fire Zone IB-119-201A. The ceiling is the roof of the Intermediate Building, and is constructed of reinforced concrete.

Fire Zone IB-119-201A is the remaining portion of the Intermediate Building Elevation 119. However, the area for which the exemption is requested is the narrow portion between the Turbine Building and the Reactor Building. The layout of this zone is shown on Figure 5B. The north wall is reinforced concrete with a 3-hour rating. The south wall of the area of interest is the Reactor Building wall which is reinforced concrete with an approximate thickness of 42 inches. The floor is reinforced concrete with an approximate thickness of 36 inches. The east side of the zone is the jailbar doorway to Fire Zone IB-119-201B and the west side opens to the remaining portion of Fire Zone IB-119-201A. The ceiling is the roof of the Intermediate Building and has openings to the outside.

The raceways required for post-fire safe shutdown in this area are conduits CDR44, MSS44, RCR235, RCR251, SPS128, and SPS160. The circuits in these conduits are associated with instrumentation. Conduit RCR251 enters from the Reactor Building through penetration 406 and exits into the Auxiliary Building. This conduit run is in the personnel access area. The remaining conduits enter from the Reactor Building from either penetration 130 or 132 and traverse the entire area of interest (the narrow portion of Fire Zone IB-119-201A and the personnel access area.)

As shown on Figure 5B, the Thermo-Lag on some of these conduits will be replaced with a 1-hour fire rated barrier (Mecatiss). The Thermo-Lag is being replaced because the Thermo-Lag had experienced some water damage or had sections removed for testing. The amount of protection provided by "water damaged" Thermo-Lag could not be determined and enhancing the sprinkler coverage over these sections without repairing the Thermo-Lag was not deemed to be adequate. Therefore, replacement was the only viable option.

The hazards in this area include electrical cable, motor control centers (MCCs), cabinets for reactor coolant pump motor protection and pressurizer heater control, P-10 compressed gas bottles, and transient type combustibles. The MCCs and electrical cabinets are not required for post-fire safe shutdown. There are

four MCCs located along the north wall of the area. These MCCs are A and B Ventilation MCCs and A and B Pressurizer Heater MCCs. Like other MCCs at CR-3, these are designed to contain the energy from a fault and limit damage to an individual cubicle. There are two 6900V cabinets that contain current limiting reactors and power monitors for the reactor coolant pump motors. The current limiting reactors are large induction coils which limit current if a fault were to occur while giving the feeder breakers time to open. These are passive components which only function in the unlikely event of a fault on the 6900V conductors. The pressurizer heater control cabinets contain solid state controllers which turn pressurizer heater bundles on and off to maintain reactor coolant system pressure.

The P-10 compressed gas storage bottles contain a mixture of 90% Argon and 10% Methane. This mixture is needed for operation and purging of the ion chambers in the two adjacent Personnel Contamination Monitors. The mixture is rated as "Non-Flammable" and is contained in DOT approved cylinders. The gas has a specific gravity relative to air of 0.6 so that any release would quickly be dissipated within the large volume of the Intermediate Building.

The transient combustibles are protective clothing, materials and equipment used during access to the Reactor Building. The clothing and material used for access to the Reactor Building are stored in non-combustible containers near the access hatch.

Fire Protection Equipment

Ionization smoke detectors located within the area provide an early warning alarm in the control room. Full zone automatic wet pipe sprinkler coverage is provided with sprinkler heads located at the ceiling, below significant obstructions, and below the lowest level cable trays for direct floor coverage. Figures 5A and 5B show the general layout of the existing sprinkler heads. The sprinkler heads in this area are rated at 212°F and are designed and located to provide complete coverage through the hazard area per NFPA 13-1983. An NFPA code conformance review was conducted and documented by an independent consultant, Mr. R.J. O'Laughlin, in 1988 to confirm the adequacy of the sprinkler spray system. In addition, an NRC inspection (Inspection Report #50-302/86-29 dated October 3, 1986) evaluated the sprinkler system spray pattern and found it to be acceptable.

To enhance the sprinkler coverage in this area, FPC will add two sets of sprinkler heads. One set will be located in close proximity to the Thermo-Lag fire barriers and the second set over the transient combustibles in the personnel access area. Figures 6A and 6B show the general layout of the additional sprinkler heads. The sprinkler heads will be the same rating as the existing heads, and will be located such that any temperature rise experienced at the Thermo-Lag fire barriers due to a fire will also be experienced at the additional sprinkler heads. The second set of additional sprinklers will be located such that any fire initiated from a transient combustible will lead to actuation of the sprinklers. With the sprinklers rated at 212°F, the sprinklers would actuate

before the heat and hot gases from a fire challenge the integrity of the Thermo-Lag fire barriers.

Portable extinguishers and hose stations are available within the fire zones.

Fire Loading and Calculated Fire Severity

The fire loading in Fire Zone IB-119-201B (the personnel access area) is approximately 240,000 BTU/sq. ft. with a calculated fire duration of 3 hours. The majority of the combustible loading is IEEE-383 qualified cable located in the overhead. The fire loading in Fire Zone IB-119-201A is approximately 70,000 BTU/sq. ft. with a calculated fire duration of 0.9 hours. However, this fire loading and duration is based on the entire area of the fire zone. The fire loading in the area of interest would be somewhat higher, with the majority of cable passing through a narrow passageway between the personnel hatch and the north west Reactor Building penetration area.

Fire Barrier Evaluation

Fire area IB 119-201 contains the following Thermo-Lag protected conduits that are required for post-fire safe shutdown.

Conduit	Size	Orientation	Location
CDR 44	1-1/2"	horizontal	201A and 201B
MSS 44	2"	horizontal	201A
SPS 160	3/4"	horizontal	201A and 201B
SPS 128	1-1/2"	vertical	201A
RCR 235	1-1/2"	vertical	201A
RCR 251	1-1/2"	horizontal	201B

By NEI and FPC testing, it has been established that thermal failure of 3/4" conduit will occur around 26 to 29 minutes. By interpolation of NEI test 2-1 with consideration of the thickness of the CR-3 installation, thermal failure of conduit raceway fire barriers greater than 3/4" diameter could be reasonably expected to occur in the 34-36 minute range. Although no hose stream testing was done to determine if full barrier integrity was maintained in conjunction with thermal performance, an estimated barrier duration of 34-36 minutes for 1-1/2" and 2" conduits is reasonable based on enhanced construction attributes of CR-3 fire barriers, including thicker TSI shells and closer band/tie wire spacing. In addition, because several of the conduits are routed in whole or in part against a massive concrete wall, actual temperatures seen by these fire barriers would be lower due to heat sink effects and the fact that the barrier is not exposed to radiant energy across its entire 360° circumference.

Several portions of the conduit raceway array for IB-119-201 represent untested configurations. From the walkdown of conduit raceway in this fire area, it is evident that a construction style change took place that involved an interpretation of the TSI eighteen (18) inch-rule. As conduit CDR-44 ran through

IB-119-201 up to angle steel electrical support CSA 119-271, all intervening non-essential elements were individually wrapped out 18 inches with Thermo-Lag 330. Starting at support CSA 119-270, intervening non-essentials were boxed out 18" at each support such that the essential and non-essential raceways were commonly, instead of individually, protected with Thermo-Lag. For aluminum raceway, this represents an untested configuration. In addition, at electrical support CSI 119-82, two jacketed cables protected with Thermo-Lag also enter and exit the boxed enclosure as "air drops".

Ganged conduits protected in a boxed arrangement at these supports closely replicate 24" x 4" cable tray fire barrier designs where the trays are attached to structural supports. NEI test 2-7 shows that these trays fail thermally in 22-25 minutes. Because these supports have unprotected non-essential conduits running through the barrier, a conservative estimate of barrier duration should include an estimate of when an unprotected conduit would melt past the 1/2" thick Thermo-Lag 330 panel. FPC/UL testing showed that unprotected conduit end caps melted through in approximately 22 minutes. Because the Thermo-Lag barrier is only 1/2" thick, it is also expected that the aluminum will melt past the fire barrier and allow a direct convective pathway into the interior volume of the boxed enclosure. Some small lag time would occur before the interior space was heated beyond the pass/fail criteria for the raceway, but it would be on the same order of time for failure of trays as seen in NEI test 2-7. It is expected that the "air drops", protected in accordance with the 18" rule, would not contribute to the barrier failing before the 22-25 minute time frame.

In conclusion, conduits in fire area IB-119-201 would have an equivalent fire rating of 22 to 36 minutes. Although no specific hose stream testing can be presented, a small degradation in barrier performance would be likely due to the mechanical and thermal stresses associated with this portion of the fire test.

Assessment

As with the previous fire zone, three categories of fires were evaluated for these fire zones: (1) a fire originating from a transient combustible, (2) a fire originating from failure of equipment or components in the area, and (3) a fire originating from a faulted cable.

The evaluation of transient combustibles does differ from the above evaluated fire zones in that this fire area includes the access point to the Reactor Building. As such, transient combustibles of protective clothing do accumulate near the access hatch periodically. Fires from this type of combustible would generate sufficient combustion products to be detected by the ionization smoke detectors before sufficient heat and hot gases would challenge other combustibles (IEEE-383 qualified cables). The fire brigade would appropriately respond. Also, the additional sprinkler heads located above the floor area where the combustibles tend to accumulate would experience a heat rise and actuate before sufficient heat and hot gases could challenge the cable trays. These additional sprinkler heads provide direct floor coverage and are capable of suppressing and extinguishing fires resulting from these types of transients.

The evaluation of fires from transient combustibles of wood, paper, plastic, and protective clothing for the remainder of this area also differs slightly from the above assessments. Fires from these types of combustibles should generate sufficient combustion products to be detected by the ionization smoke detectors before sufficient heat and hot gases would challenge other combustibles (IEEE-383 qualified cables). Detection could be slightly delayed because the detectors are located high in the overhead. Upon detection and alarm, the fire brigade would appropriately respond. The existing sprinkler heads located below the lowest level cable trays would experience a heat rise and actuate before sufficient heat and hot gases could challenge either unprotected or Thermo-Lag protected cable trays. The sprinkler heads located below the lowest cable trays provide direct floor coverage and are capable of suppressing and containing, if not extinguishing, fires resulting from these type of transients.

Transient liquid combustibles would be limited to quantities which are being moved through these fire zones in approved containers except for oil involved in servicing the Reactor Coolant Pumps. Even at the Reactor Building access hatch, transient combustibles would be limited and present only during servicing of equipment in the Reactor Building which occurs mostly during outages or during the on-line servicing of the Reactor Coolant Pumps. Oil involved in servicing the Reactor Coolant Pumps is temporarily staged in this area in preparation for a Reactor Building entry and during clean-up after a Reactor Building entry. The oil would be stored in plastic containers for de-contamination purposes, and would be less than 25 gallons. A fire involving these types of transient combustibles could only result from a spill during movement of the containers and the introduction of an external ignition source to the spill. Equipment located in the area would not provide an ignition source to a spill because the equipment does not have any electrical or heat sources located near the floor. Spills would also be channeled to floor drains. Such an incident would be readily detected by the personnel involved in the movement of the containers thereby providing prompt and appropriate response to the situation.

The existing sprinkler heads located below the lowest level cable trays (and the additional sprinkler heads over the access hatch floor area) would experience a heat rise and actuate before sufficient heat and hot gases could challenge the unprotected or Thermo-Lag protected cable trays that are located in the overhead. The sprinkler heads located below the lowest cable trays provide direct floor coverage and are capable of suppressing and containing fires resulting from these type of transients. The existing sprinkler heads located at the ceiling level and the additional sprinkler heads located in close proximity to the Thermo-Lag would also actuate before sufficient heat and hot gases challenge the cable trays. The geometry of the area of interest is such that a floor based fire would not be expected to generate a significant temperature gradient from the cable trays to the sprinkler head locations such that the cable ignition point would be reached before actuation of the sprinkler heads. Any propagation of the floor based fire to unprotected cables would be limited. Thus, the sprinkler system in conjunction with the protection provided by the Thermo-Lag fire barriers would protect the safe shutdown cables until the fire is extinguished.

Larger equipment such as motor control centers and electrical cabinets represent the primary hazards in these zones. Components such as lighting fixtures are not located in close proximity to combustibles with low ignition temperatures and these type of components would not generate sufficient heat to challenge the cable trays in the area. In postulating a fire that challenged the IEEE-383 qualified cables located above the motor control centers and panels, the existing sprinkler heads located below the lowest level cable trays would experience a heat rise and actuate before sufficient heat and hot gases could challenge unprotected or Thermo-Lag protected cable trays. The sprinkler heads located below the lowest cable trays provide, for the most part, direct floor coverage and are capable of suppressing and containing, if not extinguishing, fires resulting from this equipment. In addition, as the fire generates smoke and hot gases, the detector located at the ceiling would alarm and the fire brigade would appropriately respond. If the fire were to spread quickly and was able to sustain itself, as heat and hot gases were generated, the additional sprinkler heads located in close proximity to the Thermo-Lag would also actuate. These sprinkler heads would actuate before sufficient heat and hot gases challenge remaining unprotected or Thermo-Lag protected cable trays in the overhead. As the hot gases reached the ceiling, another set of existing sprinklers would actuate at the ceiling. The geometry of the area of interest is such that a fire would not be expected to generate a significant temperature gradient from the cable trays to the sprinkler head locations that would result in propagation of the fire before sprinkler actuation. Thus, the sprinkler system in conjunction with the protection provided by the Thermo-Lag fire barriers would protect the safe shutdown cables until the fire is extinguished.

The cables within the trays in these fire zones are IEEE-383 qualified cable. All power and control cables are protected by breakers and/or fuses sized to preclude any cable overheating. Instrument cables are not protected with any interrupting device, but the current carried by instrument cables is only in the 4-20 milliamp range which would preclude any cable overheating. If a failure did lead to overheating of the cable, it is not expected that the failure of the cable would lead to a fire in the cable tray. However, if a fire was initiated, the ionization smoke detectors would provide detection (slightly delayed because the detectors are located high in the overhead) and the fire brigade would appropriately respond. If the fire was able to sustain itself, as heat and hot gases were generated, the existing sprinkler heads located at the ceiling level and the additional sprinkler heads located in close proximity to the Thermo-Lag would actuate. These sprinkler heads would actuate before sufficient heat and hot gases challenge the remaining unprotected or Thermo-Lag protected cable trays in the overhead. The geometry of the area of interest is such that a cable tray fire would not be expected to generate a significant temperature gradient from the cable trays to the sprinkler head locations that would result in propagation of the fire before sprinkler actuation. Thus, the sprinkler system in conjunction with the protection provided by the Thermo-Lag fire barriers would protect the safe shutdown cables until the fire is extinguished.

In summary, for the types and the extent of fires that could occur in this fire area, the existing automatic wet pipe sprinkler system with the additional sprinkler heads over the personnel access floor area would provide prompt and

effective suppression. The sprinkler system with the proposed additional sprinkler heads in conjunction with the Thermo-Lag fire barriers would provide protection of one train of safe shutdown cables until the fire is extinguished. Therefore, application of the rule (10CFR50 Appendix R, Section III.G.2.c) is not necessary to achieve the underlying purpose of the rule in this fire area.

5.0 Summary

As indicated above, the underlying purpose for Appendix R, Section III.G was to ensure the capability to achieve and maintain safe shutdown conditions during and after any postulated fire in the plant. The use of a 1-hour fire rated barrier in conjunction with an automatic fire suppression system and fire detection was (a) to ensure prompt and effective suppression of a fire and (b) to ensure that the fire damage would be limited until the fire was extinguished. The requested exemption achieves the underlying purpose of the rule. The existing sprinkler system in these three fire areas (AB-95-3, AB-119-6, and IB-119-201) with sprinkler heads located (a) at the ceiling, (b) below significant obstructions, and (c) at a lower level for direct floor coverage, provides prompt and effective suppression of any fire in these areas. The additional sprinkler heads in the personnel access area to the Reactor Building further enhances the capability to provide prompt and effective suppression of any fire. The additional sprinkler heads located in close proximity to the Thermo-Lag fire barriers along with the protection provided by the existing Thermo-Lag fire barriers, will protect one train of safe shutdown cables until the fire is extinguished. Reasonable assurance has been provided in ensuring the capability to achieve and maintain safe shutdown conditions during and after any postulated fire in these plant areas. Therefore, the exemption request should be granted.

ENCLOSURE B

APPENDIX R SECTION III.J EXEMPTION REQUEST

1.0 Executive Summary

Florida Power Corporation (FPC) is requesting an exemption from the requirements of 10 CFR 50, Appendix R, Section III.J to allow use of AC-powered lighting in several fire areas, and portable battery powered lighting units in one area for safe shutdown activities. Section III.J requires "*Emergency Lighting units with at least an 8-hour battery supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.*" As part of FPC's post-fire safe shutdown analysis changes and plant modifications to reduce the plant's reliance on Thermo-Lag, post-fire operator actions to align breakers and valves are being used. A review of the AC-powered lighting systems determined that normal lighting systems would be available for a majority of these post-fire operator actions. The normal lighting systems in conjunction with the existing battery emergency lighting units would be available for lighting these post-fire access and egress routes needed to support operator actions. For Fire Area AB-95-3, the need is solely to enter the fire area after the fire has been extinguished. Therefore, portable lighting provides the only reliable option. Additional battery supplied emergency lighting units would not enhance the safety of the plant. The availability of the normal lighting systems and the use of portable lights for Fire Area AB-95-3 justifies this exemption request.

2.0 Introduction

Crystal River Unit 3 (CR-3) was licensed to operate in December 1976. All plants licensed to operate before January 1, 1979 are required to comply with, inter alia, 10 CFR 50, Appendix R, Sections III.G, III.J, and III.O and 10 CFR 50.48(b). FPC modified CR-3 by adding fire protection features that, taken together, were considered adequate to comply with Sections III.G, III.J and III.O of Appendix R. Those modifications included installation of 8-hour battery powered lighting units in the Auxiliary Building, the Control Complex, the Intermediate Building, and the Turbine Building to support safe shutdown activities. Those modifications also included installation of Thermo-Lag fire barriers. These fire barriers were installed in 1984 and 1985 in support of FPC's due date for implementation of Appendix R in July 1985. An NRC Team Inspection was performed at CR-3 in July and August of 1985 to evaluate fire protection and FPC's actions regarding Appendix R Sections III.G, III.J, III.L, and III.O. No violations or deviations were identified.

Problems with the manufacturer's rating of Thermo-Lag fire barriers have resulted in a re-evaluation of the basis for Appendix R compliance, and the use of Thermo-Lag to achieve compliance. As reported in our December 21, 1995 letter, FPC designed a Thermo-Lag resolution strategy to explore all the options available for resolution of the Thermo-Lag fire barrier issues, with a goal of identifying solutions that considered both safety benefit and cost. The FPC Thermo-Lag Resolution Strategy consisted of four (4) major activities, entitled: "Appendix

R Reanalysis", "NEI Application Guide", "Alternate Barriers", and "EPRI-Tailored Collaboration (TC)". The Appendix R reanalysis activities were to identify means of reducing the plant's reliance on Thermo-Lag fire barriers by either analysis changes and/or plant modifications. Through the activities of the Thermo-Lag Resolution Strategy, FPC has committed the resources and initiated the actions to achieve an approximate 77% reduction in the raceways that require Thermo-Lag fire barriers. This reduction would be achieved through rerouting cables, using offsite power sources for post-fire safe shutdown, using redundant equipment and instrumentation added to the plant since the original Appendix R analysis, and using post-fire operator actions to align breakers and valves.

These post-fire operator actions are in plant areas that are not fully covered by the existing emergency lighting units and require, in some cases, different access and egress routes than those covered with the existing emergency lights. In addition, the post-fire actions include entry into one fire area after the fire has been extinguished. For a fire in this area, any lighting units installed in the area, whether the lighting is from emergency battery lighting units or normal lighting (AC-powered) units, could not be relied upon for post-fire actions. A review of the AC-powered lighting systems was conducted to determine the availability of the normal lighting systems. This review determined that the normal lighting systems would be available for a majority of these post-fire operator actions. However, the existing emergency lighting units would also be required. Thus, the normal lighting systems in conjunction with the existing battery emergency lighting units would provide lighting for these post-fire operator actions and for access and egress routes. Additional 8-hour battery lighting units will not offer an enhancement to the safety of the plant and represent an unnecessary short-term installation cost and long-term maintenance cost.

3.0 Specific Exemption Requested

Florida Power Corporation hereby submits a request for exemption from the requirements of 10 CFR 50, Appendix R, Section III.J in accordance with the provisions of 10 CFR 50.12. This exemption will allow for the use of existing AC-powered lighting in various plant areas in lieu of 8-hour battery powered lighting, and will allow for the use of portable battery powered lighting units for one fire area (Fire Area AB-95-3).

3.1 No Undue Risk

In accordance with 10 CFR 50.12(a)(1), Florida Power Corporation demonstrates herein that the requested exemption is authorized by law, will not present an undue risk to the public health and safety, and is consistent with the common defense and security. The request does not create conditions adverse to the safe operation of the unit in that an adequate level of fire protection (emergency lighting for post-fire safe shutdown activities) is maintained consistent with the purpose of Appendix R as described below.

3.2 Special Justifying Circumstances

The special circumstances which justify the Commissions's approval of the exemption request is consistent with the following requirement of 10 CFR 50.12.

10 CFR 50.12(a)(2)(ii) *Application of the regulation in the particular circumstances would not serve the underlying purpose of the rule or is not necessary to achieve the underlying purpose of the rule.*

Appendix R, Section III.J, "Emergency Lighting" requires "*Emergency Lighting units with at least an 8-hour battery supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto.*" As indicated in the Supplementary Information which was provided with publishing 10 CFR 50, Appendix R (Federal Register/Vol. 45, No. 225/November 19, 1980), the purpose for Section III.J was to ensure adequate lighting for post-fire safe shutdown activities. The emergency lighting addressed by this requirement is not lighting that may be needed for fire fighting activities. The Technical Basis for this requirement states, in part, that "*The need is for lighting that aids the access to equipment and components that must be manually operated by plant personnel to effect safe plant shutdown during plant emergencies. Because such activities may extend over a considerable period of time both during and after the fire, it is prudent to provide 8-hour battery emergency lighting capability to allow sufficient time for normal lighting to be restored with a margin for unanticipated events.*"

The requested exemption does not prevent achieving the underlying purpose of the rule. As described in the following evaluation, existing AC-powered lighting would be available during and after the fire to support safe shutdown activities since their power supplies and circuits will not be damaged. The AC-powered lighting is the normal lighting in these areas; as such, additional 8-hour battery emergency lighting is unnecessary. For Fire Area AB-95-3, portable battery powered lighting represents the only reliable alternative. As described below, the operator would enter this area after the fire has been extinguished. Installed lighting in this area, whether AC-powered or battery powered, could be subjected to fire damage and could be unavailable to support post-fire activities.

4.0 Evaluation

Lighting at Crystal River Unit 3 (CR-3) consists of normal, essential, emergency and security (outdoor) systems. Normal lighting is provided indoors in areas other than the Control Complex and constitutes the major portion of the plant lighting. Illumination is from incandescent, fluorescent, and HID fixtures supplied from non-safety related power sources. Reactor Building lighting is supplied from a 208/120 volt AC panel. The remaining portion of the normal lighting is generally supplied from 480/277 volt AC panels with some lighting supplied from 208/120 volt AC panels. In areas other than the Control Complex, essential lighting operates in conjunction with the normal lighting to provide egress illumination should there be a failure of the normal source. This essential lighting is supplied from safety related (diesel generator backed) AC

power supplies. Common panels using a split bus arrangement supply both the normal and essential lighting.

The lighting within the Control Complex is considered essential and is supplied from safety related (diesel backed) AC power supplies. However, split bus panels are not utilized. Two power sources feed the lighting in the Control Complex. The lighting fixtures are divided between the power sources such that every other fixture is fed from a common source and the entire area would still have lighting if one of the power sources is lost. The Main Control Room itself also is provided with emergency lighting consisting of a limited number of fixtures supplied from the plant batteries.

In addition, emergency lighting consisting of 8 hour fixed battery-pack lighting units are provided for Appendix R Section III.J requirements in various areas of the Auxiliary Building, the Intermediate Building, the Turbine Building and the Control Complex, including the Main Control Room. These fixed battery-pack emergency lights are physically identified and marked, and are placed in such a manner as to assure adequate illumination for access/egress routes and work areas associated with required post-fire safe shutdown activities. Further, portable battery powered emergency lights are also located in the Control Complex outside the Cable Spreading Room.

The Appendix R analysis changes and plant modifications to reduce the plant's reliance on Thermo-Lag fire barriers include using post-fire operator actions to align valves and position switches. Depending upon the type and extent of fire damage, post-fire operator actions would be used to accommodate hot shutdown conditions. For example, if Control Room control and position indication of a valve were damaged by the fire, an operator would need to verify the valve position locally and possibly manually align the valve. The post-fire operator actions are associated with the emergency and auxiliary feedwater systems (valves and a switch), the makeup system (valves), and the power distribution system (switches). The locations for these operator actions are the Auxiliary Building Elevation 95, the Auxiliary Building Elevation 119, the Control Complex Elevation 124 (CRD/Relay Room), the Control Complex Elevation 145 (Main Control Room), the Intermediate Building Elevation 95, the Intermediate Building Elevation 119, the Turbine Building Elevation 95, and the Turbine Building Elevation 119. For each operator action in these fire areas, the availability of the normal (AC-powered) lighting was assessed. The assessment of the normal (AC-powered) lighting was conducted by identifying the specific electrical power distribution equipment and power feeders to the ultimate power source (offsite power or diesel generator) that are essential to energize the lighting for the location of the operator actions and the access and egress routes. The locations of the lighting equipment and cables were then compared to the fire areas that required performance of the operator actions. If the lighting equipment and cables were not located in the postulated fire that required the operator actions, the normal lighting would be available during and after the fire. The lighting assessment also accounted for the effects of associated circuits including multiple high impedance faults.

Fire Area AB-95-3 Auxiliary Building Elevation 95

The operator actions in this fire area consist of manually aligning valves for the makeup system. Fires in five of the plant's 38 fire areas could result in the need for these actions, including fires in this area. The access route to this fire area from the Main Control Room is via the Control Complex stairwell and Control Complex Elevation 95. This access route and some areas (access points) of this fire area are provided with battery-pack emergency lighting. The normal lighting for this area is provided by Lighting Panel ACDP-17, Reactor MCC 3A2, and 480V Reactor Auxiliary Bus 3A. This equipment including the power source and related cables are not located in fire areas which could result in the need for these operator actions, with the exception of this fire area. In the event of a fire in this area, the operator would enter the area after the fire was extinguished. These valves (depending upon the extent and type of fire damage) may require verification of position or re-alignment within approximately 4 hours following a reactor trip and reactor coolant system isolation. While this area and access points within the area are provided with normal (AC-powered) lighting and battery-pack emergency lighting respectively, this lighting may not be available because of direct fire damage to the lights. Portable lighting which is stored outside this area, would provide the only dependable source of lighting to support these safe shutdown actions. As described above, portable battery powered emergency lights are located in the Control Complex outside the Cable Spreading Room.

Fire Area AB-119-6 Auxiliary Building Elevation 119

The operator actions in this fire area consist of manually aligning valves for the makeup system. Fires in three of the plant's 38 fire areas could result in the need for these actions. The access route to this fire area from the Main Control Room is via the Control Complex stairwell, Control Complex Elevation 95 and Auxiliary Building Elevation 95. This access route is provided with battery-pack emergency lighting. The normal lighting for this fire area is provided by Lighting Panel ACDP-17, Reactor MCC 3A2, and 480V Reactor Auxiliary Bus 3A. This equipment, including the power source and related cables, is not located in the three fire areas which could result in the need for operator actions in Auxiliary Building Elevation 119. Thus, the normal lighting would be available during and after the fire.

Fire Area CC-124-111 Control Complex Elevation 124 (CRD/Relay Room)

The operator action in this area consists of manually positioning a switch on a DC distribution panel. Fires in two of the plant's 38 fire areas could result in the need for this action. The access route from the Main Control Room is via the Control Complex stairwell which is provided with battery-pack emergency lighting. The essential lighting for this area is provided from redundant sources: Lighting Panel ACDP-41, ES MCC 3A1 and 480V ES Bus 3A; and, Lighting Panel ACDP-44, ES MCC 3B1 and 480V ES Bus 3B. The redundant equipment including the power sources and related cables are located such that one train of essential lighting would be available during and after the fire.

Fire Area CC-145-118B Control Complex Elevation 145 (Main Control Room)

The operator actions in this fire area consist of positioning various switches on the main control board and control panels in the Main Control Room. Fires in nine of the plant's 38 fire areas could result in the need for these actions. As described above, the Main Control Room is provided with essential (AC-powered) lighting, a limited number of fixtures which are supplied from the plant battery, and 8-hour fixed battery-pack lighting units. The essential lighting for this area is provided from redundant sources: Lighting Panel ACDP-41, ES MCC 3A1 and 480V ES Bus 3A; and, Lighting Panel ACDP-44, ES MCC 3B1 and 480V ES Bus 3B. One train of essential lighting would be available during and after the fire except for two fire areas. For these two fire areas, the operator actions are on the main control board which is covered by the 8-hour battery-pack lighting. Thus, the essential lighting in conjunction with the 8-hour fixed battery-pack emergency lighting ensures lighting for safe shutdown activities.

Fire Area IB-95-200 Intermediate Building Elevation 95

The operator actions in this area consist of manually aligning valves for the emergency feedwater system. Fires in nine of the plant's 38 fire areas could result in the need for these actions. This area and the access route from the Main Control Room via the Control Complex stairwell, Control Complex Elevation 95 and Auxiliary Building Elevation 95, are provided with battery-pack emergency lighting. The normal lighting for this area is provided by Lighting Panel ACDP-21, 480-120/208 Transformer for ACDP-21, Reactor MCC B, and 480V Reactor Auxiliary Bus 3B. This equipment including the power source and related cables is not available for all of the nine fire areas which could require operator actions in this area. Thus, the existing battery-pack emergency lighting would be needed for this area.

Fire Area IB-119-201 Intermediate Building Elevation 119

The operator actions in this area consist of manually aligning valves for the emergency and auxiliary feedwater system. Fires in ten of the plant's 38 fire areas could result in the need for these actions. The access route from the Main Control Room is via the Turbine Building operating floor, the Turbine Building stairwell and the Turbine Elevation 119 which is not provided with battery-packed emergency lighting. The normal lighting for this area is provided by Lighting Panel ACDP-32, Water Treatment MCC 3B and 480V Turbine Auxiliary Bus 3B. The normal lighting for the access route is provided by Lighting Panel ACDP-33, Turbine MCC 3A and 480V Turbine Auxiliary Bus 3A. This equipment, including the power source and related cables, is not located in the ten fire areas which could result in the need for operator actions in Intermediate Building Elevation 119. Thus, the normal lighting for this area including for the access route, would be available during and after the fire.

Fire Area TB-95-400 Turbine Building Elevation 95

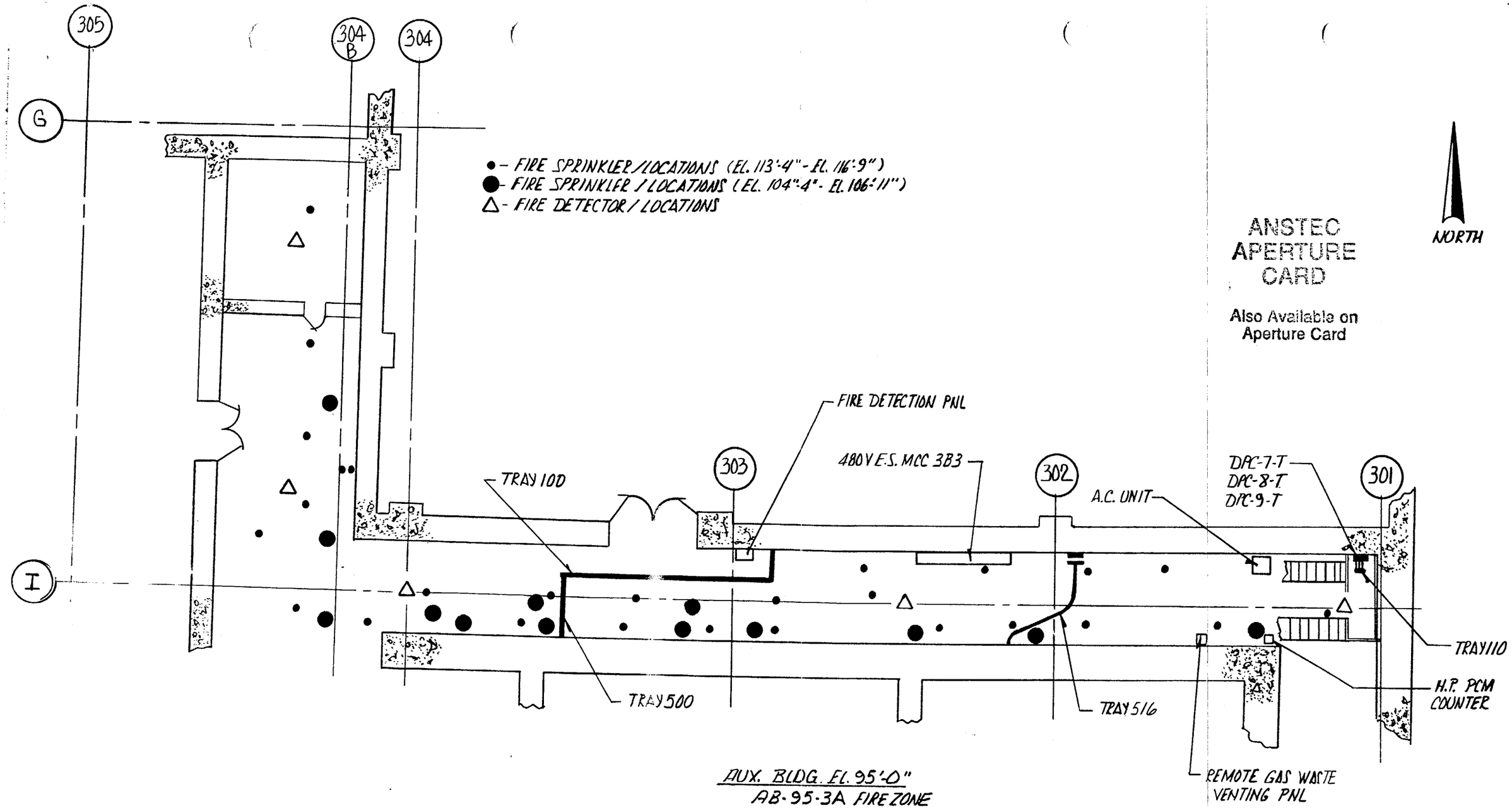
The operator action in this area consists of manually positioning a switch on a DC distribution panel. Fire in one of the plant's 38 fire areas could result in the need for this action. The access route from the Main Control Room is via the Control Complex stairwell and Control Complex Elevation 95 which is provided with battery-pack emergency lighting. The normal lighting for this area is provided by Lighting Panel ACDP-33, Turbine MCC 3A and 480V Turbine Auxiliary Bus 3A. This equipment, including the power source and related cables, is not located in the fire area which could result in the need for operator action in Turbine Building Elevation 95. Thus, the normal lighting would be available during and after the fire.

Fire Area TB-119-400 Turbine Building Elevation 119

The operator action in this area consists of manually positioning a switch for the auxiliary feedwater pump. Fires in ten of the plant's 38 fire areas could result in the need for this action. The access route from the Main Control Room is via the Turbine Building operating floor and Turbine Building stairwells. The access route is not provided with battery-packed emergency lighting. The normal lighting for this area and the access route is provided by Lighting Panel ACDP-33, Turbine MCC 3A and 480V Turbine Auxiliary Bus 3A. This equipment, including the power source and related cables, is not located in the ten fire areas which could result in the need for operator action in Turbine Building Elevation 119. Thus, the normal lighting would be available during and after the fire.

5.0 Summary

Normal and essential (AC-powered) lighting systems would be available during and after the fire in various plant areas. The normal and essential (AC-powered) lighting systems in conjunction with the existing 8-hour battery-pack emergency lighting provides the lighting needed to support safe, hot shutdown conditions. In one fire area (AB-95-3), portable lighting provides the only reliable source of lighting for post-fire safe shutdown actions. Additional 8-hour battery-pack lighting units are not required to provide lighting during and after a fire and thus would not enhance the safety of the plant. The use of AC-powered lighting systems and the use of portable lighting for re-entry to a fire area satisfies the underlying purpose of Appendix R Section III.J. Therefore, the exemption request should be granted.



AUX. BLDG. EL. 95'-0"
AB-95-3A FIRE ZONE

NORTH

ANSTEC APERTURE CARD

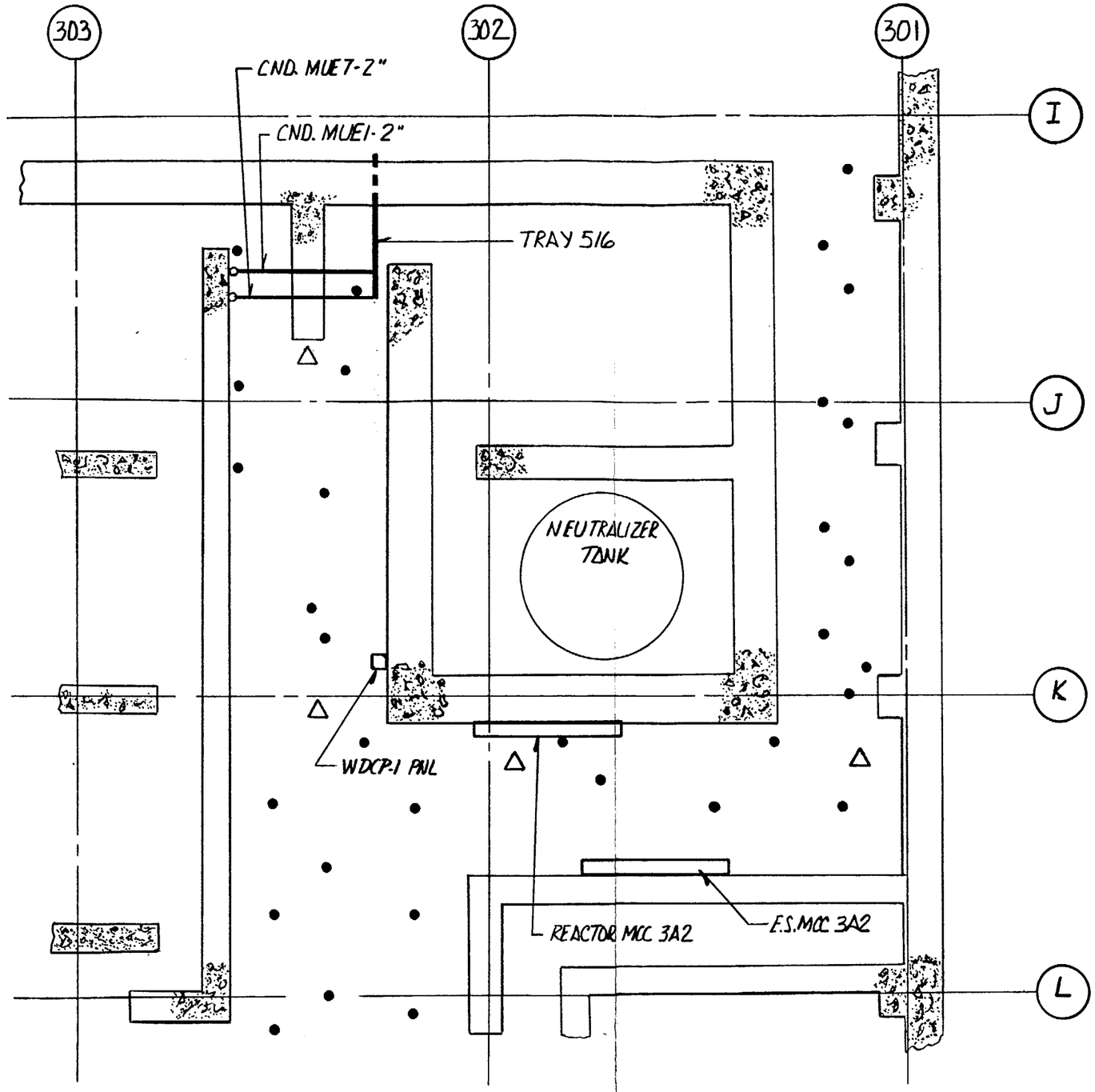
Also Available on Aperture Card

FLORIDA POWER CORP

FIGURE 1A

AUX. BLDG. EL. 95'-0"
FIRE ZONE AB-95-3B

9606260270-01



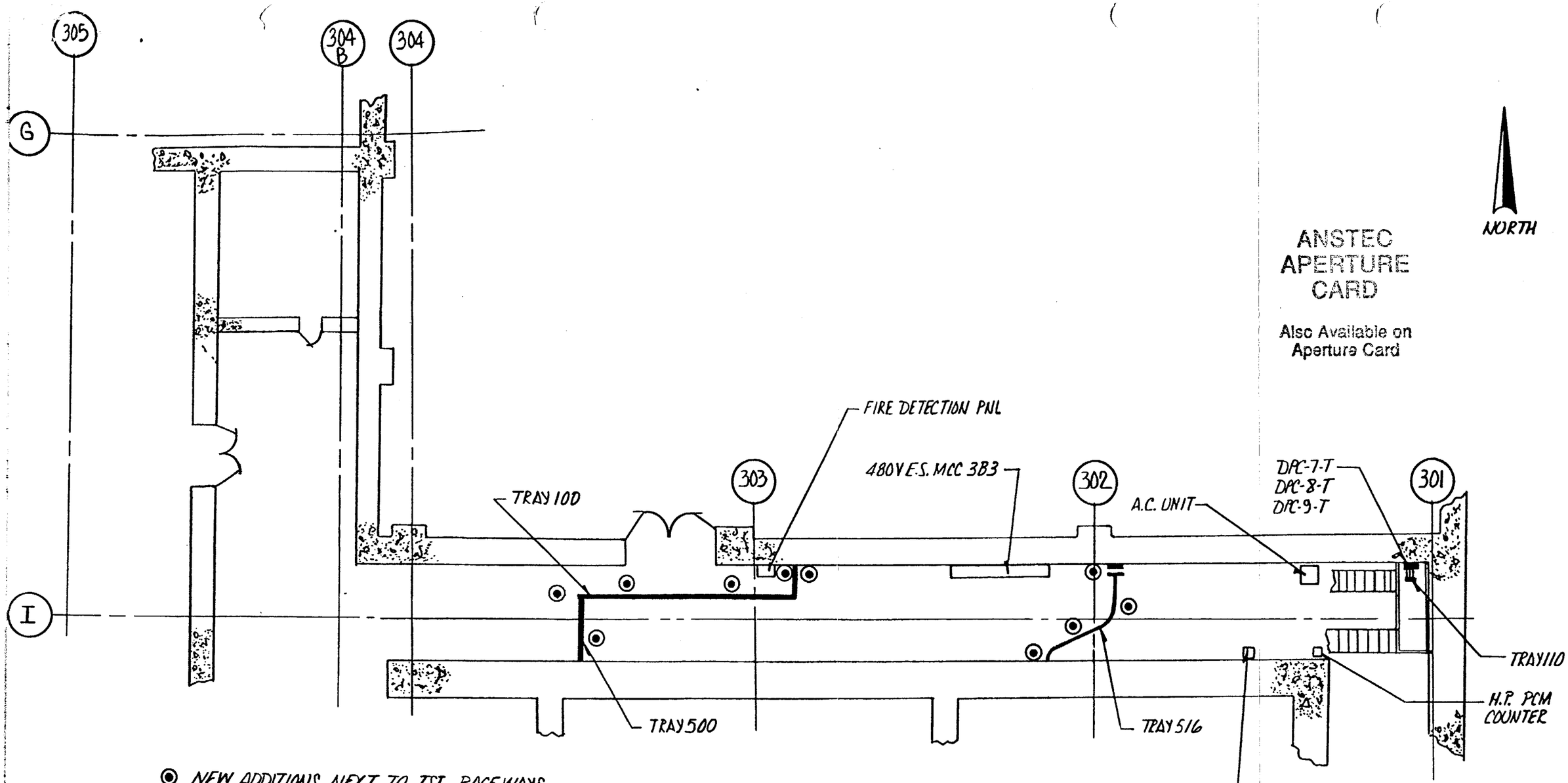
NORTH

● - FIRE SPRINKLER LOCATIONS
△ - FIRE DETECTOR LOCATIONS

AUX. BLDG. EL. 95'-0"
AB-95-3G FIRE ZONE

FLORIDA POWER CORP

FIGURE 1B
AUX. BLDG. EL. 95'-0"
FIRE ZONE AB-95-3G



NORTH

◉ NEW ADDITIONS NEXT TO TSI RACEWAYS

AUX. BLDG. EL. 95'-0"
AB-95-3A FIRE ZONE

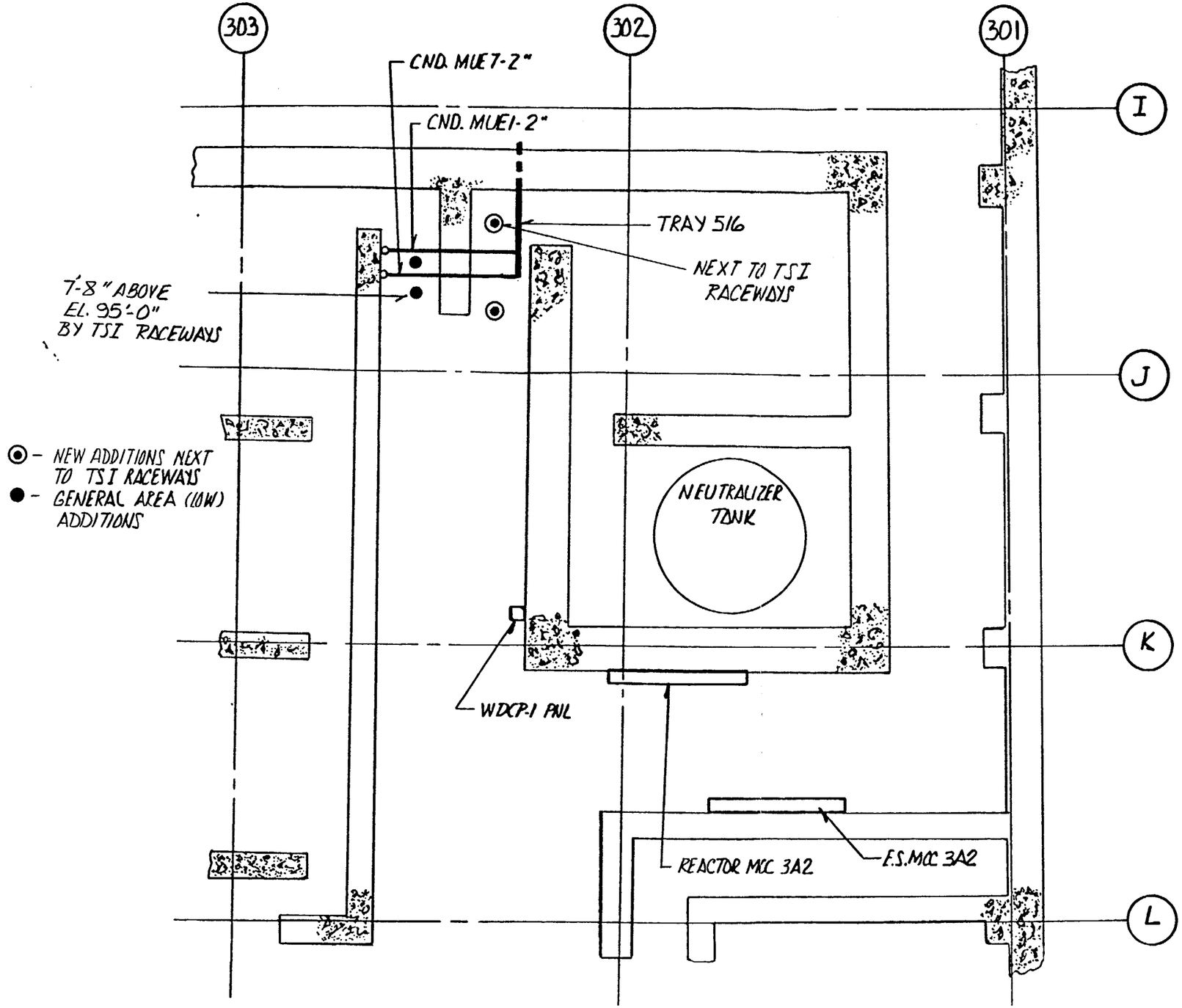
PROPOSED ADDITIONAL SPRINKLER SYSTEMS HEAD LOCATIONS

FLORIDA POWER CORP

FIGURE 2A

AUX. BLDG. EL. 95'-0"
FIRE ZONE AB-95-3B

9606260270-03



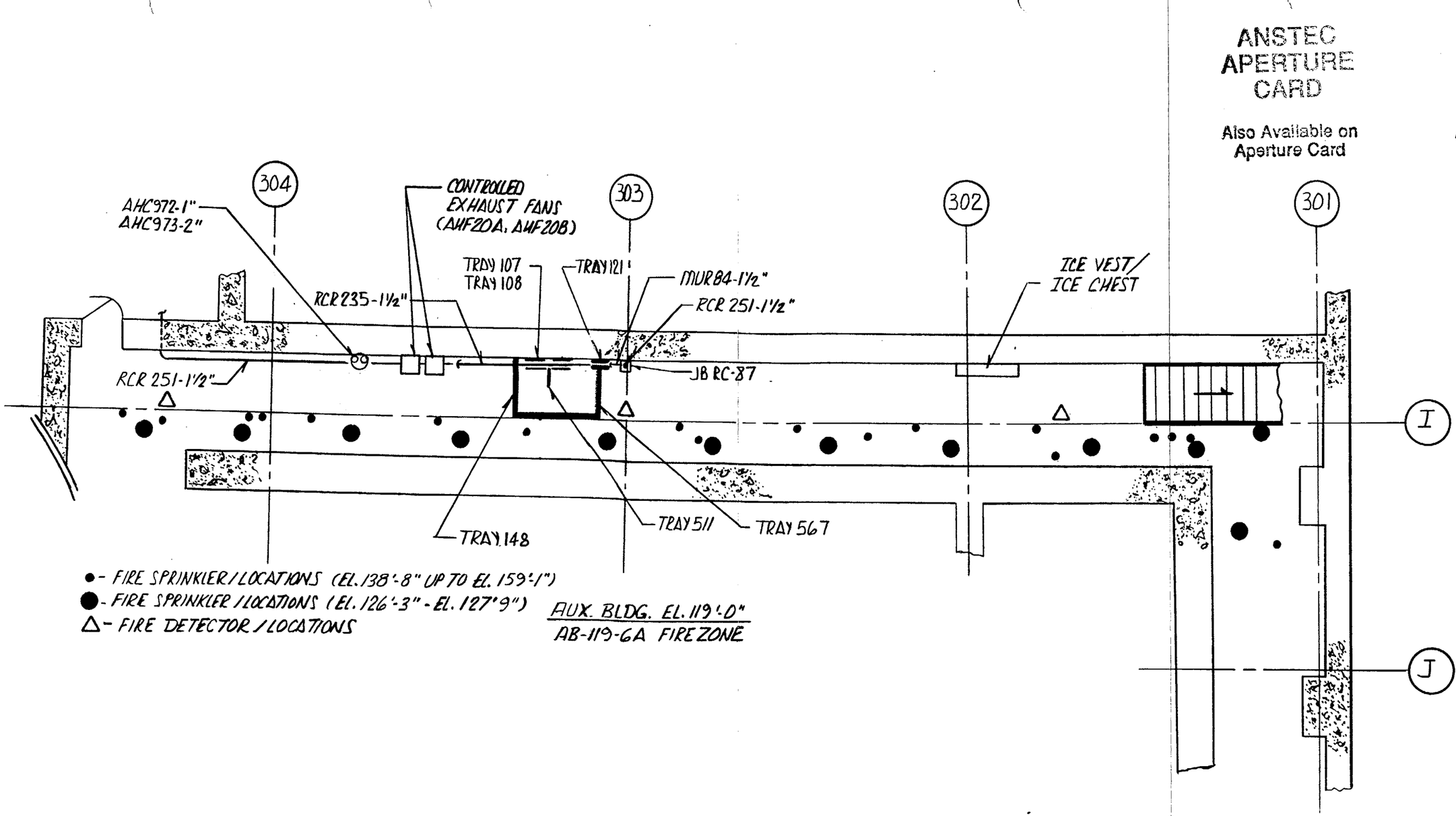
NORTH

PROPOSED ADDITIONAL SPRINKLER SYSTEMS HEAD LOCATIONS

FLORIDA POWER CORP

FIGURE 2B

AUX. BLDG. EL. 95'-0"
FIRE ZONE AB-95-3G

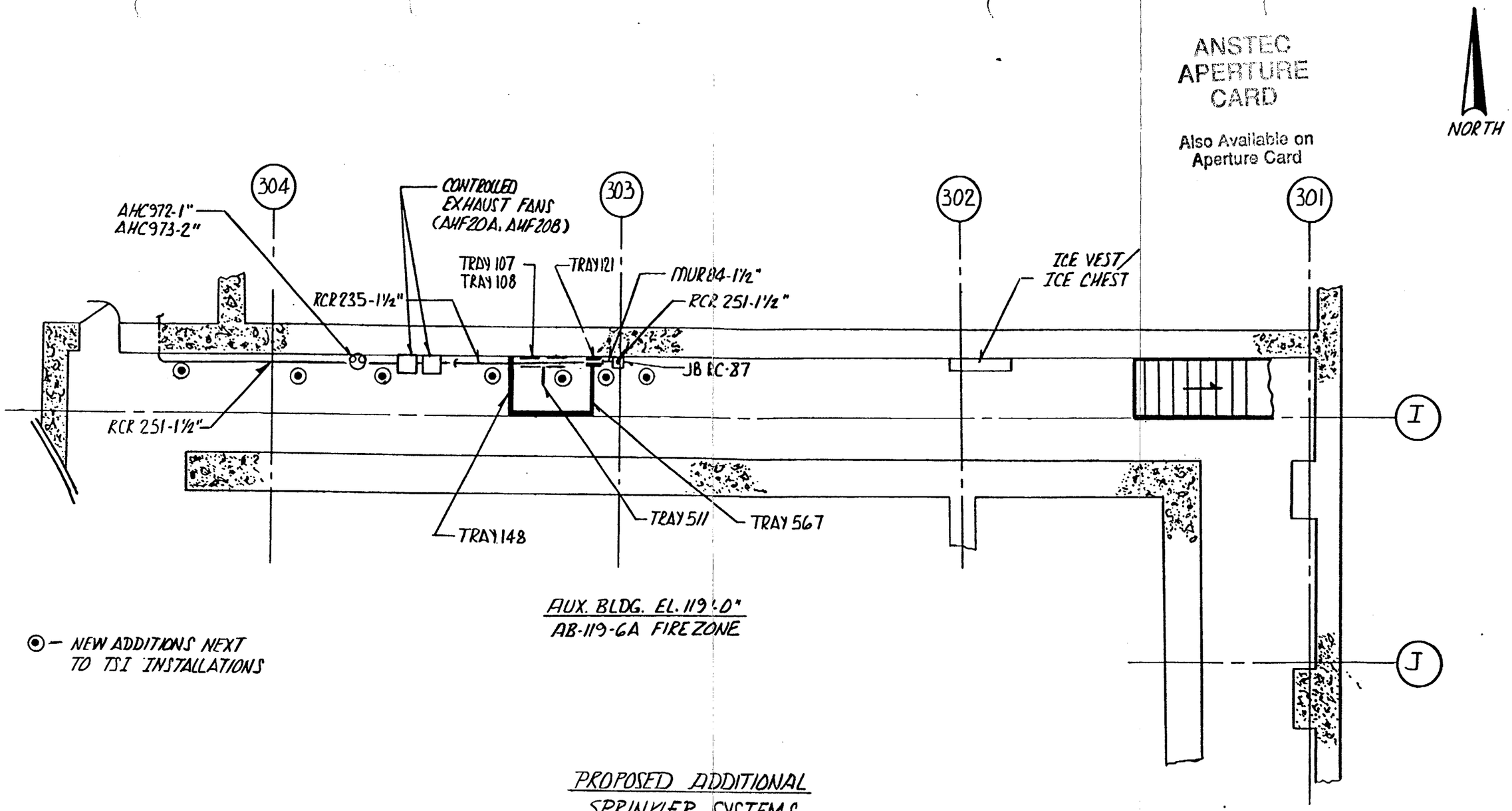


●- FIRE SPRINKLER LOCATIONS (EL. 138'-8" UP TO EL. 159'-1")
●- FIRE SPRINKLER LOCATIONS (EL. 126'-3" - EL. 127'-9")
△- FIRE DETECTOR LOCATIONS

AUX. BLDG. EL. 119'-0"
AB-119-6A FIRE ZONE

FLORIDA POWER CORP.

FIGURE 3
AUX. BLDG. EL. 119'-0"
FIRE ZONE AB-119-6A



AUX. BLDG. EL. 119'-0"
AB-119-6A FIRE ZONE

⊙ — NEW ADDITIONS NEXT TO TSI INSTALLATIONS

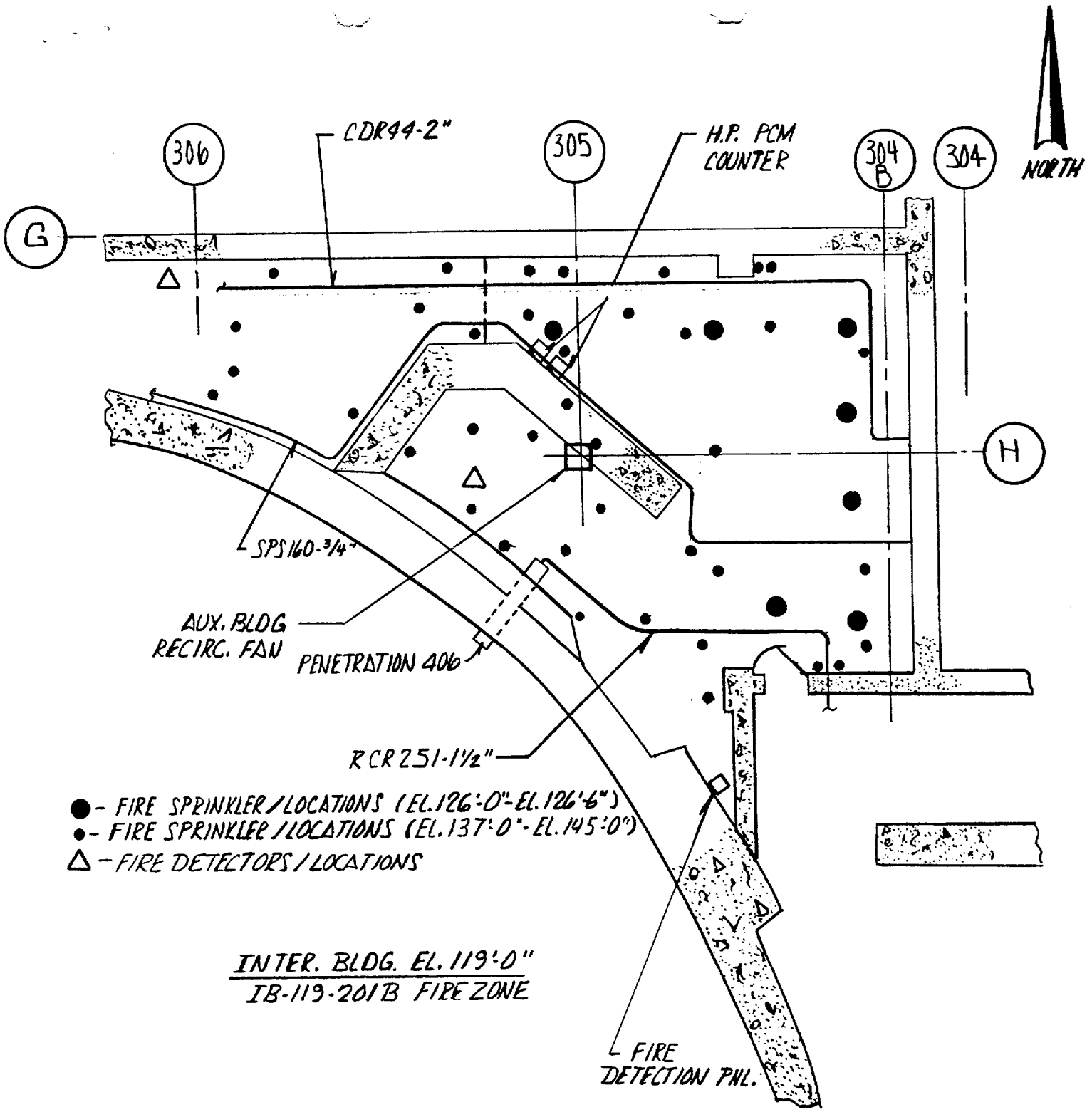
PROPOSED ADDITIONAL
SPRINKLER SYSTEMS
HEAD LOCATION

FIGURE 4

9606260270-06

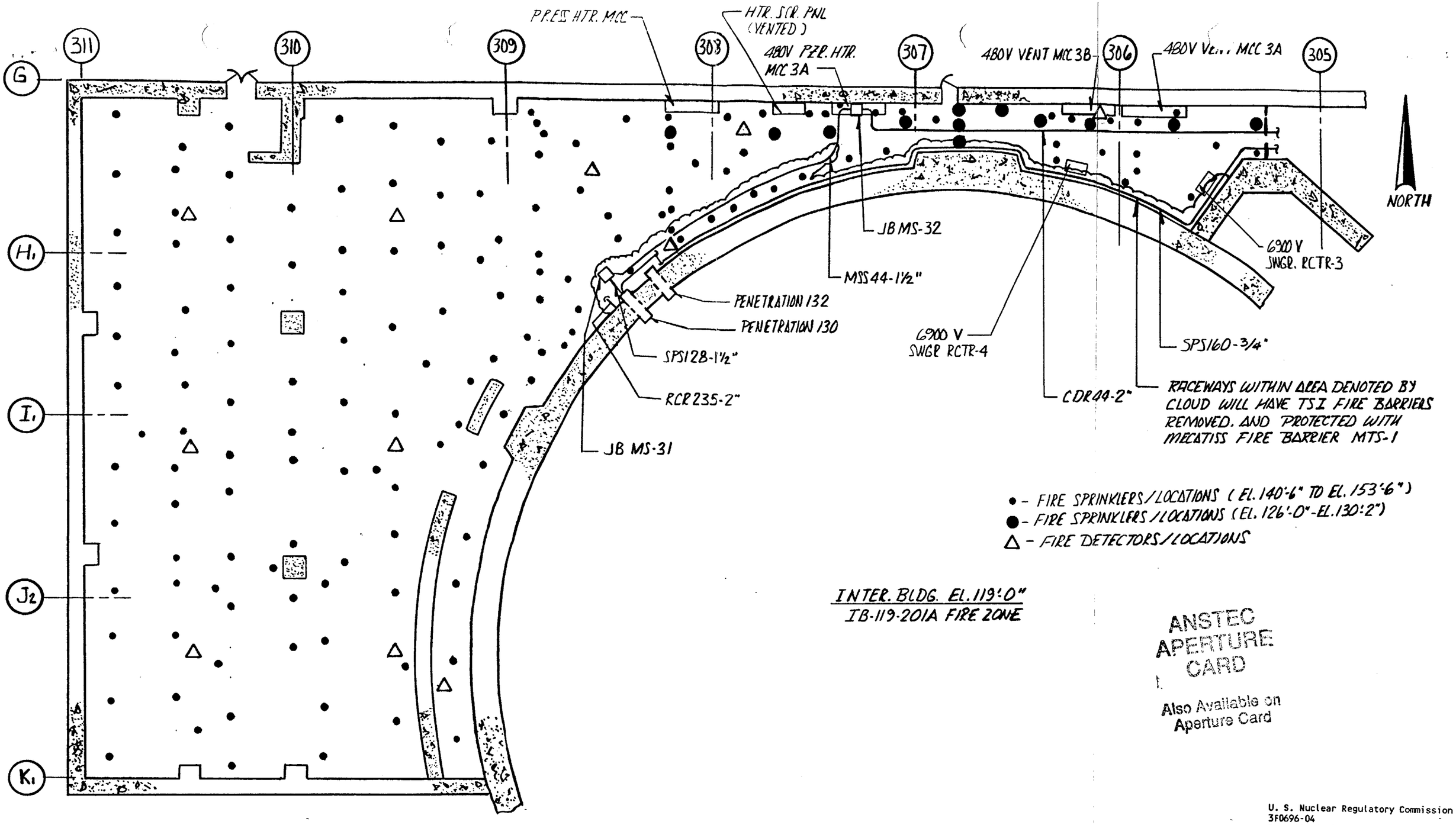
FLORIDA POWER CORP

FIGURE 4
AUX. BLDG. EL. 119'-0"
FIRE ZONE AB-119-6A



FLORIDA POWER CORP.

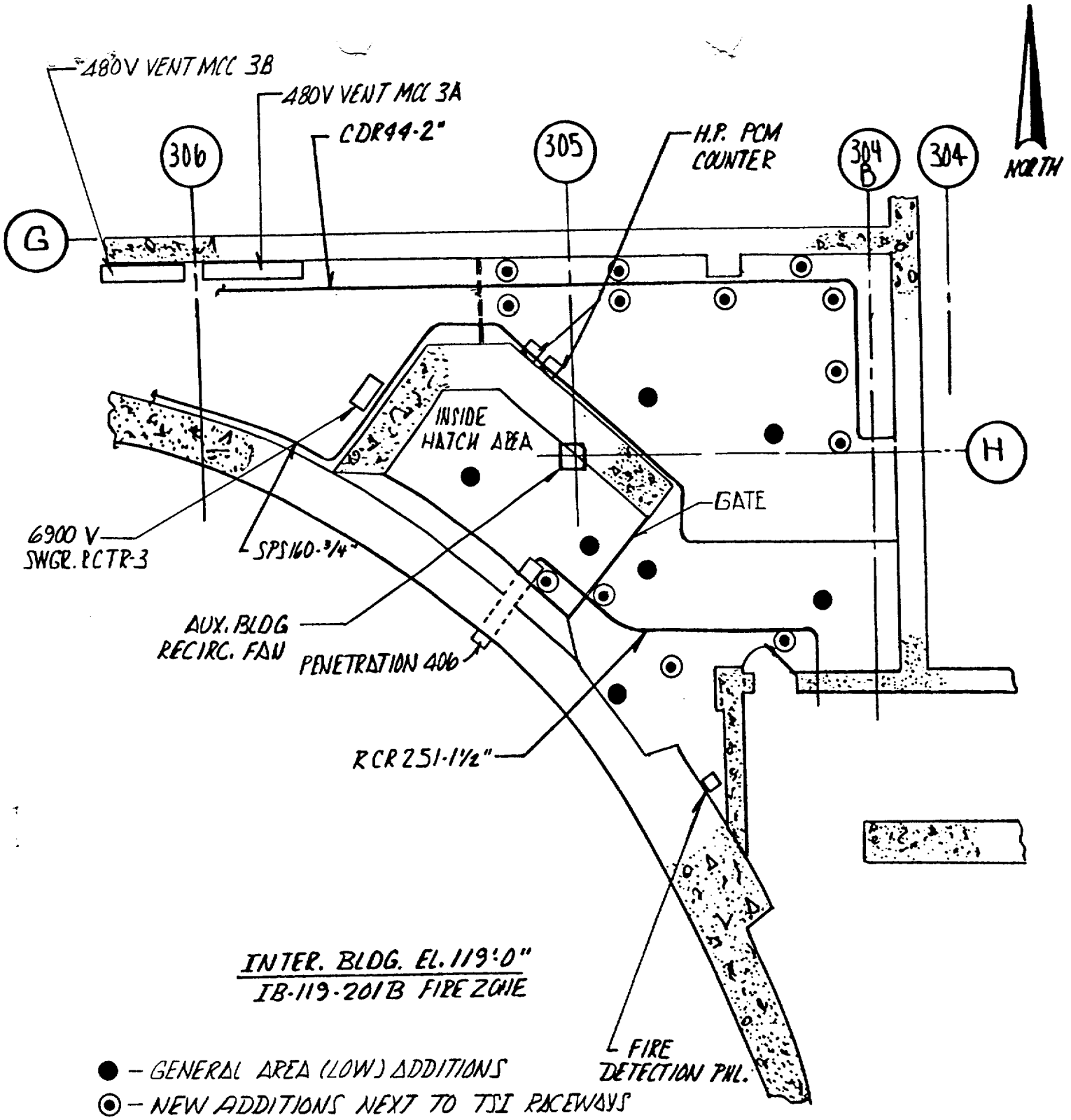
FIGURE 5A
INTER. BLDG. EL. 119'-0"
FIRE ZONE IB-119-201B



INTER. BLDG. EL. 119'-0"
IB-119-201A FIRE ZONE

FLORIDA POWER CORP
FIGURE 5B
INTER. BLDG. EL. 119'-0"
FIRE ZONE IB-119-201A

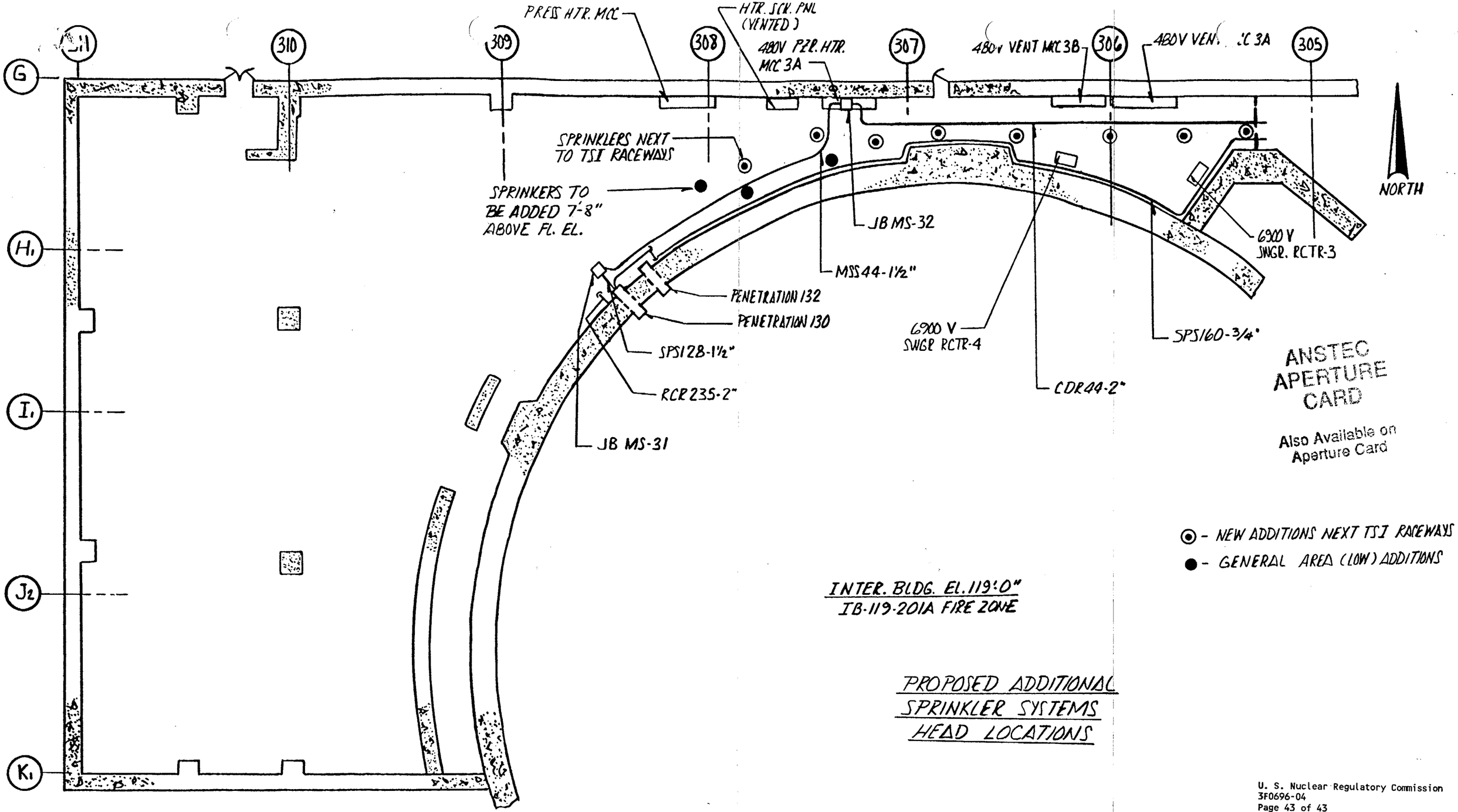
9606260270-07



PROPOSED ADDITIONAL SPRINKLER SYSTEMS HEAD LOCATIONS

FLORIDA POWER CORP

FIGURE 6A
INTER. BLDG. EL. 119'-0"
FIRE ZONE IB-119-201B



FLORIDA POWER CORP

FIGURE 6B
INTER. BLDG. EL. 119'-0"
FIRE ZONE IB-119-201A