John D. O'Toole
Vice President

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September 9, 1983

Re: Indian Point Unit No. 2
Docket No. 50-247

Mr. Darrell G. Eisenhut, Director
Division of Licensing
U. S. Nuclear Regulatory Commission
Washington, D. C. 20555

Dear Mr. Eisenhut:

In response to your letter of June 29, 1983, our letter of July 29, 1983 indicated that we would submit supplemental information in order to resolve concerns raised by the NRC staff in their draft SER. In subsequent telephone conversations, the staff requested additional information relative to the Appendix R exemption requests addressed in our January 10, 1983 and July 13, 1983 submittals. Enclosure 1 to this letter describes supplemental modifications for Indian Point 2 in order to more fully justify exemption requests submitted under 10 CFR 50.48(c) in our January 10, 1983 submittal. Enclosure 2 provides the fire hazards evaluation for the IP-1 Superheater Building and the construction of the non-rated steel wall separating the Central Control Room from the Alternate Safe Shutdown System cables located in the adjacent corridor. Enclosure 3 addresses various items related to emergency lighting, including supplemental information on exemption requests submitted under 10 CFR 50.12 in our July 13, 1983 submittal, clarification of emergency lighting for the containment area, and a description of our planned emergency lighting program. Enclosure 4 addresses Con Edison's commitments and requirements relative to fire barrier penetration seals. Enclosure 5 provides a change to previous commitments relative to protection for cables in Yard Manhole 21.

With respect to the commitments made in the Enclosures to this letter, a reasonable amount of time is necessary to enable us to fully develop the scope and schedule and to implement these items. We will make a best effort to complete the physical modifications by the end of the next refueling outage; however we will be unable to establish firm schedules until the full scope of the modifications is developed. Therefore, within 3 months of the date of this letter we will submit our firm schedule for these physical modifications.

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Certain exemption requests contained in our January 10, 1983 submittal made note of security guard stations in the yard area and in the Primary Auxiliary Building (PAB). Our justification for exemption noted that nearby security guards would provide further assurance of prompt detection and rapid response to fires that might occur. Our understanding from recent telephone conversations with NRC staff personnel is that no credit for these security guards was given in the recommendations granting the exemption requests for these areas. Recent changes in security assignments resulted in removal of security guards from these specific locations. Since adequate detection capability is provided in these zones or adequate alternative justification has been provided, removal of security guards will not diminish the fire protection capability provided in these areas, and it is anticipated that it will not affect NRC conclusions relative to the exemption requests in the yard area or in the PAB.

Exemption Request 4.14 (contained in our January 10, 1983 submittal) relied on intervening fire zones as being an adequate means to preclude propagation of fire from one zone through the intermediate zone and into an adjacent zone. As a result of supplemental modifications proposed in Enclosure 1, based on anticipated approval of exemption requests as a result of these committed modifications, and based on indicated approval of other exemption requests as noted in your June 29, 1983 draft SER, Exemption Request 4.14 is not required.

We believe that the proposed modifications described in these enclosures and the supplemental information that is provided, resolve the NRC Staff concerns raised in the August 10, 1982 letter and in your June 29, 1983 draft SER. In addition, Supplement 1 to the January 10, 1983 report which was submitted on July 13, 1983 contains information that overlaps certain items considered by the Staff in the draft SER. We also wish to note that our submittals of January 10, 1983, July 13, 1983, July 29, 1983 and this submittal, together with the October 8, 1982 revisions to the Indian Point Probabilistic Safety Study (IPPSS), supersede our submittal of March 19, 1981 and contain the required evaluation of the IP-2 fire protection features for Sections III.G, III.J and III.O of 10 CFR 50 Appendix R.

In our January 10, 1983 submittal we committed to provide a 55 minute fire barrier on certain cables in Yard Manhole 21 by the end of next refueling outage. Enclosure 5 to this letter which is being submitted for Staff review, revises the method of protecting the power cables in Manhole 21 and its implementation schedule. Enclosure 5 supersedes item 4 of Section 1.4 of the January 10, 1983 submittal. In addition, in items 6 and 8 of Section 1.4 of the January 10, 1983 submittal we committed to seal certain penetrations by the next refueling outage. Enclosure 4 to this letter revises the implementation schedule for items 6 and 8 in order to be commensurate with our systematic plans to survey and modify, as necessary, other penetration seals in IP-2. With the

exception of item 2, the implementation of the remaining items is underway. The necessary modification packages are developed, equipment is either on order or will be placed on order shortly, the requisite approvals and classifications are either in place or forthcoming and their completion is expected on a priority basis.

Should you or your staff have any questions concerning this submittal, please contact us.

Very truly yours,

John D. O'Toole

John D. O'Toole
Vice President

ENCLOSURE 1 -

SUPPLEMENTAL PLANT MODIFICATIONS

These modifications are being proposed in order to resolve concerns raised by the NRC staff with respect to several exemption requests included in Con Edison's January 10, 1983 submittal. Con Edison will make a best effort to complete these modifications by the end of the next refueling outage.

SER Section	Area/Zone	Modifications
2.0 (Exemption Request 4.1)	CCW (Zone 1)	• Wrap the 1 power feed conduit from transfer switch (EDF-9) to CCW pump 23 motor (refer to description of thermal wrapping below). • Partial separation barrier between CCW pumps 22 and 23 constructed of non-combustible material and extending approximately one foot beyond the width and height of the pump-motor assembly. The barrier shall be mounted on the curbing* between CCW pumps 22 and 23. • Partial separation barrier behind transfer switch (EDF-9) at el. 80' adjacent to CCW pit. The barrier shall be of non-combustible material and extend the width and height of the transfer switch.
2.0 (Exemption Request 4.12)	AFW (Zone 23)	• Wrap of conduits from AFW pump motor 23 box down to floor level (refer to description of thermal wrapping below). • Partial separation barrier between AFW Pumps 21 and 23 constructed of non-combustible material and extending approximately one foot beyond the width and height of the pump-motor assembly.

* To be installed per item 3 of Section 1.4 of the January 10, 1983 submittal.

ENCLOSURE 1

(Continued)

SER Section	Area/Zone	Modifications
3.0 (Exemption Request 4.2)	Piping/ Electrical Tunnel (Zone 1A)	• Wrap of instrument tubes in the fan house providing pneumatic indication for the alternate safe shutdown system of pressurizer level and pressure and steam generator level (refer to description of thermal wrapping below). • Upgrade of barrier to Zone 74A by sealing cable penetrations. • Upgrade the wall and floor/ceiling separating the piping penetration/electrical tunnel (Zone 1A) from the fan house (Zones 59A) to be 3-hour fire rated, including penetrations and door.
5.0 (Exemption Requests 4.4 and 4.6)	Charging Pump Room (Zone 5) and Corridor (Zone 7A)	• Provide additional smoke detection devices in Zone 7A to satisfy location and spacing requirements of NFPA 72E-1982. • Close off the doorway between Zones 5 and 7A by providing a rollup fire door (1-1/2 hour rated) and seal the area above the door.
7.0 (Exemption Requests 4.7 and 4.10)	Valve Rooms, Stairwell and Corridor (Zones 3A, 13A and 18A)	• Provide rollup fire doors (1-1/2 hour rated) and seal the area above the doors in the doorways to RHR 21 pump room (Zone 4).
9.0 (Exemption Request 4.9)	Control Room** (Zone 15)	• Upgrade floor penetration seals by filling to the thickness of the floor with a non-combustible material for those penetration seals that do not meet original design criteria. This upgrading will be conducted on an as needed basis in accordance with the periodic inspection frequency. This upgrading will be performed in accordance with the schedule contained in Enclosure 4.

** Also refer to fire hazards evaluation in Enclosure 2 for the Superheater Building to resolve further staff concerns.

ENCLOSURE 1

(Continued)

SER Section	Area/Zone	Modifications
11.0 (Exemption Request 4.13)	Electrical Penetration Area (Zone 74A)	• As described for SER item 3.0, the wall separating this zone from the piping penetration area (Zone 1A) will be upgraded by sealing cable penetrations.
13.0 (Exemption Request 4.14)	Several	None required. Potential deviations from Appendix R for the zones addressed have been resolved by modifications listed above or other exemption requests. This exemption request is being withdrawn.

Thermal Wrap Materials

To provide protection of the component cooling water pump cable in conduit, the AFW pump cable in conduit, and the instrument lines in Zone 1A, the B&B insulation "HEMYC System" will be used unless difficulties are experienced due to cable derating, construction, or procurement. Where such difficulties are experienced, one of the following protective systems will be used in lieu of the B&B insulation:

(1) Johns Manville "Thermo-12" insulation;

(2) TSI "Thermolag"; or

(3) 3M "M20A Mat".***

The protective system used for each of these applications will correspond to a configuration tested to ASTM E-119 to demonstrate a minimum 1/2 hour fire rating, using an acceptance criterion of 325°F maximum on the unexposed surface. These have been tested by an independent testing lab, or tests are witnessed by a representative of an independent lab, and will have included the hose stream test per ASTM E-119.

*** At present, sufficient test data is not available to support the 3M material, however, we understand that this material is currently under review by the NRC with favorable results expected soon. In our 3 month schedule update, we will be in a better position to include the 3M material as a possible alternative to satisfy the above commitments.

ENCLOSURE 2 -

FIRE HAZARDS EVALUATION - IP-1 SUPERHEATER BUILDING

Background:

The January 10, 1983 report on Indian Point 2 fire protection contained an exemption request for the Central Control Room (CCR) related to separation between the IP-2 controls in the CCR and components of the Alternate Safe Shutdown System (ASSS) located in the IP-1 Superheater Building. The exemption request noted that these components were separated by the portion of the CCR containing IP-1 components, and a non-rated wall along the south side of the CCR. The NRC's draft Safety Evaluation Report of June 29, 1983 requested further details concerning the fire hazards in the Superheater Building and the construction of the south wall of the CCR, including potential for fire propagation through this wall. This information was required in order to resolve certain NRC concerns, and allow granting of Exemption Request 4.9. This fire hazards evaluation provides the information that was requested.

The IP-1 Superheater Building previously contained components associated with power generation by Indian Point Unit 1. Indian Point Unit 1 has since been retired from service, and major components associated with the IP-1 superheater have been removed from the building. Building utilization has been changed to primarily office and computer room space, along with remaining electrical power distribution components from IP-1, some of which are now used for other applications such as the ASSS and for the IP-2 Technical Support Center (TSC).

Area Description:

The Superheater Building has several elevations. Elevation 53' corresponds to the CCR elevation. The general construction for the Superheater Buildng is multi-course brick construction on the north and east walls of the Superheater Building, corrugated steel along the south wall, and partially open to the IP-I Turbo-Generator Building on the west side. (Note that the IP-I turbine generator is out of service). The major part of the Superheater Building is taken up by the TSC. The TSC is enclosed as a separate area within the Superheater Building at several elevations. The following provides a general description of the Superheater Building contents at each elevation;

- Elevation 72' - This elevation contains office space associated with the IP-2 TSC. The office space is enclosed by concrete block or brick construction within the Superheater Building, with passageway area around the TSC. The TSC is approximately 4,000 square feet at this elevation. Ventilation fans associated with IP-I are also located at elevation 72'. This elevation of the Superheater Building is one level above the level of the CCR.

  Elevation 72' contains a limited amount of combustibles which are primarily general office supplies and reference material including files and drawings. Automatic sprinkler protection is provided over the entire office space and also for the air filtration unit charcoal filter. Sprinkler coverage is for an average density of approximately .16 gpm per square foot. Future office space may

also be added above elevation 72' (elevation 88') in the IP-I Superheater Building. Elevation 88' of the Superheater Building is presently used for temporary storage and currently contains little or no combustible material.

- Elevation 53' - This level of the Superheater Building is separated from the CCR by a wall of multi-course brick construction. A separate wall comes off of the brick wall forming a corridor between the brick wall and the CCR as shown by Figure I. Wall construction between points A and C and between points D and E in Figure I are multi-course brick construction. Cable tray and conduit penetrations between points A and B are sealed so as to avoid combustible pathways between the Superheater Building and the CCR.

  The west wall of the CCR is of 3-hour construction, with doors of 3-hour construction modified for security purposes. This wall contains no tray or conduit penetrations, and ventilation penetrations were recently closed off.

  Wall construction between points B and D from Figure I is steel panel construction. The wall is substantial steel clad over a hollow wall. Overall wall thickness is approximately 5 inches. With the substantial steel construction and the air space in the wall, substantial restriction to the propagation of fire is provided. Penetrating the steel clad wall is a non-rated door containing bullet-proof glass, approximately 22" wide by 28" high. Additionally an

observation window, of bullet-proof construction, 22" wide by 35" high is located in the wall as shown in Figure I.

With the substantial wall between points A and C that is separating the CCR and the corridor from potential hazards in the IP-I Superheater Building, and with the limited combustibles contained in the Superheater Building, the potential fire exposure to the steel wall would be extremely small. With this limited hazard, it is judged that the brick walls and the steel clad wall with the security door and window provide adequate barriers to protect the CCR from potential hazards in the Superheater Building. Additionally, the steel wall will provide a substantial barrier to protect ASSS cables routed in conduit in the corridor from potential fire hazards in the CCR.

Within the Superheater Building, elevation 53' also contains additional portions of the TSC, including computer room, office space, I&C workshop, a file room and NRC office space. Fire hazards in the area are typical office materials such as files, drawings and computer printout material. Files are located in metal cabinets. The technical support area at this elevation and computer room are protected by a total flooding Halon 1301 system actuated by smoke detection devices, with the exception of the conference room, janitor rooms, kitchen, telephone room and hallways. Automatic sprinkler protection is provided for the hallways, kitchen area, and conference room.

Outside of the TSC, the southeast corner at elevation 53' includes a pump vault protected by automatic sprinklers. The pump room contains IP-I superheater ignition pumps which are no longer used, 4 circulating water pumps associated with the house service boilers, and ignition oil transfer pumps for the house service boilers.

Three house service boilers are located along the east side of elevation 53' of the Superheater Building. One of these service boilers has been removed from service and is no longer operable. The service boilers operate on No. 6 fuel oil and are provided with combustion control features.

A small office room and storage room are located in the northeast corner of the Superheater Building at elevation 53'. The storage room is presently not used, but is planned to be used as a storage area for supplies of protective clothing.

- Elevation 33' - This level of the Superheater Building contains the IP-I Relay Room, IP-I M-G Set Room, support rooms for the TSC, and various IP-I load centers, transformers, and breakers. Combustibles at this elevation are limited primarily to electrical cables.

  The IP-I relay room contains cabinets, terminal boards and cable trays. Cables in cabinets are wrapped with abestos tape. Smoke detectors are located in each cabinet, and penetrations to the IP-I side of the CCR are stuffed with fiberglass or mineral wool.

The M-G Set Room contains cables in conduit and cable trays. The M-G Sets are small instrument type M-G Sets containing approximately a pint of lube oil in each.

Support rooms for the TSC include an Uninterruptable Power Supply (UPS) room and a battery room. Breakers in this area provide power supply for TSC equipment and other administrative services. The UPS room is provided with a total flooding automatic Halon 1301 system actuated by smoke detectors.

The general area at elevation 33' outside of the above rooms contains breakers associated with IP-1 equipment, IP-1 transformers that are of the dry type, motor control centers, and IP-1 breakers used for powering IP-2 components for the ASSS. Plans for this area include the addition of a new shower/locker facility and equipment storage area.

- Elevation 15' - This level of the Superheater Building contains limited combustibles and is located 2 elevations below the CCR. It includes the water factory which contains miscellaneous water treatment equipment as well as water treatment supplies such as phosphate and soda ash. The area does contain miscellaneous transient combustibles such as lube oil for servicing plant equipment as well as an equipment repair and service area.

Safety-Related/ Safe Shutdown Equipment

The IP-1 Superheater Building contains components used as part of the IP-2 ASSS. These components include load

centers, transformers, switchgear and controls providing a power supply from IP-1 for safe shutdown components in IP-2. The switchgear are located at elevation 33' and provide power for an IP-2 auxiliary feedwater pump, component cooling water pump, charging pump, and an additional supply for powering an SI pump, an RHR pump or MCC 27. Cables from the switchgear are routed along essentially two paths, one of which is into the IP-1 Turbo-Generator Building and then through the IP-2 Turbine Building in going to the auxiliary feedwater pump; and the other is up to elevation 53' and through the corridor adjacent to the CCR as shown in Figure 1. The walls between points A and C and between A and F in Figure 1 separate ASSS components in the Superheater Building from the CCR. Additionally, the wall along the north side of the corridor shown in Figure 1 (between points B and E) serves to separate ASSS cables passing through this corridor from components in the CCR.

Conclusion: Based on the above information, we find that the Superheater Building contains a low fire load and does not present a fire hazard to the CCR. Additionally the south wall separating the CCR from the adjacent corridor is of adequate construction to protect the alternate safe shutdown cabling in the corridor from a potential CCR fire, and vice versa. Accordingly, with the repairs to be made to the CCR floor penetrations as noted in Enclosure 1, Exemption Request 4.9 should be acceptable.

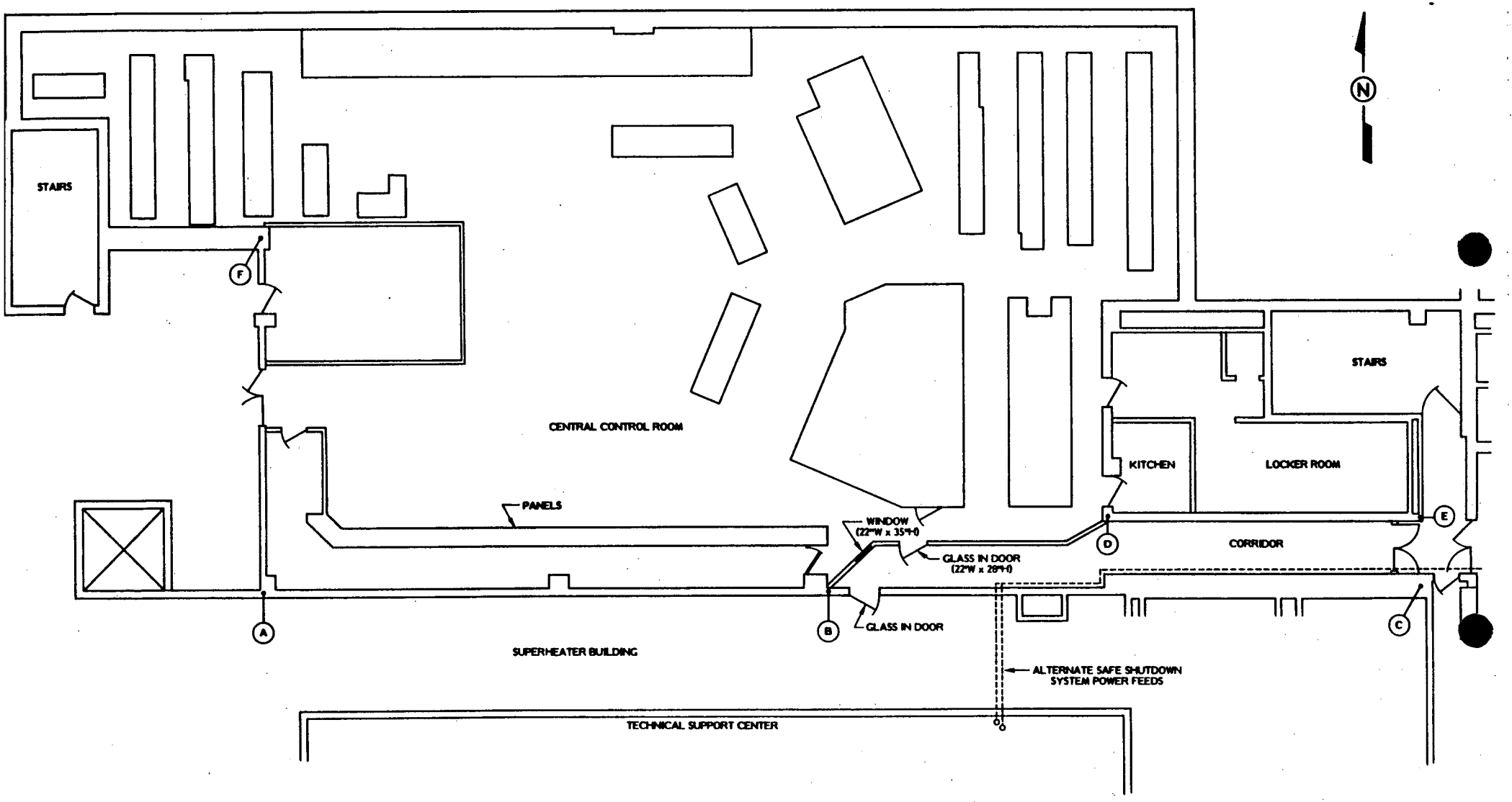

FIGURE 1

CONTROL ROOM/SUPERHEATER BUILDING INTERFACE

ENCLOSURE 3

EMERGENCY LIGHTING

3.1 REQUIREMENTS

10 CFR Part 50 Appendix R, Section III.J requires that:

> "Emergency lighting units with at least an 8-hour battery power supply shall be provided in all areas needed for operation of safe shutdown equipment and in access and egress routes thereto."

Supplement No. 1 to the TERA Corporation report entitled "Evaluation of Indian Point 2 Fire Protection Program for Consolidated Edison Company of New York", dated June 1983 and transmitted to NRC by letter dated July 13, 1983 contained information pertaining to Indian Point 2 emergency lighting, including two exemption requests, and a commitment to install additional emergency lighting units consistent with Appendix R III.J and requested exemptions.

In recent telephone conversations between Con Edison and the NRC, we understand that certain emergency lighting exemption requests submitted by Con Edison would not be acceptable as presently described. The NRC has indicated that with respect to emergency lighting in the yard area, the requirements of Section III.J of Appendix R must be satisfied. Additionally, emergency lighting units need not be considered as necessary for operations inside PWR containments; accordingly, exemption requests for emergency lighting inside containment are not required. The following provide alternative commitments and supplemental information for these areas, as well as consideration of emergency lighting for the piping penetration area and a clarification of the emergency lighting program.

3.2 CONTAINMENT EMERGENCY LIGHTING

Our January 10, 1983 report identified various valves where spurious operation could require local manual operation to correct valve position. For these valves, cable faults involving multiple hot shorts that are not interrupted would be required in order to cause spurious operation. Such failure modes, as discussed with members of the NRC staff, are considered of sufficiently low likelihood in a fire situation that provision of emergency lighting for operator actions inside containment is not necessary in order to satisfy Section III.J of Appendix R. Accordingly, battery backed emergency lighting units are not required by Appendix R to be provided inside the Indian Point 2 containment area.

3.3 PIPING PENETRATION AREA EMERGENCY LIGHTING

The piping penetration area (Zone IA) contains certain valves where access may be required in order to change valve position for operation of safe shutdown system components as well as for monitoring instrumentation located in the zone. Due to the elevated temperatures of the zone, location of the batteries to power the emergency lighting units will not be contained in the zone; however, emergency lighting fixtures will be provided in Zone IA that are powered from batteries outside of the zone. These will provide an 8-hour source of lighting for the piping penetration area. Accordingly, with this alternative design, the requirements of Section III.J will be satisfied for the piping penetration area. Consistent with Con Edison's previous commitment in the July, 1983 submittal for other emergency lighting units, Con Edison will make a best effort to install the emergency lighting units for the piping penetration area by the end of the next refueling outage.

3.4 YARD AREA EMERGENCY LIGHTING

To supplement Exemption Request 4.16 contained in our July 13, 1983 submittal, the following information is provided pertaining to the security system lighting available in the yard area. The fence perimeter lighting is powered from the security system emergency diesel which has a fuel capacity of at least 8 hours.

This perimeter lighting is in proximity to certain of the components in the yard area that must be operated or monitored in order to achieve safe shutdown in accordance with the criteria of Appendix R. Certain other emergency lighting that is provided for the yard is attached to the sides of buildings; however, this lighting is not picked up by the security system emergency diesel and may not be available due to fire damage in IP-2 fire zones. In order to assure that adequate emergency lighting is provided at locations in the yard area where operator actions are required, and in access routes to these locations, Con Edison will:

1. Perform a lighting level survey of the available lighting at the service water pump transfer switches, the switchgear on the IP-1 screenwell house that provides an alternate power supply to service water pumps 23 and 24, the condensate storage tank level gage, the RWST level gage, and access to these locations and to gas turbine GT-1;

2. Compare lighting levels to minimum established lighting criteria described in Section 3.6 below; and

3. Provide additional emergency lighting either as part of the security system lighting or alternative means in order to satisfy the minimum lighting levels described in Section 3.6 below.

Con Edison will make a best effort to complete items 1 and 2 by December 31, 1983, and item 3 by the end of the next refueling outage.

3.5 EMERGENCY LIGHTING PROGRAM

Currently, the emergency lighting units utilized at Indian Point Unit 2 for the purposes of meeting Appendix R, are Teledyne Big Beam Model No. 2TC6L100P2BKT. These units contain a 6 volt, rechargeable lead acid storage battery with 3-rate solid state charging, and automatic relay switching. Each battery unit powers 2, 25-watt sealed beam floodlamps. The illumination time of the units is 12½ hours rated to 87½% of nominal battery voltage (6 volts -5.25 volts). For surveillance and testing purposes the units contain a battery inspection window for observation of electrolyte level, three colored hydrometer indicating discs, a constant reading voltmeter, amber power supply "on" light,

red high charge indicating light, green light for indicating trickle charge and a momentary test switch for simulating power failure.

When maintained properly, these units meet the requirements of Appendix R, Section III.J with regard to illumination times. In addition, the number and location of units are selected based on providing adequate illumination levels for the specific operations anticipated in each local area and for access and egress thereto.

In order to assure an adequate availability of the emergency lighting units consistent with Appendix R, Section III.J, Consolidated Edison has implemented a procedure for periodic checking of installed emergency lighting units. Certain changes to this procedure will be made to provide adequate assurance that critical variables meet minimum required levels. With these changes the following will be provided:

(1) Procedures for monthly inspection and testing of the emergency lighting units including:

   (a) Check of battery specific gravity (colored hydrometer disc location);

   (b) Check and restoration of electrolyte level;

   (c) Check of A-C power supply;

   (d) Check of terminals and connectors for evidence of corrosion;

   (e) Verification of automatic operation by pressing test switch simulating loss of A.C. power; and

   (f) Check of battery discharge voltage.

(2) Inspection/test acceptance criteria that are consistent with (a) the manufacturer's recommendations, (b) the requirements of Appendix R, Section III.J and (c) the functional requirements for each unit.

(3) Requirements for maintenance, repair or replacement of units within 30 days of identification of deficiencies as defined by the acceptance criteria in (2) above and as evidenced by a signed and dated inspection/test report.

Consolidated Edison does not believe that random or periodic operability tests, undertaken by simulating a loss of A-C and operating the lighting units for the full 8-hour period required by Appendix R, Section III.J, are necessary or prudent for the following reasons:

(1) The monthly inspections/tests, associated acceptance criteria and corrective actions are adequate to identify unacceptable battery degradation, charging circuit malfunctions and/or lamp failures.

(2) Operating a lead acid battery in a substantially discharged state (greater than 50% discharged) or completely discharging the battery could result in damage to the battery plates. Accordingly, performing long duration discharge tests, that potentially result in either of these two conditions, could degrade battery performance and necessitate battery replacement.

(3) Substantially discharging the battery units for test purposes will result in the battery units not having their required 8-hour performance capability until sufficient recharging of the battery is accomplished. For the units currently employed at Indian Point 2, recharging from National Electric Code discharge voltage levels of 87½% of nominal battery voltage to full capacity can take 12 hours.

In summary, Con Edison's emergency lighting program includes the following:

- Selecting lighting units with an adequate design to provide the required lighting duration;

- Periodic inspection and checking of critical parameters to verify these meet minimum acceptance criteria;

- Replacement or repair of lighting units found not to satisfy minimum acceptance criteria within 30 days; and

- Provision at the access point into the area of hand held lighting units for interim use if required until repair or replacement of the faulty lighting unit.

The above program describes the methodology that Con Edison applies for implementation of the 8 hour functional requirement of III.J of Appendix R. Con Edison will make a best effort to provide required changes to procedures by December 31, 1983.

3.6 LIGHTING CRITERIA

In order to establish required lighting levels for operations that must be performed in the yard area, a review was performed of relevant sources (industry, international, military). Of the sources searched, only the military, the Illuminating Engineering Society (IES), Federal Aviation Administration (FAA) and National Fire Protection Association (NFPA) had relevant recommendations. Based on this review, minimum illumination criteria were established for four categories of local emergency operations.

Briefly, a number of considerations were used with respect to the criteria specified. These are:

1) No allowance for atmospheric conditions (snow, smoke, fog, rain)

2) Glare or lighting "hot spots" would not be a problem.

3) Legibility of switches, indicators and name plates would be maximized by appropriate human factors recommendations and all such items would be kept relatively clear.

4) The mesoptic region is the most suitable lighting range for the types of operations or observations that must be performed in the yard area. Although, conceptually, lower values could be used with scotopic (night) vision, the possibility of night vision loss due to an unexpected bright light source and the requirements for dark adaptation precluded consideration. Schematically, this is:

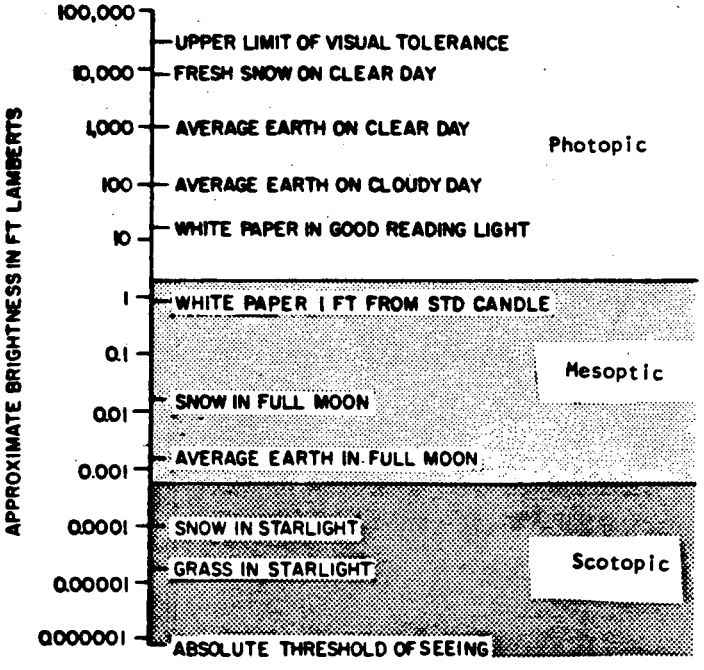

FIGURE 3-8. Examples of various levels of luminance.

(from Figure 3-8, Human Engineering Guide to Equipment Design*)

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* Human Engineering Guide to Equipment Design, Copyright 1963, McGraw-Hill Company

Terms Used:

- light falling on an area is measured in "foot candles" (ft-c) or "lux" (1 ft-c equals approx. .1 lux)

- light reflected from an area is measured in "foot lamberts" (ft-L). (ft-c x % reflectance = ft-L)

Required lighting levels for components in the yard area may be addressed as different categories:

3.6.1 Category I - Operating a Transfer Switch -

Only the military provides data for this requirement. The general military term is "control" which may be anything from a simple switch to a knob or a rotary selector. The simplest control, the transfer switch, requires only an indication of its position for operation. This is the same condition as reading a gage (see Category 3).

The Human Engineering Guide provides two essentially identical recommendations of 0.02 to 1 ft-L (Table 3-4) and 0.03 - 1 ft-L (Table 3-11) for indicators and moving pointer scales.

Because ft-L represent the light reflected from the switch, a conversion to light falling on it is required for easier measurement and survey. While the Human Engineering Guide provides an approximate reflection of 85% for white, lighter colors range from 55-75%, such as "dull white". Using a 60% reflectance,

$$\text{ft-c} = \frac{\text{ft-L (0.03 min.)}}{\text{60\% reflectance}} = 0.05 \text{ ft-c}$$

Lighting Criterion for Category I Functions - A value of 0.05 ft-c has been selected for transfer switch operation. The 0.05 ft-c level (representing 0.03 ft-L) provides sufficient light to prevent reading errors only slightly greater than obtained by higher levels. This is based on a study of the relationship between the luminance of indicator marks and the efficiency of reading them:

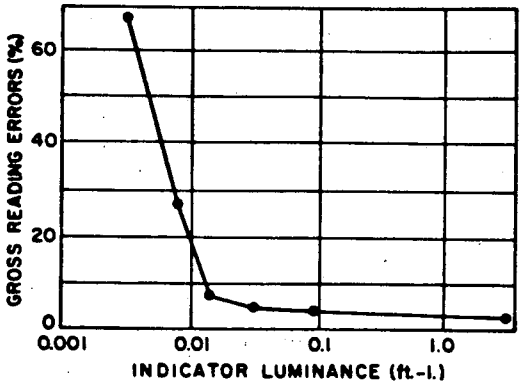

FIGURE 3-28. Instrument reading errors as a function of lighting (after Chalmers et al., 1950).

(Figure 3-28 - From Human Engineering Guide)

Note: More complex switches will require greater luminance than 0.05 ft-c. Night control operation in an Army vehicle is recommended at 3.2 lux (0.3 ft-c), for example. (MIL-HDBK - 759A - Human Factors Engineering Design for Army Material).

3.6.2 Category 2 - Reading Switch Designation (white letter, black background) -

The Human Engineering Guide to Equipment Design provides a low luminance value of between 0.03 and 1.0 ft-L for reading switch markings which are appropriately sized (0.15 -0.30" in height) and of a maximum legibility style (pp. 88-89). The category of these markings is: "Critical markings, position fixed (numerals on fixed scales, control and switch markings, emergency instructions).

Because ft-L represents reflected light levels, the reflectance factor must be included to convert to ft-c (or lux). Again, using a 60% reflectance,

$$\text{ft-c} = \frac{\text{ft-L (0.03 min.)}}{\text{60\% reflectance}} = \frac{\text{0.05 ft-c}}{}$$

Lighting Criterion for Category 2 Functions - A value of 0.05 ft-c has been selected for reading switch designations unless the size of the markings requires a higher illumination level based on the lighting survey.

3.6.3 Category 3 - Reading Gages (white face, black markings) -

The Human Engineering Guide (Table 3-4 and 3-II) provides two recommendation sources, with both being essentially the same, of 0.02/0.03 - 1.0 ft-L. Assuming that the scales and markings are appropriately designed for low luminance viewing (in a condition where dark adaptation is not necessary, but desirable), a conversion to ft-c can be performed in the same manner as for Category 2, reading switch designations.

Using the 0.03 (higher of the minimum) and a 60% reflectance, then 0.05 ft-c are required.

Lighting Criterion for Category 3 Functions - The use of 0.05 ft-c (0.5 lux) has been selected for reading gages unless the size of the markings requires a higher illumination level based on the lighting survey.

3.6.4 Category 4 - General Access and Egress

Three values were identified for the general population. In general, these values appear to be associated with three categories, as follows: (1) unfamiliarity, but with rapid egress; (2) familiarity/unfamiliarity, with leasurely egress; and (3) familiarity, with rapid egress to avoid major objects.

For (1): 11 lux (10.76 lux)* or 1 ft-c (minimum at all points)

- Life Safety Code, NFPA, Sec. 5-8.1.3 and Sec. 5-9.2.1 (1982)
- Visitor areas of nuclear power plants, high activity levels with slight hazards requiring visual detection (IES 1982 Lighting Handbook and CP-41 recommendation - "Nuclear Power Plant Light")

For (2): 5 lux (5.4 lux)* or 0.5 ft-c (minimum at all points)

- General areas of nuclear power plants, low activity levels with slight hazards requiring visual detection (IES-1982; CP-4).

For (3): 0.5 lux or 0.05 ft-c (average along aisle) -Aircraft emergency egress (FAR 25.812 -FAA)

* Rounding error, dependent upon original measurements.

Lighting Criterion for Category 4 Functions - An acceptable range is from 0.5 ft-c down to 0.05 ft-c (2 and 3) for plant personnel. The simple, direct routes chosen for post fire access and egress through various plant yard areas require for the most part major obstacle avoidance only, and therefore the lower value of 0.05 ft-c has been selected as the criterion for such areas. For complex routes, where many doors or stairs are encountered, a higher lighting criterion of 0.5 ft-c would be appropriate.

ENCLOSURE 4
FIRE BARRIER CABLE PENETRATIONS

Over the past several years Con Edison has made various commitments relative to requirements for fire barrier cable penetration protection in response to guidelines contained in BTP 9.5-1, Appendix A to the BTP, NRC staff requests or positions, and the NRC Safety Evaluation Report of January 31, 1979. Additionally, requirements for fire barriers and protection of penetrations are contained in Section III.G of 10 CFR 50 Appendix R. As a result of these, various upgrades to cable penetration seals have been made at Indian Point 2 over the last several years, and certain additional improvements will be made in the near future. Table 1 summarizes the sources of the fire barrier cable penetration commitments and requirements that apply to Indian Point 2, and has categorized these into 6 different types related to the source of the commitment.

In general it was found that fire barriers were relied on for various levels of fire protection, including separation of redundant safe shutdown components as well as simply limiting fire propagation and thus potential effects of the fire, even though the barrier may not be relied on to preserve safe shutdown capability. This could be summarized as shown in Table 2 which reflects the fire barrier cable penetration functional criteria for the various levels of penetration design. In order to clarify the requirements for fire barrier cable penetration seals, a review was performed for each of the commitments that have previously been made for Indian Point 2 fire barriers. Fire barriers that are relied on in order to satisfy Appendix R are not specifically addressed in this review since these are being discussed in the January 10, 1983 submittal and its related review. Table 3 identifies the sources of the commitment, the barrier affected, a summary of the commitment, an evaluation of the type of fire barrier cable penetration protection that is appropriate, and the associated functional criterion based on the commitment.

The result of this review essentially identified 3 levels of fire barrier penetration protection that are required. Criterion 1 fire barrier penetrations require a full 3-hour rating and would apply to certain barriers where specific commitments were previously made to have a 3-hour rated barrier as well as 3-hour rated

barriers that are relied on to satisfy Section III.G of Appendix R. The design used for upgrading these penetrations will be one listed by UL as a 3-hour rated penetration seal.

The Criterion II design penetration seal would be a design in accordance with the original IP-2 design criteria described in the Indian Point 2 fire hazards analysis as well as Con Edison's response to staff position P5, contained in a letter to the NRC dated September 18, 1978. A copy of the design description for this fire break follows the tables in this enclosure. The purpose of this design is to serve as a fire break for cable penetrations of walls, floors, or ceilings, and also to provide a means of smoke control between certain adjacent zones. This includes fire barriers identified in the Indian Point 2 Technical Specifications which require functional fire barrier penetrations for certain walls. For these walls, we have now determined that sealing of conduit and piping penetrations would also be appropriate to restrict smoke propagation. Criterion II seals that are removed or found not to meet the original design criteria will be upgraded to a 3-hour rated design, or filled to a thickness equivalent to that of the barrier with a non-combustible material.

The Criterion III fire barrier cable penetration seals apply to the remaining cable tray penetrations of walls, floors and ceilings, and are intended to serve as fire breaks to limit the propagation of fire along a combustible path between adjacent zones or rooms. The design of seals that must satisfy Criterion III is the same as defined for Criterion II, except that only cable tray (or exposed cable penetrations of floors into cabinets, panels, or switchgear) must be sealed. As with Criterion II seals, where the seals are removed or do not meet original design criteria, Criterion III seals will be upgraded to a 3-hour design or filled to a thickness equivalent to that of the barrier with a non-combustible material.

It should be noted that where fire barriers are relied on to separate redundant safe shutdown components (III.G of Appendix R), they are of the Criterion I design unless noted in exemption requests or other docketed information submitted to the NRC. The Criterion II and Criterion III penetrations are sealed with a design previously described to the NRC in order to serve as an effective fire break, but will be repaired or upgraded where removed or found not to meet original design criteria. Table 4 summarizes the fire barriers that are required to meet each of the 3 levels of functional criteria for fire barrier cable

penetrations, and the appropriate design that is to be applied to satisfy each of these functional criteria.

Modifications required to meet items 6 and 8, Section 1.4 of the January 10, 1983 report, are being completed on an expedited basis; Con Edison will make a best effort to complete these penetration seals by December 31, 1983. Con Edison will make a best effort to complete surveys to verify compliance with other criteria described above and required modifications by the end of the next refueling outage; in the interim, repairs to non-functional fire stops will be made using the original specified material.

TABLE I

SOURCES OF FIRE BARRIER CABLE PENETRATION COMMITMENTS/REQUIREMENTS

Type	Source
A	Technical Specification Fire Barriers
B	SER Fire Barrier Cable Penetrations
C	Commitments in Letters to the NRC
D	Comparison of IP-2 to Appendix A, BTP 9.5-1
E	Appendix R - 3-hour barriers
F	Appendix R Exemptions (less than a full 3-hour barrier)

TABLE 2

FIRE BARRIER CABLE PENETRATION FUNCTIONAL CRITERIA

Criterion No.	Functional Requirements
I	• 3-hour rated penetration seal (tested to ASTM E-119)
II	• Cable penetrations sealed as a fire break to prevent propagation and to control smoke; conduit and piping should also be sealed
III	• Similar to Criterion II, except only tray penetrations or exposed cable penetrations need be sealed

TABLE 3

REVIEW OF FIRE BARRIER CABLE PENETRATION COMMITMENTS[1/]

Item	Type	Location[2/]	Commitment	Evaluation/Comments	Functional Criteria
1.	A	15-F	Functional fire barrier penetrations	The purpose of the barrier and the penetration seal is to prevent fire propagation and transmitting of smoke. Barrier is not relied on to separate redundant safe shutdown components. Design only needs to be an adequate fire stop to prevent fire propagating along exposed cables. Propagation is difficult already, due to asbestos jacketing on cables.	II
2.	A	11-F	Functional fire barrier penetrations	The purpose of the barrier and the penetration seal is to prevent fire propagation and transmitting of smoke. Barrier is not relied on to separate redundant safe shutdown components. Design only needs to be an adequate fire stop to prevent fire propagating along exposed cables. Propagation is difficult already, due to asbestos jacketing on cables.	II

TABLE 3

(continued)

Item	Type	Location[2/]	Commitment	Evaluation/Comments	Functional Criteria
3.	A	32A-N	Functional fire barrier penetrations	The purpose of the barrier and the penetration seal is to prevent fire propagation and transmitting of smoke. Barrier is not relied on to separate redundant safe shutdown components. Design only needs to be an adequate fire stop to prevent fire propagating along exposed cables. Propagation is difficult already, due to asbestos jacketing on cables.	II
4.	B (31.25(12))	(See item 7)	Upgrade penetration seals to FP&L design	Since specific barriers are not identified in the SER, will have to rely on identification of critical barriers in NRC submittals (Item 7).	---
5.	B (31.25(7))	15-W 14-W 11-W	Penetration seals to be upgraded to 3-hour rated	Commitment calls for 3-hour fire rating. These barriers are also relied on for Appendix R, III.G, to separate alternate safe shutdown system components in the turbine building from redundant components in the control building.	I

TABLE 3

(continued)

Item	Type	Location[2/]	Commitment	Evaluation/Comments	Functional Criteria
6.	C (P5-UTN 12/12/78)	See Item 7.	Upgrade penetration seals to FP&L design.	Critical barriers are not defined in this NRC position or Con Edison response. Should refer to identification of critical in other submittals (Item 7).	---
7.	C (P5-UTN 9/18/78)	11-W 14-W 10-W (Intersection of 10-W with 32A)	Upgrade penetration seals to FP&L design.	The SER calls for these to be 3-hour rated. The intent of the FP&L design is to provide a 3-hour rating; however, it is Con Edison's understanding that the NRC has questioned the seal qualification. These penetration seals should be upgraded to a design that is 3-hour rated. (This is also noted above in the SER commitments for the control building barriers).	I
8.	C (P5-UTN 9/18/78)	Wall/floor penetrations by trays	Firestops provided where cable trays pass through walls and floors, and enter SWGR or other equipment.	Several designs are used for various situations. Purpose is to limit fire spread. Three-hour rating is not required.	III
9.	C (P17-UTN 9/18/78)	15-W (West wall of Control Room)	3-hour rated	Commitment calls for 3-hour rating. This is also called for in SER item (3.1.25(7)).	I

TABLE 3

(continued)

Item	Type	Location[2/]	Commitment	Evaluation/Comments	Functional Criteria
10.	D (Pg. 8-49)	Wall/floor penetrations by trays (or penetrations into cabinets by cable from the tray below).	Firestops provided where cable trays pass through walls and floors, and enter SWGR or other equipment.	Same as Item 8.	III
11.	D (Pg. 8-91)	II-E II-W II-S II-N II-C II-F	Cable penetrations are sealed with Flamemastic 71A fire retardant coating.	This refers to one of the two construction methods in the original IP-2 design basis that used Flamemastic (i.e., transite board with Flamemastic or the fiberglass with Flamemastic). Either of these designs serves as an adequate fire break. II-F is also Functional Criterion II to satisfy Item 2.	III
12.	E	Several	Penetration seals to be upgraded to 3-hour rated	Upgrade as required to a 3-hour fire rating consistent with the III.G Appendix R evaluation.	I
13.	F	Several	Less than 3-hour, or nonrated as specified in Exemption Requests.	Upgrade as required.	II

1/ Note that this only addresses commitments prior to Appendix R. Where there is overlap between these commitments and Appendix R requirements, the evaluation in this table takes the Appendix R requirements into account.

2/ Location Code is "XX-Y", where "XX" is the fire zone number, and "Y" indicates whether it is the East, West, North, or South wall, the floor or the ceiling.

TABLE 4
SUMMARY - IP2 FIRE BARRIER
CABLE PENETRATION SEALS

	Criterion	Barrier	Design/Requirements 3/
Criterion I	(3-hour rating required)	10-W (32A-E) 11-W 14-W 15-W 3-hour barriers to satisfy Appendix R.	Provide cable firestop design tested to ASTM E-119 and listed by UL as a 3-hour fire rated design. Seal mechanical penetrations with similar design.
Criterion II	(Sealed to serve as a firebreak and for smoke control)	11-F 15-F 32A-N Barriers relied on for Appendix R exemption requests, but noted as not being 3-hour barriers.	Cable firestop design to meet original IP-2 design criteria to serve as a firebreak. Seal mechanical penetrations with a similar design. Where cable firestops are removed, damaged or otherwise found to not meet the original design criteria, these will be upgraded to a 3-hour rating or filled to a thickness equivalent to that of the floor with a non-combustible material. (Note that this is already being done for the Control Room floor as described in Enclosure 1).
Criterion III	(Seal exposed cables to serve as a firebreak)	Exposed cable penetrations of walls and floors not required to meet Criterion I or Criterion II.	Cable firestop design to meet original IP-2 design criteria to serve as a firebreak for exposed cable penetrations of walls, floors, and ceilings. Where cable firestops are removed, damaged or otherwise found to not meet the original design criteria, these will be upgraded to a 3-hour rating or filled to a thickness equivalent to that of the floor with a non-combustible material.

3/ As part of our ongoing fire protection program, verification will be performed to determinre required changes to meet these requirements.

DESCRIPTION OF IP-2 CABLE PENETRATION SEALS - ORIGINAL DESIGN CRITERIA

The original design criteria for Indian Point 2 called for firestops to be provided where cable trays pass through walls and floors, and enter switchgear on other equipment. Three types of firestops are used according to the function of the cable in the tray (control, power, etc.) and ventilation requirements of the areas involved. The first type of firestop is used in trays containing control cables passing through walls, floors, or into equipment where an air seal is not required. It is composed of two alumina-silica ceramic fiber blankets, 36 inches long, laid in the tray and compressed around the cables by the cable tray cover. An ignited cable would be extinguished by this firestop because the ceramic fiber blanket limits the oxygen supply. The blanket has a low thermal conductivity and can be used at temperatures up to 2300°F, without showing any physical change. Even beyond that temperature, it retains its fire retardant characteristics.

Because of its low thermal conductivity and the fact that it covers three feet of cable surface area, this blanket cannot be used with power cables, which generate a considerable amount of heat. In addition, it cannot easily be installed in control trays, where an air seal of the wall or floor opening is required for ventilation purposes. The firestop used for these configurations consists of (1) a transite sheet to substantially close the opening, (2) Flamemastic 71A Mastic applied on the cables for 6 inches on either side of this sheet, and (3) Flamemastic 71A Mastic trowelled into the cable tray on top of the cables to seal any remaining air passage between rooms.

The third type of firestop is used only for openings in the floor where control or power cables enter switchgear, motor control centers, supervisory cabinets, or other equipment from the tray below. This configuration combines packed fiberglass with a ¼" coating of Flamemastic 71A applied on either side of the closure. It provides both protection and separation of cables as they pass through the floor. This type of firestop is used where control cables enter the panels in the Control Room floor.

ENCLOSURE 5

MANHOLE 21 PROTECTION

Exemption Request 4.15 in our submittal of January 10, 1983 described protection that would be provided in lieu of full compliance with Appendix R in order to protect redundant service water pump power cables located in Manhole No. 21. Our commitment was that power cables associated with Service Water Pumps 23 and 24 would be enclosed by a fire barrier material that has been tested to a rating of 55 minutes, the fire barrier material would be installed by the end of the next refueling outage and a fire watch would be posted during periods when work was taking place in the manhole prior to installation of the barrier material. Con Edison's plans were to use TSI Thermolag material to provide the required fire rating.

In attempting to finalize the design using the TSI material, several problems were encountered. Since the cables in the manhole come out of one series of conduits or duct banks and turn to go in an adjacent duct bank, the cables do not make a smooth transition within the manhole. Thus, based on cost of enclosing these with TSI Thermolog, difficulty in installing the TSI in the manhole, and the reliability of the final application since the TSI may easily be damaged in future cable pulls. Con Edison has evaluated other options for protecting the redundant service water cables in Manhole No. 21. In lieu of the TSI material, Con Edison plans to fill the manhole with sand. For later cable pulling operations, the sand would be temporarily removed. During periods when the sand is removed, a continuous fire watch would be posted.

Con Edison is planning to modify the circulating water system to provide variable speed controls. This modification will require cable pulling through Manhole 21, and is scheduled to take place beginning in December 1983 and to be completed in late 1984. This would run beyond the end of the 1984 refueling outage (currently scheduled to be July 1, 1984). Work in Manhole No. 21 will not

be continuous over that period; access to the manhole would be required only for cable pulling. Per our previous commitment, a continuous fire watch will be posted at all times that such cable pulling operations take place. Placement of the sand in Manhole No. 21 during the 1984 refueling outage would require removal and replacement of sand several times in 1984 after the refueling outage to complete the circulating water pump control modifications. To avoid excessive activities in the manhole, such as frequent installation and removal of sand, Con Edison proposes to defer the date for final service water power cable protection for several months, but to provide compensating protection by use of a fire watch.

Con Edison therefore wishes to revise the commitment for Manhole 21 in the January 10, 1983 report to fill the manhole with sand in lieu of the fire barrier material. The following will be satisfied for this alternative approach:

- Placement of sand in Manhole 21 in lieu of the 55 minute rated barrier;
- Provide a continuous fire watch for periods when the sand is removed;
- Install the sand commencing December 31, 1984; and
- Prior to December 31, 1984, provide a continuous fire watch to be posted during all maintenance activities in Manhole 21 and when the Manhole 21 cover is removed.