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MEMORANDUM FOR: V. Benaroya, Chief, Auxiliary Systems Branch, DSS
FROM: Faust Rosa, Chief, Power Systems Branch, DSS
SUBJECT: FIRE PROTECTION STATUS REPORT, DIABLO CANYON
UNITS 1 & 2, POWER SYSTEMS BRANCH

The enclosed first protection status report covers those portions of the Diablo Canyon Fire protection review for which the Power Systems Branch has secondary review responsibility. This report is based on amendment 51 to the FSAR, supplemental information provided by the applicant dated February 6, 1978, June 6, 1978, and August 3, 1978 and the site visit on February 14 and 15, 1978.

Items 1c, 2, 24 and 25 of the enclosure will require additional information from the applicant and evaluation by the Power Systems Branch.

Items 1d, 8, 10, 13, 14, 15, 22, 23 and 26 identify fine areas containing redundant safe shutdown cables. The acceptability of the protection provided these conduits should be evaluated by the Auxiliary Systems Branch.

*Original signed by
Faust Rosa*

Faust Rosa, Chief
Power Systems Branch
Division of Systems Safety

Enclosure:
As stated

cc: R. Tedesco
P. Hearn
D. Fischer
J. Stolz
D. Allison
J. Knox

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OFFICE	DSS:PSB	DSS:PSB			
SURNAME	JKnox:sl	FRosa F.R.			
DATE	9/14/78	9/22/78			

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UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D. C. 20555

SEP 22 1978

MEMORANDUM FOR: V. Benaroya, Chief, Auxiliary Systems Branch, DSS
FROM: Faust Rosa, Chief, Power Systems Branch, DSS
SUBJECT: FIRE PROTECTION STATUS REPORT, DIABLO CANYON
UNITS 1 & 2, POWER SYSTEMS BRANCH

The enclosed fire protection status report covers those portions of the Diablo Canyon Fire protection review for which the Power Systems Branch has secondary review responsibility. This report is based on amendment 51 to the FSAR, supplemental information provided by the applicant dated February 6, 1978, June 6, 1978, and August 3, 1978 and the site visit on February 14 and 15, 1978.

Items 1c, 2, 24 and 25 of the enclosure will require additional information from the applicant and evaluation by the Power Systems Branch.

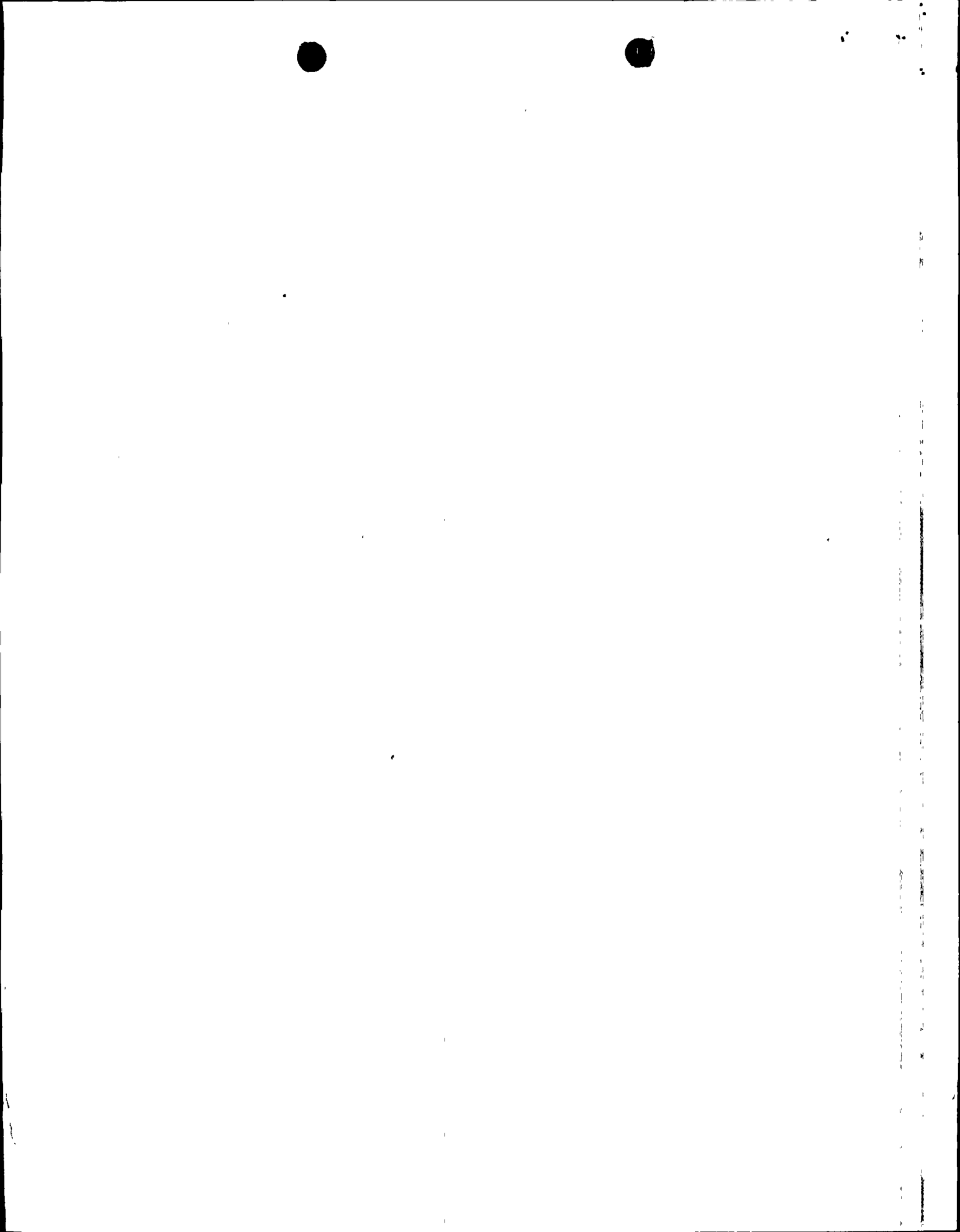
Items 1d, 8, 10, 13, 14, 15, 22, 23 and 26 identify fire areas containing redundant safe shutdown cables. The acceptability of the protection provided these conduits should be evaluated by the Auxiliary Systems Branch.

A handwritten signature in cursive script that reads "Faust Rosa".

Faust Rosa, Chief
Power Systems Branch
Division of Systems Safety

Enclosure:
As stated

cc: R. Tedesco
P. Hearn
D. Fischer
J. Stolz
D. Allison
J. Knox

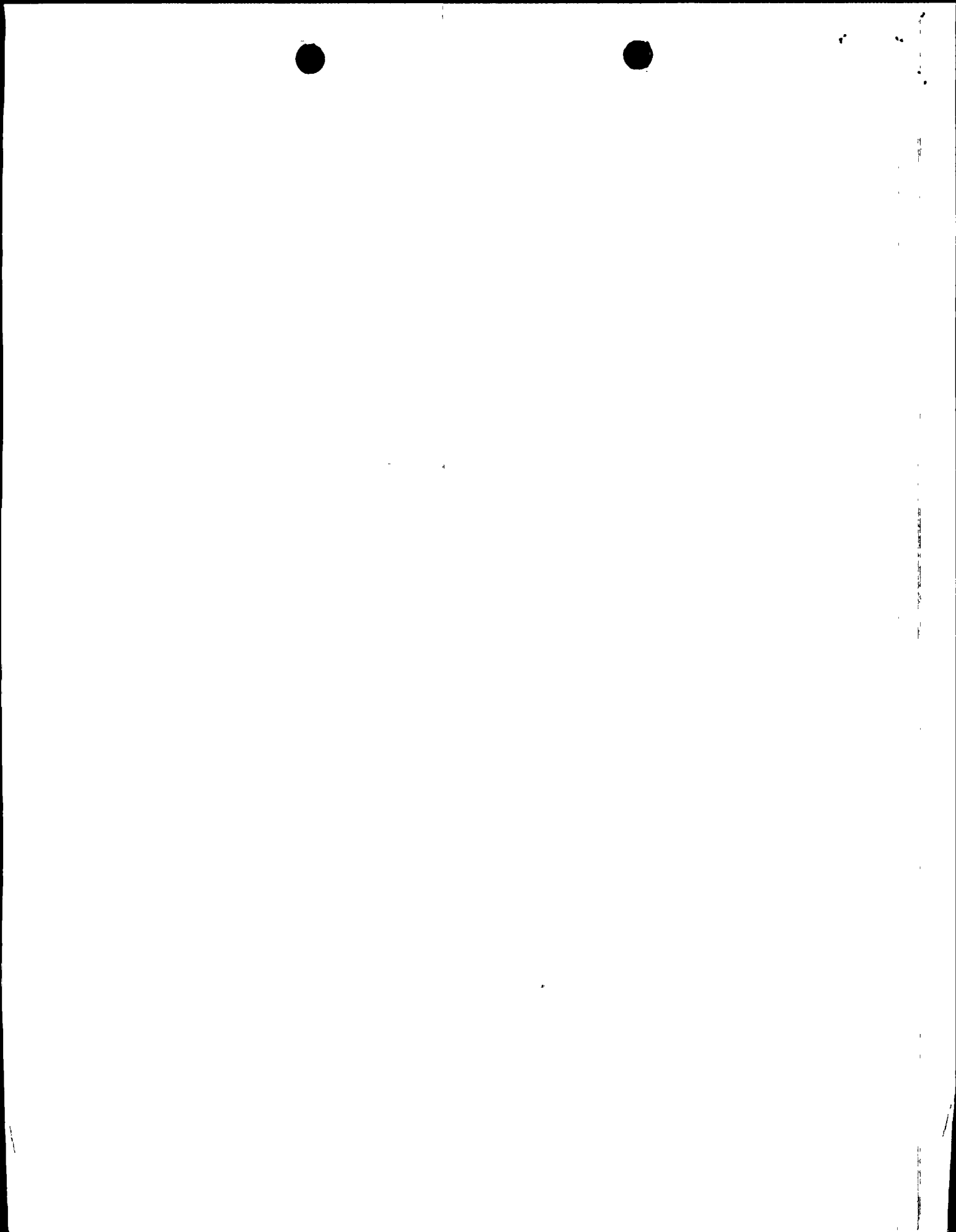


Fire Protection Report
(Power Systems Branch)
Diablo Canyon Units 1 & 2
50-275/50-323

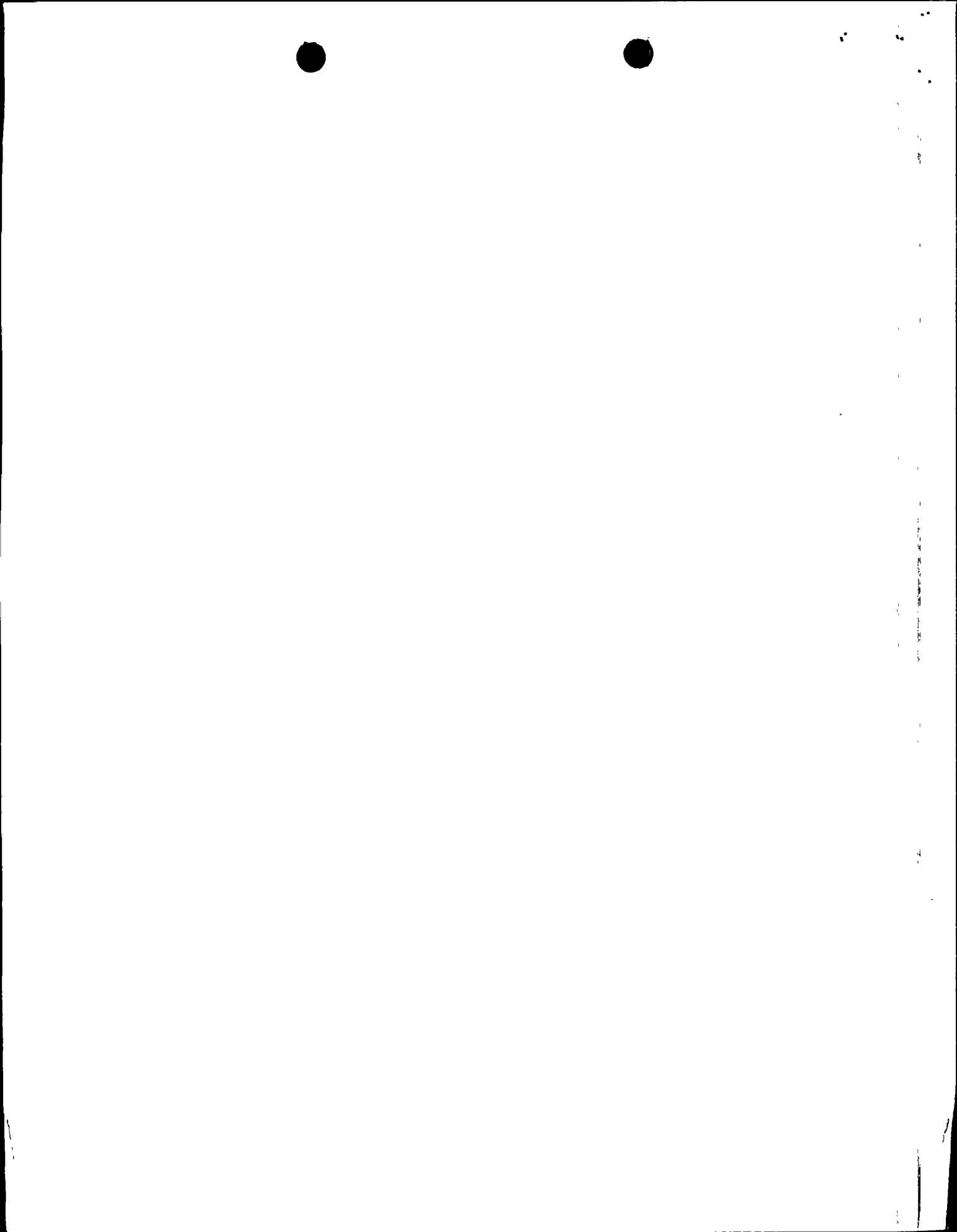
1) Fire Area 1-A: Figure 3-9

For the penetration area inside containment, the applicant identified a number of redundant conduits containing essential safe shutdown cables on drawing 57687. These conduits are located below the open floor grating at elevation 117 ft. We noted that open cable trays were located above and that primarily piping was located below the conduits. Since this piping does not contain flammable liquids, gases, or oxygen, and since the open space at floor elevation 91 ft. and below the conduit is kept free of combustible materials, we agreed that a propagating fire is unlikely in this area and that the effects of a transient combustible initiated fire over more than 20 feet diameter is improbable.

For the exposure fire of 20 feet diameter or less, we required from the applicant the results of an analysis that demonstrates that the total number of redundant cables in fire area 1A for each of the following instruments will not be reduced below an acceptable number. Our evaluation of the information submitted follows:



- A. Steam Generator Level: Information describing the physical separation between the cable in fire area 1A associated with steam generator level instrumentation has been documented on drawings 57685 and 57687 and in response to NRC question number 9. Based on our review of this information, we conclude that no single fire of 20 feet diameter or less will reduce the required redundancy below an acceptable level and is, therefore acceptable.
- B. Reactor Coolant System Temperature: Refer to item 3 for our evaluation of the separation between cable associated with the reactor coolant system temperature instrumentation in both fire area 1A and 1B.
- C. Reactor Coolant System Pressure or Pressurizer Pressure: Information has not been provided describing the physical separation between the cable in fire area 1A associated with the reactor coolant system pressure and the pressurizer pressure instrumentation. We will pursue this with the applicant and report our resolution in a supplement to this report.
- D. Pressurizer Level: Information describing the physical separation between the cable in fire area 1A associated with the pressurizers level instrumentation has been documented on drawings 57685 and 57687 and in response to NRC question number 9. Pressurizer level signals are initiated by three redundant transmitters. One of 3 of these signals is required for shutdown.



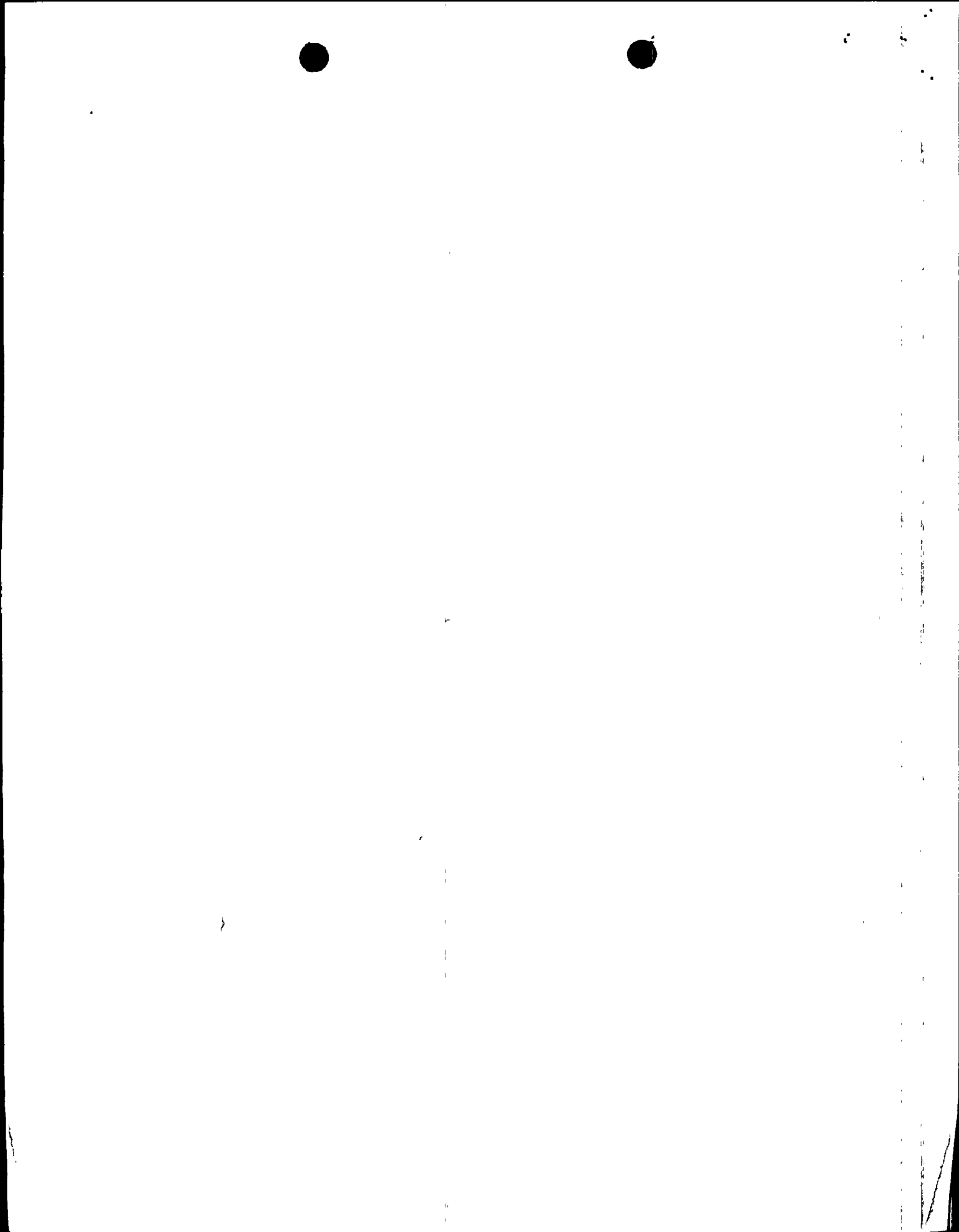
The cables associated with these signals are routed within 20 feet of each other for 180° around containment and outside the missile barrier from the vicinity of the pressurizer to the penetrations area. These cables would be subject to failure if exposed to a single 20 foot or less exposure fire. The acceptability of the protection provided these conduits will be evaluated by ASB.

2) Fire Area 1-B, Figure 3-9

In the vicinity of Reactor Coolant Pump Number 1-2, the applicant identified redundant safe shutdown instrumentation sensing lines (tubing) for the pressurizer level and pressurizer pressure indications. The sensing lines would be subject to simultaneous failure from an exposure fire from the reactor coolant pump oil leakage. The applicant agreed to protect these sensing lines by a heat shield. (Response to question 54). We find this acceptable.

3) Fire Area 1-A and 1-B, Figure 3-9

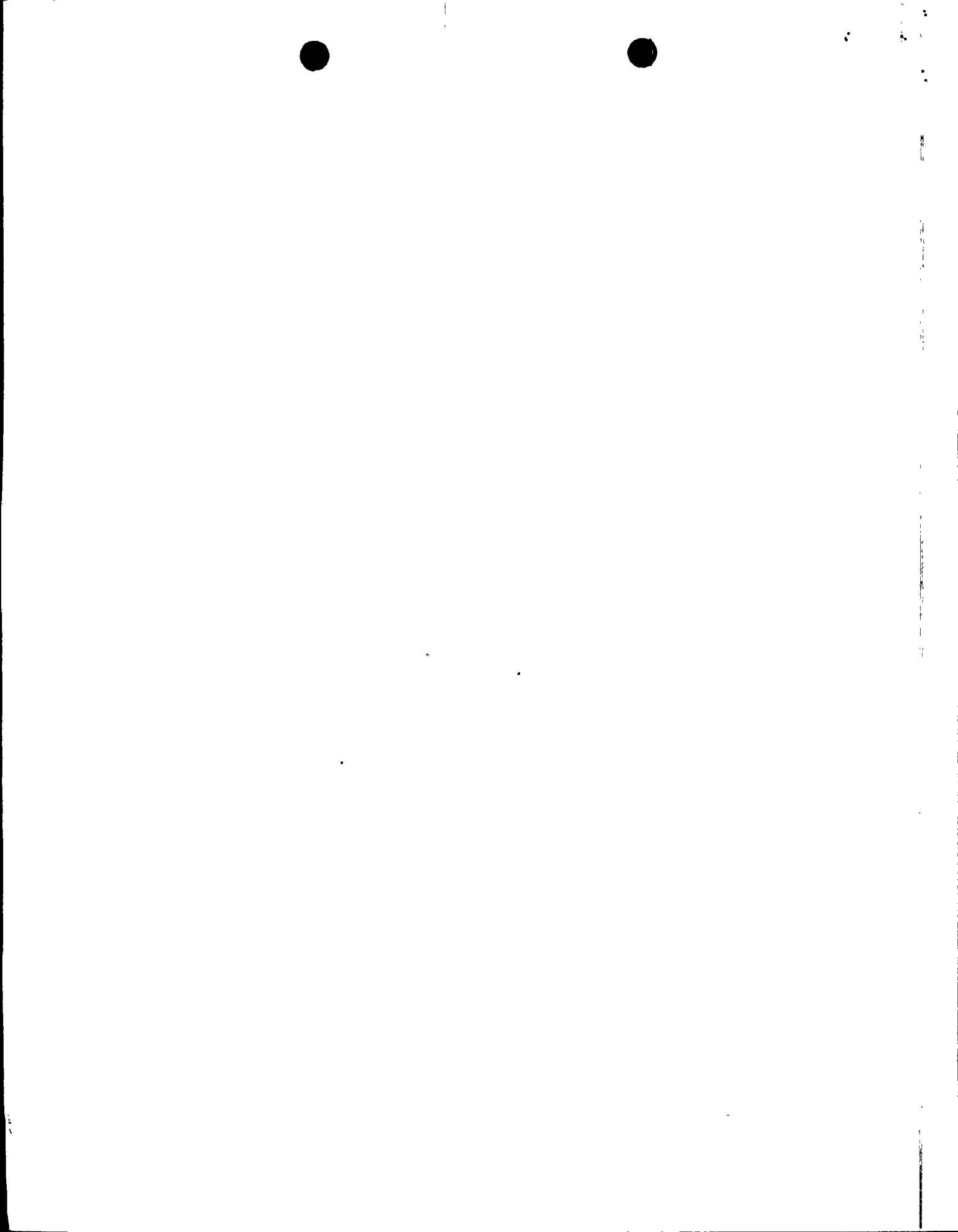
In fire area 1-B the applicant has stated that cabling associated with 4 of 8 Reactor coolant system temperature elements would at most be affected by a reactor coolant pump fire or any single fire. Information describing the physical separation between these eight temperature elements has been documented on drawings 57684, 57685, 57686, and 57687 and in response to NRC question number 9. Based on our review of this information we conclude that no single fire of 20 ft. diameter or less in fire areas 1A and 1B will reduce the required redundancy below an acceptable level and is, therefore, acceptable.



4) Fire Area No. 3-H-1, 3-J-1, 3-J-2, and 3-J-3: Figure 3-6

On the walls and ceiling of the room containing the three component cooling water pumps and the room containing the two centrifugal charging pumps, the applicant identified redundant conduits containing cables essential to safe shutdown on drawings 57691 and 57692. However, during the site visit, the applicant indicated that these conduits identified may not contain cables essential for safe shutdown or may not contain redundant divisions of essential cables. If these conduits do in fact contain cables essential for safe shutdown and are redundant, we informed the applicant that we will require that the conduits be encased with a 2-hour rated fire barrier or equivalent protection. This protection would be in addition to automatic area sprinklers.

As a result the applicant identified conduits that do in fact contain cables essential for safe shutdown and are redundant. The degree of physical separation between these cables has been identified in Section 5 of the applicants Supplementary Information for Fire Protection Review, dated June 6, 1978.



Even though these conduits are separated by 15 feet and there are generally area sprinklers covering one of the two conduits, it is the staff's position that these conduits be encased with a two hour fire barrier or equivalent protection. Based on the encasement of these conduits, the staff finds the design acceptable.

Conduit containing cable associated with the three redundant charging pumps are located in fire area 3-H-1, 3-J-2, and 3-J-3. These cables are associated with low lube oil pressure trip signal circuitry to the charging pumps. The applicant has proposed a procedure for bypassing this circuitry described in response to NRC question number 12. We find this acceptable.

5) Fire Area 3L (north east corner): Figure 3-7

In the auxiliary building at elevations 85 feet the motor driven auxiliary feedwater pump conduits pass over and adjoin non-safety related electrical cabinets and cable trays. These conduits are numbered K6998 and K6993 and are identified on drawing 57616. Because of the exposure these essential conduits are subject to and because of the poor accessibility for manual fire fighting, we informed the applicant that we will require these cables be encased.

As a result, the applicant has committed to the encasement of these conduits with two hour fire rated barriers. We find this acceptable.

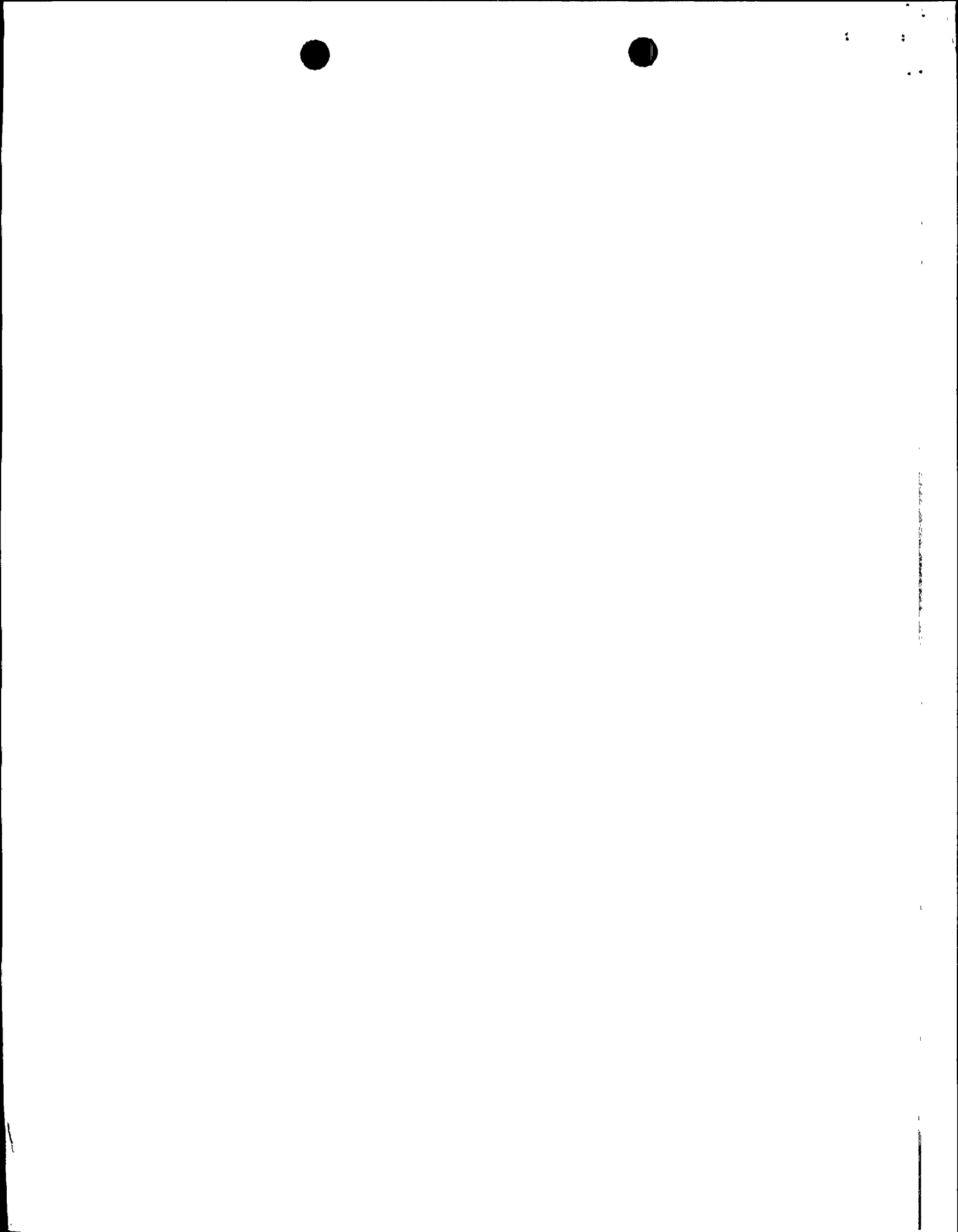


6) Fire Area 3-L, Figure 3-7

The applicant has identified a number of conduits containing power cables to redundant safe shutdown systems. These conduits penetrate high in the west wall of Fire Area 3-L and immediately leave fire area 3-L through the ceiling. The applicant has stated that fire exposure is limited to a junction box and approximately one foot of conduit. The acceptability of the protection provided these conduits has been evaluated by ASB and found acceptable.

7) Fire Zone 3-P-3, Figure 3-7 (also fire area S-3)

On the hallway ceiling located between the east end of the penetration area at elevation 85 feet around the auxiliary building, the applicant has identified conduit containing cables associated with the motor driven auxiliary feedwater pumps. These conduits are identified on drawing 500824. Because conduits associated with redundant turbine driven auxiliary feedwater pumps are located elsewhere and because this hallway space is now and will most likely remain free of combustibles in the future, we find the existing protection acceptable.



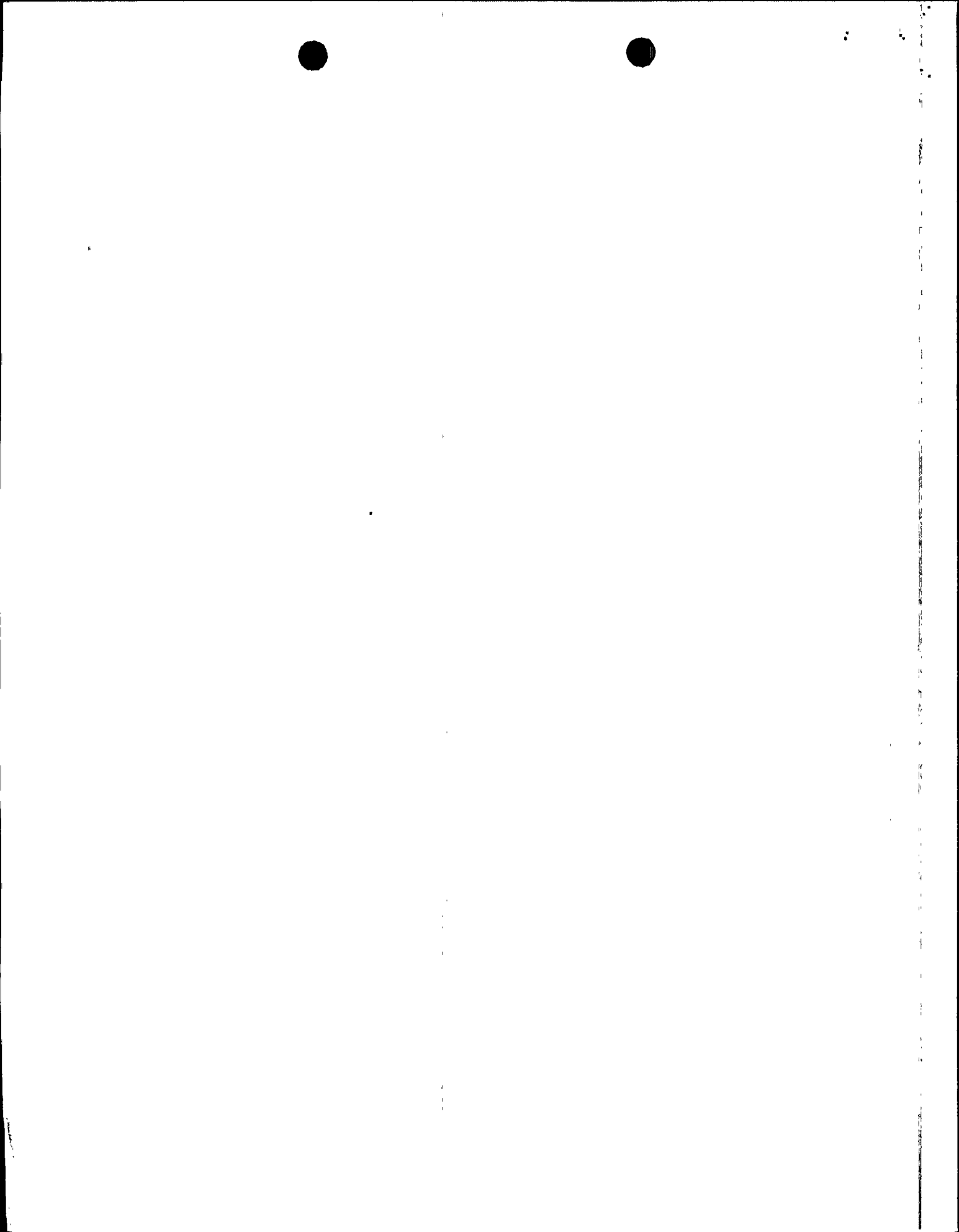
8) Fire Area 3-Q-2, Figure 3-8

The applicant identified redundant power and control cables associated with the three auxiliary feedwater pumps in fire area 3-Q-2. The applicant proposed re-routing the power and control cables to FCV-95 associated with the turbine driven auxiliary feedwater pump. We find this acceptable. The re-routing of the cables to FCV-95 will be through fire area 3-BB elevating 85, 100, and 115 feet. The spacial separation between FCV-95 cable circuits and its' redundant counterparts is 30 feet in fire area 3-BB at elevation 85 feet and 25 feet in fire area 3-BB at elevation 100 and 115 feet. The acceptability of the protection provided these conduits will be evaluated by ASB.

9) Fire Zone 3x, Figure 3-8

In the auxiliary building at elevation 91 feet between the boric acid transfer pumps and the room housing the auxiliary feedwater pumps, the applicant identified conduits containing cables essential for safe shutdown on drawing 57615. Because of the concentration of safety related conduits in this area, we informed the applicant that we will require automatic sprinklers be installed between the boric acid transfer pumps and the room housing the auxiliary feedwater pumps.

As a result, the applicant has committed to the installation of automatic sprinklers. We find this acceptable.

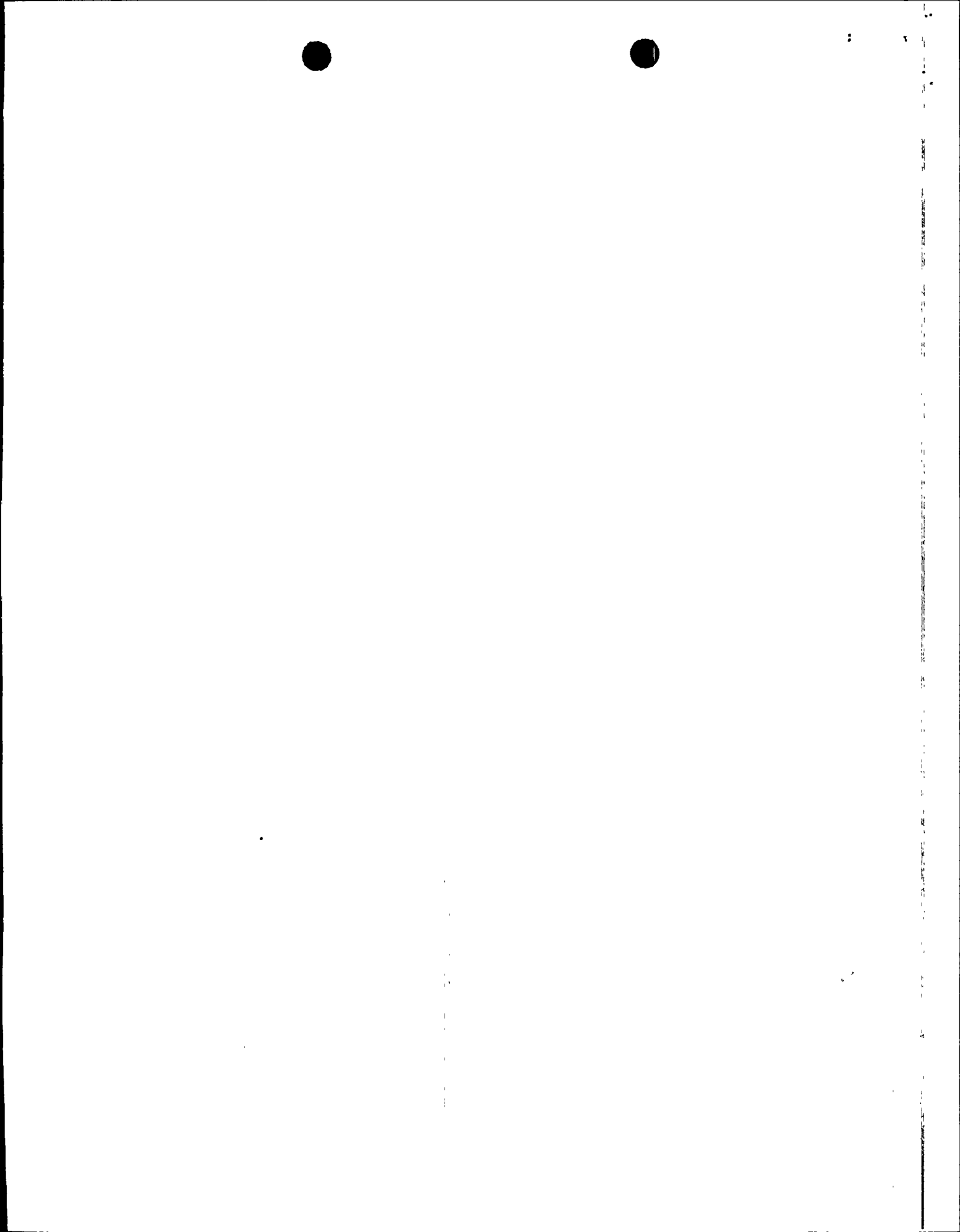


10) Fire Area 3BB Elevation 100 ft., Figure 3-8

For the penetration area outside containment at elevation 100 feet, the applicant identified numerous redundant conduits containing cables essential to safe shutdown on drawings 502078, 57595, and 57580.

Because of the concentration of safety related conduits, we informed the applicant that we will require all of this area be protected by automatic sprinklers. In addition, the applicant was requested to identify all conduits where their redundant counter parts are separated by less than 15 ft. The applicant was informed that in addition to the general area sprinklers, redundant conduits with separation less than 15 feet should be encased with 2-hour rated fire barriers or provided with equivalent protection.

The applicant identified conduits where their redundant counterparts are separated by less than 15 feet on drawing 502078 (submitted June 6, 1978). The conduits (KT 243 and KT 242) are associated with the motor driven auxiliary feedwater system valves, LCV 110, LCV 111, LCV 113, and LCV 115. These valves' redundant counterparts (LCV 106, LCV 107, LCV 108, and LCV 109) which are associated with the turbine driven Auxiliary Feedwater System, are located in conduits K5971 and K5254, and are separated by less than 15 feet as shown on drawings 502078 and 57580.



In addition conduits associated with the three redundant auxiliary feedwater systems cross as shown on drawing 502078. The acceptability of the protection provided safe shutdown conduits located in fire area 3-BB will be evaluated by ASB.

11) Fire areas involving ventilation system for safe shutdown.

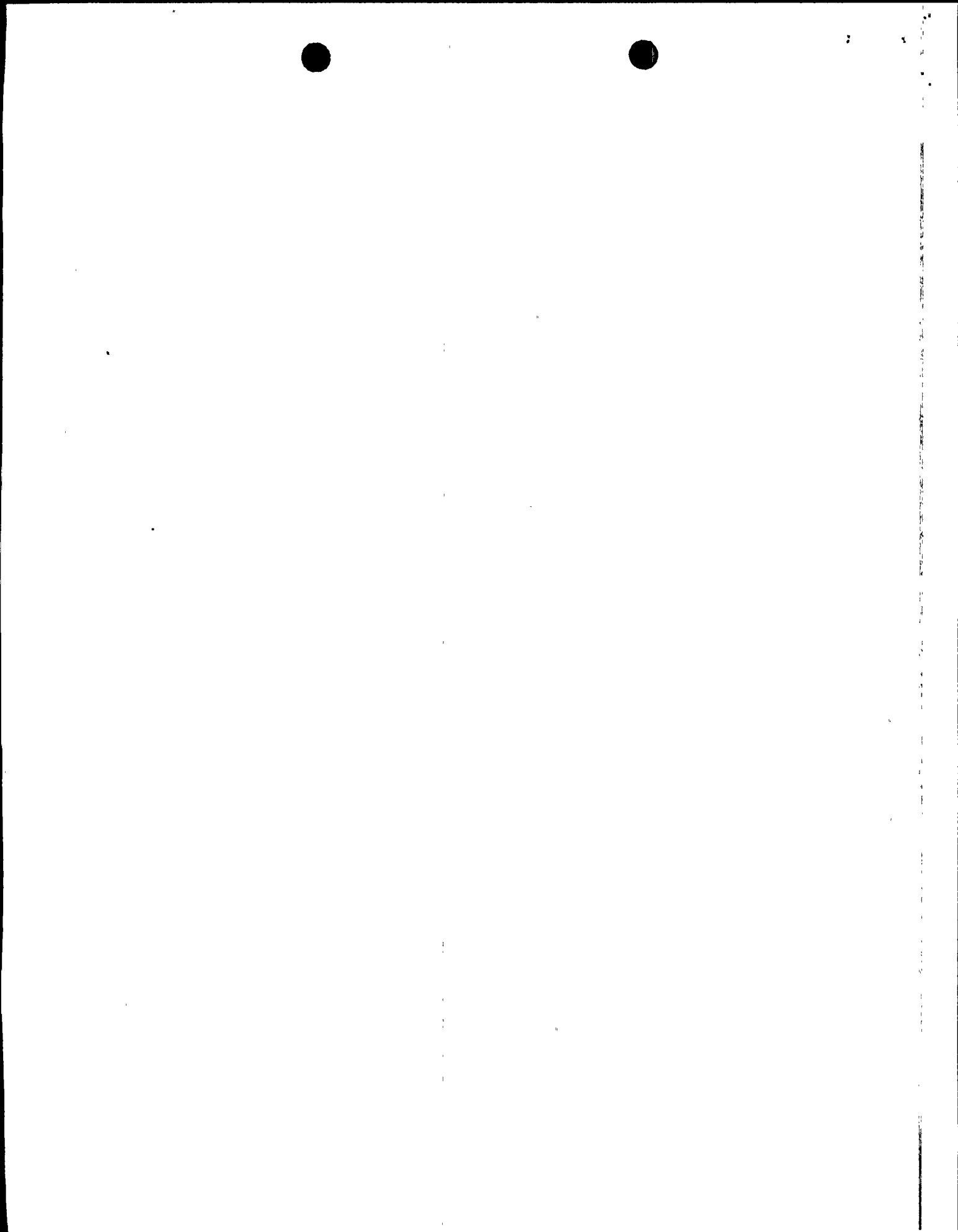
The applicant has identified a number of fire areas containing redundant conduits for ventilation systems required for safe shutdown equipment. These areas include 3-P-4, 3x, 3AA, 3-A-1, 6-A-1, 5-A-2, 6-A-2, 5-A-3, 6-A-3, 3I, 13E, 8-B-3, 8-B-1, 7-A, 8-C, 3-Q-1. The acceptability of the protection provided these conduits has been evaluated by ASB and found acceptable.

12) Fire Area 3-A-A, Figure 3-9

The applicant has identified redundant circuits associated with Boric acid tank heaters and controllers separated spacially in fire area 3-AA. The acceptability of the protection provided these conduits has been evaluated by ASB and found acceptable.

13) Fire Area 3-BB, Figure 3-9, Elevation 115 ft.

For the penetration area outside containment at elevation 115 ft., the applicant identified numerous redundant conduits containing cables essential to safe shutdown on drawing 502079. Because of the concentration of safety related conduits, we informed the applicant that we

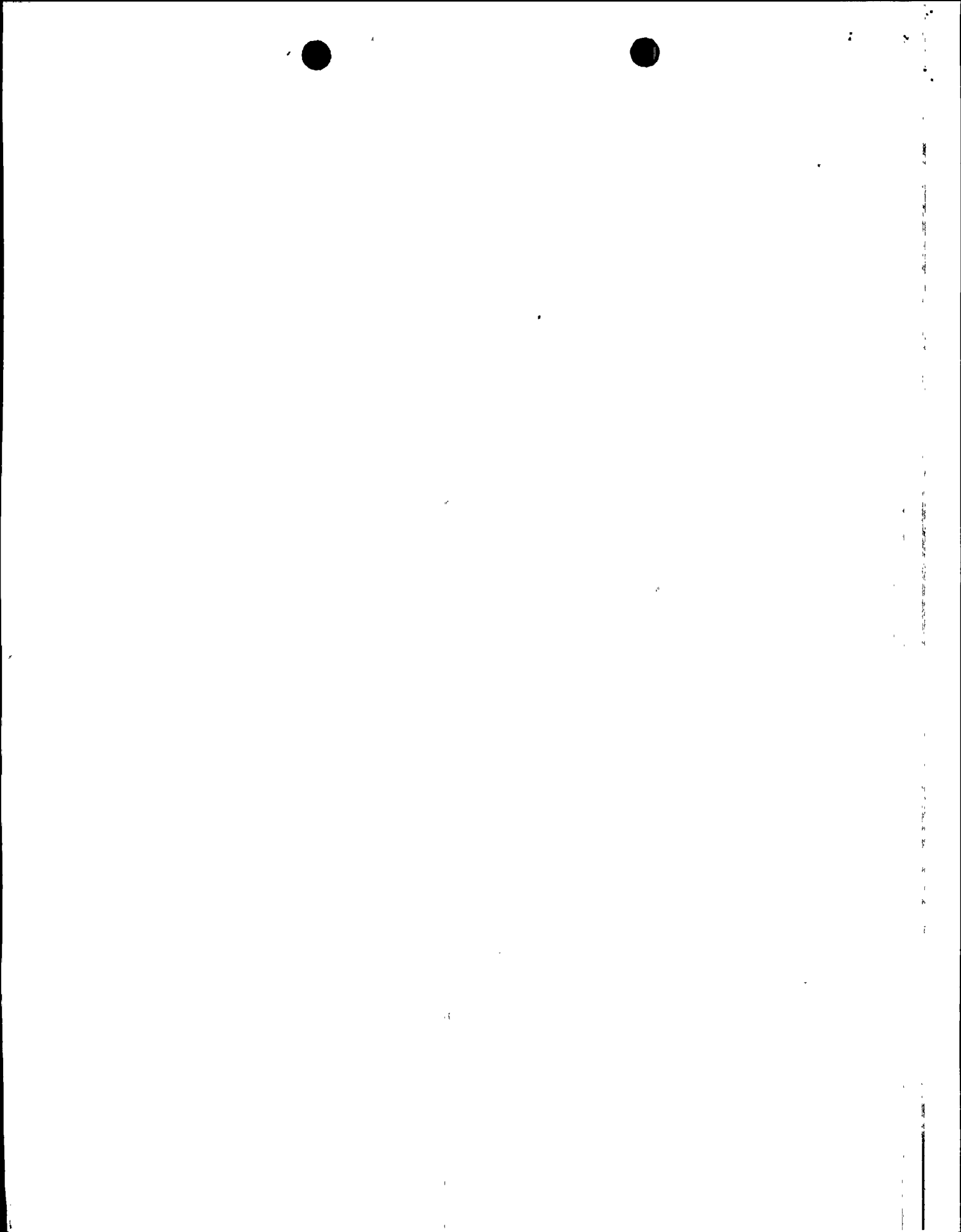


will require all of this area be protected by automatic sprinklers. In addition, the applicant was requested to identify all conduits where their redundant counterparts are separated by less than 15 ft. The applicant was informed that in addition to the general area sprinklers, redundant conduits with separation less than 15 feet should be encased with 2-hour rated fire barriers or with equivalent protection.

As a result the applicant identified cables essential for safe shutdown and committed to the installations of automatic sprinklers throughout fire area 3BB, at elevation 115 feet. We find this acceptable. However, for cables separated by less than 15 feet, the applicant has described existing protection or alternate shutdown methods as the equivalent protection to encasement with 2-hour rated barrier. Resolution as to the acceptability of the equivalent protection will be evaluated by ASB.

14) Fire Area 4A, Figure 3-7

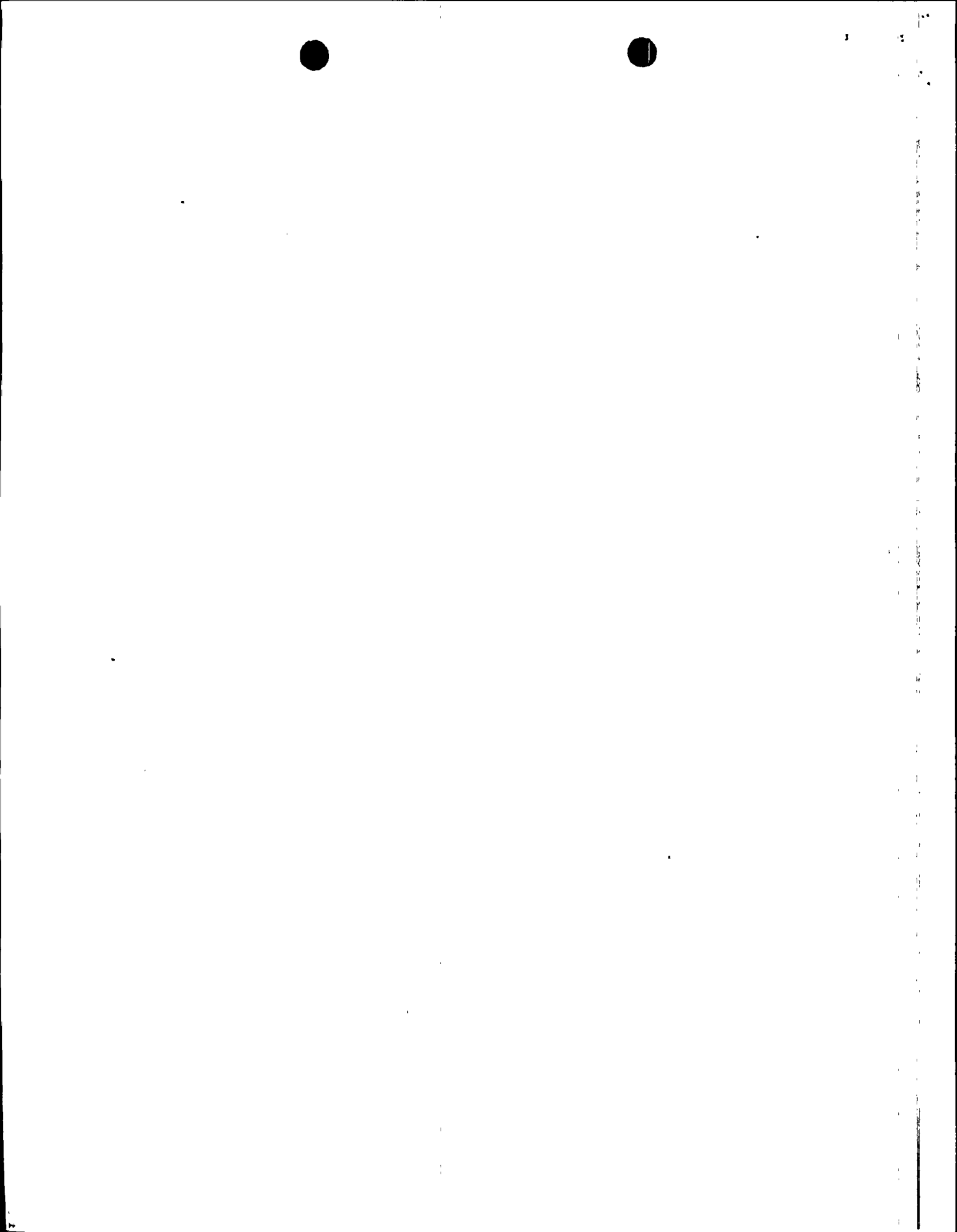
In the space above the suspended ceiling and in the space between partitions and surrounding walls of the laboratory area, three divisions of redundant conduit containing cables essential to safe shutdown have been identified by the applicant on drawings 57691, 57606, and 57602. The laboratory area below the suspended ceiling is protected by automatic sprinklers. The applicant proposed addi-



tional sprinklers above the suspended ceiling. The applicant was informed that this proposal is unacceptable. The additional sprinklers do not materially decrease the probability of failure of safe shutdown cables in case of fire in the space below. The suspended ceiling had many missing tiles, access openings, and vents and exhaust ducts passing through the ceiling. The ceiling with its many openings provided an unacceptable method of protection for the safe shutdown conduits located above the ceiling. The applicant was informed it is our position that the laboratory ceiling should be replaced with a membrane fire rated ceiling, with access openings strictly limited and of designs approved for use in fire-rated assemblies. In regard to safe shutdown conduits located in the wall space, the applicant was informed that we will require the conduits be encased with a 2-hour fire rated barrier or equivalent protection.

As a result the applicant has proposed that the electrical raceways be subdivided such that redundant divisions are separated from each other by two hour rated barriers versus encasement of conduits with a two hour fire rated barrier. The acceptability of the applicants proposal will be evaluated by ASB.

For the laboratory ceiling the applicant has proposed the replacement of the ceiling with a one hour fire rated ceiling. In addition, smoke detectors would be provided above the ceiling with the existing automatic sprinklers being retained below the ceiling. The acceptability of the applicants proposal has been considered by the staff and found acceptable.



15) Fire Area No. 4B, Figure 3-7

In the floor adjacent to the Remote Hot Shutdown Panel, there is a steel equipment hatch shown on drawing 57601 and Figure 3-8. Below this equipment hatch there is a room designated for use as an office that contains a whole-body radiation counter. This room is provided with automatic sprinklers, and removable ceiling panels are installed below the hatch. Because of the convenient locations to the laboratory and decontamination areas, we are of the opinion that there is a high probability that the room could become a storage area. If combustible materials would be stored in this room, a fire would subject the hot shutdown panel, located above, to an unacceptable fire hazard. The applicant was informed that it is our position that the removable panels remain in place and that signs reading "No Storage of Any Kind Permitted in This Room" or similar wording be posted in the room.

Subsequently the applicant provided additional information identifying redundant power circuits located above the suspended ceiling that are essential for safe cold shutdown. This additional information is being reviewed by the staff. The staff's conclusions will be evaluated by ASB.



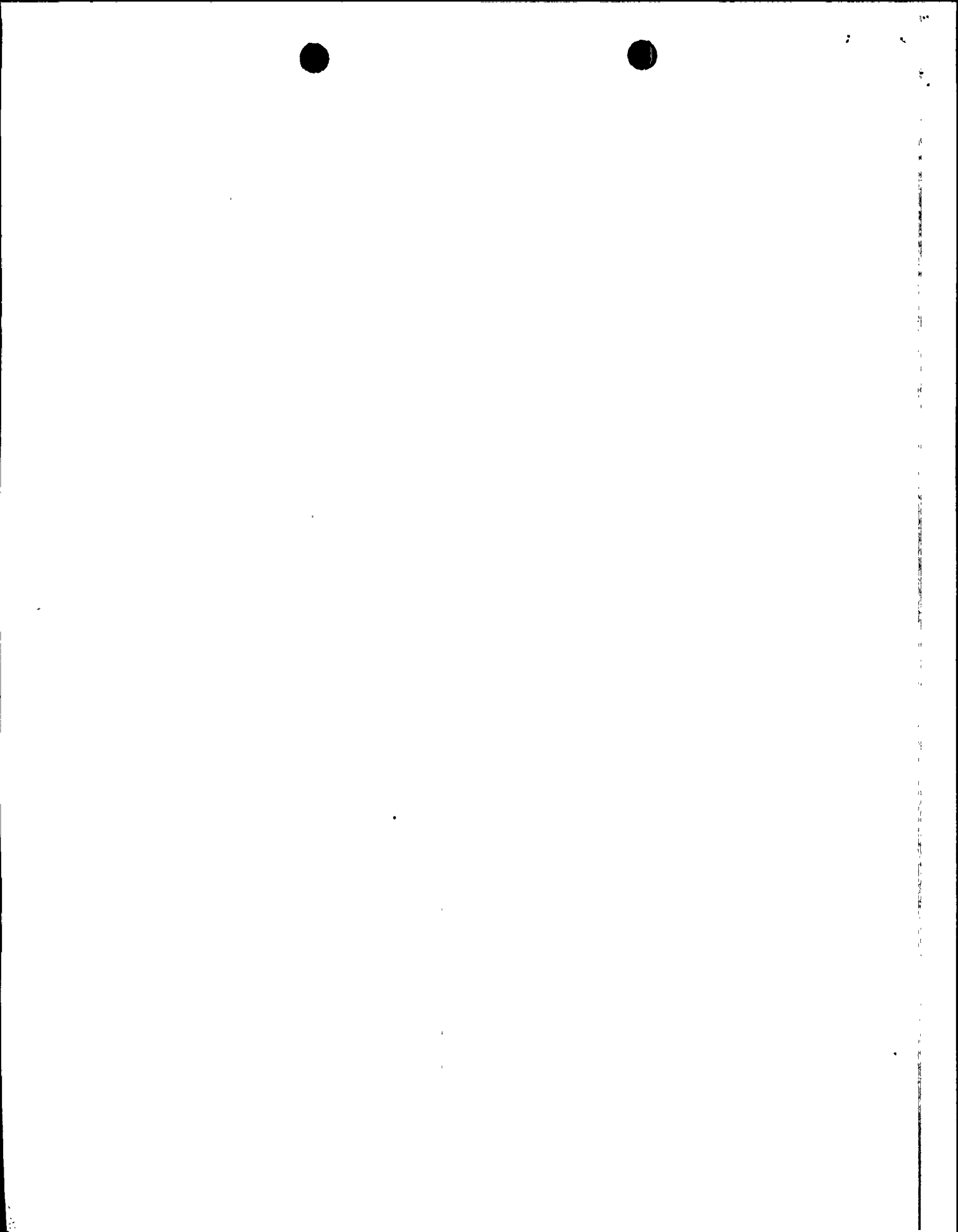
16) Below Fire Area No. 10: Figure 3-1

On the east wall of the 12 kilovolt switchgear cable spreading room below fire area No. 10, a number of conduits containing redundant cables essential for shutdown have been identified by the applicant on drawing 57572. These conduits, with one exception, are encased in the wall by two-inch thick non-combustible transite barriers and are therefore, effectively isolated from an exposure fire. We conclude that this encasement is acceptable. Conduits associated with bus "H" 4.16 kilovolt power division, however, are not encased. Since only one division of safe shutdown systems would be effected by an exposure fire in this room, we find the existing protection acceptable.

17) Fire Area No. 10, Figure 3-1

On the east and west walls of the fire area number 10, a number of conduits containing redundant cables essential for shutdown have been identified by the applicant on drawing 57568. These conduits are separated by a minimum of 10 feet. The main transformers are located outside of the east wall and are protected by a deluge water spray system. The wall between the conduits and the transformers is a two-hour rated fire barrier, with the exception of ventilating openings.

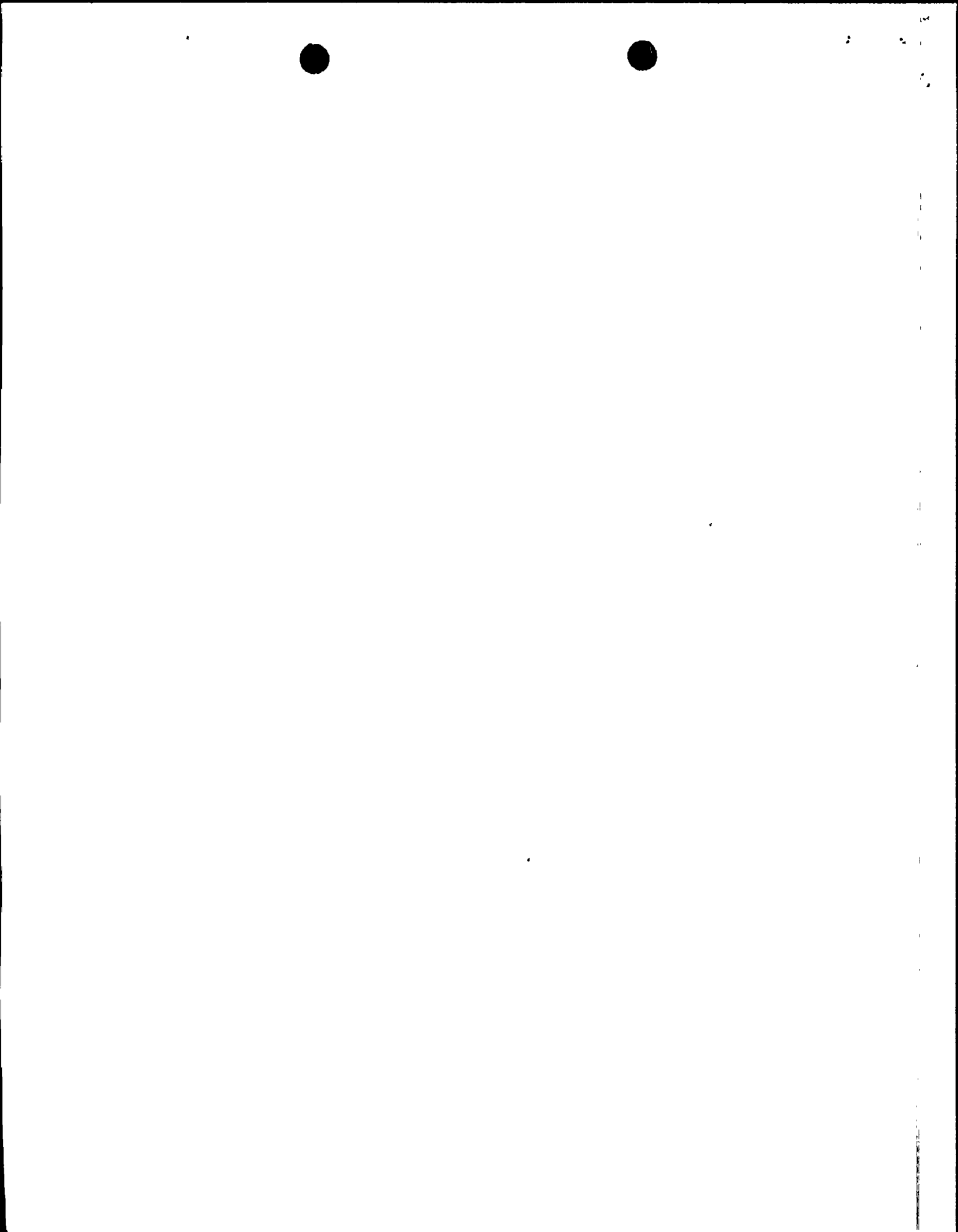
We informed the applicant that we require all conduits containing cable essential for safe cold shutdown in this room be identified and encased with a 2 hour fire rated barrier or equivalent protection.



As a result the applicant identified conduits containing cable essential for safe shutdown and proposed to box in the conduits to give two hour rated protection and to upgrade the ventilating openings in the east wall to a minimum two hour barrier. We find these proposals acceptable.

18) Fire Area 12A and 12B, Figure 3-2 (revised)

In the 4.16 Kv switchgear bus "G" cable spreading room (fire area 12B) conduit K2669 was identified by the applicant on drawing 57563 as containing essential shutdown cable associated with the redundant 4.16 KV switchgear bus "F". Likewise, the 4.16 KV switchgear bus "F" cable spreading room (fire area 12 A), conduit K2637 was identified as containing essential shutdown cable associated with the redundant 4.16 KV switchgear bus "G". However, during the site visit, the applicant indicated that these two identified conduits contain associated but not essential cables for safe shutdown. The applicant was informed that if these conduits do in fact contain cables essential for safe shutdown, we will require the conduits be encased with a 2 hour rated fire barrier or equivalent protection. Subsequently, in response to NRC questions 27, the applicant indicated that conduit K2669 contains an automatic start circuit for an auxiliary salt water pump. Based on our review of the auxiliary salt water pump automatic start circuit schematic diagram drawings 437594 and 437625, we agreed with the applicant that fire damage to this circuit would not prevent operation of the redundant auxiliary salt water pump. The existing design is, therefore, acceptable pending documentation of drawings 437594 and 437625.



19) Fire Area No. 12-D and 12-F, Figure 3-2 (Revised)

In fire area, Number 12-D and 12 F, a number of conduits containing redundant cables essential to safe cold shutdown were identified on drawing 57563.

We informed the applicant that we require all conduits containing cable essential for safe cold shutdown in this room be identified and encased with 2-hour fire rated barriers or equivalent protection.

As a result the applicant identified conduits containing cable essential for safe shutdown and proposed 2-hour fire rated barriers be installed between redundant divisions. The proposed barriers from ceiling to floor between versus encasement of the conduit provides equivalent protection. We find this proposal acceptable.

20) Fire Area No. 14A: Figure 3-2

On the southeast wall of the turbine building at elevation 104 ft. to 119 ft., redundant conduits containing safe shutdown cables have been identified by the applicant on drawing 57566.

The applicant indicated that these cables are associated with the two motor driven auxiliary feedwater pumps. Cables associated with the turbine driven auxiliary feedwater pumps (which are redundant to the motor driven pumps) are located elsewhere and are unaffected by a fire in this zone. To reduce dependence upon the turbine driven



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auxiliary feedwater pumps, the applicant has proposed encasement of these conduits within two hour rated barriers. The general area is provided with automatic sprinklers. We find the existing and proposed protection for these conduits acceptable.

21) Fire Area 3-BB, Elevation 100 and 115 feet, Figure 3-8 and 3-9

The applicant has identified control cable to redundant valves (HCV-637 and HCV-638) located in fire area 3-BB and subject to a single fire. These valves are associated with the Residual Heat Removal System and 1 of 2 valves are required for safe shutdown. The applicant stated that a fire affecting the current loop circuitry to these valves would cause the valves to open.

Sufficient information was not provided, in regard to the valves control circuitry, to permit an independent evaluation. However, the acceptability of the protection provided these conduits has been evaluated by ASB and found acceptable. The control circuit information is, therefore, not required.

22) Fire Area 11-D, Figure 3-1

The applicant has identified redundant conduits located in the corridor outside the three diesel generator rooms. These conduits contain control circuitry associated with the three diesel generators. Two of the three diesel-generators are required for safe shutdown. To protect this circuitry from an exposure fire the applicant has proposed a one hour rated ceiling with automatic sprinkler protection. The acceptability of this protection will be evaluated by ASB.

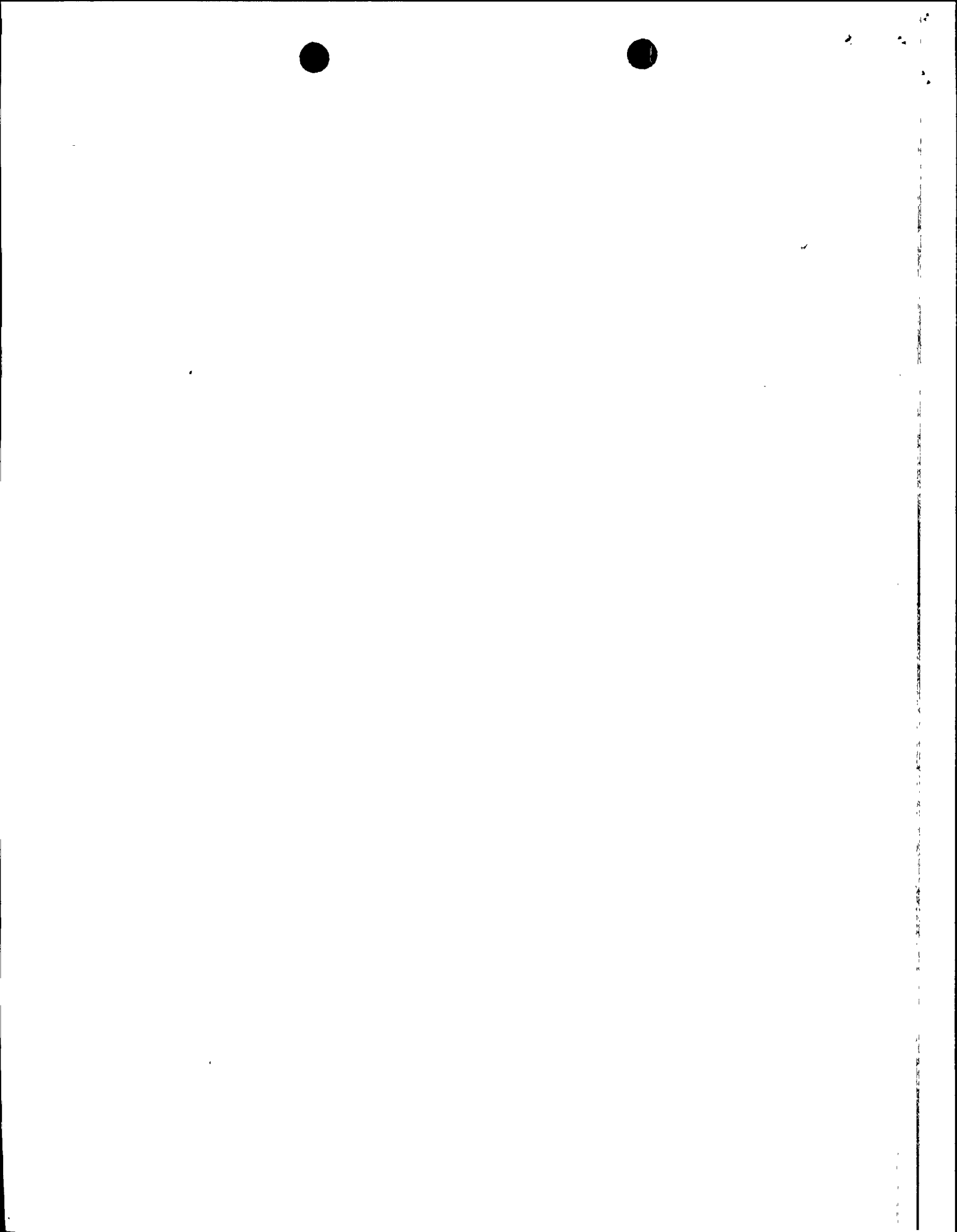


23) Fire Areas Involving Diesel Generator Fuel Transfer Pumps

The applicant has identified redundant conduits containing control and power circuitry associated with the diesel generator fuel transfer pumps. One of two fuel transfer pumps and one of two LCV's per day tank are required for safe shutdown. This circuitry is located in fire areas 5-B-2, 5-B-3, 5-B-4, 5-A-4, 11-A-1, 11-B-1, and 11-C-1. In fire areas 11-A-1, 11-B-1 and, 11-C-1, the applicant has indicated that failure of circuitry in each area could prevent the redundant fuel transfer pumps from performing their safety function when required. The applicant has indicated that circuit modifications and additional fire protection within these fire areas is necessary. The circuit modifications and additional protection has been documented by the applicant in response to NRC questions 26.

The circuit modifications include relocating relays associated with each of the redundant fuel transfer pumps to the hallway outside the diesel generator rooms (fire area 11D). We find this acceptable.

For our evaluation of the protection provided these relocated relays in fire area 11D refer to item 22. The acceptability of the additional protection provided in fire area 11-A-1, 11-B-1, and 11-C-1 and the protection provided in fire areas 5-B-2, 5-B-3, 5-B-4, and 5-A-4 will be evaluated by ASB.



24) Fire Area 7-A and 8-6, Figure 3-10 and 11

In regard to a cable spreading room fire, the applicant has indicated that a number of redundant safe shutdown systems can be operated from the hot shutdown panel or other remote panels and are, therefore, not affected by a cable spreading room fire. These redundant safe shutdown systems include:

1. Automatic start of diesel generators
2. Automatic loading of diesels
3. Control of valves FCV-95, LCV-106, 107, 108, 109
4. Control of motor driven auxiliary feedwater pumps
5. Control of RHR pumps
6. Control of the three charging pumps
7. Control of boric acid transfer pumps
8. Control of component cooling water pumps
9. Control of auxiliary saltwater pumps.

Sufficient information has not been provided to permit an independent evaluation in order for one to conclude that these systems will not be affected by a cable spreading room fire. We will pursue this with applicant and provide our evaluation in a supplement to this report.



25) Fire Area 5-A-4, Figure 3-8

In regard to a fire in the immediate proximity of the hot shutdown panel, the applicant has indicated that a fire right at the hot shutdown panel could affect a number of redundant safe shutdown circuits. The applicant further stated that damage to these circuits would not affect control of the safe shutdown equipment from the control room with the exception of the transfer switch (see item 26). These circuits are associated with the following redundant systems, 1) auxiliary feedwater systems, 2) boric acid transfer pumps, 3) component cooling waterpumps and 4) auxiliary salt water pumps. Sufficient information has not been provided to permit an independent evaluation in order for one to conclude that a hot shutdown panel fire would not affect control of safe shutdown equipment from the control room. We will pursue this with the applicant and provide our evaluation in a supplement to this report.

26) Fire Area 5-A-4, Figure 3-8

The applicant has indicated that a fire at the hot shutdown panel may transfer control away from the control room for the systems listed in item 25. The applicant has proposed to establish procedures to jumper out the hot shutdown panel's transfer switch in the event of a fire at the hot shutdown panel. The acceptability of this proposal will be evaluated by ASB.

